

# The Developing-8 Organization for Economic Cooperation: Synergies, Cooperation and Trajectories

Editors

Isiaka Abdulqadir Imam

Ismail Bello

Muhammad Imran



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## **Editors**

**Ambassador Isiaka Abdulqadir Imam**

The Secretary-General, The Developing-8 Organization for Economic Cooperation, Istanbul, the  
Republic of Türkiye

**Dr. Ismail Bello**

Department of International Relations and Diplomacy, Baze University, Abuja, Nigeria  
Secretariat of the Developing-8 Organization for Economic Cooperation, Istanbul, Republic of  
Türkiye

**Dr. Muhammad Imran**

The Mittal South Asia Institute, Harvard University, Cambridge, United States of America  
The Institute of Regional Studies, Islamabad, the Islamic Republic of Pakistan

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## **The Developing-8 Organization for Economic Cooperation: Synergies, Cooperation and Trajectories**

**Editors** Ambassador Isiaka Abdulqadir Imam  
Dr. Ismail Bello  
Dr. Muhammad Imran

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## ABOUT THE EDITORS

### Isiaka Abdulqadir Imam

Ambassador Isiaka Abdulqadir Imam is a seasoned Nigerian diplomat with a distinguished career in foreign affairs, international trade, and multilateral cooperation. He earned a B.A. in Political Science from the American University in Cairo and a Diploma in Foreign Service from the Nigerian Foreign Service Academy. With over three decades of experience, he has served in various capacities at Nigeria's Ministry of Foreign Affairs, holding key diplomatic postings in Brazil, Japan, South Africa, and Saudi Arabia. His expertise spans political and economic diplomacy, trade facilitation, and regional integration, making significant contributions to Nigeria's foreign policy engagements. He has been instrumental in advancing Nigeria's participation in international economic forums, including the ECOWAS summits, the China-Africa Ministerial Conference, and the Tokyo International Conference on African Development (TICAD). In April 2021, Ambassador Imam was appointed Secretary-General of the D-8 Organization for Economic Cooperation, a role in which he has worked to enhance economic collaboration among member states. His leadership has focused on promoting trade, investment, and development initiatives across D-8 countries.

### Ismail Bello

Dr Ismail Bello was a Senior Lecturer at the Department of Political and Administrative Studies, College of Humanities and Social Sciences, Kampala International University (KIU), Kampala, Uganda, from May 2021 to April 2023. He also taught at the Department of International Relations and Diplomacy, Baze University, Abuja, Nigeria and served as Adjunct supervisor & external examiner at National Open University of Nigeria. During his time in the academia, he taught undergraduate and graduate students and supervised over thirty graduate theses. Dr Bello completed Master in International Affairs and Diplomacy and Bachelor of Science Degree in Political Science respectively from Ahmadu Bello University in 2015 and 2011. He obtained PhD in International Studies from School of International Studies, Universiti Utara Malaysia. His PhD thesis was recommended for Best Thesis Award by the external examiner. Dr Bello's main research areas include sustainable development goals, international development, foreign policy, and security. Dr. Bello is also a Social Science consultant and researcher. He has worked on internationally funded projects. In addition to academic experience, Dr Bello currently works at the Secretariat of the Developing-8 Organization for Economic Cooperation; an Intergovernmental organization based in Istanbul, the Republic of Türkiye. In this role, he supports the Secretariat Sectoral Cooperation.

### Muhammad Imran

Muhammad Imran Mehsud is a Research Fellow at the Institute of Regional Studies (IRS) and a Research Associate in international relations at Harvard University. His research focuses on India-Pakistan transboundary water governance. Before joining IRS, he taught international relations at the Department of Political Science and International Relations at Hazara University Mansehra for 16 years. During this time, he taught at BS, MPhil, and PhD levels and supervised over 20 MPhil research theses. Imran has held a postdoctoral fellowship at the Mittal South Asia Institute, Harvard University, and a doctoral fellowship at the Centre of South Asian Studies, University of Cambridge. His postdoctoral research examined the effectiveness of the Indus Waters Treaty of 1960 in addressing current transboundary water issues between India and Pakistan. An overview of his research is featured in an interview published in the Mittal Institute's online newsletter. While at Harvard, Imran also audited three courses: "Water Resources in Developing Countries," "Modern China: 1894–Present," and "Civil War and Insurgency in the Modern World." Imran obtained his PhD and MPhil degrees from the School of Politics and International Relations, Quaid-i-Azam University Islamabad. His doctoral thesis focused on the Indus Waters Treaty



in the context of Pakistan's quest for water security, while his MPhil thesis explored hydropolitics in South Asia, particularly the India-Pakistan water disputes. He holds an MSc in Political Studies from the Area Study Centre, Quaid-i-Azam University Islamabad, and a BA from Islamia College Peshawar. In addition to his academic work, Dr. Imran has authored a novel with a central theme on childhood indoctrination and the challenging process of unlearning deeply ingrained early lessons.

## ABOUT THE CONTRIBUTORS

### Jahur Saleem

Ambassador Saleem has previously worked at the highest echelons of Pakistan Foreign Service, including as Foreign Secretary, Special Secretary, Additional Foreign Secretary, Head of the Foreign Service Academy and Director General for European Affairs. He also served as Pakistan's ambassador to Germany, Italy, Bosnia & Herzegovina, and Bahrain, as well as Pakistan's Permanent Representative to Food and Agriculture Organization (FAO), International Fund for Agricultural Development (IFAD), and the World Food Program (WFP). He was the elected President of 38-member country International Development Law Organization (IDLO) from 2020-2022. Ambassador Saleem studied English Literature, Government, International Relations and International Economics at Government College University, University of Pennsylvania, and Johns Hopkins. He also did a fellowship at Georgetown University and served as adjunct faculty member of prestigious universities in Europe and USA. He also contributes regularly to print and electronic media as an international relations expert.

### Morteza Damanpak Jam

Dr. Morteza Damanpak Jami is a seasoned Iranian diplomat, scholar, and researcher with extensive experience in international relations, economic diplomacy, and multilateral cooperation. He holds a PhD in International Relations from Allameh Tabatabai University, Tehran, and has played a key role in Iran's diplomatic engagements. Over his career at the Ministry of Foreign Affairs of Iran, he has served in various high-ranking positions, including Ambassador to Ethiopia, Denmark, and Portugal, as well as Director of ECO Affairs and Permanent Representative to the Economic Cooperation Organization (ECO). He has also been actively involved in international forums, representing Iran in key meetings such as the UNGA, UNIDO, IAEA, World Economic Forum, and D-8 Summits. Additionally, he was a member of the D-8 Eminent Persons Group (EPG) in 2014, contributing to the strategic development of the organization. Beyond diplomacy, Dr. Jami has made significant academic contributions as a researcher and author. He has served as a guest professor at various institutions, including the ECO College and the Faculty of International Relations in Iran. His published works include books on Iran's economic diplomacy, foreign relations, and regional cooperation, along with over 20 scientific articles on international affairs, energy, and disarmament. He has also participated in numerous think-tank discussions and policy debates worldwide, collaborating with institutions such as the Academy of Sciences of Russia, the Sasakawa Peace Foundation of Japan, and the RAISINA Forum of India. Currently, he is a Senior Fellow Researcher at the Institute for Political & International Studies (IPIS), where he continues to contribute to policy discussions and international diplomacy.

### Aleena Saeed

Aleena Saeed is an M.Phil. Scholar at the Department of Strategic Studies, National Defence University Islamabad, Pakistan. She's currently a research intern at the Institute of Regional Studies (IRS) Islamabad. With a keen interest in geopolitics, security studies, nuclear security, arms control, and disarmament, Aleena advocates for peace and stability in the world. She is a graduate of International Relations with distinction from the International Islamic University Islamabad. She has also been



associated with the Arms Control and Disarmament Center (ACDC) at the Institute of Strategic Studies Islamabad (ISSI).

### Joshua O Bolarinwa

Joshua Olusegun BOLARINWA, PhD, studied International Relations at the Obafemi Awolowo University (OAU), Ile Ife, Osun State for his first degree and his first Master's degree in Peace and Conflict Studies at the University of Ibadan. Bolarinwa had his second Master's degree and Ph.D in International Relations and Strategic Studies at the University of Lagos. He joined the Research and Studies Department of the Nigerian Institute of International Affairs (NIIA) Lagos, Nigeria in 2005 (now 20 years). He is an International Peace Academy scholar. He teaches International Relations, Strategic Studies, Peace Studies and Conflict Resolution in many universities in Nigeria, including the University of Lagos (UNILAG) and Lagos State University (LASU) amongst others (on visiting basis). He is a visiting scholar to the University of Calgary, Calgary, Canada. Bolarinwa is an expert in security and war studies, peace and conflict resolution, humanitarian intervention and multilateralism amongst others. Bolarinwa has published widely in the areas of his expertise and he is a Consultant with the Economic Community of West African States (ECOWAS) and a Member of African Union (AU) Net4peace Strategy Group. He is a member of the editorial board of the Journal of the Adebayo Peace Institute of the Redeemer's University, Ede; the editorial board of the journal of Institute of Peace and Conflict Resolution, Abuja and board member of the Journal of the Russian Science Academy, Moscow, Russia. He is currently a Professor and the Director of Research Department, Nigerian Institute of International Affairs (NIIA) Lagos, Nigeria.

### Mohd Faiz Abdullah

Datuk Prof Dr Mohd Faiz Abdullah leads the institute's policy development and Track-Two diplomacy, including through the ASEAN Institutes of Strategic and International Studies (ASEAN-ISIS) and the Pacific Economic Cooperation Council (PECC). Faiz is also the Malaysia representative to the ASEAN Regional Forum Experts and Eminent Persons (ARF EEP) meeting and Co-Chair of the Council for Security Cooperation in the Asia Pacific (CSCAP). His diverse career spans media, law enforcement and education and three decades of legal practice, focusing on corporate law and public interest litigation, as well as strategic and international affairs advisory to federal and state governments. In 2009, with Dato' Seri Anwar Ibrahim, Faiz co-founded the World Forum for Muslim Democrats, dedicated to providing a common platform for public intellectuals to articulate their views on Islam, reform, democracy and governance. Faiz has authored four books on topics ranging from Shariah reforms to the Fourth Industrial Revolution. He is the founding dean of the Selangor Business School. He graduated with First Class Honours in LLB from the International Islamic University of Malaysia, an MBA from the University of Southern Queensland, and a PhD from the Putra Business School. His first degree, prior to law school, was in English Literature from the University of Malaya.

### Qarrem Kassim

Qarrem Kassim's research focuses on economic security, global political economy, and the development of MSMEs. His recent work examines the growing geoeconomic impact of critical mineral industrial policies, the emergence of BRICS, long-term food security and Malaysia's strategic engagement with Central Asia. He has been featured in Nikkei Asia, the East Asian Policy Journal, FIDE Forum, The Edge and Bernama. He was previously a Big 4 consultant, specialising in strategic financial planning and public policy advisory, focusing on MSME policy formation and capital infrastructure projects. With experience spanning both public and private sectors, he offers insights into policy gaps between the firm and macro level, equipping decision-makers to navigate complex geoeconomic challenges.

### Yinka Sabuur Hammed

Yinka Sabuur Hammed holds a PhD in Economics from the prestigious Obafemi Awolowo University (OAU), Ile-Ife, Nigeria. His research focuses on Finance, International Trade and Investment Flows, Un-



certainty, Macroeconomic Policies, Growth, and Development. He has published in various international journals, including *International Review of Financial Analysis*, *Sustainability*, *Heliyon*, *Energy Research Letters*, *MethodX*, *Journal of Social and Economic Development*, and *Journal of Risk and Financial Management*. He also serves as a reviewer for several journals, such as *Scientific Africa*, *Energy Research Letters*, *International Review of Financial Analysis*, and *Emerging Markets Finance and Trade*. Currently, Yinka is a Research Fellow at the Nigerian Institute of International Affairs (NIIA), Lagos. He is also affiliated with the Bashir Adeniyi Centre for International Trade and Investment (BACITI), NIIA, Lagos, and the Centre for Econometric and Applied Research (CEAR), Ibadan. He has presented at various academic and professional forums, including the Circularity Conference held at the International Institute of Tropical Agriculture (IITA). Additionally, he is a contributing editor at *Arbitzer*, where he analyses local and global business and economic trends. Yinka is open to research collaborations in the fields of social sciences and education.

### Abla Abdel Latif

Dr. Abla Abdel Latif is currently the Chair of the Presidential Advisory Council for Economic Development and the Executive Director and Director of Research of The Egyptian Center for Economic Studies (ECES). She has been in both positions for the last seven years. She is an Egyptian national with a B.A. in economics from the American University in Cairo (AUC) (with highest honors) and an M.A. and Ph.D. in economics from the University of Southern California in Los Angeles, California. She was a Professor of Economics at the American University in Cairo (AUC) for over twenty years and has been selected to be a Life Time Research Fellow at the Economic Research Forum (ERF) and has authored a large number of publications in class A internationally refereed Journals. Her professional experience is also extensive, starting from being the Policy Unit Manager in the Industrial Modernisation Centre (IMC) to being the Minister of Industry's Advisor shortly after the 25th of January Revolution and until 2015 when she became the Chair of the Presidential Advisory Council for Economic Development. She was also a Member of the Central Bank of Egypt's Coordinating Council, and a Board Member of the National Bank of Egypt – the first female in this position, for over six years. She has also been a senior international expert in several UNIDO projects and other international organizations. In 2013, she was honored with membership of the Committee of Fifty, whose mission was to draft Egypt's Constitution following June 30, 2013. In that capacity, she was officially representing the Egyptian Federation of Industries, and one of only five females in the Committee. Dr. Abla received several awards among which a special award for outstanding achievement and excellence in research from Sussex University in the UK and a faculty excellence teaching award from the American University in Cairo. She is also a cofounder and Board Member of BASEERA (the Egyptian Center for Public Opinion Research), and "El Nidaa" Foundation for job creation for women and youth in Upper Egypt.

### Kenan Bağcı

Dr. Kenan Bağcı holds a Ph.D. in International Trade and Development from the University of St. Gallen, Switzerland. He has conducted extensive research on international trade, digital economy, industrial development, and labour markets, contributing to scholarly publications and policy reports. He has led and contributed to numerous research projects for international organisations, including the Islamic Development Bank, Organization of Turkic States, Asian Development Bank, and OECD. His work has provided key policy insights on trade policies, technology-driven economic transformation, skills development. Previously a Senior Researcher at SESRIC in Ankara, Türkiye, Dr. Bağcı recently joined Qatar University, where he continues his research on economic development and trade dynamics in emerging markets.



### Adesuwa O. Erediauwa

Adesuwa Osatohamwen Erediauwa is a Senior Research Fellow at the Nigerian Institute of International Affairs (NIIA) and the Head of the Bashir Adeniyi Centre for International Trade and Investment (BACITI), an initiative of the NIIA and the Current Comptroller General of the Nigerian Customs Service. The Centre is a trade and investment think tank dedicated to advancing economic development in Nigeria and across Africa through trade facilitation and investment promotion. Dr. Erediauwa holds a BSc (Ed.) in Economics, as well as an MSc and PhD in Economics from Benson Idahosa University, where she spent over 13 years as a lecturer, teaching and mentoring students before transitioning into full-time policy research. Her areas of interest are development economics, monetary policy, and international trade. As the Head of BACITI, Dr. Erediauwa oversees economic research, policy advisory, and stakeholder engagement, focusing on areas such as trade facilitation and investment promotion. She leads the weekly BACITI Economic Insight, a critical analysis publication that provides timely, data-driven perspectives on Nigeria's economic trends, trade policy decisions, and global economic developments. Dr. Erediauwa's research focuses on international economics, development economics and Monetary Economics. She has contributed to numerous classified government policy reports and research papers within the NIIA. Dr. Erediauwa has been invited as a panelist and presenter at international conferences, including the African Union Studies Annual Symposium, and the Centre for International Policy Research's Strategic Studies Conference. Dr. Erediauwa is passionate about leveraging research to influence economic policy and is committed to driving Africa's economic transformation through evidence-based policy recommendations, capacity building, and strategic stakeholder engagement.

### Talha Tufail Bhatti

An environmental scholar heading the 'Strengthening Regional Climate Resilience' program at the Institute of Regional Studies, Islamabad, Talha Tufail Bhatti's core interests are climate change and environmental policy. Bhatti holds analytical skills for regional and global climate dashboards, and co-authored reports for multilateral donor agencies like EU, ADB, GIZ. He taught undergraduate programs for 3 years in multiple federal universities like Quaid-I-Azam University and Bahira University where he produced more than 400+ climate informed advocates. Bhatti now regularly publishes short articles in print media on multiple topics like climate breakdown, Nature security, climate justice, and regional diplomacy and appears regularly on national and international media outlets like PTV World, News, VOA, FmSuno, Times, TEDx, Pakistan Radio, Inside Climate etc. He has also contributed in conferences like LCOY, QAU Action Summit as panelist and keynote speaker. He has held capacity building sessions in multiple universities and think tanks including FSA, NUST, BAU, BNU, QAU, HU, SZABIST, FCDO, CSCR, CRSS, Muslim hands, KIIR, CSCCC, SDPI, UNHCR - Geneva, UN-Women, US-State Department, US-AID, KCFR, WWF and SDGs Academy and also published three research articles in international journals "Fuel", "Environmental Management" and "Science of Total Environment", investigating applications of nanotechnology and smart agriculture.

### Stanley Akachukwu

Dr. Stanley Akachukwu is a research scientist specializing in international and development economics. He is a results-driven economist with over four years of teaching and research experience in public policy and international finance. Currently, Dr. Stanley is a member of the Bashir Adeniyi Center for International Trade Investment (BACITI) research team at the Nigeria Institute of International Affairs in Lagos, Nigeria. He holds a Ph.D. in Economics from the University of Ibadan, Nigeria, and has published work in reputable journals, including the African Development Review. He is a Network Member of the African Economic Research Consortium (AERC), Kenya. Dr. Stanley is passionate about utilizing research to drive growth in Africa.



### Sultan Habibullah Khan

Dr. Sultan Habibullah Khan earned his PhD in Plant Sciences from the University of Manchester, England in 2004. He has held research and teaching positions at the University of California, Berkeley and Sultan Qaboos University, Oman, and has been serving at the University of Agriculture, Faisalabad (UAF) since 2005. Currently, he is Professor at Center of Agricultural Biochemistry and Biotechnology (CABB) and Director of Center for Advanced Studies in Agriculture and Food Security (CAS-AFS), a flagship research centre established in collaboration with the University of California, Davis. With over 20 years of experience in agricultural biotechnology, genetics, and molecular biology, Dr. Khan's work focuses on genome editing, AI-driven precision agriculture, and climate-smart crop improvement. Under his leadership, CAS-AFS has led Pakistan's National Center for Genome Editing (NCGE), and pioneered digital agriculture tools like Kisan360. As Director of the D-8 Research Center for Agriculture and Food Security (D8RCAFS), Dr. Khan promotes regional collaboration among Developing-8 nations, strengthening food security through policy engagement, capacity-building, and joint R&D initiatives. He has trained scientists in genome editing, bioinformatics, and smart farming while leading strategic partnerships to enhance agricultural resilience. A recipient of national and international research fellowships, the Research Productivity Award (2014), and competitive grants, Dr. Khan has authored over 100 publications, including two co-authored books. His work continues to drive innovation, shape policy, and advance sustainable food systems across the D-8 region.

### Muhammad Asif Kamran

Dr. Muhammad Asif Kamran is a Professor of Agriculture Policy, Law & Governance at Faculty of Social Sciences, University of Agriculture Faisalabad (UAF), Pakistan. Prof. Kamran has more than 20 years of experience of working in different organizations including leading local and international funded projects. Prof. Kamran's academic interests include Natural Resources Governance, Institutional Analysis, Policy Analysis, Political Economy, Urban Economics, Water Governance, and Economic Analysis of Climate Change.

### Rashid Nazir

Rashid Nazir was graduated as soil and environmental scientist in 2006 from University of Agriculture Faisalabad, Pakistan and completed his PhD. Degree (2012) at Microbial Ecology department of Groningen University, Netherlands. He has post-doctoral research experience (May 2015 – April 2017) at Research Center for Eco-Environmental Sciences (RCEES), Chinese Academy of Sciences, Beijing - China. He has over 17 years of research experience in the field of fundamental and applied microbiology with particular focus on microbial interactions, bioenergy and antimicrobial resistance. With national research funding (Higher Education Commission, Pakistan and COMSATS), Dr. Nazir succeeded for several international research grants including ISDB-TWAS, ANSO, TWAS-COMSTECH. Moreover, Rashid Nazir won awards and distinctions like CAS-PIFI (Chinese Academy of Sciences, China), Best Young Researcher Award (2022-2023 at CUI-Abbottabad), Research Productivity Awards (CUI-Abbottabad), and Travel Grants (HEC, ISME, FEMS). Dr. Nazir is experienced in peer-review (reviewer for varied journals and editor for PlosOne) and has established a regional chapter i.e., American Society for Microbiology (ASM-Himalaya) at COMSATS Abbottabad. His publication indices include Book Chapters: 03, peer review research articles: 42, h-index: 20, i10-index: 26, Citation: 1919.

### Abdullahi Balarabe Inuwa

Dr. Abdullahi Balarabe Inuwa is a microbiologist and environmental scientist with extensive academic and research experience. He holds a PhD in Environmental Sciences from COMSATS University Islamabad, Pakistan, with a specialization in tracking antibiotic resistance genes in microalgae-based wastewater treatment systems. He also earned an MSc in Environmental Microbiology and a BSc in Microbiology from Bayero University Kano, Nigeria. Dr. Inuwa has been a lecturer at Bayero University,



Kano, since 2012, where he has contributed to teaching and research in microbiology and environmental sciences. His research focuses on wastewater treatment, antibiotic resistance, and bioremediation, and he has published widely in peer-reviewed journals. Dr. Inuwa has made significant contributions to environmental microbiology, particularly in exploring biosurfactants for heavy metal removal and assessing the efficiency of microalgae-based wastewater treatment systems. His work has been featured in leading journals such as the International Journal of Environmental Science and Technology and Antibiotics. He has collaborated with researchers worldwide, advancing knowledge in wastewater treatment technologies and environmental sustainability. With a strong background in microbiology and environmental science, Dr. Inuwa continues to impact research and academia, addressing critical issues in microbial ecology and environmental biotechnology.

### Ozgur Dogan

Ozgur Dogan graduated as an environmental engineer in 1997 and obtained his MSc degree (2003) in Environmental Engineering from Marmara University. He completed his PhD. Degrees (2010) at Environmental Engineering from Gebze Technical University. He has over 25 years working experience and since 1999, he has been working as a chief researcher in The Scientific and Technical Research Council of Turkey, Marmara Research Center, Climate and Life Science Vice Presidency (TUBITAK-MRC CLS-VP) in Resources Efficiency and Clean Energy Research Group. His PhD thesis is on “Research on Recovery And Disposal Methods Of Phosphate Sludge From Automotive Industry”. He has over 20 years of experience on design of biological treatment system, wastewater characterization studies, characterization and disposal of solid waste and hazardous material & waste, obtaining valuable chemicals and/or energy recovery from solid wastes by bio degradation.

### Chinyere Rita Agu

Chinyere Rita Agu (PhD) is a Senior Research Fellow with the Nigerian Institute of International Affairs (NIIA). She is Head of the International Law Division of the Research and Studies Department of NIIA. Her research interests include International Trade and Investment law, Human Rights law, International Development law, and Migration law. She obtained her Bachelor of Laws (LL.B Hons.) from Enugu State University of Science & Technology, Nigeria, Master of Laws (LL.M) from Imo State University, Owerri, Nigeria and Doctor of Philosophy (Ph.D) in Law from Abia State University, Uturu, Nigeria. She has practised in different reputable law firms in Nigeria and was appointed Special Assistant (Legal) to the Secretary to the State Government of Imo State (2007-2010). She has over eleven years of research experience in academic and applied research and has conducted fieldwork for international organisations, regional organisations and think-thanks including the Samuel Hall FZE/International Organisation for Migration(IOM) Regional Project on ‘Community Mapping and Socio-Economic Assessment of Areas of Return in West and Central Africa’-2018 and through NIIA worked with NEPAD Office, Abuja on African Union Development Agency/New Partnership for Africa’s Development (AUDA-NEPAD) Nigeria second review of the Federal Republic of Nigeria on corporate governance. She has published in both international and national journals/books. She is a member of the Nigerian Bar Association (NBA) Lagos Branch, Nigerian Society of International Affairs (NSIA) and Owerre-Ezukala Development Union Women’s Wing Lagos (served as President).

### Soroush Ghazinoori

Soroush Ghazinoori is a full professor of Technology Management and Entrepreneurship at the Faculty of Management and Accounting, Allameh Tabatabai University. He serves as the chair of the Iran National Research Institute of Science Policy (NRISP). With a prolific academic career, Ghazinoori has published over 140 research papers and authored 7 books. He has also supervised 99 Master’s and Ph.D. theses. His research areas include Science and Technology (S&T) Policy, Strategy and Innovation, and Business Ecosystems.



### Rasoul Rajaei

Rasoul Rajaei completed his graduate degrees in Control Systems Engineering and has concurrently studied Technology Management at Allameh Tabatabai University. He has conducted various research articles focusing on complex networks. Rajaei is a graduate member of the IEEE, and his research interests primarily lie in the fields of innovation networks, innovation systems, complex networks, and international collaborations in science and technology. Additionally, he serves as the Executive Director of the D-8 Technology Transfer & Exchange Network and collaborates with Pardis Technology Park in the area of technology exchange.

### Salar Ghadiri Alamdari

Salar Ghadiri Alamdari completed his graduate studies in Mechanical Engineering and has a strong interest in research and development related to innovation ecosystems. He is currently serving as a Technology Cooperation Officer with the D-8 Technology Transfer and Exchange Network (TTEN).



## PREFACE

This book presents a nuanced and comprehensive examination of the Developing-8 Organization for Economic Cooperation, encapsulating its historical evolution, sectoral initiatives, challenges, and future prospects. Beginning with an insightful account from the Istanbul Seminar to the Istanbul Declaration, the book contextualizes the formation, objectives, and structural dynamics of the D-8, setting a solid foundation for understanding its role in fostering South-South cooperation. The book methodically explores the D-8's multisectoral initiatives across agriculture, trade, industry, energy, and tourism, highlighting key achievements such as the Dispute Settlement Mechanism, the Preferential Trade Agreement, and the establishment of specialized research centers. Sector-specific analyses provide a critical lens on the D-8's potential in high-technology production, sustainable energy, and regional integration, with a focused case study on Nigeria's energy sector. Furthermore, the book offers an in-depth look at the economic profiles and sectoral opportunities of member states, emphasizing the significance of intra-trade relations in driving economic development. The role of education systems in transitioning D-8 countries towards knowledge-based economies is meticulously examined, alongside Malaysia's strategic economic cooperation under the MADANI government's vision. A critical analysis of the D-8's legal and policy frameworks underscores their role in shaping economic cooperation, while discussions on climate-smart agriculture and sustainable energy highlight future pathways for ensuring food security and economic resilience. Concluding with an evaluative discourse on the D-8's challenges and opportunities within the global economic landscape, this book serves as an essential academic resource, offering scholars, policymakers, and stakeholders a well-rounded understanding of the D-8's trajectory and its potential for fostering sustainable economic development in the Global South. The book will appeal to students, scholars, researchers of economic, international relations, history and management in general. It will also be helpful for public policymakers in the D-8 and outside the member states that are interested in understanding the dynamics, progress, cooperation and challenges of the D-8.





## The Rationale for International Economic Cooperation and the Role of the D-8



Ismail Bello <sup>1,2</sup> & Aleena Saeed <sup>3</sup>

<sup>1</sup> Secretariat of the Developing-8 Organization for Economic Cooperation, Türkiye

<sup>2</sup> Department of International Relations and Diplomacy, Baze University, Abuja, Nigeria

<sup>3</sup> Department of Strategic Studies, National Defence University, Islamabad, Pakistan.

### Abstract

International Organizations (IOs) have become instruments that promote inter-governmental collaboration and cooperation. In contemporary times, states face globalized issues including climate change, transnational terrorism, poverty, territorial disputes, increasing the demand for collective action. IOs provide a platform to address challenges that threaten economic growth. By establishing trade relations and introducing free trade areas, the international economic organizations encourage trade and contribute to collective economic growth of nations. International economic organizations face criticism as well, for which necessary reforms are required to ensure the sustainable economic growth. With the aim of promoting collective growth between developing Muslim economies, D-8 Organization for Economic Cooperation is a cross-regional organization having a global structure rather than a regional one. The study employs qualitative methodology to argue that D-8 is unique from other international economic cooperation organizations. D-8 organization includes exclusively Muslim-majority developing countries and is non-political in nature unlike G-20 and BRICS. The organization aims to reduce reliance on Western institutions involving North-South cooperation frameworks and promotes South-South cooperation model. The D-8's focus on increasing intra-trade among its members aligns with the principles of South-South Cooperation's objective of reducing dependence of developing countries on the Global North.

### Keywords

International Economic Organizations · Development · D-8 Organization · Trade



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Corresponding author: Ismail Bello [Ismail.bello@developing8.org](mailto:Ismail.bello@developing8.org), [ismailbello12@gmail.com](mailto:ismailbello12@gmail.com)

## The Emergence of International Organizations in a Globalized World

International Organizations (IOs) are formal entities, established by sovereign states to address shared challenges in the global arena. IOs derive their legal personality from certain agreements and treaties signed by member states to facilitate cooperation and integration (Pease, 2018). IOs can be categorized in different ways, based on their membership rules like UN has open joining policy and NATO has selective joining policy focusing on certain factors, and can be based on governmental or nongovernmental actors as well. According to Realist school of thought in International Relations, States create institutions to preserve the existing international order that serve their interests. The Institutional school of thought provides a different viewpoint and claim that states develop institutions to facilitate cooperation prospects, overcome collective problems and enhance collective well-being (Weiss & Wilkinson, 2023). The book focuses on governmental organization category in which states create IOs to enhance cooperation and collaboration in a variety of areas to further common goals.

In the contemporary era of globalization, the number of international institutions has increased significantly. Past 50 years has seen an increase in international cooperation and institution-building, including an overall boom in intergovernmental interaction, treaties, and international organizations. Continued interest and collaboration in developing and strengthening International organizations can be expected from nation states to resolve the challenges presented by this increasingly interconnected world (Nye & Donahue, 2000). Modern day problems including climate change, Ukraine war, and COVID 19 pandemic, increase the demand for collective action, especially mutual recognition, delegation and consensus. Governments have become more aware of the prospective benefits of giving up some of their sovereignty to international organizations specifically devoted to addressing global challenges (Klabbers, 2002).

Even though there are traces of international cooperation mechanisms throughout history, including the late-medieval Hanseatic League, the ancient Greek councils and early examples like the Swiss Confederation, formal establishment of organizations resembling those of today did not occur until the nineteenth century. In the discipline of international relations, the Congress of Vienna (1814–1815) is rather significant. After a period of instability marked by turbulence and violence following the French Revolution, it heralded the creation of a modern political and legal framework for Europe (Lesaffer, 2015). States started to realize at this point that the existing structure was inadequate for dealing with emerging disputes amongst them (Reinalda, 2014). In this regard, international organizations expanded significantly in a variety of domains beyond communications and transportation. To address health-related challenges, for instance, the International Office of Public Health was established in 1903. This era also saw the emergence of early precursors of modern international organizations in the field of economics, including the International Copyright Union (1886), International Sugar Union (1902), and the International Institute for Agriculture (1905) (Klabbers, 2002).

However, the end of World War I marked the beginning of the significant expansion of international organizations. Established on January 10, 1920, by the Treaty of Versailles, the League of Nations was the first international governmental organization with extensive powers. Its main objective was to provide a dispute settlement mechanism for states. But even though it was created, the League of Nations did not become very popular and was formally disbanded when World War II broke out (Library of Congress). International organizations are transitioning from merely establishing and limiting states' respective spheres of influence to becoming instruments that promote collaboration among governments (Klabbers, 2002).

International economic organizations contribute significantly to the global economic growth. D-8 Organization for economic cooperation is one such international organization, established with the

aim of enhancing cooperation among developing Muslim-majority countries. This chapter utilizes qualitative methodology to analyze D-8 Organization as a unique organization than other international economic organizations.

## Economic Cooperation as a Driver of Development and Stability

Economic wellbeing is necessary to ensure the creation of societies in which generations could thrive. The pursuit of peace brings about unprecedented economic growth which leads to development and stability in this chaotic world. Following the tragic end of Second World War, Japan adopted the Yoshida doctrine, shifting from its former aggressive policy to peace and reconstruction approach in international relations. Through strategic alliances and partnerships with other countries, Japan prioritized economic development over pursuit of enhancing military capabilities. Education and technological innovation were made the cornerstone of the country's post-war recovery strategy and resultantly Japan emerged as the third largest economy in the world (Baibourtian & Pathak, 2024). This suggests that when resources are diverted from military expenditures to nation-building endeavors, infrastructure projects gain momentum and trade flourishes, contributing to the economic progress of a country.

Economic Interdependence has evolved as a tangible force over the decades, shaping global dynamics in the international stage and is not merely an abstract idea. Post World War II era witnessed the emergence of the US as a hegemonic power and the foundations for economic interdependence were laid as well. Advocating for interconnected economies and introducing institutions, the theoretical frameworks particularly Liberalism projected a vision of peace and stability during that time (University of Exeter, 2024).

Far beyond bilateral trade, economic interdependence introduces a culture of cooperation that drives development and stability in the world. Economic institutions like World Trade Organization, established on the foundations of economic interdependence, provides forum for conflict resolution and dispute settlement (Baibourtian & Pathak, 2024). This way international institutions promote global stability and foster development initiatives.

Due to the uncertainty surrounding security and stability, the possibility of conflict discourages both domestic and foreign investment. Resolving disputes promotes an atmosphere where investments can thrive by sending a favorable message to the business community. Economic zones and regional cooperation are often made possible by successful conflict resolution mechanisms, developing inter-connections that are advantageous to all parties involved. The European Union (EU) serves as an example of how historically hostile countries might come together to form economic partnerships after settling long-standing disputes. Regional cooperation reduces the possibility of violence while simultaneously promoting economic integration and a sense of shared stability (Baibourtian & Pathak, 2024).

Trade connections naturally prevent armed conflict. In the event of conflict, countries involved in economic transactions simply are at a risk to lose too much (Copeland, 2015). Trade relations function as a conduit for mutual benefits and therefore shifts the momentum from aggression to harmony and peace. The economic ties between great powers exemplify how economic fallout prospective will shape geopolitical tensions. Cooperation between countries generate 'mutual benefits', not only in terms of economics but also in political realm (O'Farrill et al., 1999). In the contemporary times, nation states are facing globalized challenges which require collective action including issues of environmental sustainability, transnational terrorism threats and pandemics amongst others. In this sense, cooperation between states enables them to resolve problems that extend beyond borders and require collective action.



The world economy is under recovery from the supply chain disruptions in the aftermath of pandemic, energy crisis in the wake of Russia-Ukraine ongoing war and a boost in inflation. Global economy remain resilient despite all the setbacks. Multilateral cooperation can guarantee improved growth outcomes for nations (Gourinchas, 2023). Amidst this, international organizations play an important role in addressing challenges that threaten economic growth through facilitating cooperation between countries. Strengthening international organizations ensures resilience towards global economic disruptions and crisis. The next section provides overview of some international and regional economic organizations that facilitate cooperation.

## Overview of Other Economic Cooperation Organizations

In the global economic landscape, international economic organizations are significant. These organizations ensure economic stability, trade relations and promote development initiatives in an increasingly globalized world. Bretton Woods Institutions, established in 1944, including the World Bank and International Monetary Fund (IMF), are major economic organizations. After the World War II, Bretton Woods Institutions were created for the purpose of rebuilding post-war economy, introduce foreign exchange rate system and enhance international economic cooperation (Chen, 2024). Even though the Bretton Woods agreement dissolved in 1970s, its institutions World Bank and IMF continue to play an important role in Global economy (Next IAS Team, 2024). There are other important economic cooperation organizations vital in global economic realm, apart from these two institutions. The table represents the overview of some economic cooperation organizations and their contribution to global economic stability so far.

**Table 1**

*Overview of Economic Cooperation Organizations*

	<b>Founded</b>	<b>Members</b>	<b>Purpose &amp; Functions</b>	<b>Key Achievements</b>
Organization for Economic Cooperation and Development (OECD)	1961	38	Promotes economic growth, trade, and development among high-income nations, focusing on policy coordination and economic research.	Introduced global tax reform policies and regulated international trade
Group of Twenty (G20)	1999	19 countries + EU	Global Forum for discussing economic issues and financial stability.	Coordinated global response to the 2008 financial crisis and the COVID-19 pandemic economic recovery.
BRICS	2006	Brazil, Russia, India, China, South Africa	Advocate for promoting multipolarity in global governance and countering western influence in international institutions.	Established the New Development Bank (NDB) and increased trade and investment cooperation among member states.
Economic Community of West African States (ECOWAS)	1975	15	Promotes economic integration, free trade, and regional stability in West Africa.	Implemented a common external tariff in 2015, facilitated peacekeeping missions, and supported regional economic development projects.

	<b>Founded</b>	<b>Members</b>	<b>Purpose &amp; Functions</b>	<b>Key Achievements</b>
Southern African Development Community (SADC)	1992	16	Focus on regional integration to alleviate poverty, support socially disadvantaged people, improve standard of life in Southern Africa through economic cooperation, infrastructure development, and political stability.	Promoted infrastructure development, regional peace, and trade liberalization through the SADC Free Trade Area.
Association of Southeast Asian Nations (ASEAN)	2015	10 ASEAN members	Aims for economic, cultural and security cooperation in Southeast Asia.	Created a single market and production base, significantly increasing intra-ASEAN trade and investment.
Economic Cooperation Organization (ECO)	1985	10	Promotes regional trade, connectivity, and economic collaboration in Central and South Asia, the Middle East, and Eurasia.	Developed major transport corridors, including the ECO Trade and Development Bank, to enhance economic connectivity.
South Asian Association for Regional Cooperation (SAARC)	1985	8	Encourages economic, social, and cultural cooperation in South Asia, though hampered by regional tensions.	Launched the SAARC Development Fund and facilitated regional projects in trade, energy, and infrastructure.
European Free Trade Association (EFTA)	1960	4	Facilitates free trade, removal of trade barriers and economic relations between countries outside European Union.	Negotiated free trade agreements with multiple global partners, boosting economic opportunities for member states.

During economic crisis, international economic institutions support global economy through financial assistance and policy advice. Economic organizations enhances development initiatives to improve living standards in developing countries. By establishing trade relations and introducing free trade areas, the international economic forums encourage trade and contribute to collective economic growth of nations. In addition to these roles, economic organizations serve as platforms for addressing global economic challenges to enhance collaboration and cooperation between countries (Next IAS Team, 2024). International economic organizations face criticism as well, for which necessary reforms are required to ensure the sustainable economic growth.

## The D-8 Organization for Economic Cooperation

D-8 Organization for Economic Cooperation, established in June 1997, in Istanbul, is a cross-regional international organization. Members of D-8 stretch from Southeast Asia to Africa, with Bangladesh, Egypt, Indonesia, Iran, Malaysia, Nigeria, Pakistan and Turkiye as its founding members and Azerbaijan as a recent addition. The organization includes some of the world’s largest Muslim economies and provide a platform to enhance connectivity, promote trade, development and economic growth. With



the aim of collective growth, D-8 is a forum to develop common approaches to shared economic challenges and architecture (Ministry of Foreign Affairs Pakistan, 2022). The organization is a strategic grouping of like-minded nations to enhance their economic standing (Kadir, 2025).

In terms of geographical area and the principles of the organization, it has a global character rather than a regional one. It has open joining policy towards all developing countries in the world. The main areas of cooperation in D-8 framework are trade, transportation, industry, energy, agriculture and food safety, health and tourism (Ministry of Foreign Affairs Turkey, n.d.). The D-8 member states have a combined population of 1.2 billion, or 15% of the world's total population. An estimated USD 2.1 trillion is the market value of the D-8 member states, which represents 6.88% of the global trade total in 2023 (Developing-8 Organization for Economic Cooperation, 2025).

D-8 is a diverse economic organization focusing on key economic sectors including agriculture development to ensure food security and safety, development of small and medium enterprises, energy, science, technology, industry, infrastructure, trade, investment and transportation. These areas of cooperation align with the organizations objective of facilitating shared development goals and addressing challenges in today's evolving global landscape. Enhancing cooperation across these multiple sectors is necessary to ensure sustainable development, economic empowerment, poverty eradication, agricultural productivity and shared prosperity among member states.

Unlike other international economic cooperation organizations, D-8 organization includes particularly Muslim-majority developing countries. The organization includes leading Muslim economies, also members of OIC (Organization of Islamic Cooperation), across the globe and adds to the uniqueness of the organization. It aims to reduce reliance on Western institutions involving North-South cooperation frameworks and promotes South-South cooperation model. The purpose of Developing 8 Organization is non-political in nature unlike G20 and BRICS and it advocates for economic growth between member states.

## Trade and Economic Integration in D-8

One of the main focus areas of D-8 Organization is to enhance intra-trade among members and ensure sustainable economic growth in the light of unprecedented global challenges. At the fifth D-8 Summit, which Indonesia held in Bali in 2006, the eight founding nations signed the Preferential Trade Agreement (PTA) to reduce tariffs and encourage smooth trade flow between members. The D-8 PTA came into effect in 2011 (Developing-8 Organization for Economic Cooperation, 2025). Although it faces several challenges, the 11 Summit of D-8 showcased hope for the implementation of PTA. To further enhance the economic cooperation among members, D-8 has embarked on the journey to establish D-8 New Generation Barter Trade System (D-8 NGBT) in July 2024. While serving as an instrument to boost trade transaction volume among D-8 member countries, the new barter trade system will be an alternative solution to settle trade balances. It is said to increase the intra-trade of D-8 countries by 50 million USD in ten years after establishment (Developing-8 Organization for Economic Cooperation, 2024). Interestingly, the Cairo Declaration (2024) adopted in the 11<sup>th</sup> Summit of D-8 showcases potential areas of expansion in the organization, underlining the importance of sea-based economy, utilizing emerging technologies like AI in Healthcare policy, supporting initiative to establish D-8 Economic Think Tanks network, acknowledging the significance of developing energy-efficient technologies and facilitate visa procedures for businessmen, amongst other areas. The digital economy, green economy, and halal-based industry are the future economic sectors. The artificial intelligence (AI) and sustainable renewable energy domains present opportunity for D-8 countries to optimize economic prospects (Kadir, 2025).



## Organization of the Book

The book brings together diverse perspectives from experts on the D-8 Organization for Economic Cooperation and constitutes thirteen chapters apart from the introduction and conclusion. It is essential in understanding the potential and working of the organization to enhance cross-regional cooperation among Muslim countries. In Chapter 2, authors analyze the initiatives, achievements and challenges of the cooperation domains under D-8 Organization. The establishment of D-8 Organization is discussed in terms of enhancing South-South Cooperation model. This chapter examines the success of sectoral initiatives of the organization notably the Dispute Settlement Mechanism (DSM) and Trade Facilitation Strategies (TFS) protocols under the D-8 Preferential Trade Agreement (D-8 PTA), the establishment of the D-8 Research Center for Agriculture and Food Security (D-8 RCAFS), the establishment of SME Center, and training and capacity building programs in civil aviation cooperation. Authors also note the hindrance to the success of the organization posed by limited publicity and low intra trade among members, even though there is huge potential in D-8 contributing as a significant player in the global economy by 2050.

Chapter 3 traces the historical origins and highlights the key events that shaped the foundation of D-8 Organization for Economic Cooperation. Conceptual framework behind the establishment of the organization was to enhance cooperation between prominent Muslim developing countries. The formal establishment of D-8 and the commencement of its activities were traced from a conference on "Cooperation in Development" conducted in Istanbul in 1996 to the "Istanbul Declaration of 1997." Authors argue that the organization is a global framework rather than a regional one, involving members from different regions. The organization is intended to be neutral and the obligations arising from membership of countries in other multilateral institutions should not infringe upon D-8. The chapter, in short, undertakes the overview of the organization, outlining its purpose, structure and significance in global landscape.

Kenan Bağcı, in Chapter 4, delves into promotion of trade and production of High Technology Products between D-8 members. The linkage of economic development with innovation and industrialization is explained for reassessing development strategies. The chapter highlights an opportunity for Developing-8 countries to reshape their industrial policies, especially in light of emerging technological trends and shifting global market dynamics. The challenge for the D-8 countries is to build a robust ecosystem that fosters technological innovation and supports research and development. With the right policies and strategic investments, they can transform their industrial base and achieve sustained economic growth. Therefore, governments must focus on creating an enabling environment for the growth of high-technology industries by offering incentives for innovation, facilitating partnerships between private firms and research institutions, and improving digital infrastructure. Moreover, targeted investments in education and skill development are key to ensuring that the workforce can adapt to the demands of new technology-driven industries.

Authors examine the potential role of sustainable energy in the progress and prosperity of D-8 countries in Chapter 5. Rapid increase in population of D-8 countries has increased industrialization, requiring more energy as well. Such industrialization mainly depends on fossil fuel that has several negative impacts. Alternative energy sources are crucial for a sustainable future, offering a cleaner, more secure, and more equitable energy system. As technologies continue to evolve and economies of scale improve, the alternative energy sources will become increasingly more viable and essential for a low-carbon future. The current contribution aims to provide an understanding within D-8 countries about their role in fostering the regional integration for energy sources and for sustainable development. The chapter provides a comprehensive report of the D-8 countries achievements about alternative energy, underscoring the essential partnerships that drive D-8 countries' overall success.



Pakistan and Turkiye are already excelling in wind energy along with hydro power projects. Moreover, being populated and urbanized regions, D-8 have also a significant potential for biomass, biofuel and landfill gas energy.

Despite its contributions, D-8 Organization faces several challenges and criticisms, which Morteza Damanpak Jam examines in chapter 6. The author addresses main questions including whether D-8 has been able to achieve the goals of regional integration? What factors have been effective in its successes or failures? And can we still hope for the success of this organization? The main hypothesis of the research is that despite its extensive activities, D-8 has not achieved its main goals, and a series of internal and external challenges and obstacles has prevented its success. The analytical framework of the research is the eclectic theory, which emphasizes the use of a set of variables and criteria of classical and modern theories of regionalism.

Chapter 7 examines the Developing-8 economic integration in energy and its effect on Nigeria's energy resources. Regional economic integration across the globe aims to boost productivity and economic growth. Stanley Uche Arachukwu contends that the world energy market is characterized by fluctuations resulting from supply chain disruptions, geopolitical crises and investment gaps in the energy sector. However, stable energy is vital for manufacturing, industrial and agricultural transformation, and overall economic development. Nigeria is one of the members of the Developing-8 organization and is richly endowed with abundant energy resources, including renewable (hydrocarbon, biofuel, and Solar energy) and non-renewable (crude oil and natural gas). However, Nigeria faces serious energy shortages for local consumption and export, which hampers economic development. Investment and structural bottlenecks have been identified as major challenges in financing energy infrastructure to boost productivity in Nigeria. It is expected that the cooperation among the developing-8 would help to ameliorate Nigeria's energy crises. Therefore, this chapter examines the mutually beneficial role of the Developing-8 organization in energy sector investment and productivity in Nigeria.

Abla Abdel Latif, in Chapter 8, explores the individual economies of each member state, uncovering existing dynamics of cooperation as well as potential opportunities. Through this exploration, the chapter seeks to provide a nuanced understanding of the D-8's role as a driver of economic synergy and growth within the Global South. By examining the economic landscapes, collaborations, and future possibilities within the D-8, the study aims to shed light on how these nations, despite varied challenges, can leverage their collective strengths and complementary economic features to become influential players in the global economy.

Talha Tufail Bhatti explores the critical intersections of agriculture, food security, and climate change with a focus on D-8 member states in Chapter 9. The discussion sets the scope of food security and agriculture, and how it can relate to Sustainable Development Goals (SDG). A detailed review of intra-state policies and institutional frameworks in relation to the climate-food-security nexus within D-8 is undertaken to identify key initiatives in agriculture and food security. An investigation into the bilateral and multilateral disaster risk resilience action plans and transboundary management treaties is also undertaken. Furthermore, this chapter shortlists major barriers of conflicts, dysfunctional policy implementation, and community awareness, with a special focus on GMOs, climate justice, and foreign debt. This is followed by recommendations for eco-centric low carbon tech-based climate applications to strengthening feeding resilience.

In Chapter 10, Yinka Sabuur Hammed adopts both descriptive and econometric approaches to examine the extent of intra-trade relation among the d-8 countries; investigate the effect of this relationship on the economic development of members, and establish possible role of policy uncertainties in their intra-trade relation. While the formation of the organization boosts the trade relation among many members, their volumes have not been consistent over the years, except for Turkey,

Indonesia and Bangladesh. Also, the current intra-trade relation suggests positive impact on economic development of each countries as the impact is more obvious in raising household welfare and firm productive capacity. On the role of policy uncertainties, both trade policy uncertainty (TPU) and global economic policy uncertainty (GEPU) have long-term spillover effects. Specifically, the spillover dampens imports significantly suggesting possible wider implication on their economies. As for the climate policy uncertainty, its impact is found to reduce both export and import in the short run, while the long run impact is positive, suggesting long-term positive effect of environmental protection policy adopted by each country to bridge the climate uncertainty syndrome while additional evidence suggests that exports raises inflow of foreign currency and result in appreciation of local currencies of member states. These analyses have wider implications for the D-8 countries, suggesting the need to boost and sustain current trade-relations.

In Chapter 11, Adesuwa O. Erediauwa argues that an overview of advanced nations' economic development models reveals that a strong educational framework precedes any economic development experience. Their transition to developed economies was based on a solid structure of technological innovation. These nations have proven that the shift towards a knowledge-based economy is an essential path to achieving sustainable economic growth and development, and they continue to operate a knowledge-driven development paradigm. For the D-8 Organization for Economic Cooperation, including Bangladesh, Egypt, Indonesia, Iran, Malaysia, Nigeria, Pakistan, and Turkey, the challenge of adapting education systems to support a knowledge-based economy is both significant and pressing. Education plays a crucial role in driving innovation, fostering critical thinking, and developing technological expertise, which are all essential in this transition. Recognizing this fact, the D-8 recently included education, human resource development, and ICT to its objectives. It is against this backdrop that this chapter analyzes the education systems of the D-8 countries in terms of access, quality, and alignment with the needs of a modern economy.

Mohd Faiz Abdullah and Qarrem Kassim, in Chapter 12, examine Malaysia's economic integration with the Developing 8 (D8) Organization for Economic Cooperation, with a focus on the challenges the country faces in deepening economic ties with member states. Despite the existence of a Preferential Trade Agreement (PTA) and shared development goals, Malaysia's trade and investment activities within the D8 remain limited and lack diversification. Key challenges include structural economic differences among D8 members, trade barriers, limited market access, and political and economic uncertainties in some member countries. Moreover, Malaysia's longstanding focus on traditional markets, coupled with limited market knowledge and connectivity within the D8, has constrained its ability to capitalize on the economic potential of this bloc. The chapter highlights how the D-8 addresses common economic challenges and promotes sustainable development among member states by exploring the organization's treaties, agreements, and institutional arrangements.

In Chapter 13, Chinyere Agu provides a comprehensive analysis of the Developing-8 Organization for Economic Cooperation (D8), centering on its legal and policy frameworks. Founded to promote economic collaboration among eight developing countries, the D-8 aims to improve trade, investment, and technological cooperation. This chapter examines the foundational legal documents and policy structures that steer the D-8's operations and objectives. The chapter highlights how the D-8 addresses common economic challenges and promotes sustainable development among member states by exploring the organization's treaties, agreements, and institutional arrangements. The analysis also evaluates the efficacy of these frameworks in facilitating regional integration and economic growth, offering insights into the strengths and limitations of the D-8 approach. Through a comprehensive review, this chapter aims to clarify how legal and policy considerations shape the D-8's strategic direction and impact economic trajectories of member states.

In Chapter 14, Sultan Habibullah Khan and Muhammad Asif Kamran argue that agriculture and food security provides enormous potential and opportunities for collaboration among the D-8 countries. With different levels of progress in crops yields, mechanization, seed genetics and technology, and application of data science and AI in agriculture, the member states can develop collaboration through identification of complementarities in these areas. There is a need for more interaction among the agriculture and food security institutions to identify areas of collaboration and build capacity through working together. There is also a need for institutional mapping, study of regulatory environments of member states for trade and technology transfer and promoting enabling environment for collaboration and trade among the member states.

In Chapters 15 and 16, Rasoul Rajeai, Salar Ghadiri Alamdari, and Soroush Ghanzinoori examined the foundation of science, technology and innovation cooperation in the D-8 and insights on current and future perspectives of D-8 STI Cooperation. These chapters highlights the economic and technological benefits of STI partnerships, illustrating how they enhance industrial competitiveness, promote technology transfer, and strengthen innovation ecosystems. Furthermore, the second chapter discusses the regulatory and policy adjustments necessary to enhance collaboration, emphasizing the importance of harmonized intellectual property rights, funding mechanisms, and public-private partnerships. The chapter concludes by outlining strategic policy recommendations to ensure that D-8 nations remain competitive in the global innovation ecosystem while addressing their unique economic and technological challenges.



#### Author Details **Ismail Bello (Senior Lecturer)**

<sup>1</sup> Secretariat of the Developing-8 Organization for Economic Cooperation, Türkiye

<sup>2</sup> Department of International Relations and Diplomacy, Baze University, Abuja, Nigeria

0000-0002-6484-9906    ✉ [Ismail.bello@developing8.org](mailto:Ismail.bello@developing8.org), [ismailbello12@gmail.com](mailto:ismailbello12@gmail.com)

#### **Aleena Saeed (M.Phil. Scholar)**

<sup>3</sup> Department of Strategic Studies, National Defence University, Islamabad, Pakistan.

0009-0007-1104-0939    ✉ [aleenaa.saeed@gmail.com](mailto:aleenaa.saeed@gmail.com)

## References

- Association of Southeast Asian Nations. (2007, November 20). *Charter of the Association of Southeast Asian Nations*. [https://asean.org/wp-content/uploads/2024/07/17th-reprint\\_July-2014-The-ASEAN-Charter-17th-Reprint.pdf](https://asean.org/wp-content/uploads/2024/07/17th-reprint_July-2014-The-ASEAN-Charter-17th-Reprint.pdf)
- Baibourtian, A., & Pathak, A. (2024, June 24). The economics of peace: Exploring the interplay between economic stability, conflict resolution, and global prosperity. *UN Chronicle*. <https://www.un.org/en/un-chronicle/economics-of-peace-interplay-between-stability-conflict-resolution-global-prosperity>
- Chen, J. (2024, July 2). Bretton Woods Agreement and the institutions it created explained. *Investopedia*. <https://www.investopedia.com/terms/b/brettonwoodsagreement.asp>
- Copeland, D. C. (2015). *Economic interdependence and war*. Princeton University Press.
- Developing-8 Organization for Economic Cooperation. (2012, November 22). *Charter of the Developing-8 Organization for Economic Cooperation*. <https://developing8.org/image/Otherdocument/8388836.pdf>
- Developing-8 Organization for Economic Cooperation. (2024, December). *Third edition of the D-8 newsletter (July-September 2024)*. <https://developing8.org/wp-content/uploads/2024/12/Third-Edition-of-the-D-8-Newsletter-July-September-2024.pdf>
- Developing-8 Organization for Economic Cooperation. (2024, December). *Adopted Cairo Declaration 2024*. <https://developing8.org/wp-content/uploads/2024/12/Adopted-Cairo-Declaration-2024.pdf>



- Developing-8 Organization for Economic Cooperation. (2025, February 22). *Brief history of D-8*. <https://developing8.org/>
- Developing-8 Organization for Economic Cooperation. (2025, February). *D-8 Trade Ministers' Council meets in Dhaka, agrees to bolster implementation of D-8 PTA*. <https://developing8.org/news/d-8-trade-ministers-council-meets-in-dhaka-agrees-to-bolster-implementation-of-d-8-pta/>
- Developing-8 Organization for Economic Cooperation. (2025, February). *Fourth edition of the D-8 newsletter (October-December 2024)*. <https://developing8.org/wp-content/uploads/2025/02/Fourth-Edition-of-the-D-8-Newsletter-October-December-2024.pdf>
- Gourinchas, P.-O. (2023, October 10). Resilient global economy still limping along, with growing divergences. *IMF Blog*. <https://www.imf.org/en/Blogs/Articles/2023/10/10/resilient-global-economy-still-limping-along-with-growing-divergences>
- Kadir, Z. A. (2025, February). National statement at the 11th Developing Eight (D-8) Summit. In *Fourth edition of the D-8 newsletter (October-December 2024)* (p. 32). Developing-8 Organization for Economic Cooperation. <https://developing8.org/wp-content/uploads/2025/02/Fourth-Edition-of-the-D-8-Newsletter-October-December-2024.pdf>
- Klabbers, J. (2002). *An introduction to international institutional law*. Cambridge University Press. <https://doi.org/10.1017/CBO9781139165051.004>
- Lesaffer, R. (2002). *The Congress of Vienna (1814–1815)*. *Oxford Public International Law*. Oxford University Press. <https://opil.ouplaw.com/page/477>
- Ministry of Foreign Affairs, Pakistan. (2022). *D-8 Council of Foreign Ministers meeting*. Ministry of Foreign Affairs.
- Ministry of Foreign Affairs, Turkey. (n.d.). *Developing Eight (D-8) Organization for Economic Cooperation*. [https://www.mfa.gov.tr/\\_d-8\\_en.mfa](https://www.mfa.gov.tr/_d-8_en.mfa)
- Next IAS Team. (2024). International economic organizations: IMF, World Bank & others. *Indian Economy*. <https://www.nextias.com/blog/international-economic-organizations/>
- Nye, J. S., Jr., & Donahue, J. D. (Eds.). (2000). *Governance in a globalizing world*. Brookings Institution Press.
- O'Farrill, E., Fierro, J., Moraga, M. E., Pérez, E., & Vallejos, M. (1999, December). *Economic cooperation*. Chilean International Cooperation Agency. [https://www.agci.cl/images/centro\\_documentacion/documento\\_de\\_trabajo\\_cooperacion\\_economica\\_ingles.pdf](https://www.agci.cl/images/centro_documentacion/documento_de_trabajo_cooperacion_economica_ingles.pdf)
- Office of the Historian, Foreign Service Institute, U.S. Department of State. (n.d.). *Bretton Woods-GATT, 1941–1947*. <https://history.state.gov/milestones/1937-1945/bretton-woods>
- Office of the United States Trade Representative. (2025, February 23). *Economic Community of West African States (ECOWAS)*. <https://ustr.gov/countries-regions/africa/regional-economic-communities-rec/economic-community-west-african-states>
- Pease, K.-K. S. (2018). *International organizations: Perspectives on global governance* (6th ed.). Routledge.
- Reinalda, B. (2014, December). From the Congress of Vienna to present-day international organizations. *UN Chronicle*, 51(3), 12–15. <https://doi.org/10.18356/1393c8b5-en>
- Siripurapu, A., Berman, N., & McBride, J. (2025, February 24). What does the G20 do? *Council on Foreign Relations*. <https://www.cfr.org/backgrounder/what-does-g20-do>
- University of Exeter. (2024). *Explore the concept of economic interdependence among the great powers and assess its role in mitigating or exacerbating international tensions*. Studocu.
- Weiss, T. G., & Wilkinson, R. (Eds.). (2023). *International organization and global governance* (3rd ed.). Routledge.





## Chapter 2

# D-8 Member States: Economic Profiles, Sectors and Opportunities



Abla Abdel Latif<sup>1</sup>

<sup>1</sup> Egyptian Center for Economic Studies, Egypt

### Abstract

To highlight the D-8 Organization's mission and underscore its economic potential, this chapter delves into the individual economies of each member state, uncovering existing dynamics of cooperation as well as potential opportunities. Through this exploration, the chapter seeks to provide a nuanced understanding of the D-8's role as a driver of economic synergy and growth within the Global South. By examining the economic landscapes, collaborations, and future possibilities within the D-8, we aim to shed light on how these nations, despite varied challenges, can leverage their collective strengths and complementary economic features to become influential players in the global economy. By identifying each country's strengths and challenges, this analysis lays the groundwork for understanding their roles and contributions to D-8 cooperation. Through structured approach, the chapter underscores the D-8 Organization's potential to narrow economic disparities and enhance the global economic integration of its member states. By fostering deeper cooperation and implementing strategic initiatives, the D-8 countries can transform their collective ambitions into meaningful progress, bolstering their influence and economic standings on the world stage.

### Keywords

Developing-8 · Economic Opportunities · Trade



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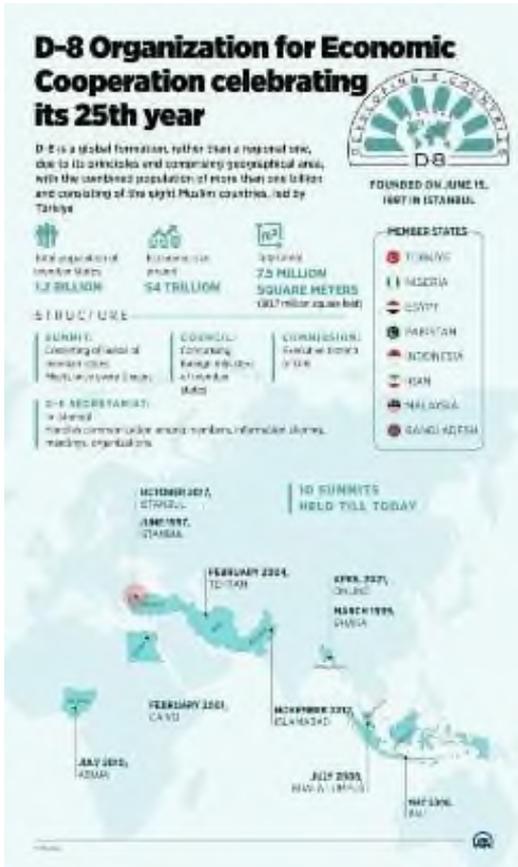
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2025. Latif, A. A.

Corresponding author: Abla Abdel Latif [alatif@eces.org.eg](mailto:alatif@eces.org.eg)

## Introduction: D-8 Overview:

The D-8 Organization for Economic Cooperation, established on June 15, 1997, through the Istanbul Declaration, serves as a crucial platform for intergovernmental cooperation among nine member states: Bangladesh, Egypt, Indonesia, Iran, Malaysia, Nigeria, Pakistan, and Türkiye (Ministry of Foreign Affairs of Türkiye). Azerbaijan joined the organization in March 2025. This coalition aims to enhance the international standing of its members, diversify trade opportunities, and improve living standards through collaborative economic development (Ministry of Foreign Affairs of Türkiye).



Together, the D-8 countries represent approximately **15.4% of the global population**, amounting to around **1.2 billion people**. However, they contribute only **5.5% to the world's GDP**, highlighting a significant disparity between their demographic weight and economic output (Developing Eight Organization for Economic Cooperation). The average **GDP per capita in these nations is about \$5,810** (constant 2015 US\$), compared to the global average of \$11,567. This indicates substantial potential for economic growth and intra-trade among these nations, which span an area of **7.6 million square kilometers**, roughly **5% of the world's land area** (Ministry of Foreign Affairs of Türkiye).

In recent years, economic indicators have pointed to some positive trends across the D-8 countries. In 2023, the average **GDP growth rate for D-8 countries was reported at 3.8%**, while the average GDP per capita growth was 2.6% (Developing Eight Organization for Economic Cooperation). **Despite their large population** and collective economic size exceeding \$4 trillion, intra-trade among D-8 countries remains relatively low at around \$100 billion, accounting for only 2% of global trade volume (Ministry of Foreign

Affairs of Türkiye). The total global trade volume involving D-8 countries is estimated at \$700 billion, which constitutes approximately 14% of global trade (Developing Eight Organization for Economic Cooperation).

Labor dynamics within D-8 countries reflect their status as some of the world's largest labor-abundant nations. In 2022, labor force participation rates were recorded at about **58%** of the total population aged 15-64. However, youth unemployment rates are notably higher than overall unemployment figures, indicating challenges in integrating younger populations into the workforce (Ministry of Foreign Affairs of Türkiye).

Inflation is another pressing issue affecting the D-8's economic landscape. In 2023, **inflation reached approximately 26%** across the member states due to expansionary monetary policies that led to price



growth. This inflationary environment poses additional challenges to achieving sustainable economic development and improving living standards within these countries. Despite these challenges, the D-8 group occupies strategic positions across three continents and is committed to enhancing cooperation in various sectors including industry, agriculture, communication, science and technology, health, energy, and banking (Ministry of Foreign Affairs of Türkiye). All member states are also part of the Organization of Islamic Cooperation and are recognized as leading nations within it in terms of technological advancement and economic potential. Thus, while the D-8 countries represent a significant portion of the global population with substantial economic potential, their current contribution to global GDP reflects untapped opportunities for growth and intra-trade. In that realm, the organization continues to strive towards improving economic cooperation among its members to enhance their collective standing in the global economy.

## Country's Economic Profiles:

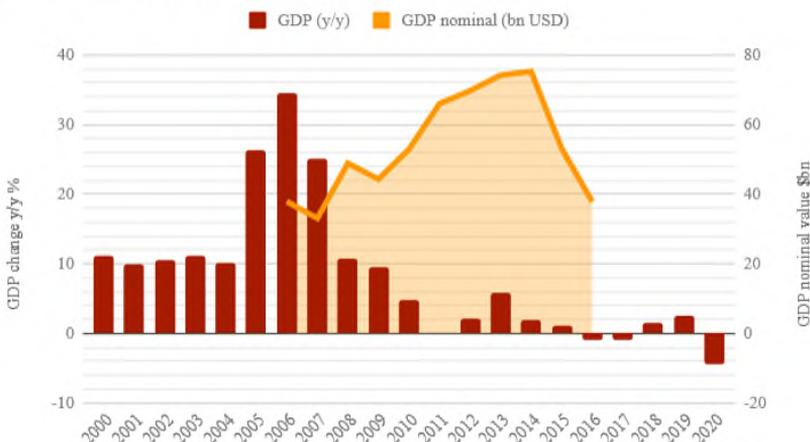
To gain a thorough understanding of the diversified economic landscapes within the D-8 coalition, it is essential to explore the **economic profiles** of each member country. Accordingly, this section provides a nuanced analysis of each nation's distinct strengths, weaknesses, opportunities, threats, and overall economic environment. By examining key indicators such as GDP, trade patterns, labor markets, and sectoral contributions, we aim to highlight the unique economic conditions that shape each member state of the D-8 coalition. This comprehensive overview lays the groundwork for identifying opportunities for collaboration and growth, paving the way for a deeper discussion of intra-D-8 trade dynamics and cooperative initiatives in the upcoming sections of the chapter (MFA, 2024; SESRIC, 2016).

### Azerbaijan

#### Strengths.

As the newest member of the D-8, Azerbaijan has significant hydrocarbon energy resources and strategic geographic advantages due to proximity to Europe and Asia. The country's economy is heavily reliant on its oil and gas sector, but efforts are underway to diversify into agriculture, tourism, logistics and manufacturing. However, challenges such as inflation, reliance on hydrocarbons, and regional geopolitical tensions could impact its economic stability and growth prospects (Vusal, 2022).

Azerbaijan GDP (annual)



**Weaknesses.**

Azerbaijan faces challenges such as high inflation, which reached 12% in 2023, and economic dependency on hydrocarbons, leaving it vulnerable to global oil price fluctuations (IMF, 2024). The labor market struggles with underemployment, particularly in rural areas, and youth unemployment remains a concern. Furthermore, the non-oil private sector is underdeveloped, hindered by bureaucratic inefficiencies and limited access to SMEs

**Opportunities.**

Azerbaijan has significant potential to expand its renewable energy sector, leveraging its solar and wind resources to reduce its reliance on fossil fuels. The government’s focus on agricultural modernization and building new agro-industries could enhance food security and create jobs. Additionally, the country has a rich cultural heritage and natural landscapes which provides opportunities for ecotourism and historical tourism.

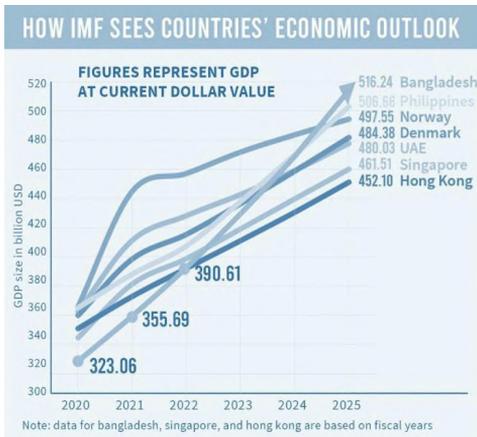
**Threats**

Geopolitical tensions in the South Caucasus region and political stability in the Middle East pose risks to Azerbaijan’s economic stability, particularly regarding trade routes and energy infrastructure. Climate change also threatens agricultural productivity and water resources, which are critical for rural livelihoods. Lastly, slow progress in economic diversification and structural reforms could impede long-term growth, especially if global hydrocarbon energy demand declines.

**Bangladesh:**

Bangladesh has demonstrated impressive economic growth and resilience, positioning itself as a leading emerging economy among the D-8 nations. However, challenges such as high youth unemployment, inflationary pressures, and vulnerability to climate-related disruptions present obstacles that may hinder its progress toward sustainable development.

**Strengths:.**



In terms of strengths, Bangladesh has established itself as a fast-growing emerging economy, with a real GDP of approximately \$323 billion and a notable **real GDP growth rate of 5.8%** in 2023 (MFA, 2024), despite a slight slowdown from previous years. The country recorded the highest growth in GDP and GDP per capita among the D-8 nations, indicating strong economic performance relative to its peers. Additionally, the **labor force participation rate was robust at 60.9%** in 2022 (MFA, 2024), reflecting a significant portion of the population engaged in economic activities. The economy is transitioning from labor-intensive agriculture to more capital-intensive sectors like manufacturing and services, enhancing productivity and economic diversification.



### Weaknesses.

Despite its growth, Bangladesh faces challenges such as a **youth unemployment rate of 15.7%**, which is particularly concerning given that youth make up a significant portion of the labor force (MFA, 2024). The overall unemployment rate was around **5.1%** in 2023, indicating some structural issues within the job market. Additionally, the **inflation rate** stood at approximately **9.02%**, which can erode purchasing power and affect consumer confidence (MFA, 2024). The reliance on traditional agriculture poses risks due to limited arable land and **susceptibility to natural disasters** like floods and cyclones, which can disrupt food production and economic stability.

### Opportunities.

In terms of opportunities, Bangladesh has considerable opportunities for growth, particularly in enhancing its **manufacturing sector** (MFA, 2024), which is already a significant contributor to its GDP. The expansion of the **services sector**, which **grew by nearly 90%** between 2015 and 2021, offers potential for job creation and economic development. Moreover, with around two million young people entering the labor force annually, there is a demographic dividend that can be leveraged if adequate job opportunities are created. The push for **new agricultural technologies** to improve productivity can also lead to advancements in food security and rural employment.

### Threats:

Despite such opportunities, the economy is **vulnerable to external shocks**, such as fluctuations in global demand for textiles (MFA, 2024) and other exports, which could impact economic stability. Furthermore, **high inflation rates** could deter foreign direct investment (FDI), which was recorded at only \$1.39 million recently, suggesting potential stagnation in capital inflows. Climate change poses a significant threat as Bangladesh is **prone to natural disasters** that can disrupt both agriculture and urban infrastructure. Lastly, socio-political issues could hamper economic reforms necessary for sustaining growth and improving employment conditions in the long term.

## Egypt

Within the D-8 framework, Egypt stands out for its strategic location and economic diversity, which offer considerable potential for trade and investment. Despite robust growth in sectors like ICT and automotive manufacturing, Egypt faces significant challenges, including high inflation, unemployment, and political instability, which weigh on economic stability and investor confidence.

### Strengths.

In terms of strengths, Egypt's **strategic geographic location** as a gateway to Africa, Asia, and Europe provides significant advantages for trade and investment. Moreover, the country has a **diverse economy**, with key sectors including agriculture, manufacturing, energy, and services (MFA, 2024), which collectively contribute to economic output. In 2023, the information and communications technology (**ICT**) sector emerged as the **fastest-growing** industry, showcasing a growth rate of **16.3%** during the 2022/2023 period (MFA, 2024). Additionally, ongoing structural reforms aim to enhance productivity by removing administrative barriers and fostering cooperation between private and state-owned enterprises.

### Weaknesses.

Despite such strengths, the Egyptian economy faces substantial challenges due to **high inflation rates**, which reached **33.9%** in 2023 (MFA, 2024), and a **labor force participation rate** of only **46.5%**, indicating underutilization of human resources. The unemployment rate stands at **7.3%**, with youth

unemployment significantly higher at **19%**. Political instability has been a persistent issue since the revolution in 2011, impacting investor confidence and economic growth. Furthermore, the country has experienced **major trade deficits**, with a current account **deficit of 3.2% of GDP** in 2023.

**Opportunities.**

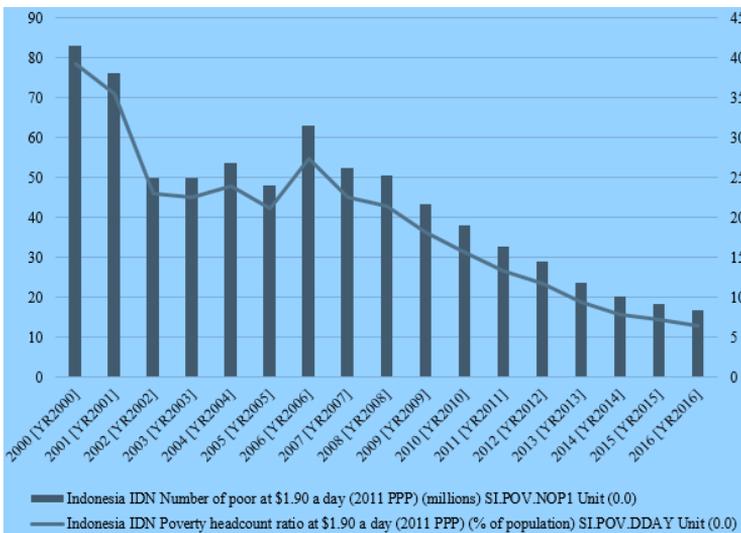
In terms of opportunities, Egypt's population growth presents opportunities for **expanding the labor market and consumer base** (MFA, 2024). The government's initiatives to reclaim agricultural land and enhance productivity through modern farming practices could improve food security and reduce reliance on imports, which currently account for about 40% of food needs. Additionally, foreign direct investment (FDI) inflows are projected to increase as macroeconomic stabilization efforts take effect, particularly with support from international partners like the IMF and UAE investments. The **growth potential in sectors such as pharmaceuticals and automotive manufacturing** also offers avenues for economic diversification.

**Threats.**

Despite such opportunities, the ongoing **political unrest and regional conflicts**, such as the Gaza war, pose significant threats to Egypt's economic stability (MFA, 2024). These conflicts have led to declines in tourism and Suez Canal revenues—critical sources of foreign income—exacerbating existing economic challenges. **High external debt levels**, recorded at \$164.7 billion in mid-2023, further complicate fiscal management and may limit governmental capacity to respond effectively to economic shocks. Additionally, **persistent inflation** could undermine purchasing power and consumer spending, hindering recovery efforts.

**Indonesia**

As a key player within the D-8, Indonesia stands out with the largest economy in Southeast Asia and ranks among the top ten globally in purchasing power parity (World Bank, 2023).. However, despite its impressive economic growth and progress in poverty reduction, Indonesia grapples with significant challenges, including economic inequality, supply chain inefficiencies, and environmental threats that impact its agricultural productivity and overall economic stability (Del Vecchio, 2023; Balisacan et al, 2003).



### Strengths.

In terms of strengths, Indonesia boasts the largest economy in Southeast Asia and ranks among the **top ten globally in terms of purchasing power parity** (PPP) with a real GDP estimated at \$1,179 billion in 2023 (World Bank, 2023). The country has made significant strides in poverty reduction, halving its poverty rate since 1999, reaching around 10% by 2019 before the COVID-19 pandemic disrupted progress (Bappenas, 2018; Del Vecchio, 2023). Additionally, Indonesia benefits from a **large and youthful population**, with a labor force participation rate of 69.1% and a **relatively low unemployment rate of 3.4%** (World Bank, 2023). The agricultural sector plays a crucial role, as Indonesia is one of the world's largest producers and exporters of key commodities, including palm oil and natural rubber, which bolsters its trade surplus.

### Weaknesses.

Despite its economic growth and poverty reduction achievements, Indonesia faces significant challenges. Economic inequality remains a pressing issue (Del Vecchio, 2023), with the wealthiest individuals holding more wealth than the poorest segments of the population. The country also struggles with technological advancement and supply chain inefficiencies, exacerbated by **environmental challenges** such as droughts that affect agricultural productivity (World Bank, 2023). Furthermore, while the manufacturing sector is substantial, it heavily relies on small and medium enterprises (SMEs), which may lack the resources for innovation and expansion.

### Opportunities.

In terms of opportunities, Indonesia's ongoing digitization efforts in agriculture and increasing adoption of agricultural technology present opportunities for enhancing productivity and sustainability in this vital sector (Bappenas, 2018). The growth of renewable energy sources like solar power offers potential for diversifying energy production and reducing dependence on fossil fuels. Additionally, the government's focus on inclusive economic growth strategies aims to create more equitable job opportunities and improve access to education and infrastructure, particularly in rural areas. The tourism sector also holds promise as a significant source of income, especially as global travel rebounds post-pandemic.

### Threats.

Despite such opportunities, Indonesia's economic stability is threatened by external factors such as global economic fluctuations and trade tensions (World Bank, 2023). The recent trade balance shows a surplus in goods but a deficit in services, indicating vulnerabilities in specific sectors. Environmental issues like climate change pose risks to agriculture and fisheries, which are crucial for both employment and exports. Moreover, the lingering effects of COVID-19 have reversed some poverty reduction gains, highlighting the fragility of progress made in recent years. Political instability or policy shifts could also impact foreign investment attractiveness (Del Vecchio, 2023), which is essential for sustaining economic growth.

### Iran:

As a notable player in the D-8, Iran leverages its vast natural resources, ranking as the third-largest producer of natural gas and among the top ten oil producers globally (S&P Global, 2023; Offshore Technology, 2024). However, despite these advantages and a diverse agricultural sector, the country faces significant economic challenges, including high unemployment, soaring inflation, and a largely state-controlled economy that stifles competition and efficiency (Iran International, 2024).

### Strengths.

In terms of areas of strengths, Iran possesses significant natural resources, being the third-largest producer of natural gas and among the top ten oil producers globally (Offshore Technology, 2024). This endowment provides a robust foundation for its economy, with fossil fuel industries contributing over half of state revenues (Iran International, 2024). Additionally, the country has a diverse agricultural sector, which supports one-third of employment and fulfills four-fifths of food needs, showcasing its capacity for self-sustainability in food production. Furthermore, Iran's telecommunication development ranks among the highest globally, indicating a strong potential for technological advancement and connectivity (Iran International, 2024).

### Weaknesses.

Despite its strengths, Iran faces substantial economic challenges. The unemployment rate **remains high**, particularly among youth and women, with 23% unemployment for young people in 2023 (Iran International, 2024). Inflation has surged dramatically, reaching 44.6% in 2023, which erodes purchasing power and economic stability. The economy is largely state-controlled, leading to inefficiencies and a lack of competition in various sectors (Iran International, 2024). Moreover, the labor productivity is relatively low at \$23 per hour worked, indicating room for improvement in workforce efficiency.

### Opportunities.

In terms of opportunities, Iran's ongoing shift towards economic liberalization, especially in agriculture, presents opportunities for growth and modernization (Iran International, 2024). The government's focus on increasing non-oil exports can diversify the economy and reduce dependency on fossil fuels. Additionally, leveraging its vast mineral resources could foster new industries beyond hydrocarbons. The potential for international partnerships and trade agreements could also enhance economic prospects, particularly if sanctions are eased or lifted (Iran International, 2024).

### Threats.

Despite such opportunities, Iran's economy is heavily impacted by international sanctions related to its nuclear program and geopolitical tensions, which restrict trade and investment opportunities (Stimson Center, 2024). These sanctions contribute to economic instability and hinder development efforts. Additionally, high inflation rates pose a threat to social stability and public health systems by limiting access to essential goods and services (Iran International, 2024). The ongoing issues of human rights abuses and regional conflicts further complicate Iran's international relations, potentially isolating it from beneficial economic partnerships (Stimson Center, 2024).

## Malaysia

As a key contributor to the D-8, Malaysia has established itself as a dynamic economic powerhouse in Southeast Asia, demonstrating impressive diversification and investment attraction. However, despite its economic strengths and a stable labor market, the country faces challenges such as an aging population, youth unemployment, and rising income inequality that could threaten social cohesion and long-term stability.

### Strengths.

In terms of strengths, Malaysia is recognized as an economic powerhouse in Southeast Asia, boasting a high real GDP per capita of \$11,691 and a stable growth rate of 2.6% in 2023. The country has successfully diversified its economy from agriculture to manufacturing (23% of GDP) and services (53.5% of GDP), attracting significant investments that foster growth and innovation. Additionally, Malaysia maintains a relatively low unemployment rate of 3.9%, indicating a stable labor market close to full employment, which supports economic resilience and consumer confidence.

### Weaknesses.

Despite its economic strengths, Malaysia faces challenges such as an aging population and a declining birth rate, which may lead to future labor shortages and increased healthcare and pension costs. The labor force participation rate stands at 69%, but youth unemployment remains concerning at 12.5%. Furthermore, the economy is grappling with heightened income inequality, which could lead to social unrest if not addressed effectively. The Gini coefficient indicates that while inequality has decreased in relative terms, absolute income gaps persist, particularly among different ethnic groups.

### Opportunities.

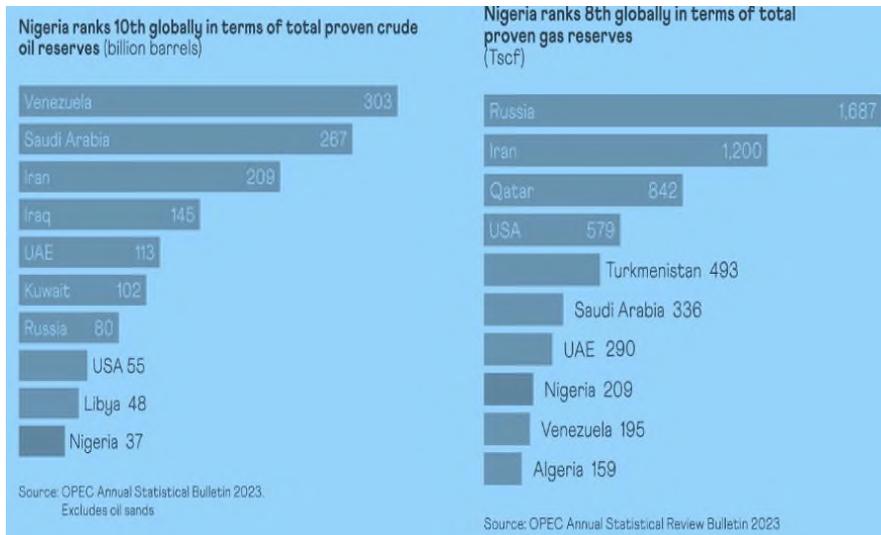
In terms of opportunities, Malaysia's ongoing adaptation to rapid digitalization presents significant opportunities for economic transformation. The shift towards advanced manufacturing and technology-driven production can create high-value jobs and elevate socio-economic well-being. The robust tourism sector also offers growth potential, particularly in hospitality and retail, driven by increasing consumer spending. Moreover, the government's support for innovation and investment in high-tech industries aligns with global trends towards sustainability and digital economies.

### Threats.

Despite such opportunities, the Malaysian economy is vulnerable to external factors such as global economic fluctuations and trade tensions, which could impact its open trade policies and current account surplus of 1.6% of GDP. Additionally, the potential for rising social dissatisfaction due to income inequality poses a threat to political stability. As the country navigates these challenges, it must also contend with the implications of climate change on its agriculture sector, particularly palm oil production, which is vital for its economy but susceptible to environmental regulations and market shifts.

## Nigeria

As a vital member of the D-8, Nigeria benefits from its vast oil and gas reserves, positioning itself among the largest economies in the world. However, despite this economic strength and a significant agricultural sector, Nigeria faces challenges such as high inflation, low labor productivity, and inefficiencies in agriculture that hinder overall growth and stability (World Bank, 2019; Navadhi, 2023).



### Strengths.

In terms of strengths, Nigeria's economy is significantly bolstered by its vast oil and gas reserves, making it one of the largest economies globally. The country recorded a real GDP of \$551 billion in 2023, with a notable growth rate of 2.9% despite challenges in other sectors. The agricultural sector remains large, engaging over 70% of the population, primarily in subsistence farming, which contributes to food security and employment (Bank Negara Malaysia, 2024). Additionally, Nigeria has a favorable trade balance with a current account surplus of 1.6% of GDP in 2023, indicating strong export performance relative to imports (World Bank, 2019).

### Weaknesses.

Despite its economic potential, Nigeria faces high inflation rates, reaching 24.7% in 2023, which is above the average for African and Sub-Saharan countries. Labor productivity is low at \$7 per hour worked (PPP), reflecting inefficiencies in the labor market. Moreover, the agricultural sector is hindered by various challenges such as poor land tenure systems, low irrigation levels, and high post-harvest losses, which stifle productivity and increase reliance on food imports (Navadhi, 2023).

### Opportunities.

In terms of opportunities, Nigeria's commitment to enhancing its natural gas production presents a significant opportunity for economic diversification. With proven gas reserves exceeding oil reserves, there is potential for growth in domestic consumption and exports. The services sector has also shown promise, with substantial growth driven by consumer demand from a burgeoning middle class. Government policies aimed at improving the business environment could further stimulate investment in manufacturing and technology sectors (Bank Negara Malaysia, 2024).

### Threats.

Despite such opportunities, the Nigerian economy is vulnerable to external shocks due to its heavy reliance on oil exports for government revenue and foreign exchange. Additionally, the country faces threats from insecurity in food-producing regions, which affects agricultural output and contributes to rising food prices. Climate change poses a long-term risk to agriculture and overall economic stability, potentially exacerbating existing challenges such as land degradation and water scarcity (World Bank, 2019; Navadhi, 2023).

## Pakistan

As an integral member of the D-8, Pakistan boasts a stable economy supported by its substantial population, which contributes to a robust labor force. However, despite these strengths and a low unemployment rate, the country faces significant economic challenges, including soaring inflation, low labor productivity, and structural inefficiencies that impede overall growth and development (Economic Times, 2024; BBC, 2023; ILO, 2023).

### Strengths.

In terms of strengths, Pakistan has a stable economy with a real GDP of \$240 billion in 2023, maintaining the same level as the previous year despite a slight decline in GDP per capita to \$1,664. The country benefits from being the sixth largest population globally, which contributes to a robust labor force with a participation rate of 55% among individuals aged 15-64. Additionally, the unemployment rate is relatively low at 5.5%, indicating a stable job market, while the services sector is emerging as a key growth driver, particularly post-COVID-19 due to advancements in digital technology (Economic Times, 2024; Finance Ministry, 2024).



### Weaknesses.

Despite these strengths, Pakistan faces significant economic challenges. The inflation rate soared to 30.8% in 2023, driven by factors such as rupee depreciation and rising fuel prices. Real GDP per capita has declined by 1.9%, reflecting economic pressures on individual prosperity. Labor productivity remains low at \$7 per hour worked, which hampers overall economic efficiency and competitiveness. Furthermore, structural issues like inadequate tax reforms and inefficiencies in public sector enterprises continue to drain fiscal resources (BBC, 2023; ILO, 2023; Economics Observatory, 2024).

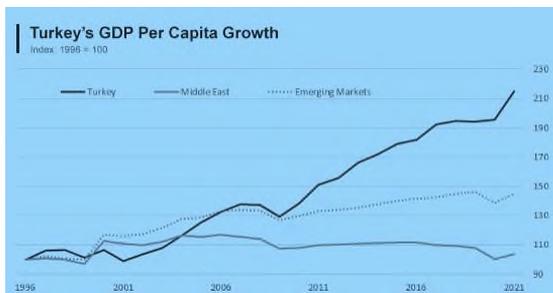
### Opportunities.

In terms of opportunities, there are promising opportunities for growth within the agricultural sector, particularly with important crops such as wheat, cotton, and rice. The derivatives market for agricultural products is experiencing increased activity due to changing weather patterns and government policies aimed at capitalizing on price fluctuations. Additionally, the manufacturing sector's division into large and small-scale manufacturing provides avenues for diversification and innovation, particularly as the economy stabilizes following recent reforms. The ongoing digital transformation in the services sector also presents significant potential for economic expansion (Finance Ministry, 2024; Economics Observatory, 2024).

### Threats.

Despite such opportunities, Pakistan's economy is susceptible to various external threats, including geopolitical tensions that can affect commodity prices and trade dynamics. The devastating impact of natural disasters, such as floods, poses a continuous risk to agricultural output and infrastructure stability. Moreover, ongoing political instability and policy uncertainty can undermine investor confidence and hinder long-term economic planning. The high inflation rate coupled with an unstable fiscal environment further complicates recovery efforts and could lead to increased social unrest if not managed effectively (BBC, 2023; ILO, 2023; Economic Times, 2024).

## Türkiye



As one of the largest economies within the D-8, Türkiye holds a prominent position in the global economy, recognized as a G20 nation with considerable growth potential (World Bank, 2019). However, despite its economic strengths and a robust agricultural sector, Türkiye faces significant challenges, including high inflation, youth unemployment, and vulnerabilities to external shocks that threaten

its economic stability and growth prospects (ILO, 2020).

### Strengths.

In terms of strengths, Türkiye is a significant player in the global economy, classified as one of the G20 nations and part of the "Next Eleven" emerging markets. With a real GDP of \$1,248 billion in 2023 and a GDP per capita of \$14,630, the country demonstrates robust economic potential and growth rates of 4.5% and 4.1% for GDP and per capita GDP respectively (Daily Sabah, 2024). Its diverse economy is bolstered by a strong agricultural sector, where Türkiye ranks among the top ten producers globally, particularly excelling in crops like hazelnuts and apricots (World Bank, 2019).

### Weaknesses.

Despite its industrial strengths, Türkiye faces significant economic challenges, including a high inflation rate of 53.9% in 2023, which has fluctuated substantially over recent years. The unemployment rate stands at approximately 9.4%, with youth unemployment reaching 17.6%, indicating challenges in job creation and economic stability (AVEKON, 2022). Additionally, while labor productivity is relatively high at \$40 per hour (PPP), the post-COVID environment has seen a downward trend in overall productivity levels (ILO, 2020).

### Opportunities.

In terms of opportunities, Türkiye's strategic geographical position as a bridge between Europe and Asia presents unique opportunities for trade and investment. The country has also seen a tourism boom over the past decade, which can be further leveraged to enhance economic growth. Moreover, the information technology sector is rapidly evolving, promising advancements that could drive innovation and economic diversification. Increased labor participation rates, which rose to 58% in 2022, suggest potential for greater workforce engagement and productivity improvements.

### Threats.

Despite such opportunities, Türkiye's economy is vulnerable to external shocks, particularly given its high inflation and fluctuating currency values that can deter foreign investment. Political instability and regional conflicts could also impact economic performance and investor confidence. Furthermore, reliance on agriculture and manufacturing makes Türkiye susceptible to global supply chain disruptions and changing market demands. The ongoing challenges posed by youth unemployment may lead to social unrest if not addressed effectively (AVEKON, 2022).

## Existing Collaborations at the Sectoral Level



Given the diversified economic landscapes of D-8 member countries as displayed in the previous section, cooperation within the Developing Eight (D-8) organization is structured primarily on a sectoral basis, with each member state is designated to lead specific areas of collaboration in tandem with its economic profile (MFA, 2023). The allocation of responsibilities among member states is as follows:

1. **Türkiye:** Industry, health, and environment
2. **Bangladesh:** Rural development
3. **Indonesia:** Poverty alleviation and human resources
4. **Iran:** Science and technology
5. **Malaysia:** Finance, banking, and privatization
6. **Egypt:** Trade
7. **Nigeria:** Energy
8. **Pakistan:** Agriculture and fisheries

These designated areas of leadership facilitate the D-8's commitment to initiating a diverse array of collaborative projects that encompass multiple sectors, including trade, communication, finance, agriculture, energy, tourism, culture, and technology. A central aim of the D-8 is to address pressing challenges such as poverty alleviation and trade facilitation, while ensuring a cohesive information network among member countries to facilitate knowledge sharing and resource optimization (MFA, 2023).

To effectively guide these initiatives, the D-8 has adopted the Decennial Roadmap for 2020-2030, which outlines strategic approaches for sectoral cooperation. This roadmap emphasizes the need for collaborative efforts in combating poverty, establishing Islamic banks, and enhancing cooperation in aquaculture development, thereby intertwining economic growth with social welfare objectives. Recent agreements such as the Dhaka Trade Declaration, a dispute settlement protocol, and a trade facilitation strategy have been established to strengthen trade, investment, and technological collaboration, forming a solid foundation for future strategic initiatives (MFA, 2023).

Additionally, the D-8 encourages member countries to engage in effective multilateral and bilateral policies to ensure sustainable cooperation in addressing economic challenges. Under this roadmap, two significant programs have been launched:

1. **D-8 Health and Social Protection Program (D-8 HSP):** Initiated in 2018, this program aims to enhance health services across member states and improve living standards by addressing hunger, poverty, and diseases in alignment with the United Nations Sustainable Development Goals (SDGs) 1, 2, and 3.
2. **Network of Pioneers for Research and Innovation (D-8 NPRI):** This initiative is designed to elevate innovation levels within D-8 countries to foster economic growth essential for sustainable development. It focuses on identifying research capabilities, facilitating exchanges of research results among industries in member states, expanding laboratory access for researchers and students, conducting joint research projects in industrial sectors, and promoting research fellow exchanges between universities within the D-8 framework.

Additionally, the D-8 has renewed its **Preferential Trade Agreement (PTA)** to reduce tariffs and encourage trade among member states. A Dispute Settlement Mechanism has also been adopted to provide a structured approach for resolving trade disputes, promoting a stable trading environment. Furthermore, a **Trade Facilitation Strategy (TFS)** has been implemented to streamline trade procedures and minimize administrative barriers.

Building upon these foundational agreements and strategies, the D-8 has consistently pursued initiatives to deepen economic integration and foster collaboration among its members. These include:

- **Visa Simplification Agreement:** Signed on February 24, 2001, in Cairo for businesspeople from D-8 member states.
- **Multilateral Agreement on Customs Assistance:** Signed on May 13, 2006, in Bali.
- **Preferential Trade Agreement:** Established on May 13, 2006.
- **Memorandum of Understanding between Airlines:** Signed in June 2008 in Bali.
- **Strengthening of D-8 Secretariat:** Financially and legally reinforced during a meeting in Kuala Lumpur in July 2008.
- **Roadmap for Economic Cooperation (2008 - 2018):** Adopted in Kuala Lumpur in July 2008.
- **Collaboration with International Organizations:** Enhanced relations with entities such as OIC (Organization of Islamic Cooperation), UNIDO (United Nations Industrial Development Organization), UNCTAD (United Nations Conference on Trade and Development), FAO (Food and

Agriculture Organization), UNWTO (United Nations World Tourism Organization), and ITC (International Trade Centre).

- **NGO Engagement:** Strengthened cooperation with NGOs and private sector representatives from both D-8 countries and beyond.
- **Establishment of Working Groups:** Fifteen working groups focused on socio-economic cooperation have been formed to boost intra-trade among member states.

These efforts collectively underscore the D-8's commitment to fostering economic cooperation among its members while addressing shared challenges through collaborative initiatives. The organization's structured approach to cooperation, highlighted by its sectoral leadership model and strategic roadmap, creates a dynamic framework for sustainable economic development that is essential for the growth and stability of its member states. As we look ahead, this framework opens up exciting opportunities for innovation and investment, paving the way for member countries to collaborate effectively. This sets the stage for exploring potential collaboration opportunities that can enhance competitiveness and drive sustainable growth in a dynamic global landscape.

## Potential Opportunities



The existing collaborations and initiatives within the D-8 organization - as displayed in the previous section - lay a robust groundwork for exploring the myriad opportunities that can emerge from enhanced economic cooperation and strategic partnerships among member states. The Developing Eight (D-8) Organization for Economic Cooperation presents a distinctive framework designed to elevate the global standing of developing countries, diversify trade relations, and promote active participation in international decision-making processes.

By concentrating on these objectives, the D-8 aims to improve living conditions, foster economic cooperation through tangible joint projects, and enhance the visibility and influence of developing nations on the global stage. In this realm, this section aims to explore the multifaceted opportunities that the D-8 can harness to achieve its objectives while enhancing the status of its member countries on the global stage (D-8 Organization for Economic Cooperation, 2024).

### *D-8 Guiding Framework for Collaborations:*

At the heart of the D-8's mission are its guiding principles, which emphasize the importance of fostering a collaborative environment among member states. Accordingly, the D-8's mission is supported by several key objectives:

- **Improving Economic Position:** The organization seeks to bolster the representation and influence of developing countries within the global economy, ensuring they have a stronger voice in international markets.

- ii. **Diversifying Trade Relations:** By creating new opportunities for trade, D-8 members can diminish their reliance on traditional markets, thereby exploring alternative economic partnerships that can lead to more resilient economies.
- iii. **Enhancing Decision-Making Participation:** The D-8 is committed to ensuring that developing countries have a voice in international forums, which enables better advocacy for their interests and needs.
- iv. **Concrete Joint Projects:** Collaborative initiatives among member states are designed to tackle shared challenges and leverage collective strengths, fostering economic growth and development.

### Channels of Collaboration

Building on this foundation, the potential for economic integration within the D-8 emerges as a significant opportunity, especially given the diverse economic profiles of its member countries, which include emerging economies and resource-rich nations. This integration can be catalyzed through:

- i. **Trade Liberalization:** Reducing trade barriers to facilitate easier access to markets among member states, thus encouraging intra-regional trade.
- ii. **Investment Facilitation:** Creating an environment conducive to investment flows within the bloc, which can stimulate economic activities and development projects.
- iii. **Infrastructure Development:** Enhancing both physical and digital infrastructure is essential to support trade and economic activities among member nations.

Such initiatives could assist in achieving the D-8's ambitious target to increase intra-trade volume to at least 10% of its total global trade by 2030. Furthermore, as the D-8 seeks to maximize its impact, it realizes that human capital is a critical asset for economic growth. The significant remittances from migrant workers serve as a vital source of foreign capital for many D-8 countries, thus, to capitalize on this potential, the D-8 encourages member nations to focus on:

- i. **Access to Education:** Providing opportunities for tertiary education and vocational training to equip migrant workers with essential skills necessary for high-income employment.
- ii. **Skill Development Programs:** Tailoring training initiatives to meet market demands to empower workers and contribute significantly to overall economic development.

In addition to human capital development, D-8 member states are well-positioned to leverage their youthful demographic profile by harnessing digital technology for innovation. As digital transformation becomes increasingly essential for economic advancement, key strategies include:

- i. **ICT Sector Collaboration:** Promoting cooperation in information and communication technology to facilitate technology transfer and capacity building among member states.
- ii. **Entrepreneurship Initiatives:** Supporting startups and small businesses to drive job creation and stimulate local economies, fostering an entrepreneurial spirit across member countries.

Recognizing the interconnections between these initiatives, the D-8 also acknowledges that sustainable development is integral to its mission. Strategies in that realm may involve:

- i. **Investment in Green Transportation Networks:** Enhancing connectivity to facilitate trade and boost economic growth among member countries by reducing transportation costs and time.
- ii. **Prioritizing Renewable Energy:** Transitioning towards renewable energy sources to reduce reliance on fossil fuels while combating climate change effects that disproportionately affect developing nations.

- iii. **Healthcare Infrastructure Improvement:** Strengthening healthcare systems is essential for addressing public health challenges.
- iv. **Agriculture and Food Security:** Enhancing sustainable agricultural productivity collaborations.

### Actionable Collaborations

Based on the channels of potential collaborations outlined in the previous sub-section, the D-8 countries (Bangladesh, Egypt, Indonesia, Iran, Malaysia, Nigeria, Pakistan, and Türkiye) can leverage their diverse strengths and address their common challenges through actionable collaborative initiatives. Here are key areas for such partnerships:

#### Trade Enhancement and Market Access.

**Intra-D-8 Trade Agreement:** The D-8 countries can create or strengthen preferential trade agreements to facilitate intra-D-8 trade. This can help reduce barriers, standardize tariffs, and enable smoother transactions. The D-8 should aim to increase trade among members, leveraging each country's unique exports (e.g., Indonesia's palm oil, Nigeria's oil and gas, and Türkiye's agricultural goods).

**Integrated Supply Chains:** Each country can specialize in stages of production based on comparative advantages, creating supply chains that span multiple D-8 nations. This would reduce dependence on external markets and add resilience against global supply shocks.

#### Agricultural Cooperation and Food Security.

**Agri-Tech Partnerships:** Given that many D-8 members have strong agricultural sectors (e.g., Nigeria, Iran, and Pakistan), they can collaborate on agricultural technology initiatives to boost productivity and reduce vulnerabilities to climate change. Sharing expertise in modern farming practices and sustainable agriculture would improve food security.

**Shared Agricultural Markets:** Establishing regional food distribution hubs could reduce costs and increase access to essential goods across D-8 countries. Countries like Egypt and Türkiye, with strategic geographic locations, could serve as distribution hubs.

#### Energy Collaboration.

**Joint Investments in Renewable Energy:** With countries like Indonesia and Malaysia focusing on renewable energy, the D-8 can pool resources to develop solar, wind, and hydroelectric projects across member states. This could help reduce energy costs and lessen dependence on fossil fuels.

**Shared Energy Infrastructure:** D-8 countries could develop shared pipelines and grid connections, especially in oil and gas sectors (led by Iran, Nigeria, and Egypt), to improve energy security and trade within the bloc.

#### Youth Employment and Workforce Development.

**Vocational Training Programs:** Addressing high youth unemployment across the D-8, countries could implement exchange programs for vocational training, especially in growing sectors like ICT (Egypt), manufacturing (Bangladesh), and services (Indonesia).

**Start-up and Innovation Hubs:** Establish regional start-up hubs to attract young entrepreneurs, supported by digital platforms and funding partnerships. These hubs could focus on ICT, fintech, and agri-tech, promoting job creation and entrepreneurship.

#### Digital Economy and Tech Development.



**Collaborative R&D Centers:** Establish research and development centers for technology, which focus on D-8-relevant fields like digital finance, mobile banking, and health tech. Malaysia and Egypt, with strong ICT sectors, could take leading roles in creating these hubs.

**Cross-Border E-commerce Platforms:** Launch a D-8 e-commerce platform to enhance intra-trade by offering SMEs across D-8 access to each other's markets. Digital trade agreements can also improve cyber security and data protection, encouraging investment in online business.

### Health Sector Cooperation.

**Pharmaceutical Alliances:** Egypt's growing pharmaceutical sector could collaborate with other D-8 nations to create a common market for affordable medicines, potentially supported by joint research on vaccines and treatment for regional health issues.

**Shared Medical Training and Infrastructure:** Pool resources to create shared healthcare facilities and training programs, reducing healthcare costs while improving standards across D-8 nations.

### Inflation Control and Monetary Stability.

**Policy Coordination on Inflation:** Given the high inflation rates in many D-8 countries, monetary policy dialogues could help exchange best practices and coordinate policies to stabilize inflation. These dialogues can include workshops on fiscal management and anti-inflation measures.

**Joint Reserve Fund:** Consider establishing a small, collective financial reserve or stabilization fund to support members facing currency instability, drawing on successful examples like the Chiang Mai Initiative.

### Tourism and Cultural Exchange.

**Joint Tourism Campaigns:** The D-8 can promote cultural tourism through collaborative marketing campaigns, creating multi-destination packages. This could significantly increase tourism flows, benefiting economies like Türkiye, Malaysia, and Egypt.

**Visa Facilitation and Travel Agreements:** Simplify visa procedures and travel arrangements between member countries, encouraging more tourism and boosting people-to-people connections.

### Banking and Financial Cooperation.

**Cross-Border Banking Services:** Facilitate cross-border banking and payment systems to support easier transactions for businesses and individuals. This could include creating a D-8 payment system that supports transactions in local currencies, reducing reliance on the dollar.

**Development of Islamic Finance:** Being a bloc of predominantly Muslim-majority nations, D-8 countries could expand the Islamic finance sector and increase access to sharia-compliant funding sources for infrastructural and productive projects.

## Conclusion

Thus, it is evident that the D-8 Organization for Economic Cooperation is strategically poised to translate its vision into impactful results that enhance both the individual economies of its members and the collective strength of the bloc. By building on its established frameworks and embracing new opportunities, the D-8 can achieve significant progress in trade, investment, technology, and sustainable development. Each member nation's unique assets — such as Türkiye's agricultural resources and Malaysia's ICT expertise — lay a solid foundation for coordinated growth across crucial sectors. The potential for increased intra-regional trade, diversified partnerships, and resilient supply chains underscores the D-8's capacity to fortify economic security while reducing reliance on external markets. Collaborative initiatives in renewable energy, infrastructure, and financial stability can drive sustain-

able growth and enable the bloc to navigate global economic challenges with greater independence. Beyond economics, D-8 member states are fostering joint efforts in areas such as education, healthcare, and digital transformation, creating social and economic benefits that resonate across their populations. These initiatives not only bolster internal development but also amplify the bloc's influence on the global stage, positioning D-8 nations to collectively advocate for the interests of developing countries. Through focused collaboration, the D-8 can establish a robust and inclusive growth model that elevates its members' standing worldwide and promotes shared prosperity.



Author Details    Abla Abdel Latif (Executive Director and Director of Research)

<sup>1</sup> Egyptian Center for Economic Studies, Egypt

0009-0000-2046-0619    [alatif@eces.org.eg](mailto:alatif@eces.org.eg)

## References

- Balisacan, A. M., Pernia, E. M., & Asra, A. (2003). Revisiting growth and poverty reduction in Indonesia: What do subnational data show? In E. M. Pernia & A. B. Deolalikar (Eds.), *Poverty, growth and institutions in developing Asia* (pp. 191-218). London: Palgrave Macmillan.
- Bank Negara Malaysia. (2024). *Economic & monetary review 2023*. Retrieved from [https://www.bnm.gov.my/documents/20124/12141961/emr2023\\_en\\_book.pdf](https://www.bnm.gov.my/documents/20124/12141961/emr2023_en_book.pdf)
- Bappenas. (2018). *Reducing poverty and inequality in Indonesia*. Retrieved from <https://www.bappenas.go.id/files/a95d5510-b4b2-4791-962e-1d0e98f4937f/download>
- BBC News. (2023). *Pakistan economy: Price spikes, political woes hit millions*. Retrieved from <https://www.bbc.com/news/world-asia-67494013>
- Del Vecchio, M. (2023). *Poverty and economic growth in Indonesia*. The Borgen Project. Retrieved from <https://borgenproject.org/economic-growth-in-indonesia/>
- Developing Eight Organization for Economic Cooperation. (n.d.). *Developing 8 (D-8)*. Retrieved from <https://trade.gov.tr/data/5b8e935813b8761b8471c11b/Developing%208.pdf>
- Developing Eight Organization for Economic Cooperation. (n.d.). *Istanbul Declaration*. Retrieved from <https://developing8.org/report/istanbul-declaration/>
- Economic Times. (2024). *Pakistan: As economic woes deepen, citizens continue to struggle from soaring inflation*. Retrieved from <https://economictimes.indiatimes.com/news/international/world-news/pakistan-as-economic-woes-deepen-citizens-continue-to-struggle-from-soaring-inflation-unemployment-crisis/articleshow/113366483.cms>
- Economics Observatory. (2024). *The phoenix that never rises: What's holding back Pakistan's economy?* Retrieved from <https://www.economicsobservatory.com/the-phoenix-that-never-rises-whats-holding-back-pakistans-economy>
- Finance Ministry of Pakistan. (2024). *Highlights - Pakistan Economic Survey 2023-24*. Retrieved from [https://www.finance.gov.pk/survey/chapter\\_24/Highlights.pdf](https://www.finance.gov.pk/survey/chapter_24/Highlights.pdf)
- International Labour Organization (ILO). (2023). *Pakistan: Employment outlook in a setting of austerity*. Retrieved from <https://www.ilo.org/media/7296/download>
- Iran International. (2024). *Iran aims to boost oil production to 4 million barrels per day*.
- Ministry of Foreign Affairs of Turkey. (2024). *Developing Eight (D-8) Organization for Economic Cooperation*. Retrieved from <https://www.mfa.gov.tr/d-8.en.mfa>
- Navadhi. (2023). *Malaysia snapshot - PESTLE, SWOT, risk and macroeconomic trends analysis*. Retrieved from <https://www.navadhi.com/publications/malaysia-snapshot-pestle-swot-risk-and-macroeconomic-trends-analysis>
- Offshore Technology. (2024). *Iran natural gas production: Data and insights*.



S&P Global. (2023). *Iran starts gas production from phase 11 of South Pars: Report*

SESRIC. (2016). *D-8 Economic Outlook 2016/2017 - NET*. Retrieved from <https://sesricdiag.blob.core.windows.net/sesric-site-blob/files/article/653.pdf>

Stimson Center. (2024). *Why is Iran importing natural gas from Russia*

World Bank. (2019). *Malaysia's economy to see continued growth, but downside risks are elevated*. Retrieved from <https://www.worldbank.org/en/news/press-release/2019/07/01/malaysias-economy-to-see-continued-growth-but-downside-risks-are-elevated>

World Bank. (2023). *Indonesia overview: Development news, research, data*. Retrieved from <https://www.worldbank.org/en/country/indonesia/overview>

**Infographics Sources:**

Image 1: [https://en.wikipedia.org/wiki/D-8\\_Organization\\_for\\_Economic\\_Cooperation](https://en.wikipedia.org/wiki/D-8_Organization_for_Economic_Cooperation)

Image 2: <https://www.aa.com.tr/en>

Image 3: <https://www.imf.org/en/Publications/WEO>

Image 4: [https://www.researchgate.net/figure/Poverty-trend-in-Indonesia\\_fig3\\_336155980](https://www.researchgate.net/figure/Poverty-trend-in-Indonesia_fig3_336155980)

Image 5: <https://www.savannah-energy.com/operations/nigeria/country-overview/>

Image 6: <https://www.worlddeconomics.com/Thoughts/Living-Standards-in-Turkey...>

Image 7: <https://www.shutterstock.com/search/d-8-organization-economic-cooperation>

Image 8: <https://developing8.org/>



## From the Istanbul Seminar to the Istanbul Declaration: Tracing the Journey, Objectives, Structural Evolution, of the Developing-8 (D-8) Organization for Economic Cooperation



Joshua O. Bolarinwa <sup>1</sup> , Isiaka Abdulqadir Imam <sup>2</sup> & Ismail Bello <sup>2</sup>

<sup>1</sup> Nigerian Institute of International Affairs (NIIA), Victoria Island, Lagos, Nigeria.

<sup>2</sup> Secretariat of the Developing-8 Organization for Economic Cooperation, Türkiye.

<sup>3</sup> Department of International Relations and Diplomacy, Baze University, Abuja, Nigeria

### Abstract

This study historicises the formation of D-8. The D-8 organization, often known as Developing-8, was established to foster development cooperation among the countries of Bangladesh, Egypt, Indonesia, Iran, Malaysia, Nigeria, Pakistan, and Turkey. Official announcement of the formation of the D-8 was made during the Istanbul Declaration of Summit of Heads of State and Government on June 15, 1997. The primary objective is to boost the positions of member states in the global economy, promote diversity, generate new trade and broader international economic links, increase involvement in global political decision-making, and elevate standards of life. The study adopts qualitative research method, relying on historical and descriptive approach for its analysis. The study evidently revealed from the composition of its members that the D-8 is a global arrangement rather than a regional one. The forum is intended to be neutral and should not infringe on the bilateral and multilateral obligations of the member countries, which arise from their membership in other regional or international bodies. The formal establishment of D-8 and the commencement of its activities were traced to a conference on “Cooperation in Development” conducted in Istanbul in 1996 and the “Istanbul Declaration of 1997.” The study recommends that it requires immediate and concerted efforts for the organization to realize its potential and translate strategies into tangible actions. The success of D-8 will ultimately depend on its ability to adapt to the evolving global landscape and address the structural weaknesses that have historically impeded its progress.

### Keywords

Developing-8 · Economic Cooperation · Trade · Development



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Corresponding author: Joshua O. Bolarinwa [segunbolarinwa@yahoo.com](mailto:segunbolarinwa@yahoo.com), [j.bolarinwa@niia.gov.ng](mailto:j.bolarinwa@niia.gov.ng), [directorofresearch@niia.gov.ng](mailto:directorofresearch@niia.gov.ng) [segunbolarinwa1985@gmail.com](mailto:segunbolarinwa1985@gmail.com)

## Introduction: Theoretical and Philosophical Underpinnings

Developing 8 (D-8) is an inter-governmental cooperation for development among Bangladesh, Egypt, Indonesia, Iran, Malaysia, Nigeria, Pakistan and Turkey representing more than 930 million people (Saleh, 2022). It was officially established through the Istanbul Declaration of Summit of Heads of State/ Government on June 15, 1997. The D-8 was mooted by Dr. Necmettin Erbakan, the then Prime Minister of Turkey, during a Seminar on “Cooperation in Development” held in Istanbul in October 1996. The group envisioned cooperation among countries stretching from South East Asia to West Africa. This seminar was the first step towards the establishment of D-8, and it was only after a series of preparatory meetings that D-8 was set up officially and began its activities with the Istanbul Declaration issued at the end of the summit of Heads of State and Government held in Istanbul on June 15, 1997 (Developing-8 Organization 1997, June 15).

Ali & Khurshid (2022) assert that the D-8 is recognised as an intergovernmental body founded on human and natural resources. It aims to evolve into a dynamic economic bloc that fosters sustainable development among its member states while making substantial contributions to global economic governance and international economic cooperation. D-8 is a group with unique features. It envisions cooperation among countries stretching from South East Asia to Africa. These countries are characterized by economic strength, abundant geographical endowment for tourism, and close religious, historical and cultural ties. D-8 is a global arrangement rather than a regional one. It is not a monopoly association; all members are at compatible stages of development, and all have large Muslim populations. The combined population of the eight countries is about 60 per cent of all Muslims, close to 13 per cent of the world population (Smith & Ali, 2022).

The geopolitical context of the seminar is crucial for understanding the growing endorsement of the concept of such an institution. By the mid-1990s, the world was transitioning into a post-Cold War paradigm. The dissolution of the Soviet Union and the Eastern Bloc marked the onset of a new era defined by the dominance of Western powers, particularly the United States and the European Union, in the global economic and political landscape. In this setting, many emerging countries, particularly in Asia, the Middle East, and Africa, faced economic challenges that were difficult to address autonomously. Dr. Erbakan, a persistent advocate for the empowerment of impoverished nations, recognised the increasing power imbalance and sought a new cooperative framework to counteract Western economic dominance.

The Istanbul Seminar was established as a forum to tackle the shared challenges encountered by these developing nations and to explore cooperative approaches for improving their global economic standing (Erbakan, 2019). The conference established a platform for these nations to discuss common challenges, including trade disparities, underdevelopment, political instability, and the imperative for sustainable advancement. The idea for the Developing-8 Organisation was conceived here. The conference did not expressly define the organization. However, it represented the first concrete step towards building a multilateral framework for collaboration. The Istanbul Seminar highlighted the synergistic benefits of the participating nations, including access to vast natural resources, large people, and rapidly growing markets.

The Developing-8 Organization for Economic Cooperation (D-8) was established, marking the end of preparatory meetings for a formal economic grouping. The Istanbul Declaration officially signed by the heads of state and government of eight countries marked the group's creation (Developing-8 Organization, 1997). Key goals included promoting sustainable economic development, improving trade relations, and enhancing their influence in global governance. D-8 aimed to foster economic growth, reduce poverty, and elevate the standard of living in its member countries. The organization was a



response to the growing economic and political dominance of Western countries in global affairs. D-8's membership was distinctive for its shared cultural and religious ties, with the majority being Muslim-majority countries. Despite these cultural attributes, D-8 sought to establish itself as a global group, open to collaboration with other developing countries and international organizations.

The D-8 countries are rich with natural resources and high population, characterized by economic potency, huge and beautiful geographical endowment for tourism, and close religious, historical and cultural ties. D-8 has a vast potential for development, given large amounts of land, abundant inexpensive and skilled labor, diversified human capital, rich natural resources, and a large market of around one billion people. Recognizing these potentials, the member countries of D-8, besides cooperation in D8 organization, have also economic and trade cooperation within regional groupings and other international organizations. The D-8 cooperation has been set by exploiting underlying complementarities and comparative and competitive advantages; enhancing the regions' competitiveness for investment and exports; promoting tourism; lowering transport and transaction costs; and reducing production and distribution costs through greater economies of scale.

This paper provides a comprehensive analysis of the D-8 Organisation, its history, objectives, organisational structure, key summits, achievements, challenges, and future prospects. Specifically, this paper examines the historical development of the D-8, tracing its evolution from the idea presented by Dr. Erbakan to its formal establishment and subsequent activities. The core objectives and guiding principles of the D-8 are rooted in its focus to enhance the global influence of its member states.

In addition, the paper explores the organizational structure of the D-8, including its governance framework, member roles, and the neutrality of the organization in international obligations. It also examines key summits and achievements, highlighting the major milestones, agreements, the impact of D-8 on its member states and the global economy, the challenges and criticisms faced by the D-8, including its limitations in achieving its objectives, internal political dynamics, and criticisms regarding effectiveness and inclusivity. Also, the paper examines the prospects of the D-8, outlining strategies for overcoming challenges and exploring opportunities for greater impact in the next decade.

This paper will adopt a historical and descriptive methodological approach to explore these themes. A historical analysis will provide a chronological overview of the D-8's development while descriptive analysis will focus on the key objectives, initiatives, and challenges facing the organisation today. This combined approach will allow for a detailed exploration of the D-8's achievements and limitations, as well as its potential future role in global economic and political governance.

The historical approach will focus on the timeline of events that led to the creation of the D-8, including the Istanbul Seminar in 1996, the signing of the Istanbul Declaration in 1997, and subsequent summits and activities. This approach will allow for a thorough understanding of the context in which the D-8 was established, as well as the socio-political dynamics that shaped its objectives. The descriptive approach will focus on explaining the current structure, objectives, achievements, and challenges of the D-8, using available data from official D-8 documents, summit declarations, and scholarly articles. This approach will also allow for an examination of the D-8's effectiveness in achieving its goals, as well as the criticisms and limitations it faces. This methodology will provide a balanced view of the organisation, highlighting both its successes and areas where further progress is needed.

## **Developing-8: Historical and Contextual Explanation**

Since its establishment in 1997, D-8 has grown in both scope and activities, supported by the vigor and dynamism of the private sector, which built many partnerships and alliances. At the same time, people-to-people contact has increased trust and confidence and instilled a feeling of community amongst the D8 member states. There are also significant gains in trade, industry, investment, travel and



tourism, as well as improvements in physical projects within the D-8 regions. Continuing globalization and recent trends in global and regional economic environment affecting trade and investment have also increased the strategic importance of well-designed economic grouping cooperation measures. Thus, during the 5th D-8 Summit Meeting held in Bali in May 2006, the member governments reaffirmed their commitment to the D-8 and its continuing growth and development.

The establishment of D-8 coincided with broader geopolitical transformations occurring globally after the Cold War. The termination of the Cold War in 1991 significantly altered the worldwide power arrangement. As numerous impoverished nations grappled with the repercussions of globalisation, economic dependency, and market liberalisation, the United States and Western Europe emerged as the predominant political and economic powers. Numerous D-8 members were undergoing significant transformations during this period. Some were adapting to the consequences of economic mismanagement and underdevelopment, while others were emerging from prolonged political turmoil. During the 1990s, these nations experienced rapid technological advancements and increasing global interconnectedness, presenting both opportunities and challenges.

Under this context, the development of D-8 was observed as a calculated attempt to offset the impact of Western powers. It was a political statement aimed at improving the position of underdeveloped nations in international debates as much as a reaction to economic problems. Forming D-8, member states aimed to have a cohesive voice able to argue for their interests in international platform such as the World Trade Organisation (WTO) and the United Nations. In terms of trade imbalances, access to technology, and economic equality, the D-8's founding also coincided with mounting worries about the widening gap between the global North and South (Ahmed & Youssef, 2022, Patel, 2021). D-8 provided member states the opportunity to escape the restrictions of conventional political and economic institutions that had underprivileged developing countries. Based on mutual respect, shared wealth, and group progress, it aimed to present another form of economic cooperation.

## Scope of Cooperation

The D-8 member states cooperate in alignment with the principles established in the “Istanbul Declaration” and the “Charter.” These guiding principles include peace over conflict, dialogue over confrontation, cooperation over exploitation, justice over double standards, equality over discrimination, and democracy over oppression. Cooperation is further built upon the values of fraternity, peace, dialogue, justice, equality, rule of law, and democracy. Member states are committed to resolving disputes through peaceful means and ensuring that obligations under the “Charter” do not conflict with their bilateral or multilateral commitments.

The scope of D-8 cooperation spans ten primary sectors, each assigned to a member country, including trade, industry, telecommunications, finance, banking, agriculture, energy, transportation, science and technology, and human resource development. Additional areas include poverty alleviation, environmental sustainability, health, tourism, and humanitarian assistance. Technical meetings and collaborative initiatives have been hosted across these sectors to promote and strengthen inter-member relations. D-8 cooperation also extends to political consultation and international coordination. This includes fostering partnerships in areas like rural development, small and medium enterprises, science and technology, and cultural exchange. The group emphasizes maintaining its economic focus without undermining member countries' commitments to other regional or global organizations.

As highlighted in the D-8 Facts and Figures Publication, the organization's core objectives are: (a) to enhance developing countries' positions in the global economy, (b) to diversify and create new opportunities for trade, (c) to improve participation in international decision-making and (d) to provide better

standards of living for member states. The inaugural Summit Declaration (Istanbul, 1997) underscored the role of D-8 in advancing socio-economic development, promoting global trade, and adhering to its founding principles of peace, dialogue, cooperation, justice, equality, and democracy. The specific objectives of D-8 include:

- Promoting sustainable socio-economic development through the effective utilization of collective resources.
- Enhancing welfare, reducing poverty, and improving the quality of life for citizens.
- Supporting private sector growth through public-private partnerships and collaboration between chambers of commerce and industry.
- Strengthening ties with other nations, regional organizations, and NGOs to advocate for developing countries' interests.
- Establishing a significant role in the global economy that reflects the collective capacity of its member states.

## Overall Objective of Developing-8

The Developing-8 (D-8) organization was founded to bolster the worldwide standing of its member states through the enhancement of economic collaboration, promotion of socio-economic development, and augmentation of their influence in international decision-making. The objectives are founded on ideals of peace, justice, democracy, and equality, generally prioritizing collaboration over exploitation and dialogue over conflict (Smith & Ahmed, 2021).

The primary aim of the D-8 is to deepen intra-group trade and economic collaboration among its member nations, enhance economic relations by diminishing trade barriers, facilitate market access, and foster trade volumes among its members. This objective is crucial for fostering economic growth and mitigating economic inequities among developing nations. The D-8 promotes economic collaboration that fosters infrastructure development, enhances exports, and facilitates the exchange of optimal corporate management practices (Batra & Jones, 2022). It also seeks to advance sustainable development by tackling the socio-economic difficulties encountered by its member nations. This includes programs aimed at alleviating poverty, improving living standards, and ensuring equitable opportunities by investment in sectors such as education, healthcare, and agriculture.

In addition, the D-8 prioritizes socio-economic development, focusing on poverty reduction and enhancement of quality of life, which are crucial for attaining sustained growth and stability (Choudhury, 2023). The D-8 aims to augment the aggregate political and economic influence of its member states internationally. The organization seeks to enhance its members' participation in international forums by consolidating resources and knowledge, therefore allowing them to influence global economic policy, while serving as a unified representative for developing nations striving to guarantee that their concerns are adequately articulated in significant international dialogues (Hussain & Zhang, 2022).

**Promotion of Peace, Stability, and Security:** A critical objective of the D-8 is to encourage peace and stability through diplomatic cooperation. By fostering dialogue and resolving conflicts through non-violent means, the D-8 aims to create a secure environment in which its members can thrive. The organization emphasizes peaceful cooperation over confrontation and strives to create a stable political and economic environment, which is vital for sustainable development (Nouri & Leung, 2021).

**Sustainable Development Based on Justice and Equality:** The D-8 advocates for sustainable development based on principles of justice, equality, and fairness. By promoting policies that ensure equitable distribution of economic and social benefits, the organization strives to reduce inequality within and among member countries. This includes addressing issues such as gender equality, social

justice, and the protection of marginalized groups, ensuring that development is inclusive and benefits all members (Rashid & Qadir, 2023).

**Technology and Knowledge Sharing:** In an increasingly interconnected world, technological development is crucial for socio-economic progress. The D-8 organization encourages the sharing of technological knowledge and expertise among member countries. This includes initiatives to improve technological capabilities in areas such as agriculture, renewable energy, and healthcare. By promoting technology transfer, D-8 members can accelerate innovation, enhance productivity, and achieve higher levels of competitiveness (Ibrahim & Singh, 2021).

**Strengthening Institutional Frameworks and Cooperation:** The D-8 also focuses on strengthening institutional frameworks to ensure effective implementation of its objectives. This involves creating and maintaining robust governance structures, promoting coordination between member states, and ensuring transparency and accountability in all projects. The effective functioning of D-8's secretariat and operational committees is essential for achieving its long-term goals and maintaining the trust of its members (Khan & Tan, 2022).

**Environmental Sustainability:** Environmental sustainability is a growing concern for the D-8, as the organization works to ensure that its development efforts do not compromise the ability of future generations to meet their needs. Hence, the D-8 promotes the adoption of green technologies, renewable energy sources, and sustainable agricultural practices to mitigate the impacts of climate change. This goal is central to ensuring long-term socio-economic stability and environmental protection for its member countries (Rahman & Yousaf, 2022).

From the foregoing, the objectives of the D-8 are multifaceted, ranging from promoting economic cooperation and socio-economic development to enhancing global political influence and ensuring environmental sustainability. By focusing on principles such as peace, justice, and equality, the organization aims to create a more balanced and equitable global order where developing countries have a stronger voice in shaping international policies. The D-8's success in achieving these goals will significantly contribute to improving the quality of life and economic well-being of its member states, setting an example for other developing nations to follow.

## Ideology and Economic Rationale behind the Formation of D-8

The beginning of the interactions between geographical discoveries and civilizations at a global level have brought about a deepening of mutual relations in political, social and cultural issues especially in the global economy. The phenomenon of globalization, which entered the first phase of capitalism with the overseas expansion, has passed through various phases as a result of historical breaking points. Although the industrial revolution is one of the breaking points in question, the relations of production have changed radically and industrialized countries like England have added their economic power to their political power.

With the development of communication and transportation technologies in the global economic policy in the 1970s, the shift towards private companies made multinational companies important actors in global politics and an intricate relationship was established between nation-states, multinational companies and regional economic organizations. States, which are the main determining actors of the system according to realism, started to share their authorities with regional and cross-border organizations. This situation pointed to another breaking point where globalization gained momentum. The stage in which globalization manifested itself was the end of the Cold War period, which entered the period of collapse with the fall of the Berlin Wall, and the main strength of the system in this direction was the USA.

The countries that have gained their independence from the Soviet Union and the states that are on the way to become regional powers have sought new quest to gain their political and economic powers by taking advantage of the authority gap. In this regard, integration into the Western world led by the USA after the Cold War has become the main political and economic goal of most countries and organizations, and the view that economic power depends on the relations with the West has become a definite position.

In this regard, D-8 is a global economic organization with regional potential, formed by 8 Islamic countries coming together, independent of the conjuncture of the pre-21st century period. Although the studies on D-8 are inadequate in the literature, there are claims that D-8 does not have a major impact compared to other economic organizations. To eliminate the gaps in literature as alluded to in the preceding paragraph, this study seeks to further espouse the structure, functions and potentials of the D-8.

## Challenges faced by the D-8 Organization

Despite its promising goals and huge potentials, the D-8 organization has faced several challenges in achieving its objectives. These challenges stem from internal and external factors that limit the ability of the D-8 to fully realize its goals. However, through collaboration, team work and dedication, the D-8 is poised to surmount these challenges and achieve its mandates.

**Internal Political and Economic Dynamics:** One of the major challenges facing the D-8 is the varying political and economic conditions of its member states. While the member countries share common goals, their political systems, economic strategies, and levels of development differ considerably. This disparity often creates difficulties in achieving uniformity in decision-making and policy implementation. For example, countries like Malaysia and Turkey have relatively stronger economies compared to countries like Bangladesh and Pakistan, leading to challenges in balancing the interests of both economically stronger and weaker members. Moreover, some member countries have experienced political instability or governance challenges, which have hindered their ability to engage effectively in the group's activities. For instance, the political turmoil in countries such as Egypt and Pakistan have sometimes limited their capacity to focus on the long-term goals of the organization, affecting the cohesiveness of D-8 initiatives (Pinto & Urrutia, 2023).

**Lack of Effective Implementation:** The D-8's ambitious objectives require effective cooperation, yet the implementation of projects has been slow. Despite the formation of various committees and working groups, the pace of achieving concrete outcomes has often been slow. This has been attributed to the lack of sufficient resources, administrative capacity, and coordination between member countries. In some instances, the absence of a clear, actionable roadmap for key projects has led to limited progress in areas such as infrastructure development, trade liberalization, and poverty alleviation (Melkumyan, Melkonyan, & Javadyan, 2024).

**Competition with Other Regional and Global Organizations:** The D-8 faces significant competition from other regional and global organizations, such as the African Union (AU), the Association of Southeast Asian Nations (ASEAN), and the Organization of Islamic Cooperation (OIC). Many member states of the D-8 are also part of these organizations, which sometimes leads to competing priorities and interests. For example, while D-8 aims to foster deeper economic ties among its members, many countries prioritize their obligations to other economic groups, often diluting the commitment to D-8 initiatives (Christopher & Pellitteri, 2023). The membership overlap with these other groups can lead to conflicting goals and limit the D-8's ability to carve out a unique space in global governance.

**Limited Economic Integration:** Although the D-8 has made strides in economic cooperation, the level of integration among member countries remains low. Trade flows between D-8 countries have

not increased significantly, and member states have not fully utilized their collective market potential. This limited economic integration has been due to a combination of factors, including protectionist policies, differences in trade regulations, and a lack of infrastructure to support regional trade (O'Brien, 2024). While the potential for intra-D-8 trade is high, political will and sustained effort are needed to overcome these barriers.

## Prospects of D-8

While D-8 has faced several obstacles since its inception, the organization possesses immense potential to enhance its influence and effectiveness through strategic reforms. By addressing internal inefficiencies and actively engaging with key stakeholders, D-8 can play a more prominent role in the global economic and political arena. One significant avenue for progress is improving the institutional capacity of D-8. Scholars have argued that institutional inefficiencies often hinder multilateral organizations like D-8 from achieving their full potential. Melkumyan et al. (2024) note that “developing countries must invest in stronger operational frameworks to ensure that agreements translate into actionable policies” (p. 115). In D-8’s case, strengthening the secretariat by providing greater financial resources and expanding its staff capacity would enable it to tackle implementation delays. Moreover, introducing standardized mechanisms for member states to coordinate development projects could enhance efficiency. Such measures would allow D-8 to overcome its historical challenges, creating a stronger foundation for impactful collaboration.

In addition, engaging with the private sector also presents an essential opportunity for D-8 to foster economic growth. While the Istanbul Declaration emphasizes the importance of private sector involvement, its practical application within D-8 countries remains inconsistent (Melkumyan et al., 2024). Encouraging collaboration between governments and businesses requires more than just declarations. For example, D-8 could establish regional investment forums to facilitate partnerships and streamline regulatory procedures that often discourage private investors. As Christopher and Pellitteri (2023) argue, “Public-private partnerships in developing economies must address bureaucratic inefficiencies to attract sustainable investment” (p. 89). If D-8 countries adopt such reforms, they could stimulate greater investments in critical sectors, including renewable energy, technology, and infrastructure. Intra-regional trade is another area where D-8 has significant potential for improvement. Despite being home to over 930 million people, trade among member states remains underdeveloped due to persistent barriers. Christopher and Pellitteri (2023) highlight that “Fragmented trade policies and inadequate infrastructure often prevent regional organizations from achieving meaningful economic integration” (p. 73). To address this, D-8 must prioritize removing trade barriers by standardizing tariffs and regulations. Additionally, substantial investments in transport networks and digital trade infrastructure could reduce logistical challenges. By consolidating its economic power, D-8 would not only promote regional prosperity but also become a formidable player in the global market.

Furthermore, D-8 holds a unique position to advocate for the interests of the Global South on international platforms. This opportunity arises at a time when global institutions like the World Trade Organization and United Nations are increasingly scrutinized for favoring developed economies. According to Melkumyan et al. (2024), “A unified voice from developing nations can reshape the global economic agenda to prioritize fair trade and sustainable development” (p. 102). D-8’s collective stance on issues such as climate change and equitable development aid could amplify its influence and strengthen its position as a representative of developing countries. However, achieving this requires a cohesive strategy that aligns the diverse interests of its members. While D-8 faces numerous challenges, it also has considerable opportunities to enhance its global impact. By strengthening its institutional framework, fostering meaningful private sector engagement, removing intra-regional trade barriers, and advocating for the Global South, D-8 can achieve sustainable development and greater global

influence. However, realizing this potential requires immediate and concerted efforts to translate strategies into tangible actions. The success of D-8 will ultimately depend on its ability to adapt to the evolving global landscape and address the structural weaknesses that have historically impeded its progress.

## Conclusion

The D-8 Organization has made notable progress since its formation in 1997, but it faces several challenges in achieving its overarching goals of promoting sustainable development and economic cooperation. Its diverse membership, ranging from politically unstable countries to economically advanced ones, creates both opportunities and difficulties in fostering cohesive and effective cooperation. Despite these challenges, the future prospects for the D-8 remain promising, especially if it can strengthen its institutional framework, promote greater economic integration, and leverage public-private partnerships. As the global geopolitical landscape continues to evolve, the D-8 has the potential to play an increasingly important role in shaping global economic and political affairs, particularly in advancing the interests of developing countries.



### Author Details

**Joshua O. Bolarinwa (Director of Research)**

<sup>1</sup> Nigerian Institute of International Affairs (NIIA), Victoria Island, Lagos, Nigeria.

0000-0003-0082-3632 ✉ segunbolarinwa@yahoo.com, j.bolarinwa@niiia.gov.ng, directorofresearch@niiia.gov.ng segunbolarinwa1985@gmail.com

**Isiaka Abdulqadir Imam**

<sup>2</sup> Secretariat of the Developing-8 Organization for Economic Cooperation, Türkiye.

0009-0007-0896-7004 ✉ Isiaka.imam@developing8.org

**Ismail Bello (Senior Lecturer)**

<sup>2</sup> Secretariat of the Developing-8 Organization for Economic Cooperation, Türkiye.

0000-0002-6484-9906 ✉ Ismail.bello@developing8.org, ismailbello12@gmail.com

## References

- Ahmed, F., & Youssef, K. (2022). The D-8 and the global economic divide: Addressing trade imbalances and inequality between the North and South. *Global Economic Review*, 44(2), 78-95. <https://doi.org/10.1016/j.ger.2022.03.007>
- Batra, R., & Jones, M. (2022). Trade and economic integration among developing nations: Case studies from the D-8 group. *Journal of International Trade and Development*, 29(3), 243-257. <https://doi.org/10.1080/09638199.2022.1837654>
- Choudhury, S. (2023). Socio-economic development in developing countries: Strategies and policies for poverty reduction. *International Journal of Development Studies*, 47(1), 34-45. <https://doi.org/10.1177/0972150923111344>
- Christopher, D., & Pellitteri, M. (2023). Introduction—On politics of visual media. *Mutual Images Journal*, 11, 53-59. <https://mutualimages-journal.org/index.php/mi/article/download/121/96>
- D-8 Organization for Economic Cooperation, *Developing 8*, <http://www.developing8.org/About.aspx> (accessed March 12, 2013). "Developing 8 Countries, (2013)" [http://wiki/Developing\\_8\\_Countries](http://wiki/Developing_8_Countries).
- Developing-8 Organization. (1997, June 15). *Istanbul Declaration* issued at the summit of Heads of State and Government. Developing-8 Organization. Retrieved from <http://www.developing8.org/istanbul-declaration>
- Developing-8 Organization. (1997, June 15). *Istanbul Declaration* issued at the summit of Heads of State and Government. Developing-8 Organization. Retrieved from <http://www.developing8.org/istanbul-declaration>



- Erbakan, N. (2019). *Economic empowerment of developing nations: The birth of the D-8*. Istanbul University Press.
- Hussain, M., & Zhang, Q. (2022). The global influence of regional cooperation groups: A focus on the Developing-8. *Global Politics Review*, 8(2), 79-95. <https://doi.org/10.1007/s11356-022-21955-5>
- Ibrahim, F., & Singh, R. (2021). Technology transfer and development: Enhancing innovation among developing nations. *Technology in Society*, 65, 101517. <https://doi.org/10.1016/j.techsoc.2021.101517>
- Khan, A., & Tan, S. (2022). Institutional frameworks for regional cooperation: Lessons from the D-8 experience. *Journal of Regional Development*, 25(4), 321-334. <https://doi.org/10.1016/j.jrd.2022.03.009>
- Melkumyan, Y., Melkonyan, N., & Javadyan, S. (2024). The image of the US Army in American movies: The soft power of American cinema. *Journal of Political Science: Bulletin of Yerevan University*, 3(1), 56-69. <https://pub.yasu.am/index.php/j-pol-sci/article/download/12097/9556>
- Nouri, M., & Leung, Y. (2021). Peacebuilding and regional cooperation: The role of the Developing-8 organization. *Journal of Peace Research*, 58(5), 789-804. <https://doi.org/10.1177/0022343321103184>
- O'Brien, D. (2024). The allure and threat of onscreen computers: A supercut of onscreen computers in speculative screen fiction. *Iluminace*, 36(2), 29-40. [https://repository.essex.ac.uk/39607/1/Iluminace\\_ilu-202402-0005.pdf](https://repository.essex.ac.uk/39607/1/Iluminace_ilu-202402-0005.pdf)
- Patel, S. (2021). *Economic inequalities and the North-South divide: The role of regional cooperation in development*. Oxford University Press.
- Rahman, M., & Yousaf, S. (2022). Sustainable development and environmental policies in developing countries: A case study of the D-8. *Environmental Policy and Governance*, 32(5), 391-404. <https://doi.org/10.1002/eet.2047>
- Rashid, M., & Qadir, A. (2023). Sustainable development through social justice: The role of developing countries in promoting equality. *Sustainability*, 15(3), 1722-1737. <https://doi.org/10.3390/su15031722>
- Saleh, B. (2022). An assessment of Nigeria's engagement with developing eight countries (D8) in the fourth republic, 1999-2019. *International Journal of Foreign Trade and International Business*, 4(1), 34-50. <https://doi.org/10.33545/26633140.2022.v4.i1a.68>
- Smith, J., & Ali, R. (2022). *Demographic trends and global population distribution of Muslim-majority countries*. *Journal of Global Demographics*, 45(3), 220-230.



## Advancing South-South Cooperation: Analysing the Developing-8 Organization's Multisectoral Initiatives and Achievements



Ismail Bello <sup>1,2</sup> , Isiaka Abdulqadir Imam <sup>2</sup>  , Jauher Saleem <sup>3</sup>  & Muhammad Imran <sup>3</sup> 

<sup>1</sup> Department of International Relations and Diplomacy, Baze University, Abuja, Nigeria

<sup>2</sup> Secretariat of the Developing-8 Organization for Economic Cooperation, Türkiye.

<sup>3</sup> Institute of Regional Studies, Islamabad, Pakistan

### Abstract

South-South Cooperation denotes the collaboration among developing countries in the Global South to promote economic, social, and political development through leveraging comparative advantages among countries with similar development trajectories and challenges. This cooperation often involves sharing contextually relevant solutions to confront challenges and achieve collective growth. This ideology led to the establishment of the Developing-8 Organization for Economic Cooperation (D-8) in 1997 by Muslim-majority countries, namely Bangladesh, Egypt, Indonesia, Iran, Malaysia, Nigeria, Pakistan, and Turkey. This study explores the initiatives, achievements, and challenges of D-8 cooperation areas, including agriculture and food security, trade, transportation, industry, tourism, and energy. Utilizing qualitative methodology, the findings indicate that D-8 has made modest progress in its sectoral cooperation. Notable achievements include the Dispute Settlement Mechanism (DSM) and Trade Facilitation Strategies (TFS) protocols under the D-8 Preferential Trade Agreement (D-8 PTA), the establishment of the D-8 Research Center for Agriculture and Food Security (D-8 RCAFS), the creation of the SME Center, and the initiation of training and capacity-building programs in civil aviation cooperation. Despite these accomplishments, the D-8 faces significant challenges, such as limited publicity and low levels of intra-trade among member states. However, with enhanced strategic coordination and effective leveraging of shared resources and markets, the D-8 has the potential to develop into a powerful economic bloc and become a significant player in the global economy by 2050.

### Keywords

Developing-8 · Advancing South-South Cooperation · Multisectoral Initiatives · Achievements



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 Corresponding author: Isiaka Abdulqadir Imam [Isiaka.imam@developing8.org](mailto:Isiaka.imam@developing8.org)

## Introduction

In an increasingly interconnected world, the concept of South-South Cooperation has become a cornerstone in fostering sustainable development among developing nations in the Global South. This collaboration is driven by the recognition that countries with similar development trajectories and challenges can leverage their comparative advantages to achieve mutual growth and development. South-South Cooperation emphasizes solidarity, mutual benefit, and the sharing of contextually relevant solutions, making it a vital mechanism in addressing the unique challenges faced by these nations.

The Developing-8 Organization for Economic Cooperation (D-8) is a prime example of this cooperative framework in action. Established in 1997 by eight Muslim-majority countries—Bangladesh, Egypt, Indonesia, Iran, Malaysia, Nigeria, Pakistan, and Turkey—the D-8 aims to promote economic and social cooperation, create new opportunities in trade and industry, and improve living standards within its member states. The D-8 was founded on the principles of peace, dialogue, and cooperation, with a vision to enhance member states' position in the global economy, diversify and create new economic opportunities, and improve the standard of living for their populations. The combined population of the D-8 countries is approximately 1.2 billion, 63% of all Muslims, nearly 16% of the world's population. Recently, Azerbaijan has been admitted as a member. This highlights the open joining policy of the D-8 and represents the potential of expansion of the organization.

Over the years, the D-8 has undertaken various initiatives aimed at strengthening collaboration in key sectors such as agriculture and food security, trade, transportation, industry, tourism, and energy. These initiatives are driven by the belief that collective efforts and shared knowledge can lead to more effective and sustainable solutions. One of the key areas of focus for the D-8 has been the development and implementation of the D-8 Preferential Trade Agreement (D-8 PTA). The D-8 PTA, along with its pivotal components—the Dispute Settlement Mechanism (DSM) and Trade Facilitation Strategies (TFS)—is designed to enhance trade relations and reduce barriers among member states. Additionally, the establishment of the D-8 Research Center for Agriculture and Food Security (D-8 RCAFS) reflects the organization's commitment to addressing food security challenges through innovative research and collaboration.

While the D-8 has achieved notable successes, it faces several challenges, including limited publicity and low levels of intra-trade among member states. The hindrance to the progress of the organization can be analysed utilizing the lens of Global Economic Context, particularly difficulties in the Eurozone present significant challenges. These obstacles highlight the need for enhanced strategic coordination and greater public awareness of the organization's efforts and achievements. Looking ahead, the potential for the D-8 to evolve into a powerful economic bloc and a significant player in the global economy by 2050 is immense. Even though the pace of the progress has been slow, the organization has all the ingredients of becoming an inspiration for the regional cooperation frameworks. By leveraging shared resources, markets, and strategic partnerships, the D-8 can continue to drive progress and create lasting impacts, with strong commitment from founding members, on the global stage.

Therefore, this study delves into the initiatives, achievements, and challenges of the D-8 across its core areas of cooperation. The use of qualitative methodology in the study allows for a comprehensive analysis of the organization's efforts and underscores the importance of South-South Cooperation in the quest for sustainable development.

## Understanding South-South Cooperation

The concept of South-South Cooperation (SSC) is rooted in the decolonization movements of the mid-20th century, when newly independent nations sought to assert their autonomy and establish



cooperative economic ties outside the traditional Western-centric framework. Early efforts, such as the Bandung Conference of 1955, laid the groundwork for SSC by bringing together leaders of 29 Asian and African countries to promote economic and cultural cooperation and oppose colonialism. Over the decades, SSC has evolved into a comprehensive framework underpinned by various international agreements and initiatives, including the Buenos Aires Plan of Action (BAPA) in 1978 (UNDP, 1978).

South-South Cooperation (SSC) represents a transformative framework for collaboration among developing countries in the Global South, aimed at promoting economic, social, and political development. By leveraging shared histories, comparable development challenges, and unique local solutions, SSC fosters the exchange of knowledge, resources, and technologies to achieve sustainable growth. This cooperative model contrasts with traditional North-South development paradigms, emphasizing mutual respect, non-conditionality, and equality among partners (UNDP, 1978).

At the heart of SSC lies the principle of solidarity among nations that share historical trajectories of colonization and economic marginalization. SSC seeks to address systemic global inequalities by enhancing collective self-reliance, reducing dependency on traditional power structures, and empowering countries to chart independent development paths (BAPA, 1978). Key frameworks like the Buenos Aires Plan of Action (BAPA) provide a roadmap for SSC, outlining strategies for technical cooperation among developing countries to share contextually relevant solutions (UNDP, 1978).

In this context, the D-8 Organization exemplifies SSC by uniting nine Muslim-majority nations—Azerbaijan, Bangladesh, Egypt, Indonesia, Iran, Malaysia, Nigeria, Pakistan, and Turkey—in their route to prosperity. It seeks to leverage the comparative advantages of its members, which include substantial human capital, abundant natural resources, and diverse cultural heritage, to promote sustainable development (D-8 Organization for Economic Cooperation, 1997). By fostering sectoral collaboration across trade, agriculture, energy, and transportation, the D-8 reinforces the core tenets of SSC, contributing to global efforts to achieve the Sustainable Development Goals (SDGs) (UN, 2015).

As SSC continues to evolve, it holds significant potential for shaping a more equitable and sustainable global order. Future efforts must focus on deepening collaboration, leveraging technological advancements, and addressing emerging issues such as digital inequality and climate change. By maintaining its core principles of solidarity and mutual respect, SSC can play a pivotal role in driving inclusive development and fostering a new era of global cooperation.

## **Developing-8 Organization: Rationale and Origin**

The Developing Eight (D-8) Organization for Economic Cooperation, established in 1997, occupies a central position in the dynamic landscape of international economic collaboration. Composed of member states from Asia, Africa, and the Middle East, the D-8 plays a pivotal role in fostering economic integration and cooperation. As reflected by composition of its members, D-8 is a global arrangement rather than a regional collaboration. In an era marked by increasing globalization, the D-8's mission becomes even more significant, addressing the pressing need for cross-regional collaboration.

Recognizing the importance of economic collaboration for national development, the founding member states—Bangladesh, Egypt, Indonesia, Iran, Malaysia, Nigeria, Pakistan, and Turkey—sought to establish a framework for shared prosperity. This aligns with global trends, as numerous organizations have emerged with similar objectives. For instance, the European Union (EU) demonstrates the benefits of deep economic integration through its single market and customs union. Similarly, the Association of Southeast Asian Nations (ASEAN) excels in fostering intra-regional trade and diplomacy, serving as a model for Asian nations (Jusoh & Hussain, 2018).

The creation of the D-8 was driven by the necessity of economic cooperation among developing nations, aimed at bolstering their bargaining power on the global stage. The Organization seeks to



enhance the standard of living of its member states, particularly in trade and other areas of cooperation. This objective is echoed in the founding principles of the African Union (AU), which aims to enhance economic integration among African nations as a means of fostering unity and self-reliance. D-8 member states, collectively housing 1.2 billion people or 16% of the world's population, represent a potential economic powerhouse, with a combined Gross Domestic Product (GDP) of approximately \$4 trillion, accounting for nearly 5% of the global GDP.

By analysing the role and operational structure of established regional organizations, the role of D-8 in fostering economic cooperation can be enhanced and lessons drawn would help to make it an effective organization. The EU, with its single market and customs union, illustrates the advantages of deep economic integration (Bhagwati, 1995). ASEAN's success in intra-regional trade and diplomacy offers a blueprint for Asian nations. The AU's efforts to establish the African Continental Free Trade Area (AfCFTA) demonstrate the commitment of African nations to regional cooperation.

The D-8's objectives include achieving sustainable socio-economic development, promoting welfare, alleviating poverty, improving the quality of life for its members, strengthening economic ties, and enhancing cooperation with other countries and regional and international organizations. These goals are based on principles of peace, dialogue, cooperation, justice, equality, and democracy. Initially focusing on agriculture and food security, trade, industry, small and medium enterprises (SMEs), transportation, energy, minerals, and tourism, the D-8 has expanded its scope to address new global challenges. These include education and human resource development, health and social protection, e-governance, the digital economy, payment systems, and climate change. Secretary General of D-8 and Minister of Trade of Turkiye, in a meeting in 2023, emphasized the importance of developing a D-8 E-commerce platform and a Barter Trading System. This represents working on the scope expansion of the organization.

By exploring the origins and necessity of the D-8's establishment and drawing parallels with other international organizations, this research paper aims to provide a comprehensive understanding of the prospects and challenges facing the D-8 Organization for economic cooperation.

## Developing-8 Organization Multisectoral Cooperation

### Trade

Trade holds a central position in the objectives and operations of D-8, playing a crucial role in fostering economic growth, reducing poverty, and driving overall development within its member states. With a population of 1.2 billion and a market share of 14%, it is one of the largest markets globally. The D-8 operates in the economic realm, boasting a combined GDP of approximately US \$4 trillion, which accounted for over 5% of the global GDP. Trade cooperation within the Developing Eight (D-8) Organization for Economic Cooperation has significantly promoted economic integration and collaboration among its African and Asian member states. This success is evident in several key aspects:

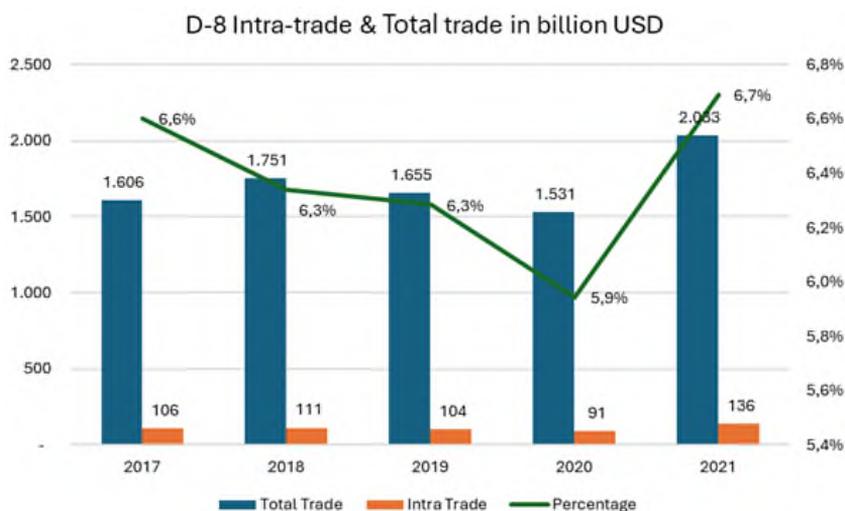
1. **Commitment to Intra-Regional Trade:** D-8 member states have consistently demonstrated their dedication to expanding intra-regional trade by implementing various trade facilitation measures.
2. **Impressive Trade Volumes:** The total trade volume of D-8 member states stands at around US\$ 2.5 trillion, capturing nearly 7% of global trade. The D-8's Decennial Roadmap 2020-2030 aims to increase trade to \$500 billion by 2030. It is a 10-year plan to increase trade between member states to at least 10% of the total global trade.
3. **Substantial Growth:** Over the past two decades, D-8 intra-trade has surged more than nine-fold, from USD 14 billion in 1997 to USD 136 billion in 2021.



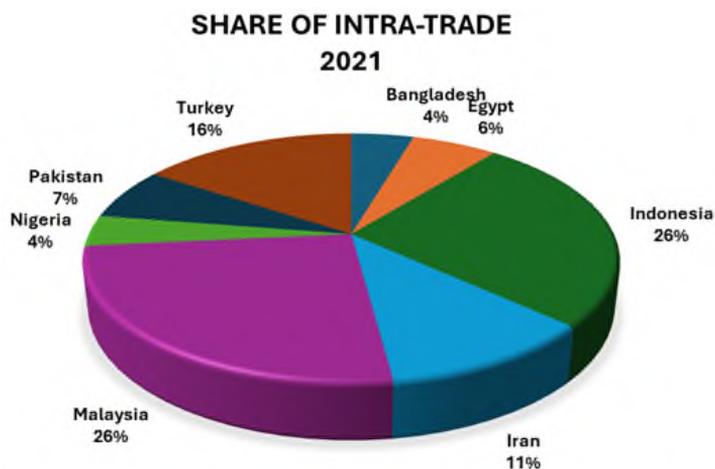
### D-8 Trade Data

D-8 Trade Data (in Billion USD)	2017	2018	2019	2020	2021
D-8 Intra Export	51.00	52.42	49.17	45.20	69.89
D-8 Intra Import	55.37	58.62	54.43	45.84	66.58
Total D-8 Intra Trade	106.37	111.04	103.60	91.03	136.47
Total Trade Volume of the Member States	1,606	1,751	1,655	1,531	2,033
Intra-Trade Percentage	6.6%	6.3%	6.3%	5.9%	6.7%

Source: Trade Map Statistics



### Share of D-8 Intra-Trade



## Trade Agreements

At the 5th Summit of Heads of State and Government in Bali, Indonesia, on 13 May 2006, the D-8 leaders signed two significant trade agreements: The D-8 Preferential Trade Agreement (PTA) and the Multilateral Agreement among D-8 Member Countries on Administrative Assistance in Customs Matters (AACM). These agreements underscore the efforts of the D-8 member states to reduce trade barriers, streamline customs procedures, and harmonize trade regulations, which have substantially contributed to the growth of intra-D-8 trade. The D-8 PTA came into effect on 25 August 2011. To date, all member states except Egypt have ratified the D-8 PTA and submitted their tariff concession offer lists. Among the seven countries that ratified the D-8 PTA, five including Bangladesh, Indonesia, Iran, Malaysia, and Turkiye have published official government gazette notifications for implementing the agreement.

To further the implementation of the PTA, the member states established the D-8 Trade Ministers Council (TMC) and the Supervisory Committee on the D-8 PTA (SC PTA). The TMC is the highest policy-making body, while the SC PTA reviews progress and ensures the effective implementation of the D-8 PTA. The D-8 targets an intra-trade figure of \$500 billion by 2030. The organization has also concluded a Dispute Settlement Mechanism (DSM) for the PTA.

## Agriculture and Food Security

Agriculture and food security are critical issues for the D-8 Organization for Economic Cooperation and its member states. Many of the D-8 countries have significant agricultural sectors, with agriculture playing a pivotal role in their economies. For instance, countries like Bangladesh, Indonesia, and Nigeria heavily depend on agriculture as a major source of income and employment for their populations. Ensuring food security, which entails access to sufficient, safe, and nutritious food for all citizens, is a shared priority within the D-8 organization. By fostering cooperation in agriculture, member states aim to increase agricultural productivity, reduce post-harvest losses, and enhance the overall food supply chain to better meet the nutritional needs of their populations. This cooperation aligns with the United Nations Sustainable Development Goal 2, which aims to end hunger, achieve food security, and promote sustainable agriculture. The D-8 member states collectively have 274.25 million hectares of agricultural land, with an aggregate agricultural production value of \$531.76 billion.

The agricultural cooperation within the D-8 is highly active. The organization has held seven ministerial meetings on Agriculture and Food Security, in addition to several meetings of D-8 task forces on Agriculture, including Fertilizer, Animal Feed, Seed Security and Trade Standards, and Trade Issues, Marine and Fisheries. The organization also established the D-8 Research Centre for Agriculture and Food Security in Pakistan, demonstrating the member states' commitment to collaborating on agricultural research, technology transfer, and capacity-building initiatives. This centre provides opportunities for member states to share knowledge and best practices to address common challenges such as the impacts of climate change on agriculture, water scarcity, and the need for sustainable farming practices.

The D-8 has partnered with several international organizations and bodies such as the Food and Agricultural Organization (FAO), the International Fund for Agricultural Development (IFAD), the International Rice Research Institute (IRRI), the International Maize and Wheat Improvement Center (CIMMYT), and the Islamic Development Bank (IsDB Group) to develop the agricultural capacity of member states. The D-8's dedication to agriculture and food security is evident in their collaborative efforts. By prioritizing agricultural development, sharing expertise, and facilitating trade in agricultural products, D-8 countries work together to enhance food security, reduce poverty, and promote sustainable economic growth across the region. These efforts underscore the organization's commitment to addressing pressing global challenges and improving the well-being of its citizens through agricultural cooperation.



## Industry

The significance of industry cooperation within the Developing-8 (D-8) Organization for Economic Cooperation cannot be overstated, especially in terms of member states' economic development and regional integration goals. This cooperative approach is crucial as it encompasses a wide range of industries that are essential to the socio-economic advancement of D-8 nations. These industries include automotive, cement, technology, small and medium enterprises (SMEs), electronics and ICT, chemical and petrochemicals, standardization and accreditation, textiles and garments, food industries, and the production of glass, ceramics, granite, and marble. Addressing these sectors collaboratively can yield substantial benefits through economic diversification and specialization.

### Small and Medium Enterprises (SMEs)

Emphasizing SMEs within industries further strengthens entrepreneurship and job creation, driving economic diversification and stability. The D-8 Organization plans to launch the D-8 SME Centre in Abuja, Nigeria in 2025. This centre aims to provide support, resources, and collaboration opportunities for small and medium-sized enterprises across member states. In recognition of the importance of industrial cooperation, the organization has held six Ministerial Meetings on Industry, where far-reaching agreements have been made to promote various sectors of industry within the D-8.

## Technology Cooperation

Fostering technology cooperation in industries such as electronics, ICT, chemicals and petrochemicals is pivotal for enhancing industrial competitiveness and fostering economic sustainability. Joint research and development initiatives, knowledge sharing, and technology transfer can catalyze innovation and promote industrial growth. The D-8 Technology Transfer and Exchange Network (TTEN) serves as a platform for member states to share technological innovations, best practices, and research findings across various sectors. By leveraging technology, TTEN enhances economic growth and competitiveness while addressing societal and environmental concerns. D-8 TTEN plays a vital role in advancing technology-driven progress within the D-8 member states and contributing to their development goals. To encourage innovation, TTEN organizes annual awards for D-8 member-state innovators to showcase their products.

## Transportation

While some member states share land borders, others are separated by geographical distances and bodies of water. For instance, Turkiye, Iran, and Pakistan share land borders, while Indonesia, Malaysia, Nigeria, Egypt, and Bangladesh do not share land borders with any other member states. Within this context, transportation cooperation, particularly in air transport and shipping, emerges as a pivotal driver of economic integration and development.

**Air Transport:** Air transport plays a central role in enhancing economic cooperation among D-8 member states, particularly those geographically distant. Rapid globalization and the increasing demand for quick and efficient transportation of goods and people have made air travel indispensable to modern economies. Air transport offers several advantages, including speed, reliability, and connectivity. To achieve cooperation and remove barriers between member states, the D-8 has emphasized the Civil Aviation sector. A Working Group for Cooperation in Civil Aviation was established in 2007, later upgraded to the Directors-General of Civil Aviation and Expert Working Group. The organization has also set up four taskforces: Air Navigation & Air Traffic Management, Commercial Issues, Safety and Security, and Training & Capacity Building. To strengthen collaboration in energy, capacity building, open sky

agreements, multilateral air service agreements, joint ventures on airplane maintenance, opening new routes, and collaboration on low-cost airlines, the organization has designated D-8 Airports in member states to promote business-to-business and tourism contact. These airports include Nnamdi Azikiwe Airport (Abuja, Nigeria), Jinnah International Airport (Karachi, Pakistan), Istanbul Sabiha Gokcen International Airport (Istanbul, Türkiye), and Soekarno-Hatta International Airport (Jakarta, Indonesia) (D-8 Report, 2022).

**Shipping:** The organization has convened three D-8 Expert Working Group Meetings on Shipping, providing member states the opportunity for collaboration aimed at improving the shipping industry. The scope of collaboration includes training, maritime safety and security, pollution management, and establishing shipping lines.

## Energy

As stated in the preceding sections, the Developing-8 (D-8) Organization for Economic Cooperation was established in 1997 with the goal of enhancing economic cooperation and fostering sustainable development among its member states: Bangladesh, Egypt, Indonesia, Iran, Malaysia, Nigeria, Pakistan, and Turkey. Among its various sectors of focus, energy cooperation stands out as a pivotal element. This comprehensive examination will break down the D-8's energy initiatives, highlighting renewable energy development, capacity building programs, energy use efficiency, sustainable supply chains, and policy and regulation harmonization. Additionally, specific examples such as Nigeria's Energy Transition Plan will be discussed.

## Tourism

Tourism cooperation within the Developing-8 (D-8) Organization for Economic Cooperation holds significant promise as a catalyst for economic growth, cultural exchange, and regional integration among its member states. The D-8 boasts a rich tapestry of cultural, historical, and natural attractions that can draw tourists from across the globe. For instance, Egypt offers iconic sites such as the Pyramids of Giza, Luxor's ancient temples, the Sphinx, Nile River cruises, and Red Sea resorts. Indonesia is renowned for Bali's beaches and temples, Komodo Island, Jakarta's cultural sites, and Raja Ampat's marine biodiversity. Iran features Persepolis, Isfahan's architecture, Shiraz's gardens, and the Caspian Sea coast. Malaysia attracts visitors with the Petronas Twin Towers, Langkawi's beaches, historic Penang, and Borneo rainforests. Notably, Türkiye stands out with Istanbul's historic sites, Cappadocia's rock formations, its Mediterranean coastline, and ancient ruins.

Among these, Türkiye holds the crown among D-8 member states for the highest tourist attractions. While not all D-8 countries have placed equal emphasis on developing their tourism sectors, the potential for growth remains considerable across the board. The D-8 organization has developed several initiatives to improve tourism cooperation among member states, with the Crescent Moon Initiative being a standout project. The **Crescent Moon Initiative** is a groundbreaking tourism effort by the D-8, poised to transform the tourism landscape of member states. This project seeks to harness the cultural, historical, and natural riches of D-8 countries to promote tourism as a driver of economic growth, job creation, and cultural exchange. By highlighting the unique attractions and diverse experiences across member states, the Crescent Moon Initiative aims to position the D-8 region as a compelling and sustainable tourist destination. It creates a collaborative platform where member states can share best practices, promote responsible tourism, and develop joint marketing strategies to attract tourists from around the world.

However, tourism cooperation within the D-8 faces several challenges. Infrastructure development, including transportation networks and accommodations, must be improved to cater to the growing

number of tourists. There is also a need for regulatory harmonization to streamline visa processes, safety standards, and marketing strategies across member states. Security concerns and geopolitical instability in certain regions can deter potential tourists. Additionally, the industry must embrace sustainable practices to protect the natural environment and cultural heritage sites, ensuring that tourism remains a viable long-term economic driver. Addressing these challenges will require collaborative efforts, funding, and policy coordination among member states to fully harness the potential of tourism cooperation within the D-8.

## Challenges of Sectoral Cooperation in D-8

One challenge faced by the D-8 is its relatively low profile compared to other economic cooperation organizations such as the Economic Community of West African States (ECOWAS) and the Association of Southeast Asian Nations (ASEAN). Factors contributing to this include its size and membership compared to other international organizations. Much as important as D-8's focus on economic cooperation and development is, it is relatively a narrow niche compared to organizations that deal with broader issues such as peace and security, humanitarian crises, or climate change. This narrower focus can limit its visibility among the general public.

Political dynamics and geopolitical considerations involving member states can also affect the visibility and effectiveness of international organizations. D-8 may face challenges related to political differences among its member states. For example, disagreements between Türkiye and Egypt have hampered Egypt's participation in the organization, partly due to the military coup against Mohamed Morsi, which removed him from office (Agdemir, 2016).

Despite the Preferential Trade Agreement (PTA), trade cooperation among member states has proven to be challenging. The share of intra-D-8 trade in total D-8 trade is relatively low at around 6.6%, due to lack of implementation by member states. Member states have been reluctant to facilitate and trade under the PTA. Member states are more focused on other organizations involving North-South framework of cooperation. While there has been considerable progress on a bilateral level through the signing of numerous Free Trade Agreements (FTA), the D-8 PTA remains relatively trivial, with most offer lists comprising least or non-traded items of less significance to the national economy. So far, only Türkiye has actively traded under the D-8 PTA.

## Conclusion

The Developing-8 (D-8) Organization for Economic Cooperation epitomizes the potential of South-South Cooperation in addressing shared development challenges and fostering sustainable growth among its member states. By promoting multisectoral collaboration in key areas such as trade, agriculture, industry, transportation, and tourism, the D-8 has demonstrated modest yet meaningful progress in advancing economic integration and regional cooperation. However, challenges such as limited intra-trade, low visibility, and political disparities among member states underscore the need for strategic reforms and enhanced coordination. Leveraging its shared resources, vast population, and collective market potential, the D-8 is well-positioned to play a pivotal role in reshaping the global economic landscape. Strengthening partnerships, addressing structural barriers, and embracing innovative solutions will be crucial in realizing the organization's ambitious goals and transforming it into a formidable economic bloc by 2050. Ultimately, the D-8's journey reflects the broader aspirations of the Global South for inclusive development, mutual prosperity, and a more equitable global order. By building on its achievements and learning from its challenges, the D-8 can chart a path of sustained growth and cooperation that benefits its members and inspires other South-South initiatives worldwide.





### Author Details **Ismail Bello (Senior Lecturer)**

<sup>1</sup> Department of International Relations and Diplomacy, Baze University, Abuja, Nigeria

<sup>2</sup> Secretariat of the Developing-8 Organization for Economic Cooperation, Türkiye.

0000-0003-0082-3632 ✉ Ismail.bello@developing8.org, ismailbello12@gmail.com

### **Isiaka Abdulqadir Imam**

<sup>2</sup> Secretariat of the Developing-8 Organization for Economic Cooperation, Türkiye.

0009-0007-0896-7004 ✉ Isiaka.imam@developing8.org

### **Jauher Saleem (President)**

<sup>3</sup> Institute of Regional Studies, Islamabad, Pakistan

0009-0009-8197-8580 ✉ jauhar@gmail.com

### **Muhammad Imran (Research Fellow)**

<sup>3</sup> Institute of Regional Studies, Islamabad, Pakistan

0000-0002-1743-5006 ✉ drimranmehsud@gmail.com

## References

- Agdemir, A. M. (2016). The Arab Spring and Israel's relations with Egypt: A view from Turkey. *Israel Journal of Foreign Affairs*, 10(2), 223–235.
- Babenko, V., Perevozova, I., Kravchenko, M., Krutko, M., & Babenko, D. (2020). Modern processes of regional economic integration of Ukraine in the context of sustainable development. *E3S Web of Conferences*, 166, 12001. <https://doi.org/10.1051/e3sconf/202016612001>
- Baldwin, R., & Wyplosz, C. (2012). *The economics of European integration* (3rd ed.). McGraw-Hill Education.
- BAPA. (1978). *The Buenos Aires Plan of Action for Promoting and Implementing Technical Cooperation among Developing Countries*. United Nations.
- Bhagwati, J. (1995). The world trading system at risk. *The American Economic Review*, 85(2), 276–281.
- Bretos, I., & Servós, C. (2016). Revisiting globalization challenges and opportunities in the development of cooperatives. *Annals of Public and Cooperative Economics*, 88(1), 47–73. <https://doi.org/10.1111/apce.12145>
- D-8 Organization for Economic Cooperation. (1997). *Establishment and cooperation framework*. D-8 Organization.
- D-8 Organization for Economic Cooperation. (n.d.). *Energy – D-8 Organization for Economic Cooperation*. <https://developing8.org/areas-of-cooperation/energy/>
- D-8 Report. (2022). *Draft report of 12th D-8 Meeting of Directors-General and Expert Working Group on Civil Aviation*. <https://developing8.org/wp-content/uploads/2022/10/Adopted-Report-of-the-12th-Directors-General-and-Experts-Workign-Group-of-Civil-Aviation-Meeting-merged.pdf>
- Dent, C. M. (2017). Regional integration in Africa: Challenges and prospects. *The Journal of Pan African Studies*, 10(9), 160–178.
- Hale, T., & Noguchi, Y. (2016). Explaining the success of the Asia-Pacific Economic Cooperation forum: A constructivist analysis. *The Pacific Review*, 29(4), 453–475.
- Jusoh, M. N., & Hussain, M. N. (2018). Regional cooperation: The case of ASEAN. *International Journal of Humanities, Arts and Social Sciences*, 4(2), 135–149.
- Ménard, C. (2004). The economics of hybrid organizations. *Journal of Institutional and Theoretical Economics JITE*, 160(3), 345–376. <https://doi.org/10.1628/0932456041960605>
- Oqubay, A. (2016). The African Union's agenda 2063: An assessment of progress and challenges. *The Journal of Pan African Studies*, 9(2), 145–164.



- Öztürk, M. I., & Baklacioğlu, T. (2018). The evolving role of the D-8 Organization for Economic Cooperation in the global economy. *International Journal of Economics, Commerce and Management*, 6(10), 74–84.
- Ribas, W., Pedroso, B., Vargas, L., Picinin, C., & Junior, M. (2022). Cooperative organization and its characteristics in economic and social development (1995 to 2020). *Sustainability*, 14(14), 8470. <https://doi.org/10.3390/su14148470>
- UN. (2015). *Transforming our world: The 2030 agenda for sustainable development*. United Nations.
- UNDP. (1978). *Concept and role of South-South cooperation in development: The basic framework*. United Nations Development Programme.
- Vanguard. (2022, September). D-8 countries pledge support for Nigeria's energy transition plan. <https://www.vanguardngr.com/2022/09/d-8-countries-pledge-support-for-nigerias-energy-transition-plan>
- Zorlu, F. (2023). D-8 aims to accelerate growth, achieve its decennial target by 2030. <https://www.aa.com.tr/en/asia-pacific/d-8-aims-to-accelerate-growth-achieve-its-decennial-target-by-2030/2924237>



# Malaysia's Economic Cooperation within the D8: Challenges and Prospects under the MADANI Government's Strategic Vision



Mohd Faiz Abdullah <sup>1</sup> & Qarrem Kassim <sup>1</sup>

<sup>1</sup> Institute of Strategic and International Studies of Malaysia, Malaysia

### Abstract

This article examines Malaysia's economic integration with the Developing 8 (D8) Organization for Economic Cooperation, with a focus on the challenges the country faces in deepening economic ties with member states. Despite the existence of a Preferential Trade Agreement (PTA) and shared development goals, Malaysia's trade and investment activities within the D8 remain limited and lack diversification. Key challenges include structural economic differences among D8 members, trade barriers, limited market access as well as political and economic uncertainties in some member countries. Moreover, Malaysia's longstanding focus on traditional markets, coupled with limited market knowledge and connectivity within the D8, has constrained its ability to capitalise on the economic potential of this bloc. Under the new Malaysian government, a recalibration of foreign economic policy is underway, emphasising a more proactive role in South-South cooperation. This paper explores the government's strategic approach to revitalising Malaysia's engagement with the D8, focusing on expanding trade and investment through policy reforms, improving trade facilitation, and promoting industrial integration. Key initiatives include strengthening institutional frameworks, addressing trade barriers, fostering private sector collaboration, and leveraging Malaysia's position in the Halal economy and Islamic finance to create niche opportunities. The article concludes by offering a set of recommendations to further enhance Malaysia's economic cooperation within the D8, with the aim of achieving sustainable, mutually beneficial growth.

### Keywords

Madani · D-8 · Malaysia · Economy · Trade



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Corresponding author: Qarrem Kassim [qarrem.kassim@isis.org.my](mailto:qarrem.kassim@isis.org.my)

## Introduction

The Developing-8 Organization for Economic Cooperation (D8) is a multilateral group founded with the objective of fostering economic cooperation among developing Muslim-majority nations. This group comprises Malaysia, Bangladesh, Egypt, Indonesia, Iran, Nigeria, Pakistan and Turkey, each committed to advancing development through collective efforts in various economic spheres. Founded in June 1997 as the brainchild of then-Turkish Prime Minister, Necmettin Erbakan, the D8 was envisioned as a platform of cooperation for Muslim emerging markets to strengthen economic and industrial progress while championing the rights and interests of the developing world.

After the inaugural D8 summit, Istanbul Declaration identified the principles on which this cooperation will be based on. The main objective was declared to be on socio-economic development in accordance with the principles of: “*peace* instead of conflict; *dialogue* instead of confrontation; *cooperation* instead of exploitation; *justice* instead of double standards; *equality* instead of discrimination; and *democracy* instead of oppression”. The D8 had also identified the main sectors of cooperation, namely in trade, industry, finance, banking and privatisation, rural development, energy, agriculture, food security and science and technology. The D8 also envisioned to direct significant efforts towards poverty eradication, as the D8 has a high proportion of its population from low-income families.

The D8 aims to create a shared geo-economic space that leverages its collective strengths, including mineral resources, population size, and strategic geography. This offers vast potential in today’s shifting geopolitical and geoeconomic landscape, where the Global South seeks greater influence and autonomy. As emerging economies increasingly look toward multipolar frameworks like BRICS, the D8 stands as an organic partner for nations seeking alternatives to traditional Western-dominated economic structures. Malaysia, which recently became a BRICS partner nation, is complementary to expanding the D8’s role in global economic realignment, particularly in connecting Muslim-majority nations to broader global value chains. Under the leadership of Prime Minister Dato’ Seri Anwar Ibrahim (DSAI), Malaysia has reaffirmed its commitment to the Global South, integrating internationalism into Malaysia’s MADANI framework, which emphasises prosperity, inclusivity and sustainable development. The shared aim of the D8 aligns with Malaysia’s view for its involvement in Global South cooperation, where Malaysia could position itself as a strong advocate for the D8 and addressing global economic inequalities.

Internationally, the D8’s overarching goals are twofold: increasing the participation and weight of Muslim nations in the global economy and enhancing collective Muslim representation in global decision-making processes. The D8 achieved a significant milestone in this regard when it gained observer status at the United Nations General Assembly (UNGA) in 2014, elevating its global visibility and opening doors for deeper engagement with international institutions. Malaysia’s leadership in promoting the D8’s agenda reflects its ambition to shape the evolving global economic order. By driving initiatives that bolster intra-D8 trade, investment, and collaboration, particularly through the lens of MADANI, Malaysia could enhance the D8’s role as a leading voice for Muslim nations in an emerging multipolar world.

## Understanding the historical context behind the D8’s formation and motivation

Before exploring the geostrategic and geoeconomic potential of the D8, it is important to understand its formation in the post-Cold War context. During this period, global organizations like the WTO and G7 played increasingly prominent roles in promoting stability and economic development. However, Muslim nations largely felt isolated from global economic and political decision-making, with no Muslim nation represented in the UN Security Council wielding veto power. This perception of isolation was



heightened during the blood-stained breakup of Yugoslavia, particularly in Bosnia and Kosovo, where Muslim civilians faced massacre. Additionally, apparent double standards regarding nuclear weapons in Muslim countries like Pakistan and Iran—compared to Israel and India—deepened the sense of geopolitical marginalisation<sup>1</sup>.

Thus, the D8 was founded as a response to this perceived exclusion, aiming to amplify the voices of Muslim voices in a rapidly expanding global economy. As globalisation expanded during the post-Cold war era, D8 nations found it in their interest to cooperate extensively in Muslim-oriented trade, investment, and finance. Formed in 1997, the D8 sought to promote economic cooperation among key Muslim-majority states, representing the demographic and economic "core" of the Muslim world. At the time of its establishment, the D8 accounted for 60% of the GDP, 55% of trade, and 65% of the population of the Organisation of Islamic Cooperation (OIC). In theory, this meant that any collective decision taken by the D8 could significantly influence the direction and response of the Muslim world, being the movers and shakers of a sizable global population.

### Hobbled expectations of the D8's economic integration

When the D8 was first initiated, expectations for creating an Islamic zone of economic influence was very high. Given the various public statements by participating nations and the projects announced, this was not a naïve assumption at the time. Although it was initially perceived that the anticipated model of an Islamic "common market" and "customs union" was coming to fruition, the D8 was not specifically designed for such a purpose. In practice the D8 functioned more as a platform for economic cooperation among developing Muslim nations. Furthermore, due to the "urgency" in responding to deteriorating geopolitical conditions and global Muslim sentiments amid a desire to present a united front, D8 precipitated a sense of geoeconomic ineffectiveness at its later stages because the necessary political and economic unification strategies had not been extensively undertaken at the outset. Political and economic challenges further impeded progress, as many D8 countries shared similar labour-intensive economies and human capital endowments, limiting their capacity for industrial cooperation and deeper market integration.

The D8 was also a victim of poor timing as major political events in many member states would occur, both preceding and following the years of its establishment, putting in question its longevity as a supra-national institution. Notably, when Nigeria was then-ruled by military leader Sani Abacha (who seized power through a coup de 'tat in 1993), executed several high-profile activists, Nelson Mandela personally intervened as President of South Africa and called for a boycott of the Nigerian oil and its expulsion from the commonwealth<sup>2</sup>. Thus, Nigeria's involvement in the D8 process was seen as an opportunity not for economic cooperation but for breaking its diplomatic isolation and shoring legitimacy for its regime. Meanwhile, Indonesia and Malaysia also experienced major destabilising political and economic crises shortly after the D8's establishment, following the 1997 Asian Financial Crisis. These events created poly-crises that stunted the D8's development while still in its infancy.

In sum, despite the extent of industrial and agricultural value chain linkages having been largely negligible in the D8, the potential for future cooperation remains. Today, the D8 benefits from a growing urban middle class, providing a renewed opportunity to foster economic cooperation. The D8's principles of economic collaboration could be revitalised to meet the needs of a burgeoning global Muslim population, despite perennial organisational hurdles.

<sup>1</sup>M. Ozkan. (2017). "Why does an international organisation fail? A theoretical and systemic approach to the Developing Eight (D8)". *OrtadoğuEtutleri Middle Eastern Studies*, December 2017, Volume 9, No.2

<sup>2</sup>CNN. (11 November 1995). Nigeria suspended from Commonwealth. CNN. <http://edition.cnn.com/WORLD/9511/nigeria/11-11/>



## Strategic shifts in the MADANI government towards the Global South

The ascension of DSAI as Malaysia's 10th Prime Minister marked a shift in the country's engagement with the Global South amid an increasingly multipolar global economy. DSAI's "Malaysia MADANI" philosophy (in a nutshell) envisions a skilled, inclusive, and civilised Malaysian society rooted in values of respect, care, and trust. Central to this new inclusive vision is a call for more Global South engagement that can better represent the economic interests of the developing world, which accounts for roughly 40% of global GDP and is emerging as a major driver of global prosperity. The administration's long-term strategy recognises that by 2050, three of the four largest economies—China, India, and Indonesia (fellow D8 member)—will hail from the Global South<sup>3</sup>. This shift aligns with the principles and goals of the D8, offering Malaysia the opportunity to influence and shape the discourse of a multipolar global economic order. DSAI has described this empowered Global South as an "inevitable" reality and has called for a refocus on key issues such as climate change, supply chain resilience, food security, and digital transformation<sup>4</sup>.

In this context, the Anwar administration seeks to internationalise the principles of Malaysia MADANI, positioning Malaysia as a trusted partner in the Global South. By leveraging the D8's collective reach of 1.24 billion people, particularly within the Muslim world, deeper cooperation between Muslim nations and the broader Global South could be enhanced. DSAI's approach to the Global South under Malaysia MADANI is largely based on the concepts of economic cooperation and an opportunity to tap into the potential for greater geopolitical and trade options in its global engagement strategy.

It is noteworthy that gradual shifts in Malaysia's engagement strategy can be seen in its aspiration to become a partner nation with the expanding BRICS and increasingly assert its own voice<sup>5</sup>, while maintaining strict neutrality between the East and West based on the principles of economic cooperation. By aligning Malaysia's geo-economic interests under the framework of Malaysia MADANI with the D8, an opportunity for deeper multilateral engagement and cooperation is created.

## An economic snapshot of the D8 and Malaysia's economic integration

### Brief overview of the D8 economy

The combined GDP of the D8 has increased substantially since the organisation's founding, with data from the World Bank indicating the collective GDP of the D8 growing nearly 5-fold since 1997. At its founding, the GDP of the D8 amounted to just over US\$1 trillion and by 2023, this grew to over US\$4.8 trillion. Meanwhile, the D8's total population grew by over 55%, from 793 million people to 1.24 billion.

**Table 1**  
Nominal GDP of D8 member states (US\$ Billion)

D8 Country	1997	2010	2023	GDP as a percentage of D8 economies (1997-2023, Average)
Bangladesh	48.2	115.3	437.4	6.2%
Egypt	78.4	219.0	395.9	7.8%
Indonesia	215.7	755.1	1,371.2	23.7%

<sup>3</sup>Pricewaterhouse Coopers. (2017). *The World in 2050. The Long View: How will the global economic order change by 2050?* <https://www.pwc.com/gx/en/research-insights/economy/the-world-in-2050.html>

<sup>4</sup>M. Rajagopal. (21 August 2024) "Rise of Global South inevitable, says Anwar". New Straits Times. <https://www.nst.com.my/news/nation/2024/08/1094601/rise-global-south-inevitable-says-anwar>

<sup>5</sup>Bernama News. (28 July 2024). "Malaysia has applied to join BRICS – Anwar". Bernama <https://www.bernama.com/en/news.php?id=2322706>



D8 Country	1997	2010	2023	GDP as a percentage of D8 economies(1997-2023, Average)
Iran	113.9	486.8	401.5	11.7%
Malaysia	100.0	255.0	399.6	8.5%
Nigeria	200.9	367.0	362.8	11.3%
Pakistan	62.4	196.7	338.4	7.7%
Türkiye	189.9	777.0	1,108.0	23.1%
<b>Total</b>	<b>1,009.6</b>	<b>3,171.8</b>	<b>4,814.9</b>	<b>100.0%</b>

Note: Any discrepancies due to rounding

Source: World Bank Database

While the D8 boasts an impressive collective GDP, there are significant developmental gaps in terms of skills and education, economic output and infrastructure. This is especially evident when accounting for the large populations of individual member states. Of the D8, only Malaysia and Türkiye have an average GDP per capita of 304% and 325% higher than the average D8 GDP per capita of US\$3,895 respectively, indicating a significantly lower quality of life for most of the D8's population. To put this into context, the average D8 individual has a GDP per capita global rank of 121, putting the group on a par with nations like Eswatini, a country with nearly 59% of the population living below the poverty line<sup>6</sup>.

Severe levels of poverty also appear to be geographically concentrated in three nations, Pakistan, Bangladesh and Nigeria, who possess a GDP per capita of 60%, 58% and 30% below the D8 average respectively. Collectively, these nations represent nearly half of the D8's 1.24 billion people. In uplifting the collective economies of the D8 therefore, policymakers must be mindful of the severe developmental imbalances that exist between the two extremes. This also suggests that there is no "one-size-fits-all" economic approach for all D8 members, and there is a need to recognise the divergence of developmental strategies of relatively high- and low-income D8 nations.

Moreover, World Bank data indicates that trade for members of the D8 tends toward primary low value-added products like agriculture and food processing, fishing and aquaculture, resources and minerals. For Malaysia and Turkey however, this is an exception. The two nations conduct a high volume of trade in high-tech and mid-to high value-added manufacturing goods, with the bulk of this trade inclined toward non-D8 countries, such as the EU and the US, ultimately creating a two-tier economic structure between high and low-income members of the D8. Despite such disparities, the D8 ratified a Preferential Trade Agreement (PTA) between its member states in 2006, which entered into force in 2011, with the objective of strengthening trade relations through tariff reduction, trade promotion and Rules of Origin (ROO) requirements, creating a fair and more predictable environment for sustainable trade growth. Under the D8 PTA, 8% of all goods with tariff rates above 10% will be covered, where such goods will attenuate towards a maximum of 10% over the course of the agreement<sup>7</sup>, while Least Developed Countries (LDC) are afforded some flexibility in their application of the tariff reduction schedule.

Concurrently with the D8 PTA, the D8 Decennial Roadmap was announced in April 2021, which outlined areas and sectors for inter-D8 cooperation under the ambit of wider South-South cooperation, aiming to increase intra-D8 trade volume to at least US\$500 Billion by the end of 2030. According to

<sup>6</sup>IMF. African Department. (2023). "Kingdom of Eswatini: 2023 Article IV Consultation-Press Release; Staff Report; and Statement by the Executive Director for Kingdom of Eswatini". Volume 2023: Issue 160. DOI: <https://doi.org/10.5089/9798400238826.002>

<sup>7</sup>Developing Eight (D8) Preferential Tariff Agreement. Official portal of the Ministry of Investment, Trade and Industry.<https://www.miti.gov.my/index.php/pages/view/372>



the World Trade Organisation (WTO) database<sup>8</sup>, in 2023, intra-D8 trade made up US\$227 Billion in total trade value, or nearly half of the roadmap's intended target. Analysis further reveals that nearly half of all D8 trade is driven by a handful of items, namely, mineral fuels and oil products (27.9%), animal and vegetable fats and oils (14.2%), iron and steel products (4.4%) and machinery appliances (4.3%). This suggests that there is a need to diversify the trade and export structure of the bloc. It is also noteworthy that both Malaysia and Indonesia are nearly entirely responsible for the D8's total trade in vegetable oils, being the two largest producers of palm oil – edible oil largely consumed in many LDCs.

## Malaysia's economic relationship with the D8

Malaysia's strategic geography sandwiched in Southeast Asia has made free and open trade crucial to the success of its economic model. While Malaysia has largely already implemented the D8 PTA, Malaysia also shares deeper and more comprehensive free trade agreements with three other D8 members, namely, Türkiye, Indonesia and Pakistan. With Indonesia specifically, there is a more robust and deeper multilateral trade framework within ASEAN, namely the ASEAN Trade in Goods Agreement (ATIGA), which goes beyond the D8 PTA in terms of trade and investment rules and regulatory standardisation, which in principle suggests deeper economic integration with these states than with the D8.

Indeed, while Malaysia's total trade value with the D8 in 2023 amounts to RM160 billion or roughly US\$37 billion, trade data indicates that within this structure, Malaysia is more economically integrated with Indonesia, with average bilateral trade constituting 69% of Malaysia intra-D8 trade since 1997. The dataset also reveals that 86% of Malaysia's D8 imports and 56% of its D8 exports was conducted with Indonesia. Notably, Indonesia remains the only country within the D8 that Malaysia has a perennial trade deficit with.

Besides Indonesia, Malaysia also has a substantial trade relationship with Türkiye, making up over 11% of its average total D8 trade. However, the same could not be said for FTA partner, Pakistan, which faces numerous domestic political and structural challenges. Furthermore, while Malaysia possesses a diverse set of global trading partners within the D8 trade network, trade items largely composed of processed mineral fuels, vegetable palm oil, machinery and iron and steel products, making up over 51% of Malaysia's total intra-D8 trade.

**Table 2**

*Malaysia's total trade with D8 member states (2020-2023), (US\$\*Billion)*

D8 Country	2020		2021		2022		2023		D8 trade intensity (% of D8 total)
	Export	Import	Export	Import	Export	Import	Export	Import	
Bangladesh	1.1	0.2	2.0	0.3	4.0	0.3	2.5	0.3	<b>8.0%</b>
Egypt	0.4	0.1	0.6	0.2	0.8	0.2	0.5	0.2	<b>2.4%</b>
Indonesia	6.5	8.0	8.6	12.3	12.2	16.2	11.1	13.2	<b>68.6%</b>
Iran	0.3	0.0	0.5	0.1	0.8	0.1	0.4	0.0	<b>1.7%</b>
Nigeria	0.6	0.2	0.8	0.3	0.5	0.3	0.5	0.4	<b>3.0%</b>
Pakistan	1.0	0.2	1.3	0.4	1.3	0.4	1.0	0.4	<b>5.0%</b>
Türkiye	1.7	0.4	3.1	0.6	3.8	0.6	3.8	0.6	<b>11.4%</b>
<b>D8 Total</b>	<b>11.6</b>	<b>9.2</b>	<b>17.0</b>	<b>14.2</b>	<b>23.4</b>	<b>18.1</b>	<b>19.8</b>	<b>15.3</b>	<b>100.0%</b>

<sup>8</sup>The World Trade Organisation. World Integrated Trade Solution (WITS) Dataset for intra-D8 trade. The World Bank. <https://wits.worldbank.org/>

D8 Country	2020		2021		2022		2023		D8 trade intensity (% of D8 total)
	Export	Import	Export	Import	Export	Import	Export	Import	

Source: Matrade Database

\*Note: The average conversion rate is calculated at RM4.57 per US\$

**Table 3**

Malaysia's top foreign direct investment partners (RM, Million)

Country/ Bloc	Malaysia's Direct Investment Abroad Position (2023)	Malaysia's Foreign Direct Investment Position (2023)
Singapore	156,255	206,778
Hong Kong	14,083	113,836
European Union	55,948	102,380
United States	27,223	96,315
Japan	850	94,179
<b>D8</b>		
Indonesia	70,572	N/A
Türkiye	4,461	N/A
Pakistan	4,082	N/A

Source: Department of Statistics Malaysia (DOSM)

Note: N/A indicates that FDI statistics were too small to record as a line item in the dataset.

In addition, despite the potential for economic collaboration, macro-level data indicates that the D8's Foreign Direct Investment (FDI) presence in Malaysia remains minimal. Malaysia's FDI inflows have primarily been centred around the export-oriented sectors of developed economies, such as semiconductors, machinery and appliances in line with Malaysia's National Investment Aspirations (NIA) policy, which prioritises high-tech, capital intensive investments over labour intensive sectors, with capital flows predominately directed from markets outside D8 or Muslim-majority states.

Conversely, Malaysia's Direct Investment Abroad (DIA) profile tells a different story. It suggests that Malaysia is a relatively significant investor in other D8 member states, namely in Indonesia, Türkiye and Pakistan, investing nearly RM80 billion in these states, primarily in the services sector. Notably, these investments have largely been facilitated by existing FTAs between Malaysia and these nations, allowing for investment flows under a more seamless and predictable environment.

## Issues hindering deeper Malaysian economic cooperation in the D8

The lack of diversification in trade and investment between Malaysia and the D8 suggests several structural challenges in the D8's economic architecture. Malaysia's trade and investment patterns align more closely with nations like Indonesia and Türkiye which have complementary economic structures supporting Malaysia's export supply chains. Ultimately, as a global hub for downstream and intermediate manufacturing, Malaysia's trade diversification with the D8 depends on the availability of intermediate inputs and resources that fit its industrial needs. Therefore, advocating for freer trade alone may not necessarily improve diversification unless value and supply chain matching is prioritised, and this requires substantial long-term investments and partnerships from the D8's collective private sector.



Compared to its global trade partners, Malaysia has largely maintained its long-standing trade and investment relationships with traditional market peers like China, ASEAN and the US. Such markets are more established, present less cultural and language barriers, and offers significant market opportunities. This is reinforced by well-entrenched value chains, logistics networks, and long-standing business relationships, making them less risky and more profitable than diversifying into unfamiliar D8 markets. In fact, over half of Malaysia's total trade was conducted with China, ASEAN and the US. The hesitance of Malaysia's private sector to diversify into other D8 markets is also reinforced by the political and market uncertainty of many of its member states like Bangladesh, Nigeria and Pakistan.

It should be noted that perceived risk of protectionism in some D8 nations, aimed at safeguarding domestic industries, also affects trade relations. Political and policy uncertainty, compounded by currency volatility and inflation in several member states, creates an environment unfavourable for deeper economic ties, deterring Malaysian firms from investing in these markets. US sanctions on Iran further restricts the scope for trade and investment.

Besides market security, there are other topical issues that limit Malaysia's economic integration with the D8. For instance, Malaysia's stringent Halal certification system may not necessarily align with the standards of other D8 members, limiting the import of Halal products such as pharmaceuticals and processed foods into the Malaysian market. The absence of a unified Halal certification system across the D8 complicates trade in an industry where Malaysia plays a global role.

Infrastructural challenges further obstruct trade within the D8, as many member states suffer from underdeveloped port transport and logistics networks. Poor infrastructure in countries like Bangladesh, Egypt, and Nigeria hampers the creation of reliable trade corridors, while inadequate access to modern ports and cold storage facilities makes exporting highly perishable agricultural products nigh impossible. Moreover, Malaysia's push for high-growth digital sectors under the Malaysia MADANI agenda amid poor internet penetration and limited adoption of digital payment systems in countries such as Pakistan, Bangladesh, and Nigeria, reduces its potential for digital trade and investment. Moreover, inconsistent regulations regarding e-commerce, data protection, and cross-border payments, complicate trade.

The lack of robust institutional frameworks within the D8 to address trade disputes and manage public-private partnerships also limits economic cooperation, which could explain why the D8's PTA remains underutilised, even in nations where it is operational, as it lacks comprehensive measures that incentivise exporters and investors. By contrast, Malaysia's trade agreements with Türkiye and Indonesia offer more comprehensive terms under their respective FTAs.

The results indicate that to raise Malaysia's trade diversification and intensity with the D8, a combination of more long-term sector-driven partnerships, investor protections and market reforms is necessary. Providing more secure market conditions and guarantees for investors is a crucial prerequisite for deeper integration. If D8 nations can stabilise their political and economic conditions while promoting greater market freedoms, the barriers Malaysian investors face in engaging with the D8 may be significantly reduced.

## Key demand growth drivers of the D8's collective economy

The D8, with over 1.24 billion people collectively, holds immense potential for market growth as emerging Muslim markets are set to grow substantially in the future. Collectively, the D8 is poised for expansion, driven by several demand growth factors, including the rise of burgeoning Muslim middle-class consumers, increasing demand for Halal products, infrastructure development, digitalisation and the shift towards green energy. The demand for Muslim products has risen significantly over the past

decade with total Muslim spending increasing from US\$1.6 trillion in 2012 to US\$ 2.3 trillion in 2022 and is expected to reach US\$3.1 trillion by 2027, according to forecasts by the Dinar Standard<sup>9</sup>.

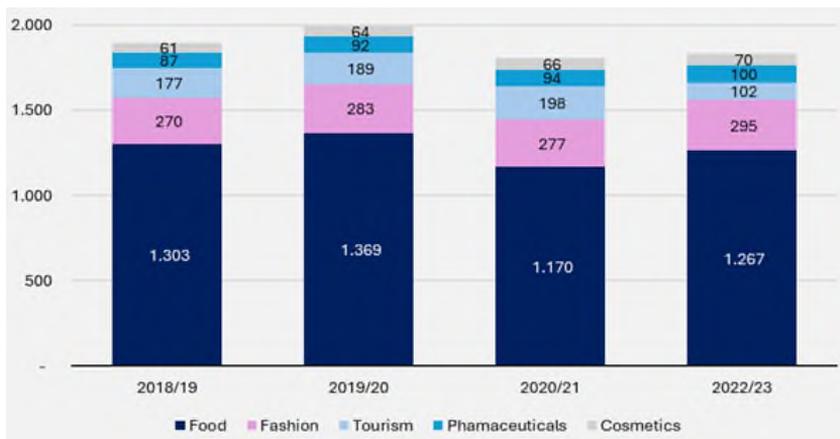
Perhaps the strongest demand driver in the global Islamic economy is a young and growing population. By 2050, it is estimated that the global Muslim population will grow to some 30% of the global population. In 2023, Muslim youth and young adults (15-29) represented 28% of the world's youth and young adults, with Gen-Z and Millennials being the largest spenders. The youthful composition of the Muslim population is poised to be a major driver to the global Halal economy.

According to the Pew Research Centre, there is evidence that religiosity has increased in the Muslim world compared to previous generations, with 70%-90% of Muslims in the Asia-Pacific and Middle East region rating religion as “very important” in their daily lives. Therefore, it is sensible to expect more religiously motivated consumption patterns to drive much of the Islamic economy. The growth of the digital economy and e-commerce, supported by greater public investment into digital infrastructure, is expected to spur increased Halal product consumption. Both the Middle East and Africa are expected to experience more substantial growth in internet penetration, with the number of D8 internet users increasing from 572 million in 2023 to 654 million in 2027.

Among key tangible sectors in the Islamic economy, Halal food is the largest sector by volume, with an estimated 16.6% share of the global food sector, and worth some US\$1.2 trillion in 2023. This is followed by fashion and tourism, which collectively accounts for an estimated US\$397 billion in market value. Halal pharmaceuticals and cosmetics also account for an increasing share of the global market, with estimates placing both sectors at US\$170 billion globally.

**Chart 1**

*Estimated Halal market size of selected sectors (US\$, Billion)*



**Source:** State of the Global Islamic Economy Report, Dinar Standard, 2024

The shared aspirations of Malaysia MADANI and the D8 are ambitious and multifaceted. They hold the potential for more sustainable and inclusive growth prospects. Considering the robust projected growth of the global Halal economy, intra-D8 cooperation and Malaysia's role must account for the future long term Halal growth potential of primarily Muslim economies. By identifying these shared focus areas, cooperation between Malaysia and the D8 can be deepened and enhanced. Notably, the identified areas of deeper institutional cooperation in the D8, accounting for trends in the global Halal economy, are in food security, green energy infrastructure, tourism, and SME industrial collaboration.

<sup>9</sup>Dinar Standard. (2024). *State of the Global Islamic Economy Report 2023/24*. Salaam Gateway. <https://www.dinarstandard.com/post/state-of-the-global-islamic-economy-report-2023>



## Strategic measures based on shared cooperation between Malaysia and the D8

### Strategic cooperation in food and agriculture through trade bubbles

Food security has emerged as a critical issue in the Global South, particularly considering the effects of rapid climate change, population growth and disruptions in global supply chains. In the context of food security, Malaysia's MADANI Economic Framework aims to optimise existing agricultural land use and improve productivity through the adoption of agro technology. Moreover, in line with the mid-term review of the 12<sup>th</sup> Malaysia Plan, a transition towards high-growth, high-value (HGHV) agriculture is underway through strengthening modernisation, smart farming methods and community-driven small farming. Additionally, MADANI emphasises the importance of global trade as a key driver for domestic growth, aligning with the ambitions of the D8 in enhancing intra-D8 trade. This is especially important as many members of the D8 are at risk of severe future shortages, with the 2022 Global Food Security Index (GFSI), a composite index measure of food vulnerability across 133 countries, placing several nations like Nigeria, Pakistan, and Bangladesh at a higher risk of food insecurity (see table 4 below).

**Table 4**

*Global food security rankings of D8 nations and scores in 2022*

Country	Global Rank	Affordability	Accessibility	Quality and Safety	Sustainability and Adaptability
Malaysia	41	87.0	59.5	74.7	53.7
Türkiye	49	58.4	65.3	78.5	61.2
Indonesia	63	81.4	50.9	56.2	46.3
Egypt	77	65.2	54.2	45.9	55.8
Bangladesh	80	52.1	61.5	58.4	43.9
Pakistan	84	59.9	58.3	49.4	37.7
Nigeria	107	25.0	39.5	55.6	53.7
Iran*			N/A		

\*Note: Iran was not included in the GFSI study for 2022

Source: Global Food Security Index 2022

Thus, given the interdependencies of the global food value chain and its networks in agriculture, there is an increasing need to shift the paradigm from one of reactionary responses to food insecurity towards a proactive approach emphasising food self-reliance which underscores continuing preparation for any future multi-pronged disruption. This requires strategic maintenance and robustness in the connectivity of global food trade networks often referred to as food "trade bubbles". This would act as a buffer against disruptions by diversifying food sources and distribution networks in securing global supplies.

The approach of a food trade bubble would encompass various initiatives to address food security. Chiefly, this involves having a multilateral food trade agreement that focuses on removing tariffs, standardising food safety regulations and harmonising food customs procedures. Meanwhile, key staples such as rice, wheat, palm oil and poultry can be afforded special measures to encourage domestic production and intra-D8 exports. This approach aims to ensure that the efficiency of multilateral food supply chains minimises vulnerabilities and the consistent availability of essential agricultural

inputs that support farmers and long-term farm investments facilitates risk management strategies for smallholders.

Furthermore, food trade bubbles should be complemented with a trade financing and investment framework friendly to LDCs and aims to mobilise financial resources across the D8 to boost agricultural productivity and trade capacity. Government-to-government (G2G) agreements should facilitate the establishment of both state and non-state-owned investment vehicles, allowing D8 nations to leverage arable farmland and agro-technologies across the D8. Securing long-term land-agriculture tenure rights for D8 investors is vital in creating cross-border value chains, spanning from upstream primary agriculture to downstream food processing.

Additionally, the D8 should advocate for a unified approach to Halal standards regulation, aiming to streamline standards across member nations. This would not only enhance market access and simplify compliance but also foster deeper integration within the global Halal food industry. Malaysia's Halal certification system, managed by the state-owned JAKIM, is renowned for its comprehensive whole-supply-chain approach to Halal accreditation. By implementing a cross-national approach to Halal trade within the D8, opportunities for Halal-oriented investments in agriculture could be unlocked. A combination of harmonised standards and a Halal-focused food trade bubble would promote more efficient, seamless trade across borders.

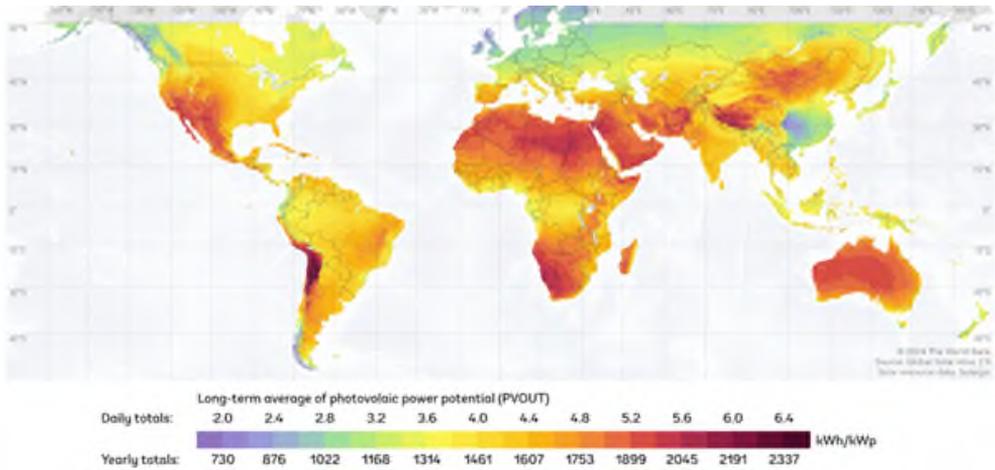
## Comprehensive green energy and conservation strategy

The right to development encompasses not just economic growth but also equitable access to sustainable, clean energy. Historically, green energy was seen as a privilege of developed countries (DCs), but with the looming challenges posed by rapid climate change, particularly affecting developing equatorial nations, it is now a necessity for all nations, including LDCs to collectively develop a green energy strategy to safeguard its futures. In this context, a D8green economy and climate adaptation framework holds the potential for key Muslim-majority nations to position itself at the forefront of the new energy revolution, transforming its vast natural capital into a green energy powerhouse.

To achieve this, national climate action must be mainstreamed at the regional D8 level, recognising that a whole-of-government approach is essential. This requires partnerships across all levels of government, international climate institutions, and civil society organisation (CSOs). Such collaboration is vital for many D8 nations, given their vulnerability to adverse climate impacts. Cooperation strategies, especially in the areas of knowledge sharing, technology transfers, capacity building, and climate financing are essential to building resilience. In this way, Malaysia can play a key inter-regional role in driving renewable energy investments across the D8 economies, given its regional leadership in groupings like ASEAN, and Malaysia's strategic positioning as an Islamic financing hub. This could enhance multi-stakeholder collaboration among government bodies, academia and civil society, fostering better integration with their respective national governments and engagement with other LDCs.

Moreover, D8 nations possess a unique set of advantages in solar photovoltaic (PV) energy potential due to its geographic location. Several member states, such as Egypt, Iran and Nigeria, enjoy high levels of solar irradiance, measured by the Global Horizontal Irradiance (GHI) score, making them ideal candidates for large-scale solar projects, allowing the D8 to become leaders in the global green energy transition.

**Chart 2**  
Global photovoltaic power potential



**Table 5**  
Solar energy potential in the D8

D8 Country	Average theoretical potential(GHI, kWh/m <sup>2</sup> /day)	PV equivalent area(% of total land area)
Egypt	6.26	0.081%
Iran	5.52	0.087%
Nigeria	5.44	0.014%
Pakistan	5.34	0.071%
Malaysia	4.71	0.215%
Indonesia	4.62	0.058%
Turkey	4.60	0.230%
Bangladesh	4.60	0.242%

Sources: Solar resource map © 2021 Solargis, <https://solargis.com>, World Bank Group, Global Solar Atlas

To underscore this potential, a global solar irradiance map reveals significant untapped capacity across D8 nations. Countries like Egypt, and Iran, with their expansive land masses and arid climates, can benefit particularly from such projects. Solar energy in these regions offers a path to affordable, sustainable energy solutions, while reducing dependence on traditional fossil fuels. Moreover, the PV equivalent area shows that a relatively small percentage of land is required to meet the domestic energy needs for much of the D8, while the excess can be exported.

However, solar energy adoption remains nascent in most D8 countries. Its major barriers include limited access to technology, capital investment, and a lack of supportive regulatory framework. It is proposed that a comprehensive green energy strategy is needed that not only considers technological needs but also the socio-economic challenges faced by the D8’s LDCs. Furthermore, special attention must be paid to solar waste disposal, a growing global concern. As solar panels reach the end of their lifecycle, environmentally responsible waste management becomes crucial to ensure that the benefits of solar energy do not inadvertently contribute to environmental degradation.

In this vein, Malaysia has taken a leading role with its National Energy Transition Roadmap (NETR), a blueprint for achieving a fair and just energy transition. The NETR prioritises access to clean energy for



all socio-economic groups, ensuring that the poor are not marginalised. The NETR focuses on increasing the nation's solar capacity with the goal of reaching 58% solar energy in Malaysia's total energy mix by 2050. The plan focuses on the creation of an industrial base that supports the production of essential green technologies, including solar panels and wind turbines. By adopting similar roadmaps at the macro-D8 level, other member states can benefit from Malaysia's expertise and industrial capacity, as the world's 3<sup>rd</sup> largest solar panel manufacturer in making clean energy accessible and affordable. As many D8 countries remain reliant on fossil fuels, natural gas can be utilised as a key transition fuel, allowing for a smoother transition towards renewable energy sources.

Furthermore, Malaysia's newly published national policy framework for climate change, dubbed the National Climate Change Policy 2.0 (NCCP), aims to reinvigorate Malaysia's just and equitable transition towards green energy through multi-stakeholder solutions and collaborative climate action through both domestic and international cooperation aligned with global climate goals. The NCCP involves more innovative mechanisms for climate financing and incentives for private players to enter the green economy. The development of a D8 climate action framework would allow Malaysia to provide best practices, financing and knowledge sharing with other D8 members, enhancing internally driven sustainable development in the Global South.

Aside from this, a crucial component of any green energy strategy is the availability of critical minerals needed for solar panels and electric batteries. Recognising the strategic importance of cooperation in this sector, countries like Nigeria and Indonesia, rich in key minerals such as cobalt, lithium, and rare earth elements, can become pivotal players for the industrial base of renewable energy. Collaborative efforts in research and development, mining practices, and sustainable extraction methods will ensure that these minerals are explored responsibly while providing long-term economic benefits to the D8 economies.

In addition, the development of a D8 green energy investment agreement could open doors for D8 countries to attract investments in solar projects from states both within and outside to the group that were previously unattainable. Governments within this framework should work towards creating a favourable investment climate by offering green energy investment incentives in the form of tax breaks, streamlined regulatory processes, and limited guarantees on returns for renewable energy projects. Public-private partnerships within member D8 nations should also be encouraged to develop large-scale solar farms, as well as inviting investments in smaller-scale, decentralised solar systems, to provide energy to remote and underserved communities.

Ultimately, the potential for the D8 to pursue a comprehensive green energy strategy must be rooted in the principle of equity, ensuring that LDCs have equal access to the same technologies and financing opportunities as its more developed members. Solar energy, with its vast potential in where most D8 members are located, should be the cornerstone of the D8's energy transformation strategy. By leveraging its collective resources, expertise and investment opportunities, the D8 can make significant strides towards building a sustainable future to meet the bloc's energy needs, becoming a trend-setter for other LDC states to follow.

## Reinvigorating Halal tourism across the D8

Halal tourism has emerged as a significant growth sector, driven by the rising demand from Muslim travellers seeking destinations that meet their cultural and religious needs. The D8 possess vast untapped potential for becoming leaders in this space. These nations, rich in cultural heritage, natural beauty, and Muslim values, are prime candidates for developing a robust Halal tourism industry. However, to unlock this potential, there is a need for greater cooperation, particularly through visa-free travel arrangements, affordable travel options, and stronger infrastructure for cross-cultural

exhibitions and food tourism. Among D8 countries, there have been efforts to increase travel mobility. For example, Malaysia and Turkey already offer relatively easy visa conditions to travellers from fellow Muslim-majority nations. Nevertheless, a formal visa-free tourism agreement across the D8 would greatly enhance the appeal of the D8 as a preferred Halal tourism hub.

A successful Halal tourism strategy must also consider the cost and accessibility of travel. Many potential travellers from D8 nations belong to low and middle-income segments, making affordable travel a top priority. Expanding low-cost airline routes within the D8 is essential for enabling affordable, intra-regional travel. Countries like Malaysia already have well-established low-cost carriers, which could be leveraged to open new routes across D8 countries.

Lastly, Halal tourism must also focus on cultural immersion and shared values. Cross-cultural exhibitions that showcase the rich history, art, and traditions of D8 countries can serve as focal points for a comprehensive D8 Halal tourism strategy. Halal food tourism is another powerful tool for reinvigorating tourism. Organising food festivals that promote Halal cuisine in the D8, culinary tours, and cooking workshops could further elevate D8 tourism by tapping into the growing global demand for Halal food experiences.

However, substantial challenges remain, especially when considering security concerns and visa policies in countries like Iran and Nigeria. Both nations face significant geopolitical and security challenges that complicate the implementation of visa-free agreements. For instance, visa security issues in Nigeria, particularly concerning document verification and border control, pose significant risks. Iran, with its culturally rich destination, faces international sanctions and complex diplomatic relations with western governments, which may hinder the prospects of potential tourist travel arrangements. As such, D8 visa policies remain largely at the discretion of each member state, with visa requirements depending on bilateral or multilateral arrangements.

Such geo-economic complexities require careful negotiation, balancing tourism development with security needs. Many D8 countries also face underdeveloped tourism infrastructure, particularly in nations like Bangladesh and Pakistan, where budget accommodations and transport systems are not well-integrated into a cohesive tourism framework. Moreover, fluctuating fuel prices, political instability, and economic factors all may affect the viability of sustained low-cost airline routes across the region. Countries like Bangladesh, Nigeria, and Pakistan will need substantial investments in infrastructure to keep pace with tourism demand. Without such investments, maximising the full potential of Halal tourism across the D8 may remain unfulfilled.

## **SME cooperation in intermediate and industrial linkages within the D8**

The D8's economic landscape is largely dominated by Small and Medium Enterprises (SMEs). While such businesses often focus on consumer-facing industries, a long-term strategic view requires a shift toward intermediate goods trading among SMEs, as final markets are often already served by local businesses. Moreover, by focusing on industrial cooperation in intermediate goods, this is often less sensitive and destabilising to the political economies of the D8 and represents a fast-growing area in global trade. In this vein, D8 nations should shift its trade mindset for SMEs from the viewpoint of final exports towards exporting incremental semi-finished goods in global value chains.

There are multiple benefits of shifting SME trade focus from final goods to intermediate inputs. Primarily, intermediate input trade is less likely to provoke economic tensions, as these are mostly Business-to-Business (B2B) transactions, meaning that countries are not directly competing in end-consumer markets. Moreover, focusing on intermediate inputs often allows for greater value addition as a proportion of output, helping SMEs in D8 nations build capacity in higher-order skillset, rather than being locked into low-margin exports of raw materials or low-value finished goods.

Traditionally, however, international trade strategies for SMEs have centred on exporting final products. Nevertheless, the world economy is increasingly interconnected through global value chains (GVCs), where intermediate goods and services are exchanged across borders before being assembled into final products. This form of trade represents most international commerce, particularly in manufacturing, IT, and agriculture sectors. Indeed, of Malaysia's total imports in 2023, 51.2% consisted of intermediate input goods, while in contrast, final consumption goods, which consisted mainly of processed foods and beverages made up 8.6%. However, Malaysia's position as an intermediate trade hub largely bypasses other D8 nations (except Indonesia), instead serving markets in DCs. The challenge for the D8, therefore, is to create a trans-national ecosystem that supports intra-D8 trading of intermediate goods and services, leveraging each country's unique capabilities and industrial strengths to build a more interconnected and resilient economic network.

In this vein, sizable opportunities lie in leveraging the growing demand from the global Muslim community for products and services that align with Islamic values. With a growing Muslim consumerist middle class, there is increasing demand for Halal-certified products, ethical finance services, and Shariah-compliant industrial practices. This demand goes beyond consumer goods and includes intermediate inputs—such as Halal-certified inputs, packaging, and production equipment—that are used in producing final Halal goods. Through private-driven and government-supported joint venture initiatives, D8 SMEs can be well-positioned to meet this demand. These initiatives should likewise focus on innovation within the Halal sector, exploring opportunities in industries in Halal pharmaceutical ingredients, cosmetics, and modest fashion. Building competencies in these high-value sectors will not only drive exports but also foster shared industrial development within the grouping.

Despite the clear benefits, there are several barriers to achieving SME cooperation in intermediate input trade across the D8. Chiefly, the current landscape has varying regulatory standards for quality control, taxation, and trade policy that create substantial barriers for SMEs. A mutual recognition agreement on standards is essential and requires coordinated effort to align trade regulations and industrial standards across the D8. Furthermore, limited access to financing in the D8 remains a significant challenge for SME expansion, with many SMEs lacking the capital to invest in new technologies and scale to meet production demands. The creation of a D8 SME fund that supports intra-D8 trade for SMEs involved in cross-border trade and joint ventures may be required to encourage deeper economic integration within the bloc.

## Conclusion

Malaysia's evolving foreign economic policy under the MADANI government represents a decisive shift towards South-South cooperation and strengthening economic ties within the D8. Strategic reforms at the federal level signals that Malaysia aims to create pathways for collaborative economic growth, positioning itself as a key player in driving sustainable, mutually beneficial development across the D8. While challenges remain like structural economic inequalities, market and political uncertainties persist, there are nevertheless significant opportunities that Malaysia is well-poised to advance. Areas such as the Halal economy, green energy and SME development present untapped potential for transformative collaboration. Malaysia's expertise in these sectors can be leveraged to support broader D8 goals, creating opportunities for innovation and cooperation. Malaysia's leadership in developing sustainable, green strategies will not only address technological advancement but ensures socio-economic inclusiveness in a region that faces severe developmental challenges. The NETR and NCCP provide a crucial blueprint for other member nations, particularly within LDCs to follow in their own energy transition plans. In addition, leveraging the Halal economy and tourism sector offers immense growth opportunities for the D8. The regulation of Halal standards within a framework of food trade bubbles could streamline Halal market access, promote cross border trade, and deepen integration with



the global Halal market, catalysing food tourism and create niche markets for global Muslim consumers. Meanwhile, SME collaboration can help drive a shift in D8 trade dynamics, from merely exporting low value goods to intermediate goods and services could enhance economic value addition and deepen trade relations, ensuring deeper industrial linkages and supply chain resilience. Ultimately, the vision of a long-term sustainable integration strategy within the D8 must prioritise its overall cooperation framework in investments in both its physical and financial infrastructure, developing more robust cooperation that cuts across multiple sectors. Such a vision would contribute to poverty alleviation, economic resilience, and unlock equitable growth opportunities across member nations. Malaysia can help play a crucial role in leading this transformation, charting a path forward for a new chapter in the D8's history.



#### Author Details

**Mohd Faiz Abdullah**

<sup>1</sup> Institute of Strategic and International Studies of Malaysia, Malaysia

0009-0001-2221-8890    faiz.abdullah@isis.org.my

**Qarrem Kassim**

<sup>1</sup> Institute of Strategic and International Studies of Malaysia, Malaysia

0009-0004-3064-1981    qarrem.kassim@isis.org.my

## References

- Bernama News. (2024, July 28). Malaysia has applied to join BRICS – Anwar. Bernama. Retrieved from <https://www.bernama.com/en/news.php?id=2322706>
- CNN. (1995, November 11). *Nigeria suspended from Commonwealth*. CNN. Retrieved from <http://edition.cnn.com/WORLD/9511/nigeria/11-11/>
- Developing Eight (D-8) Preferential Tariff Agreement. (n.d.). *Official portal of the Ministry of Investment, Trade and Industry*. Retrieved from <https://www.miti.gov.my/index.php/pages/view/372>
- Dinar Standard. (2024). *State of the global Islamic economy report 2023/24*. Salaam Gateway. Retrieved from <https://www.dinarstandard.com/post/state-of-the-global-islamic-economy-report-2023>
- International Monetary Fund (IMF), African Department. (2023). *Kingdom of Eswatini: 2023 Article IV consultation—Press release; staff report; and statement by the Executive Director for Kingdom of Eswatini*. IMF Staff Report, 2023(160). <https://doi.org/10.5089/9798400238826.002>
- Özkan, M. (2017). Why does an international organisation fail? A theoretical and systemic approach to the Developing Eight (D-8). *Ortadoğu Etütleri: Middle Eastern Studies*, 9(2).
- PricewaterhouseCoopers. (2017). *The world in 2050: The long view—How will the global economic order change by 2050?* Retrieved from <https://www.pwc.com/gx/en/research-insights/economy/the-world-in-2050.html>
- Rajagopal, M. (2024, August 21). *Rise of Global South inevitable, says Anwar*. New Straits Times. Retrieved from <https://www.nst.com.my/news/nation/2024/08/1094601/rise-global-south-inevitable-says-anwar>
- The World Trade Organization. (n.d.). *World Integrated Trade Solution (WITS) dataset for intra-D-8 trade*. The World Bank. Retrieved from <https://wits.worldbank.org/>





# Intra-Trade Relations and Economic Development of the D-8 Members



Yinka Sabuur Hammed <sup>1,2,3</sup>

<sup>1</sup> Nigerian Institute of International Affairs, VI, Lagos, Nigeria

<sup>2</sup> Bashir Adeniyi Centre for International Trade and Investment (BACITI), NIIA, Lagos

<sup>3</sup> Centre for Econometric and Applied Research (CEAR), Ibadan

### Abstract

This study adopts both descriptive and econometric approaches to examine the extent of intra-trade relation among the D-8 countries; investigate the effect of this relationship on the economic development of members; and establish possible role of policy uncertainties in their intra-trade relation. Using annual secondary data from 1997 to 2022, the following outcomes were rather established. While the formation of the organisation boosts the trade relation among many members, their volumes have not been consistent over the years, albeit, safe Turkey, Indonesia and Bangladesh. Also, the current intra-trade relation suggests positive impact on economic development of each country as the impact is more obvious in raising household welfare and firm productive capacity. On the role of policy uncertainties, both trade policy uncertainty (TPU) and global economic policy uncertainty (GEPU) have long-term spill over effect. Specifically, the spill over dampens imports significantly suggesting possible wider implication on their economies. As for the climate policy uncertainty, its impact is found to reduce both export and import in the short run, while the long run impact is positive, suggesting that D-8 countries have relatively less stringent climate and environmental protection policies, making them attractive to global investors. This is as additional evidence suggests that exports raise inflow of foreign currency and further result to appreciation of local currencies of member countries. These analyses have wider implications for the D-8 countries, suggesting the need to boost and sustain current trade-relations.

### Keywords

Intra-trade relations · economic development · organisation · policy uncertainties



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Corresponding author: Yinka Sabuur Hammed [yinkameds@gmail.com](mailto:yinkameds@gmail.com); [hammed.yinka@niia.gov.ng](mailto:hammed.yinka@niia.gov.ng)

## Introduction

The emergence of D-8 countries importantly constitutes an avenue to improve economic activities and to foster trade relations and development among members. However, one pertinent question that still remains elusive to answer in this regard is: what has this cooperation offered after twenty-seven years since its formation, particularly in fostering economic development among members? Are the trade relations with members more strengthened since after formation? Are there any external interference particularly due to various policy uncertainties? This study answers these questions by examining the extent of intra-trade relation among the D-8 members; investigating the effect of this relationship on the economic development of members; and establishing possible role of policy uncertainties in their intra-trade relation.

The importance of trade relation at international level encompasses a whole lot of benefits to the countries of concern. While this is recognised to play through with the D-8 members since its formation, there have not been any clear studies that have emphasized this stance. Rather than shifting attention to this focus, some of prior studies (Ahmed et al., 2019; Al-Arif et al., 2021; Ozigbu, 2023; Mokhtarifar et al., 2023) only relate individual country's trade volume in the organisation with the rest of the world. For instance, the emphasis by Ahmed et al. (2019) was on export and import data for these countries in relation to the world. There was no clear emphasis as to the volume of intra-trade relation among these members. This study addresses this stance by giving consideration to intra-trade data among the D-8 countries. Intra-trade data rather than overall export and import data of these countries will reveal the extent to which the organisation has fostered trade relation among members. Importantly, it will serve as a way to gauge the effectiveness of their relation since the formation of the D-8 organisation.

Part of the expected contribution of any co-operation is improving the welfarism of citizens through abundance economic activities which can be better measured through the size of gross domestic products either by expenditure or consumption. When living standard of household improves, the level of household consumptions also improves. Prior evidences have attempted to measure the extent of development of the D-8 members (see Arisman et al, 2021; Asadullah and Mansor, 2021; Duran et al., 2022), but not through the route of intra-trade relations. This study contributes to this area by using a dynamic approach which provides for analysis of both short and long run estimation. Specifically, we use Panel Auto Regressive Distributed Lag (P-ARDL) through Mean Group (MG) version as suggested by available statistical gauge.

Recently, many studies have highlighted various impacts of policy uncertainties on international trade relation (Tam, 2018; Abaidoo, 2019; Caldara et al., 2020; Borojo et al., 2022). For instance, Caldara et al. (2020) concluded that trade policy uncertainty dampens various business investments. Also, Borojo et al. (2022) confirmed that both importer and exporter country level economic policy uncertainty often constitutes significant negative effect on their trade flows for various countries. As for climate policy uncertainty, the conclusion of Eweade and Gungor (2024) is that both climate policy uncertainty and trade openness are bi-directionally related. While no clear emphasis has been offered on the organizational impact of policy uncertainty particularly with respect to the D-8 community, the present study is encouraged to further contribute in this regard. Possible outcome in this regard will provide insight into how this organisation can tackle its possible negative effect. According to Borojo et al., (2022), rising per capita income has the potential of minimizing the negative impact of EPU in any trade relation. Such likely outcome can benefit this organization when it is revealed from empirical stance.

Consequently, we can summarize the outcome from the study as follows: while the formation of the organisation boosts the trade relation among many members, their volumes have not been encouraging and consistent over the years, albeit for Turkey, Indonesia and Bangladesh. Also, the current intra-trade

relations suggest positive impact on economic development of each country as the impact is more obvious in raising household welfare and firm productive capacity through real GDP per capita. Additional evidence suggests that exports raise inflow of foreign currency and further result in appreciation of local currencies of member countries. On the role of policy uncertainties, both trade policy uncertainty (TPU) and global economic policy uncertainty (GEPU) have long-term spillover effect on D-8members through importation from members. Specifically, the spillover dampens imports significantly, suggesting possible wider implication on their economies. Again, while climate policy uncertainty dampens both export and import in the short run, the long run impact is positive, suggesting that D-8countries have relatively less stringent climate and environmental protection policies, making them attractive to global investors. As climate policy uncertainty persists, trade and intra-trade activities tend to expand in developing countries, including D-8nations, due to their more flexible climate regulations. All these submissions are in conformity with conclusion of related prior evidence.

The next section presents literature review with emphasis on trade, investment and economic growth and development of the D-8community. In section 3, the study focuses on methodology and data while section 4 presents intra-trade relation among members using intra-export and import data. Section 5 presents the results and section 6 gives conclusion and implication of the study.

## Literature Review

### The theoretical link between Uncertainty and Trade

The link between uncertainty and trade has been succinctly offered by Tam (2018). The case can either be direct or indirect. Investors in environment that is characterized by high uncertainty level and with tendency of investment cost irreversibility may adopt an option of 'wait and see' strategy. This strategy depresses output via lower purchases of goods and services and thus results in low consumer spending. The resultant effect of such uncertainty gives rise to lower trading activities. The indirect channel is also possible through exchange rate channel. In most cases, the level of uncertainty often informs different expectations of economic agents about monetary policy and the rate of exchange of currency. Usually, exchange rate is volatile where economic policy uncertainty is heightened. With rising volatility of exchange rate, trade becomes unstable and activities around that are generally affected.

As for the direct channel, Navy and Taylor (2014) developed a framework which extends the discussion of Bloom (2009) about the channel of impact of uncertainty to trade. While the approach of Bloom was primarily on closed economy, Navy and Taylor (2024) rather focused on open economy. Their framework suggests that firms typically source intermediate inputs from both domestic and foreign markets. However, when uncertainty is high, firms are more likely to cut back on foreign purchase due to higher costs, favouring domestic supplies in that regard. As a result, international trade suffers more during periods of economic policy more uncertainty than domestic trade. This essentially implies that intra-trade relations among the D-8community may weaken in times of heightened uncertainty.

### Trade and Investment Relation

Since the formation of D-8 Organisation, several research studies have been conducted to understand the benefit or otherwise of the alliance. While some of the studies look into their attraction to countries outside the organisation, others have focused on intra-organisational benefits for the member countries. An attempt on the attraction of the member countries to foreign inflows was conducted to see how their trade liberation works in this regard (Shah and Samdani, 2015). Although the outcome signifies overall benefit for the countries, the time period of such studies has been long



done, suggesting the need to redress the nexus. Again, the methodological approach which was static rather than dynamic has the potential to undermine or lead to strong biasness of the analysis.

Again, the area of trade has further been explored for the sustainable development benefit of the D-8 members. The question is: how has trade promotion among the members contributed to carbon emission which importantly negates the assumption that sustainable development objectives preserve the environment for future generation while trying to maximize the present needs? This empirical investigation indicates that various economic activities by this group result in overall significant carbon emissions and specifically for Bangladesh, Iran, Nigeria, Pakistan, and Turkey (Ahmed et al., 2019). By categories, export promotion strategies adopted by these countries tend to make exports more emission intensive than imports, with former having lingering effect beyond the immediate period. However, while this outcome gives nuanced evidence on how energy relates to trading activities of these countries, more evidence is still unknown in this nexus.

Consequently, the implication of both renewable and non-renewable energy and institutional quality was further emphasized on environmental quality and economic growth by Shah et al., (2020). Unlike the submission of Ahmed et al, (2019), their outcome indicates that both energy types contribute to rising economic growth as well as to environmental degradation for the member countries. Additionally, institutional stability was found to be more important in establishing sound economic growth and maintaining friendly environment. Another research study was more categorical with respect to disaggregating the energy components. The outcome from Gorbanian and Tarazkar (2020) study indicates that while clean energy contributes positively to economic growth, non-renewable energy does otherwise among the D-8countries, suggesting the need to go green for growth improvement.

Additionally, Al-Arif et al., (2021) emphasized the importance of exports and political stability in the promotion of economic activities among the D-8 members. Theoretically, whatever policy that drives exports leads to rising local production which by implication raises employment opportunity as well as income growth. However, the submission of the authors suggests that exports in the D-8countries have not been much effective in driving their economic growth while political stability creates a positive ground for improving it. Yet, this outcome does not entirely suggest that this is really lacking; such outcome could have resulted from methodology biases as there is likelihood of threshold effect or asymmetric impact in this relationship. In more similar stance, other research studies have paid attention to this area. Example is the work of Mokhtarifar et al (2023) which examined how regulatory quality in D-8countries impact agricultural exports, GDP and other macroeconomic variables. The main takeaway from this study is the evidence that higher regulatory index raises agricultural exports and GDP in the D-8countries.

Another important emphasis on trade integration for D-8countries in relation to economic well-being was rendered by Ozigbu (2023). The study attempted to see how trading activities of each member country with the rest of the world manifest to raising well-being of the citizens. Similar to previous finding, the outcome suggests that trade openness and the level of financial openness contribute to improving well-being of the citizens. However, trading activities with other countries could not really be a good measure to adjudge the effectiveness of the organisation. There is greater need to emphasize this impact by giving consideration to intra-trade relations among members. Perhaps, due the importance of finance in international trade, Abadiyah and Endraswati (2023) focused on establishing the importance of financial development, financial market and financial institution on international trade among the D-8 countries. However, while financial development was found to promote international trade of D-8members, similar outcome could not be verified for financial market and financial institution. This goes to say that the level of financial deepening contributes more to projecting international image of a country. With respect to investment, Hammed et al., (2025) focused on the implication of economic policy uncertainty (EPU) for Nigeria, one of D-8members, on foreign inflows. It was specifically

made clear that when EPU is heightened, the extent of FDI inflows becomes reduced, signifying the negative effect of the foreign inflows for the Nigeria economy.

## Economic Growth and Integration

Apart from trade focus, prior studies have also rendered important contribution on how the alliance among the D-8 members results in raising economic growth in the countries. Study by Ahmad and Ahmed (2005) was to establish the connection between government size and economic growth of D-8 member states. Although traditional Keynesian theory emphasizes that government size by its expenditure always spurs growth through consumption, employment and investment channels, the alternative view holds that consumption could potentially crowd out investment which by implication mars growth potential from higher spending volume. Essentially, there was no causal relationship between government spending and per capita income of these countries except in Iran. It is presumed from the study that government intervention does not necessarily stand as a prerequisite for income growth.

Studies on D-8 corporation have also been extended to how it has fostered human capital development. However, there appears to be disparity in the level of growth among the member countries. The contribution of Asadullah and Mansor (2021) was to basically explore this area by referencing Malaysia growth stance alongside other member countries in this organisation. It was argued that Malaysia economic integration and growth status can be further improved by focussing on mobility of skilled labour, trade in cultural goods and services and by ensuring free movement of international students. This provides opportunity for other members in the organisation as a way to improve their economies and as a mean to leverage on in their bilateral or multilateral agreement with other countries. Nevertheless, more exploration is still required to further validate this point using empirical analysis as a way to establish the point through existing statistical data in both immediate period and the long run.

By extension, Duran et al (2022) explored various determinants of economic growth in D-8 countries by giving consideration to variables such as capital, energy use, energy imports, exchange rate and natural resources. It was made clear that growth movement in these countries are mostly explained by capital and currency depreciation. Similarly, Javad et al., (2023) established disparity among these countries in terms of economic prosperity, research and development expenditure and stock of researchers. More importantly, it becomes clearer that volume of GDP, human capital development, income per capita and number of researchers are contributory variables towards general improvement of the countries, while knowledge and technology transfer research collaboration and investment in research and development have not been optimally utilized to the advantage of members.

While making additional contribution in this area, particularly to establish the importance and benefit of the D-8 organisation to member countries, Arisman et al. (2021) used comparative analysis between D-8 members and non-D-8 members. The outcome suggests significant differences in their economic growth in favour of D-8 member countries. This shows that the trade agreement among members holds for significant members than the otherwise of non-members. Majeed and Asghar (2021) further ventured into the relationship between energy consumption, trade, economic growth and environmental quality among D-8 and G-7 countries. While GDP, trade and energy consumption dampen environmental quality for D-8 countries, they were rather found to improve it in G-7 countries. This suggests that general level of development matters in the effectiveness of macroeconomic variables on environmental quality. Rather focusing on economic growth, Ulima (2022) explored the implication of trade openness among the D-8 members on unemployment. While consideration was given to variables such as trade openness, wages, inflation, economic growth and population, there was clear indication that trade openness reduces unemployment.



In a related study, Yayi (2024) emphasized the implication of economic policy uncertainty in the trade relation among countries categorized as less sophisticated. Findings suggest that export sophistication can determine the extent of resilience in a country in the presence of economic policy uncertainty. While Ulima (2022) examined the implication of trade openness in raising employment opportunity, Yayi (2024) established the need to arouse trade sophistication as a mechanism for withstanding policy uncertainty. Liu, Zhu and Yu (2024) also focused on the implication of economic policy uncertainty on intra-industry trade using HS 8-digit products among 23 trading partners to China. Like the outcome by Yayi (2024), they found that economic policy uncertainty inhibits the volume of mechanical and electrical exports. With intra-trade relation, the implication of EPU was found to downside, having little impact on ordinary exports but more on processing exports. This suggests that intra-trade relation could help lessen the impact of EPU on trade, exports and imports.

Zhu and Ye (2024) equally submitted that while EPU dampens firms' resilience to exports, their engagement on digital trade helps to moderate it. A further comprehensive analysis was carried out by Gignarta, Borojo and Guan (2024) on the nexus between trade and economic policy uncertainty and agricultural exports for advanced, emerging and developing countries. All D-8 members were part of countries considered for the analysis. The key findings of the study indicate that policy uncertainty adversely impact agricultural exports for the concerned countries. However, while the impact of EPU could not be distinguished between advanced, emerging and developing countries, it was found that trade policy uncertainty has more severe impact on emerging and developing economies than in advanced economies.

## Methodology and Data

This study employs dynamic approach for data analysis. The use of panel Autoregressive Distributed Lag (P-ARDL) presupposes the need for long time period (T). In other words, it is a technique for long panel. However, its choice in this study becomes necessary for an analysis that covers both short and long run periods and for possible salient future of data composition as either I(0) and / or I(10) variables. Our models are established along the objectives of the study. The technique is used for achieving objectives 1 and 2 which are to investigate the impact of intra-trade relation on economic development of D-8 members and to establish the role of policy uncertainties in the trade nexus. The data compositions are intra-export and import of the members. This data was sourced from World Integrated Trade Services (WITS) and the scope dates from 1997 to 2022<sup>1</sup>. To capture economic development stance for these countries, real GDP per capita for expenditure and consumption were used and they were sourced from Penn World Data (PWD) version 10.1. Similarly, exchange rate was utilized as control variable and it was equally sourced from PWD. Three policy uncertainty variables were considered and these are trade policy uncertainty (TPU), Global Economic Policy Uncertainty (GEPU) and Climate Policy Uncertainty (CPU). These indices are in-text generated time series data which gives consideration to frequency of certain words newspaper as related to index under discussion. Each of these policy uncertainty variables has been emphasized to have wider implication for international trade activities. Given this foregoing, the following models are presented:

$$rGDP_{it} = \alpha_{it} + \beta tr_{it} + \gamma exr_{it} + \varepsilon_{it} \quad (1)$$

Equation 2 shows that  $rGDP$  is real GDP for country  $i$  at time  $t$ , and  $tr$  is the intra-trade relation (exports and imports) for each country  $i$  and at time  $t$ . Similarly,  $exr$  represents exchange rate for each

<sup>1</sup>The data coverage for Bangladesh and Pakistan is short-off these periods. While data for Bangladesh ends at 2015, that of Pakistan starts at 2003. Author then uses aggregate export and import data from World Development Indicator (WDI) and disaggregates it using simple average methods for the missing periods. Although, this process may undermine the outcome of the result, its accuracy is checked with available data to ensure that its extent of biasing the result is minimized and less significant.

country  $i$  of the developing-8 countries and at time  $t$ , for 1997 to 2022.  $\varepsilon_{it}$  is the error term for the model. Similarly, the model that relates policy uncertainties to intra-trade relation can be presented as follows:

$$UnP_{it} = \alpha_{it} + \beta tr_{it} + \gamma exr_{it} + \varepsilon_{it} \quad (2)$$

All other parameters are as earlier defined except for  $UnP$  which is the uncertainty policies that the study adopt, namely TPU, GEPU and CPU. However, the pane-ARDL version of equation 2 and 3 can be presented as follows:

$$\begin{aligned} \Delta lrGDP_{i,t} = & \alpha_{0i} + \rho_i lrGDP_{i,t-1} + \beta_{01,i} ltr_{t-1} + \beta_{02,i} lexr_{t-1} + \sum_{j=1}^p \delta_{0ij} l\Delta rGDP_{i,t-j} \\ & + \sum_{J=0}^s \gamma_{01,i,j} \Delta ltr_{i,t-j} + \sum_{J=i}^w \gamma_{02,i,j} \Delta lexr_{i,t-j} + \mu_{0i} + \epsilon_{0it} \end{aligned} \quad (3)$$

$$\begin{aligned} \Delta ltr_{i,t} = & \alpha_i + \rho_i ltr_{i,t-1} + \beta_{1,i} lUnP_{t-1} + \beta_{2,i} lexr_{t-1} + \sum_{j=1}^p \delta_{ij} l\Delta tr_{i,t-j} + \\ & \sum_{J=0}^s \gamma_{1,i,j} \Delta lUnP_{i,t-j} + \sum_{J=i}^w \gamma_{2,i,j} \Delta lexr_{i,t-j} + \mu_i + \epsilon_{it} \end{aligned} \quad (4)$$

Equations 3 and 4 are the models to be estimated and all the variables are as earlier defined except the parameters for estimation. In these models,  $\Delta$  is the first stage of differentiation and  $\epsilon_t$  is the white noise error term. From the equation above, the short run impact is captured by  $\gamma_1$ 's with respect to associated variables while the long run impact is represented by  $\frac{\beta_{1s}}{1-\rho's}$ . The ECM term is thus captured by  $1 - \rho's$  in the models.

## Stylized Fact: Trend and Pattern Analysis

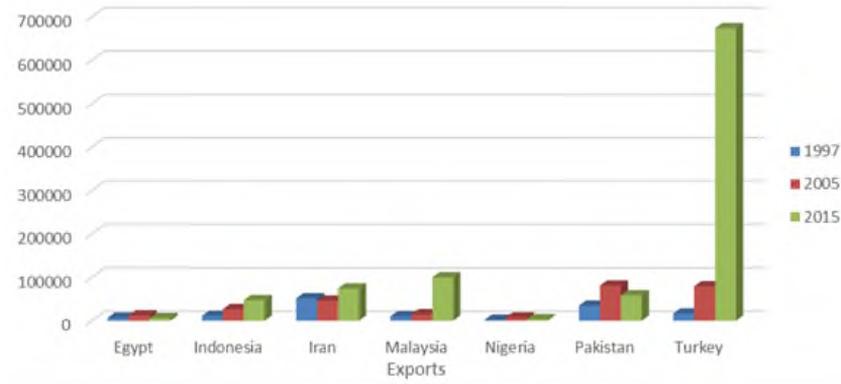
In an attempt to capture the extent of trade relation among D-8 countries, the study considers their intra-exports and -imports of goods in the last two decades: 2001; 2011 and 2021 (except for Bangladesh whose data availability ends at 2015). With this analysis, it becomes very easy to trace the volume of trade balance or imbalance among the countries since the formation of the D-8 organisation. Each country's exports and imports volume are analysed against all other countries in the group and the graphical illustration is shown in Figures 1 to 7 (each categorized into A and B).

Figure 1 (a and b) presents the trade analysis between Bangladesh and other D-8 countries. Figure 1A shows the flow of exports from the countries to other between 1997 and 2015. In the early part when the organisation was still new, Bangladesh traded more with Iran and Pakistan than any other members with figures surpassing over \$50 million and \$34 million respectively for each country. By 2005, the focus shifted more to Pakistan and Turkey where the exports to the respective countries account for over \$80 million and \$70 million. However, as 2015, most of the country's exports now go to Turkey with \$0.67 billion worth of the volume. As for the imports, Bangladesh buys more from Indonesia, Malaysia, Pakistan and Turkey in that order. While the total imports from Indonesia are over \$2 billion (from \$0.4 in 2005), the value of imports from Turkey is found around \$0.3 billion in 2015 (from \$95.5 million in 2005).

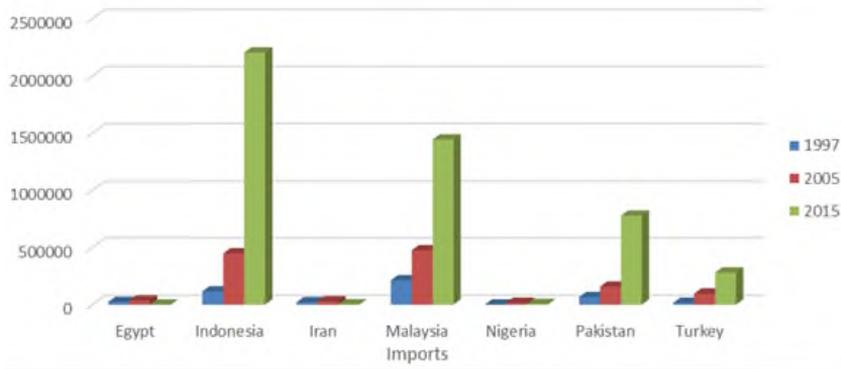
**Figure 1**

**a:** Trade relation between Bangladesh and D-8 for 1996, 2005 and 2015

**b:** Trade relation between Bangladesh and rest of D-8 for 1996, 2005 and 2015



**a**



**b**

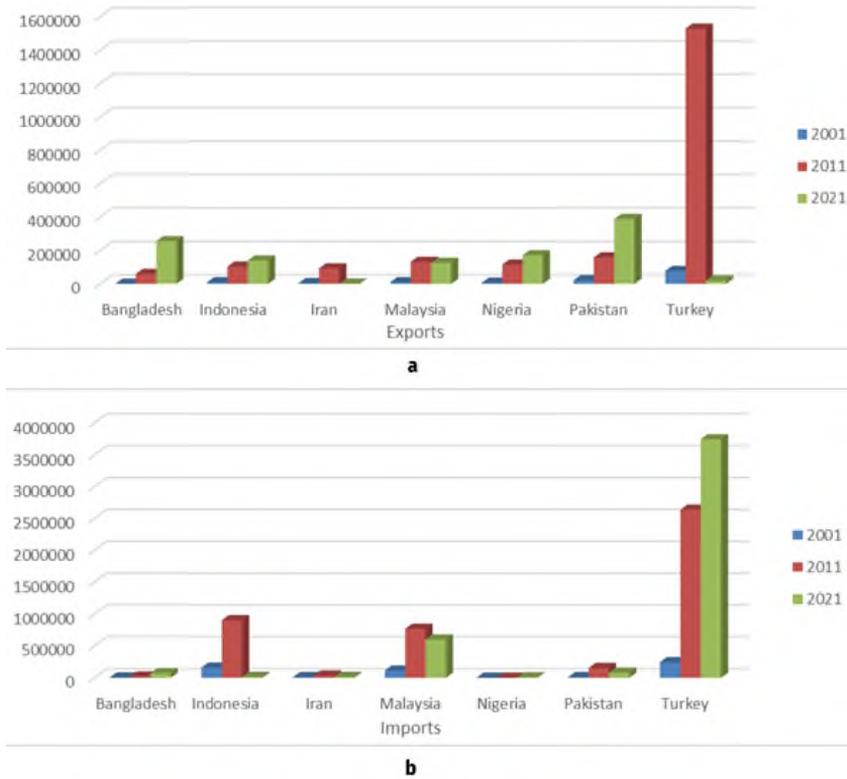
Figure 2 (a and b) presents the flows of exported and imported goods from Egypt to all other D-8 countries. Egypt trades less with D-8 members in the 2000s except with Turkey with export value of \$76.9 million. By 2011, her exportation to these countries rose, especially to Turkey (\$1.5 billion), Pakistan (\$0.15 billion), Malaysia (\$0.13 billion) and Nigeria (\$0.11 billion). While this trend continues up till recently, the value has considerably fallen with Turkey (only exports value of \$18.9 million) as exports with Pakistan rose to \$0.38 billion in 2021 and to \$0.26 billion for Bangladesh. As for the imports, in the recent time, the country imports more Turkey, Malaysia and Indonesia. These countries were most visible with the importation from D-8 countries. For example, the value of total imports from Turkey was \$0.24 billion in 2001, \$2.6 billion in 2011 and \$3.75 billion in 2021.



**Figure 2**

**a:** Trade relation between Egypt and D-8 for 2001, 2011 and 2021

**b:** Trade relation between Egypt and D-8 for 2001, 2011 and 2021



According to the Figure 3 (a and b), Malaysia represents significant trade partner with Indonesia among the D-8 members for both exports and imports. In 2001, total export to Indonesia from Malaysia amounted to \$1.8 billion while imports were \$1.0 billion, representing a trade surplus in favour of Indonesia. Similar trend was still obvious ten years after as exports have risen to \$10.9 billion while imports were valued at \$10.4 billion. By 2021, exports only rose to \$12.0 billion while imports fell to \$9.5 billion. Other prominent trade partners in this category are Pakistan, Bangladesh and Nigeria. However, while Nigeria could be regarded representing net-importer, both Pakistan and Bangladesh were net-exporters.

**Figure 3**

**a:** Trade relation between Indonesia and D-8 for 2001, 2011 and 2021

**b:** Trade relation between Indonesia and D-8 for 2001, 2011 and 2021

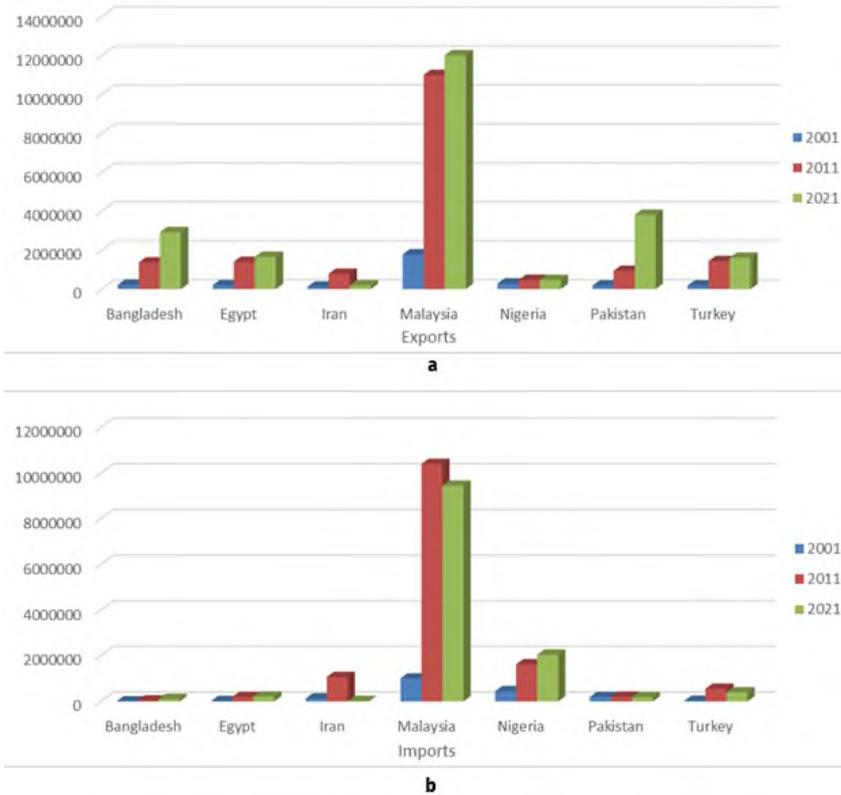


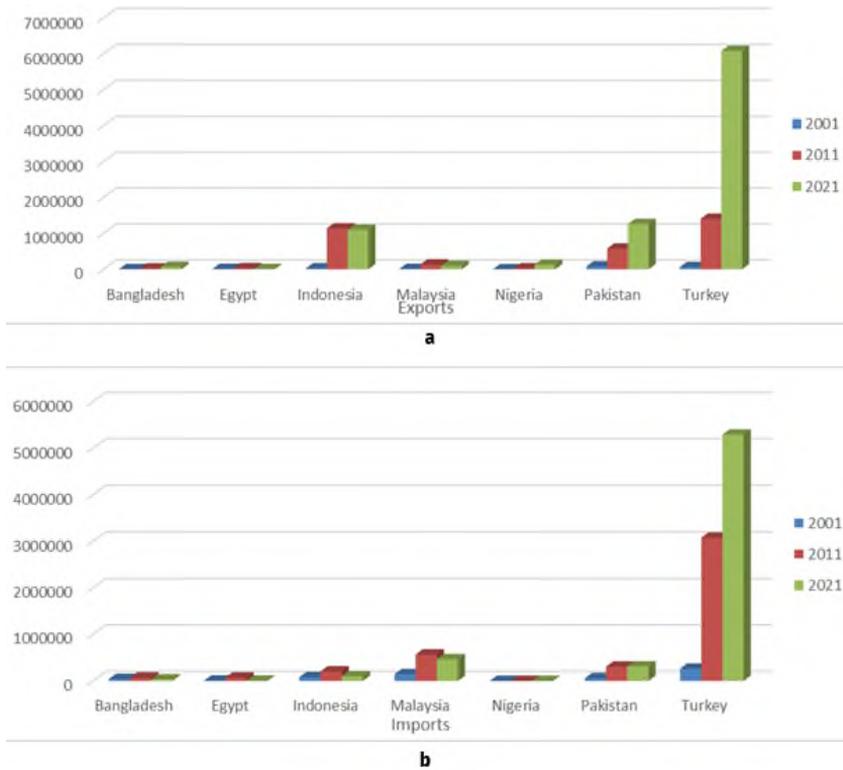
Figure 4 (a and b) shows that Turkey, Pakistan, Indonesia and Malaysia are the top partners of Iran among the D-8 members. Before the formation of the organisation in 1997, virtually all D-8 countries were not in cordial trade relation with Iran. However, by 2001, only Turkey was a bit significant in trade relation with Iran with importation amounting to \$264.4 million. This further rose to \$3.07 billion by 2011 and to whopping amount of \$5.3 billion by 2021. At the same time, Iran exportation to Turkey was \$61.8 million in 2001 and rose to \$1.4 billion in 2011. By 2021, the value jumped to \$6.08 billion. Right after 2011, Iran exportation to Pakistan began to rise from 0.56 billion to \$1.26 billion in 2021 while the importation was far below to a value of \$0.312 billion, indicating a trade surplus in favour of Iran. This situation is similar to the case for Indonesia but otherwise for Malaysia.



**Figure 4**

**a:** Trade relation between Iran and D-8 for 2001, 2011 and 2021

**b:** Trade relation between Iran and D-8 for 2001, 2011 and 2021

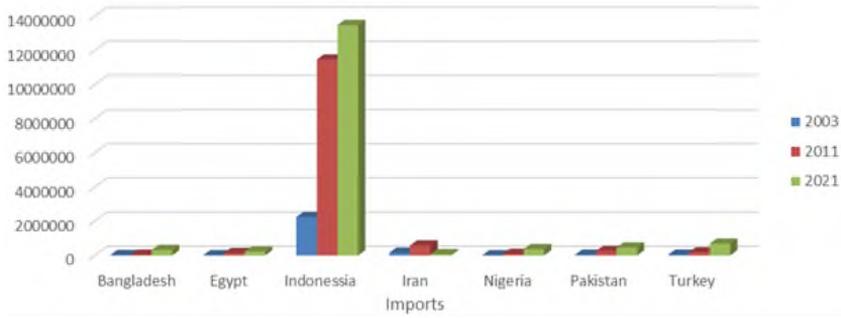


The trade relations between Malaysia and the rest of D-8members have been much significant with Indonesia, Turkey, Bangladesh and Pakistan. Among the D-8 members, Indonesia is very significant to the country's export and import. In the early part of their D-8 formation, Malaysia exports to Indonesia were valued at \$1.57 billion while her importation was 2.24 billion, suggesting Indonesia as a net-importer. Before 2011, the figure rose more sharply. While exportation from Malaysia was \$6.8 billion, their importation was still higher at \$11.47. By 2021, the figure for export rose further to \$9.47 billion while import was \$13.49 billion. Apart from Indonesia, Malaysia did make much importation form other countries. However, countries such as Turkey, Bangladesh and Pakistan are recently raising their importation from Malaysia.

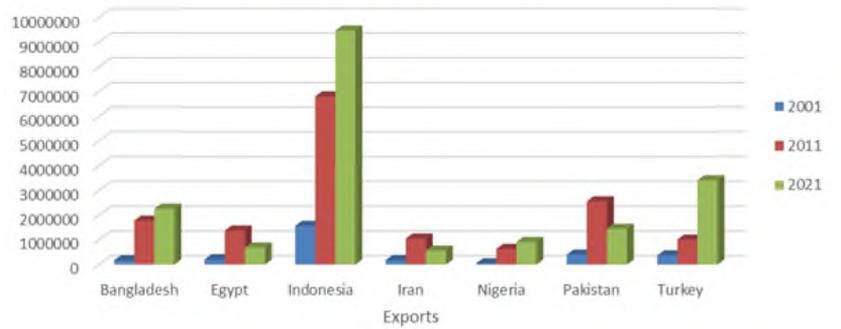
**Figure 5**

**a:** Trade relation between Malaysia and D-8 for 2001, 2011 and 2021

**b:** Trade relation between Malaysia and D-8 for 2001, 2011 and 2021



**a**



**b**

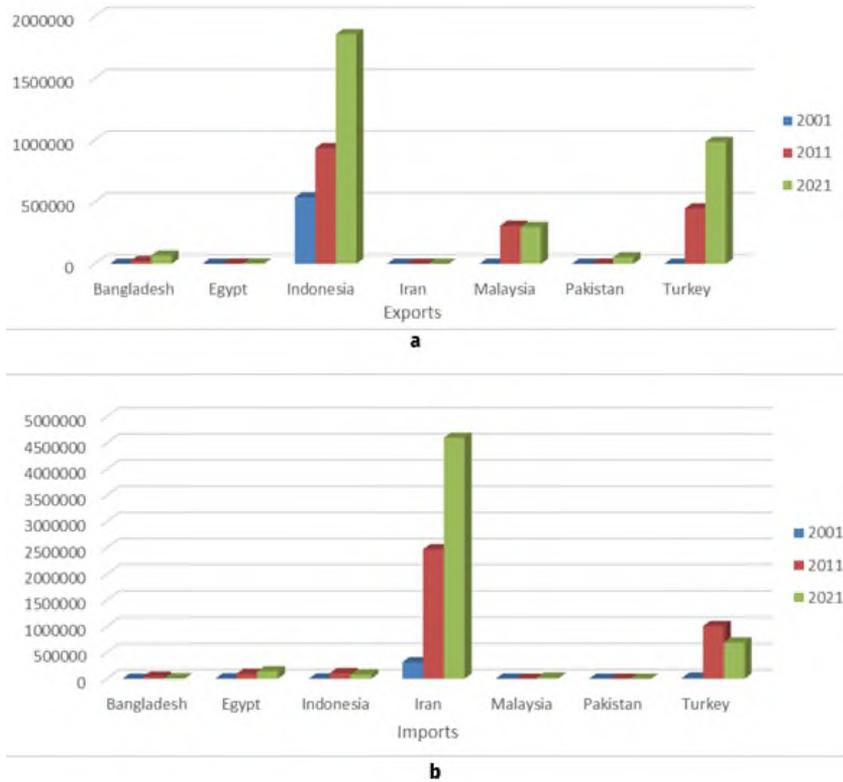
Nigeria also engaged in a significant trade relation with other members of D-8 community. While Indonesia and Turkey are specific main trade partners in terms of export goods, the bulk of importation from Nigeria for D-8 community was coming from Iran and Turkey. In 2001, significant portion of trade value was exported to Indonesia (\$0.54 billion) rising to \$0.94 billion in 2011 and to \$1.86 billion by 2021. For Turkey, Nigerian exportation was 0.45billion and more than double by 2021. As for the import, between 2011 and 2021, Nigerian exportation from Iran was \$2.47 billion by 2023 and the value is now \$4.59 billion.



**Figure 6**

**a:** Trade relation between Nigeria and D-8 for 2001, 2011 and 2021

**b:** Trade relation between Nigeria and D-8 for 2001, 2011 and 2021



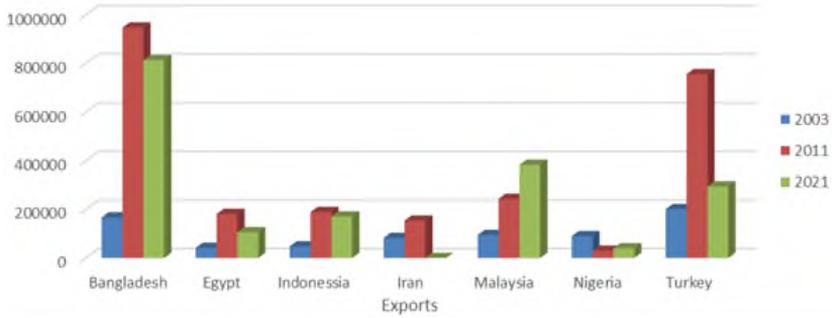
International trade policy of Pakistan appears to give consideration to the D-8 countries, perhaps for being a member. Unlike trade relation of other members with the D-8 members, exports from Pakistan go more to every member of D-8 organisation. Bangladesh tops the list with export value of \$166.2 million in 2001, to 0.947 billion in 2011 and by 2021, it slightly fell to \$0.81 billion. Similar pattern was observed with Turkey with exports value of \$200.3 million in 2003, \$0.76 billion in 2011 and fell to \$293.5 million in 2021. This can be attributed to COVID-19 pandemic when physical activities were mostly cut off across all countries. Pakistan importation of goods among D-8 was more obvious for four countries, Indonesia, Malaysia, Iran and Turkey, and the values are much more than the one recorded for exports. For instance, import value for these countries in 2021 are respectively \$4.19 billion, \$1.32 billion \$0.659 billion and \$0.533 billion. This typically suggests that Pakistan is a net-importer among D-8 members.



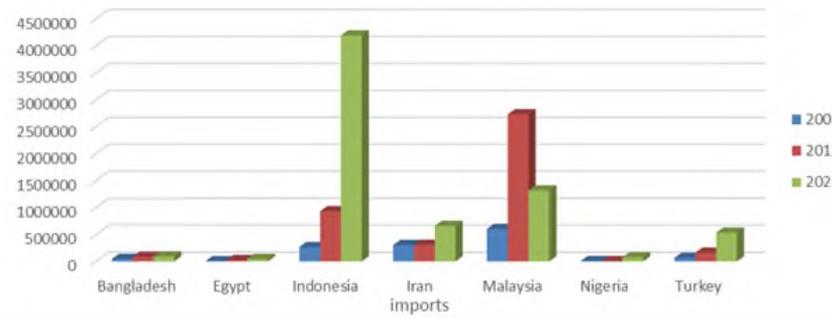
**Figure 7**

**a: Trade relation between Pakistan and D-8 for 2003, 2011 and 2021**

**b: Trade relation between Turkey and D-8 for 2003, 2011 and 2021**



**a**



**b**

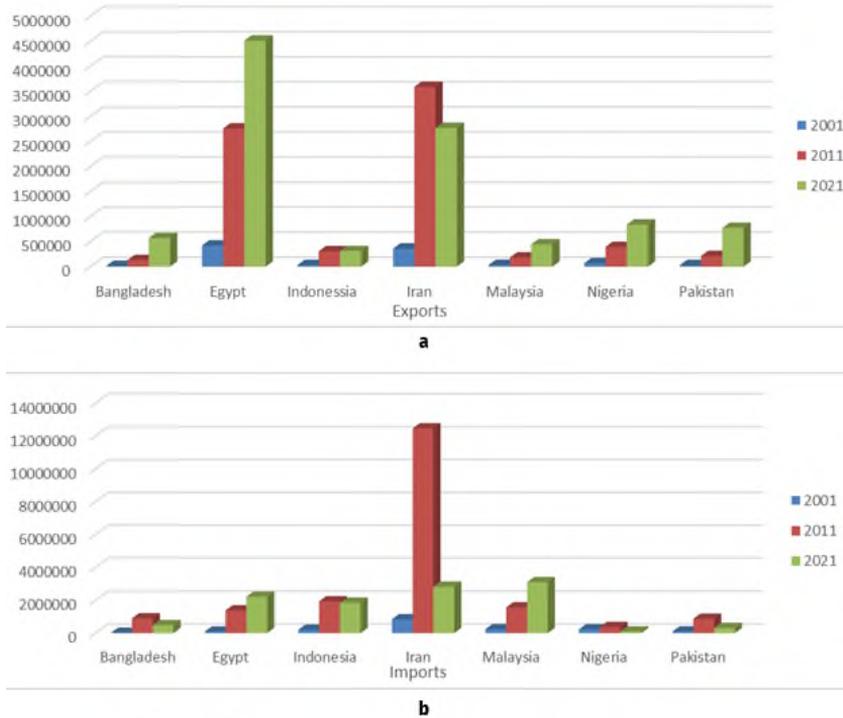
Up till 2001, the trade relation between Turkey and other D-8members was still relatively low except for Egypt and Iran. In 2001, Turkey’s export to Egypt was 421.47 million and 360.54 million for Iran. At this time, importation from Iran was 0.839 billion, higher than the addition of exports values from Egypt and Iran. By 2021, exportation to many D-8 countries from Turkey significantly grew. The values are respectively 0.57 billion; 0.773 billion; 0.841 billion; 2.77 billion and 4.51 billion for Bangladesh, Pakistan, Nigeria, Iran and Egypt. At the same time, importation from countries such as Indonesia, Egypt, Iran and Malaysia are respectively \$1.85 billion; \$2.21billion; \$2.82 billion and \$3.09 billion. These values further indicate that Turkey is a net-importer in her trade relation with D-8 members.



**Figure 8**

**a:** Trade relation between Turkey and D-8 for 2001, 2011 and 2021

**b:** Trade relation between Turkey and D-8 for 2001, 2011 and 2021



## Results

### Descriptive Statistics

We conducted descriptive analysis as a prelude to main empirical analysis. This involves summary statistics and unit root analysis. In the summary statistics, we considered average value of each variable, standard deviation, skewness and kurtosis. The average value of intra-export and intra-import for D-8 countries are respectively \$4.780 billion and 4.589 billion, positively skewed and the kurtosis values are slightly above the threshold value of 3, indicating relatively hump-shaped graph. The exchange rate value is 2979 volume of local currency to \$1, indicating low worth of domestic currency. Also, real GDP per capita income is respectively \$12.6 thousand while trade policy uncertainty is averagely 46.03. The mean value for climate policy uncertainty and global economic policy uncertainty are 109.9 and 79.7 respectively. All these variables are positively skewed and highly humped. The probability of J-Bera statistics indicates normality for all the variables.

**Table 1**

Summary Statistics

Variables	Mean	Std. Dev	Skewness	Kurtosis	J-Bera	Pro	Obs
intr_exports	4780587.00	4749299.00	1.27	3.73	60.42	0.0000	208
intr_imports	4589197.00	5595024.00	1.60	4.89	119.58	0.0000	208
ex_rate	2979.07	6727.28	3.31	16.02	1849.39	0.0000	208

Variables	Mean	Std. Dev	Skewness	Kurtosis	J-Bera	Pro	Obs
r-GDPC	12606.80	13522.07	2.84	13.31	1201.60	0.0000	208
r-GDPE	12656.27	13825.41	2.82	12.85	1116.77	0.0000	208
TPU	46.03	36.45	2.48	8.19	447.29	0.0000	208
CPU	109.90	51.49	1.11	3.00	42.48	0.0000	208
GEPU	79.70	7.80	0.87	2.22	31.69	0.0000	208

The use of Panel ARDL requires satisfying basic condition which includes unit root analysis. We adopt three approaches which are Levin, Lin & Chu; Im, Pesaran and Shin and ADF (see Table 2). Output from all these approaches indicate that the variables are stationary after first difference except TPU which is stationary at level. This outcome is normal for the use PARDL.

**Table 2**  
*Unit Root Test Result*

Variables	LLC	Status	IPS	Status	ADF	Status
intr_exports	-7.6366***	I(1)	-8.4001***	I(1)	94.1671***	I(1)
intr_imports	-7.3628***	I(1)	-8.3215***	I(1)	93.0678***	I(1)
ex_rate	-3.3449***	I(1)	-4.1776***	I(1)	54.4293***	I(1)
r-GDPC	-7.8027***	I(1)	-8.1521***	I(1)	91.2594***	I(1)
r-GDPE	-7.8205***	I(1)	-7.8145***	I(1)	87.0161***	I(1)
TPU	-2.2189**	I(0)	-2.9558***	I(0)	32.6286***	I(0)
CPU	-7.2481***	I(1)	-6.2202***	I(1)	67.5881***	I(1)
GEPU	-0.3050***	I(0)	-3.7453***	I(1)	40.4375***	I(1)

## Main Result

The empirical analysis on the relationship between intra-D-8 trade relation (using export and import among them) and their respective real GDP per capita was carried out in this sector. To ensure a robust analysis, we conducted a dynamic panel regression analysis which suggested the number of period (T) to be more than 20 for individual countries. Again, the analysis is often better as both long and short run are reported. We further conducted to separate analysis to test the sensitivity of the model. In model 1 (Table 3), the real GDP variant was expenditure and in model 2 (Table 4), it was consumption. This enabled us to measure the strength of each country using both household (individual welfare) and firm (production capacity) routes. To decide whether to use meal group (mg) or pool mean group (pmg), we ran the two models and the model could not converge for the pool mean group, suggesting the suitability of mean group. Again, where the convergence was achieved, the Huasman Test often favour mean group (mg) model<sup>2</sup>. The implication here is pointing toward a case of heterogeneity of the slope coefficient in the long run, which actually presents a good case given the regional differential of the D-8 members. Thus, while the convergence was not realized for PMG, the consideration for and estimation through MG was rather appealing in this case.

Table 3 presents the outcome for the influence of intra-trade relation with real GDP per capita for expenditure. The short run implication for individual welfare could not be established for trade export whereas it is negative import. At the same time, the long run impact of export was rather significant

<sup>2</sup>We thus resolve to using and reporting the output from mean group (mg)

but otherwise for import. In other words, while rising exports among D-8 members contribute to higher welfare of their citizens, over-dependency on import commodities may have short run implication with possible dampen effect on each country productive capacity. When export rises by 1%, real GDP per capital rises by 0.37% in the long while it rises by 0.08% with 1% fall in import. Also, the trade volume via exports gives strength to members' currencies in the short run (using dollar as reference category). With rising exports, the currencies of D-8 members appreciate. Specifically, when export rises by 1%, the quantity of individual currencies in exchange for dollar falls, indicating an appreciation of the local currency. By implication, exports lead to higher inflow of dollars which thus reduce pressure on local currency and as such strengthen it. The ECM terms suggest a slow adjustment with any drift from long run equilibrium, approximately 16% for each model for export and import in Table 3.

**Table 3**
*Intra-Trade Relations and Real GDP per capita (using expenditure side)*

Variables	Exports		Imports	
	<b>Short run</b>			
	Coefficient	(Standard error)	Coefficient	(Standard error)
EC term	-0.158***	(0.0388)	-0.157***	(0.0435)
d.lx	-0.0958	(0.0633)		
d.lxr	-0.376***	(0.0576)	-0.412***	(0.0536)
d.lm			-0.0833**	(0.0415)
	<b>Long run</b>			
Lx	0.367***	(0.0989)		
Lxr	0.102	(0.186)	-0.348	(0.545)
Lm			-0.0632	(0.251)
Constant		0.957***		1.005***
		(0.318)		(0.356)
Observations	200	200	200	200

Note: EC is the error correction model; lx is the log of exports; and lxr is the log of exchange rate. Standard errors are in parentheses. Also, \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

As a way of providing additional analysis for robustness check, another proxy was used to capture the welfare of household. Therefore, similar to analysis in Table 3, the outcome in Table 4 shows the impact of real GDP per capita that is measure through total consumption. The outcomes are similar with higher magnitudes and mostly held for exports and only in the long-run. When export values in the D-8 countries rise by 1%, real GDP also rises by 0.47% which is higher in magnitude than when real GDP per capital expenditure is used. This suggests that individual consumption is more influenced by intra-trade relation than the firm expenditure route. As for the imports, the effect is only held in the short run and raises welfare when its value fell. With 1% fall in exports, real GDP increases by 0.601. Also, the ECM term is approximately 11%, indicating a slow adjustment to long run path after any possible shift.

**Table 4**
*Intra-Trade Relations and Real GDP per capita (using consumption side)*

Variables	Exports		Imports	
	<b>Short run</b>			
	Coefficient	(Standard error)	Coefficient	(Standard error)



Variables	Exports		Imports	
EC term	-0.107*	(0.0556)	-0.110*	(0.0606)
d.lx	-0.0771	(0.0540)		
d.lxr	-0.121	(0.0802)	-0.128	(0.0858)
d.lm			-0.0601*	(0.0353)
<b>Long run</b>				
Lx	0.456**	(0.177)		
Lxr	-0.114	(0.137)	-0.0870	(0.111)
Lm			-0.143	(0.393)
Constant	0.440*	(0.259)	0.393**	(0.185)
Observations	200	200	200	200

Note: EC is the error correction model; lx is the log of exports; and lxr is the log of exchange rate. Standard errors are in parentheses. Also, \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

The third objective of this paper is to examine the role of policy uncertainties in the intra-trade relations among the D-8 members. To have a robustness analysis, three uncertainties policies were considered and these are: trade policy uncertainty (TPU), global economic policy uncertainty (GEPU) and climate policy uncertainty. Prior evidence suggests that each of these uncertainties have wider implication on any trade relation and its possibility of spillover effect is assured from advanced economy. Table 5 gives outcome of the impact of trade policy uncertainty on intra-trade relation among D-8members. The outcome suggests long run effect in this nexus for import only. When trade policy uncertainty is heightened by 1%, the volume of import downsides by 0.01%. This further indicates that international trade policy uncertainty could spillover to other countries through importation with possibility to dampen its size. Furthermore, uncertainty around trade policy may lower global trade for mostly affected advanced economies and thus strangle the potential to produce more for other countries. Therefore, due to the spillover effect of the policy uncertainty to D-8 members, they are forced to lower their importation from members' countries. In fact, at this time, the importation from other non-member countries would have equally reduced.

**Table 5**  
*Intra-Trade Relations and Trade Policy Uncertainty*

Variables	Exports		Imports	
<b>Short run</b>				
	Coefficient	(Standard error)	Coefficient	(Standard error)
EC term	-0.197**	(0.0766)	-0.210***	(0.0594)
d.tpu	0.000113	(0.000925)	0.000522	(0.00151)
d.lxr	-0.0375	(0.0739)	-0.127	(0.0984)
<b>Long run</b>				
TPU	0.000768	(0.00681)	-0.0101**	(0.00441)
Lxr	-1.796	(1.357)	-0.788	(0.791)
Constant	2.212***	(0.685)	2.782***	(0.610)



Variables	Exports		Imports	
Observations	200	200	200	200

Note: EC is the error correction model; lx is the log of exports; and lxr is the log of exchange rate. Standard errors are in parentheses. Also, \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

As a way to provide additional evidence for robustness analysis, GEPU was used for further analysis in this nexus (see Table 6). Similar to outcome from trade policy uncertainty, the impact of GEPU was only established for import and the effect was delayed and permanent. With 1% rise in GEPU, imports from various D-8 countries fell. Perhaps, each country adopts this specific policy limiting their dependency on other countries as way to reduce possible impact of GEPU on the local productive.

**Table 6**  
*Intra-Trade Relations and Global Economic Policy Uncertainty*

Variables	Exports		Imports	
	<b>Short run</b>			
	Coefficient	(Standard error)	Coefficient	(Standard error)
EC term	-0.200**	(0.0816)	-0.204***	(0.0561)
d.gepu	-0.0399	(0.0490)	0.0158	(0.0265)
d.lxr	-0.000371	(0.0624)	-0.124	(0.0900)
	<b>Long run</b>			
GEPU	-0.0180	(0.0463)	-0.0724*	(0.0395)
Lxr	-1.119	(1.028)	-1.309	(1.025)
Constant	1.117	(0.737)	3.237***	(0.947)
Observations	200	200	200	200

Note: EC is the error correction model; lx is the log of exports; and lxr is the log of exchange rate. Standard errors are in parentheses. Also, \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

Possible impact of climate uncertainty policy is presented in Table 7. The outcome suggests mixed effects for both intra-export and -import trade. In the short run, climate uncertainty policy dampens the volume of export and import among the D-8 members. When the uncertainty rises by 1% in the short run, both export and import fall by significant magnitude of 0.0055% and 0.0024% respectively. However, the impact is positive and significant in the long run. When climate policy uncertainty rises by 1% in the long run, export falls by 0.015% and import, by 0.009%. This outcome has wider implication. The emphasis in the literature about climate policy uncertainty is that many advanced countries often have stringent climate policies, and when the policies are heightened, it becomes a positive strength for developing countries such as D-8 members. In other words, they become central of focus for trade and investment activities with heightened climate policy uncertainty at global level (Ni et al, 2022). In that regard, uncertainty around climate policy is expected to rather strengthen intra-trade relations among the D-8 members by raising both exports and imports. However, the short run negative effect here is not surprising. This actually presents a case of instantaneous response of the member countries to the shock, which is expected given their relations with other advanced economies. However, by not lingering to the long run establishes the stance of the D-8 countries as developing countries with less stringent climate policies which actually make them attractive to global investors.

**Table 7**  
*Intra-Trade Relations and climate Uncertainty Policy*

Variables	Exports		Imports	
	Coefficient	(Standard error)	Coefficient	(Standard error)
<b>Short run</b>				
EC term	-0.277***	(0.0865)	-0.228***	(0.0535)
d.cpu	-0.00554**	(0.00231)	-0.00237*	(0.00133)
d.lxr	-0.0550	(0.0764)	-0.117	(0.116)
<b>Long run</b>				
CPU	0.0147***	(0.00282)	0.00904***	(0.00214)
Lxr	0.0878	(0.381)	0.129	(0.238)
Constant	2.305***	(0.321)	2.739***	(0.405)
Observations	200	200	200	200

Note: EC is the error correction model; lx is the log of exports; and lxr is the log of exchange rate. Standard errors are in parentheses. Also, \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

## Conclusion and Policy Implication

Both descriptive and panel ARDL analyses were used by this study to: (i) examine the extent of intra-trade relation among D-8 members since the formation of the organisation, (ii) investigate the impact of the intra-trade relation on the economic development of the member countries; and (iii) establish possible role of uncertainty policies in their intra-trade relation. These were done using annual data from 1997 to 2022. While the formation of the organisation boosts the trade relation among many members, their volumes have not been encouraging and consistent over the years, albeit for Turkey, Indonesia and Bangladesh. However, the current intra-trade relation suggests positive impact on economic development of each country as the impact is more obvious in raising household welfare and firm productive capacity. Additional evidence suggests that exports raise inflow of foreign currency and further result in appreciation of local currencies of member countries. On the role of policy uncertainties, both trade policy uncertainty (TPU) and global economic policy uncertainty (GEPU) have long-term spillover effect on D-8members through importation from members. Specifically, the spillover dampens imports significantly suggesting possible wider implication on their economies.

Also, the impact of climate policy uncertainty differs over time. While it dampens both exports and imports in the short run, its long-term effect is positive. This suggests that D-8 countries have relatively less stringent climate and environmental protection policies, making them attractive to global investors. As climate policy uncertainty persists, trade and intra-trade activities tend to expand in developing countries, including D-8 nations, due to their more flexible climate regulations. These findings have broader implications for D-8economies. Existing trade relations between Turkey, Indonesia, and Bangladesh and other D-8members must be sustained and strengthened. A strong trade network among member countries will not only boost economic growth but also facilitate the transfer of skills and knowledge. Despite these benefits, strong intra-D-8trade relations could also serve as a buffer against the spillover effects of policy uncertainty in advanced economies such as the U.S., China, and Japan. By fostering deeper trade ties within the bloc, D-8 countries can reduce their dependence on these major economies and enhance their economic resilience.

In addition to domestic policy measures aimed at improving citizen welfare and strengthening intra-trade relations present another viable approach. Increased exports from one D-8 member to the others can enhance firms' productive capacity and boost consumer welfare. D-8 countries should take inspiration from BRICS by leveraging their large populations and establishing favourable trade terms to facilitate intra-trade activities. Moreover, the uncertainty surrounding global climate policies underscores the need for a balanced approach within the D-8 economies. By maintaining moderate climate policies, these countries can continue benefiting from global trade even when stricter regulations are enforced at the international level. A well-structured climate policy would help mitigate short-term economic shocks caused by heightened global climate policy uncertainty while also maximizing long-term benefits arising from moderate climate approach by the D-8 community.



#### Author Details Yinka Sabuur Hammed

<sup>1</sup> Nigerian Institute of International Affairs, VI, Lagos, Nigeria

<sup>2</sup> Bashir Adeniyi Centre for International Trade and Investment (BACITI), NIIA, Lagos

<sup>3</sup> Centre for Econometric and Applied Research (CEAR), Ibadan

📞 0000-0001-8360-9193    ✉️ yinkameds@gmail.com; hammed.yinka@niia.gov.ng

## References

- Abadiyah, F., & Endraswati, H. (2023). Financial Development, Financial Market, and Financial Institutional on International Trade in Developing Eight Countries. *JurnalDinamikaEkonomi Pembangunan*, 6(2), 118-130.
- Abaidoo, R. (2019). Policy uncertainty and dynamics of international trade. *Journal of Financial Economic Policy*, 11(1), 101-120.
- Ahmad, N., & Ahmed, F. (2005). Does government size matter? A case study of D-8member countries. *Pakistan Economic and Social Review*, Vol. XLIII (2), 199-212.
- Ahmed, K., Ozturk, I., Ghumro, I. A., & Mukesh, P. (2019). Effect of trade on ecological quality: a case of D-8countries. *Environmental Science and Pollution Research*, Vol. 26, 35935-35944.
- Arif, M. N. R. A., Arisman, A., & Harahap, D. (2021). Export, political stability, and growth in developing-8 countries. *Studies of Applied Economics*, 39(2), 1-10.
- Arisman, A., Al-Arif, M. N. R., & Harahap, D. (2021). Trade agreement and economic growth: evidence in D-8countries. *Sig-nifikan: JurnallmuEkonomi*, 10(2), 311-324.
- Asadullah, M. N., & Mansor, N. (2021). Economic cooperation and human development in the D-8countries: The Malaysian model. *Journal of Economic Cooperation & Development*, 42(1), 1-24.
- Bloom, N. (2009). The impact of uncertainty shocks. *econometrica*, 77(3), 623-685.
- Borojo, D. G., Yushi, J., & Miao, M. (2022). The impacts of economic policy uncertainty on trade flow. *Emerging Markets Finance and Trade*, 58(8), 2258-2272.
- Caldara, D., Iacoviello, M., Molligo, P., Prestipino, A., & Raffo, A. (2020). The economic effects of trade policy uncertainty. *Journal of Monetary Economics*, 109, 38-59.
- Duran, M. S., Bozkaya, S., & Bekun, F. V. (2023). Empirical analysis into the nexus between energy consumption, economic growth, and natural resources in D-8bloc: evidence from panel causality analysis. *Environmental Science and Pollution Research*, 30(12), 34720-34727.
- Eweade, B. S., & Güngör, H. (2024). Climate policy uncertainty and energy impacts on trade openness and foreign direct investment in the United States: Evidence from the RALS co-integration test. In *Natural Resources Forum*. Oxford, UK: Blackwell Publishing Ltd., pg. 1-22, <http://doi.org/10.1111/1477-8947.12496>
- Gignarta, T. S., Borojo, D. G., & Guan, Z. (2024). The impacts of economic policy uncertainties on agriculture export. *Cogent Economics & Finance*, 12(1), 2382359.



- Hammed, Y., Ogunniran, M., Ademosu, S., & Muhammad, A. B. (2025). Nigerian economic policy uncertainties and foreign investment inflows: evidence from recently constructed indices. *Journal of Social and Economic Development*, 1-14. <https://doi.org/10.1007/s40847-025-00422-3>
- Hayatdavoudi, J., Kaltenbrunner, W., & Costas, R. (2023). Science and research landscapes across D-8organization member countries from a historical perspective: The policy context and collective agendas. *Quantitative Science Studies*, 4(2), 466-488.
- KargarDehbidi, N., Ghorbanian, E., & Tarazkar, M. H. (2020). The impact of renewable and non-renewable energies consumption on economic growth in D-8group countries. *new economy and trad*, 15(2), 67-90.
- Liu, D., Zhu, X., & Yu, H. (2024). Economic policy uncertainty, intra-industry trade, and China's mechanical and electrical product exports. *Plos one*, 19(1), e0290866.
- Majeed, M. T., & Asghar, N. (2021). Trade, energy consumption, economic growth, and environmental quality: an empirical evidence from D-8and G-7 countries. *Environmental Science and Pollution Research*, 28(43), 61302-61316.
- Mokhtarifar, D., Heidari, H., & Alinezhad, R. (2023). Regulatory Quality and Economic Growth in D-8Countries (PSTR Approach). *International Journal of New Political Economy*, 4(2), 143-172.
- Ni, L., Li, L., Zhang, X., & Wen, H. (2022). Climate Policy and Foreign Direct Investment: Evidence from a Quasi-Experiment in Chinese Cities. *Sustainability*, 14(24), 16469. <https://doi.org/10.3390/su142416469>
- Ozigbu, J. C. (2022). Trade integration and economic well-being: evidence from generalised methods of moments (GMM) in the D-8countries. *Sustainable Development*, 6(2), 64-75.
- Shah, M. H., & Samdani, S. (2015). Impact of trade liberalization on FDI inflows to D-8countries. *Global Management Journal for Academic & Corporate Studies (GMJACS)*, 5(1), 30-37.
- Shah, S. Z., Chughtai, S., & Simonetti, B. (2020). Renewable energy, institutional stability, environment and economic growth nexus of D-8countries. *Energy Strategy Reviews*, 29, 100484.
- Tam, P. S. (2018). Global trade flows and economic policy uncertainty. *Applied Economics*, 50(34-35), 3718-3734.
- Tam, P. S. (2018). Global trade flows and economic policy uncertainty. *Applied Economics*, 50(34-35), 3718-3734.
- Taylor, A. M., & Novy, D. (2014). *Trade and Uncertainty* (No. 9888). CEPR Discussion Papers.
- Ulima, A. O. (2022). Does trade openness foster unemployment? Evidence from D-8OIC Countries. *Muslim Business and Economic Review*, 1(1), 43-62.
- Yayi, C. L. (2024). Economic policy uncertainty and trade: does export sophistication matter? *Applied Economics*, 56(2), 169-185.
- Zhu, X., & Ye, Y. (2024). Economic policy uncertainty and enterprise export resilience in China: Does the digital economy matter? *Heliyon*, 10(10), e31091. <https://doi.org/10.1016/j.heliyon.2024.e31091>



# Promoting Production and Trade in High Technology Products in D-8 Countries



Kenan Bağcı<sup>1,2</sup>

<sup>1</sup> Senior Researcher at the Statistical, Economic and Social Research and Training Centre for Islamic Countries (SESRIC), Ankara, Türkiye

<sup>2</sup> Research Assistant Professor, Qatar University, Doha, Qatar

### Abstract

Economic development has long been intertwined with industrialisation and technological innovation. For the Developing Eight (D-8) countries—Bangladesh, Egypt, Indonesia, Iran, Malaysia, Nigeria, Pakistan, and Türkiye—the rapid advancements in digitalisation, automation, and shifting global market dynamics present both challenges and opportunities. As traditional models of industrialisation evolve towards integration into global and regional value chains, the ability of D-8 nations to enhance their technological capabilities becomes increasingly vital. However, recent disruptions in global economic integration, driven by geopolitical tensions, protectionist policies, and the impact of COVID-19 pandemic, have significantly altered the landscape for industrial cooperation. In this context, this chapter assesses the industrial production capacities of D-8 countries, with a focus on high-technology sectors, trade patterns, and the potential for regional value chain formation. While Malaysia and Türkiye lead in high-tech production and exports, other members, particularly Nigeria and Bangladesh, face structural challenges. The analysis highlights strategies for bridging technological gaps, including investment in research and development (R&D), technology transfer, digital infrastructure, and human capital development. It also explores policy measures such as harmonising industrial standards, fostering joint ventures, and removing trade barriers to enhance intra-D-8 cooperation. By offering new insights into the production and trade capacities of D-8 nations in high-tech sectors, this chapter contributes to the limited literature on D-8 economic cooperation in advanced industries. It provides strategic recommendations for strengthening regional integration and advancing the collective technological and industrial competitiveness of D-8 countries in the global economy.

### Keywords

High Technology · Trade, Developing-8 · Industries



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2025. Bağcı, K.

Corresponding author: Kenan Bağcı [kenanbagci@qu.edu.qa](mailto:kenanbagci@qu.edu.qa)

## Introduction

Economic development has been closely linked to innovation and industrialisation. Over the past decades, however, efforts to spur growth through public interventions have often fallen short of expectations in many developing countries. The recurring interests in industrialisation in the face of rising automation and digitalisation signal a crucial moment for reassessing development strategies. For the Developing Eight (D-8) countries, which include Bangladesh, Egypt, Indonesia, Iran, Malaysia, Nigeria, Pakistan, and Türkiye, this presents an opportunity to reshape their industrial policies, especially in light of emerging technological trends and shifting global market dynamics.

The modern global economy is shaped by the rapid advancement of technology, the rise of digitalization and reconfiguration of global value chains. With the evolution of traditional models of industrialisation such as import-substitution or state-led industrialization, amongst others, the focus was no longer on building self-sufficient industries in isolation but on integrating into regional and international production networks. Yet, over the last decade, global economic integration has slowed, and in some cases reversed, due to economic challenges, geopolitical tensions, and the COVID-19 pandemic. The aftermath of the Global Financial Crisis left many economies with slow growth and rising inequality, intensifying scepticism about globalization. This sentiment has been worsened by the uneven distribution of its benefits, leading to populism and protectionism, as seen in events like Brexit and the U.S.-China trade war. The pandemic further disrupted global supply chains, while geopolitical conflicts like the war in Ukraine have deepened divisions, increasing uncertainty about the future of globalization.

Another emerging trend that overshadows the global economic integration is the "geoeconomic fragmentation". This concept highlights how economic policies are increasingly influenced by national interests, leading to the fragmentation of the global economy (Aiyar et al., 2023). While some countries may gain strategic advantages in specific contexts, the overall economic costs of fragmentation are likely to be significant. The growing body of literature on these costs provides a range of quantitative estimates, reflecting various channels and scenarios (see, e.g., IMF, 2022; Javorcik et al., 2022; and Bolhuis et al., 2023). For instance, technological fragmentation alone could result in GDP losses of around 5% for many economies (Cerdeiro et al. 2021).

Technological development plays a central role in this transformation. Countries that invest in digital infrastructure, innovation, and advanced manufacturing capabilities are better positioned to move up the value chain. In particular, industries such as electronics, information and communication technologies (ICT), and automotive sectors, where production is fragmented across borders, provide valuable entry points for the D-8 economies. Considering their limited capacity to lead development and innovation in advanced technologies, they can move beyond low-value-added production and develop capacities to produce high-technology products that meet the quality and price demands of global markets by expanding their intra-regional partnership in cutting-edge technologies like artificial intelligence, robotics, and smart manufacturing.

The challenge for the D-8 countries is to build a robust ecosystem that fosters technological innovation and supports research and development in the context of exports and imports of high technology products. With the right policies and strategic investments, they can transform their industrial base and achieve sustained economic growth. Therefore, governments must focus on creating an enabling environment for the growth of high-technology industries by offering incentives for innovation, facilitating partnerships between private firms and research institutions, and improving digital infrastructure. Moreover, targeted investments in education and skill development are essential to ensure that the workforce adapts to the demands of new technology-driven industries.

In this framework, this chapter assesses the production capacities of D-8 countries in manufacturing sector with a focus on high technology sectors and evaluates the current partnership among them in the context of exports and imports of high technology products. Additionally, it explores the prospects for creating value chain among these countries. Overall, the chapter provides new insights into the challenges and opportunities presented by shifting global economic dynamics, offering policy recommendations to strengthen the D-8 countries' position in high-tech industries.

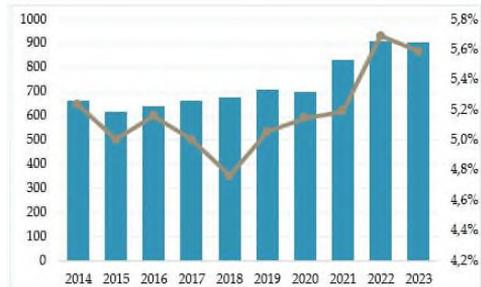
The literature on economic cooperation among D-8 countries, particularly on advanced technologies, is relatively scarce. Few studies concentrate on areas such as the determinants of trade (Jafari et al., 2011), trade and growth (Arif et al. 2021), and trade liberalization and FDI flows (Shah & Samdani, 2015). In this connection, this study is expected to contribute to the literature by providing initial evidence on the production and trade capacities in high technology products in D-8 countries with special focus on how to create regional value chains and production networks in these critical sectors.

## Industrial Production in D-8 Countries

The D-8 countries have relatively vibrant economies, yet they struggle to maintain a sustained growth in their manufacturing activities and enhance their competitiveness. Manufacturing value added (MVA) is an important indicator of a country's industrial capacity in understanding how a country is progressing in terms of industrialization, economic diversification, and global competitiveness. Presenting the recent trend in the D-8 countries in relation to global manufacturing, Figure 1 shows that the MVA remained relatively stable during 2014-2020 and showed a steady upward trajectory afterwards.

In 2014, D-8 countries collectively generated \$666 billion in MVA, which grew to \$834 billion by 2021 and reached \$912 billion in 2022. Despite a slight decrease to \$905 billion in 2023, this data indicates overall growth, with peak performance occurring during the post-pandemic recovery in 2021 and 2022. Importantly, the overall share of D-8 countries in the world's MVA followed an upward trend since 2018, peaking at 5.7% in 2022, which marks a steady integration of D-8 countries into the global manufacturing supply chain. Accounting increasingly a higher fraction of global manufacturing, the D-8 bloc has shown resilience and potential for expansion, particularly after 2018.

**Figure 1**  
Manufacturing Value Added in D-8 Countries (billion US\$, left) and Share in World (%), right)



**Source:** Author's calculation based on the World Bank World Development Indicators. 2023 data for Iran is extrapolated.

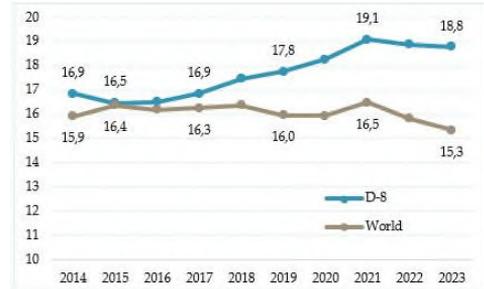
The MVA-to-GDP ratio provides additional insight into how much of each country's GDP is driven by manufacturing. In D-8 countries, this ratio followed a steady upward trend during 2015-2021 to reach 19.1% in 2021 from 16.5% in 2015, indicating that nearly a fifth of D-8's economic output was derived from manufacturing activities (Figure 2). After 2021, the ratio slightly declined to 18.8% in 2023, but it still represents an overall increase over the past decade. By contrast, the average MVA-to-GDP ratio in the world remained stable at around 16%, suggesting that while some regions, including the D-8, saw manufacturing grow, the world at large faced a slight slowdown in manufacturing's contribution to GDP.

This would provide opportunities for D-8 countries to attract higher value-added manufacturing activities by demonstrating their capacity to utilize the latest technologies and meet the demands on time. This also highlights their potential in becoming more significant players in international supply chains. The divergence between the D-8 and the global trend may indicate that the D-8 countries may be already taking advantage of certain shifts in global supply chains, potentially positioning themselves as more critical players in the global manufacturing sector. Yet, strengthening this position would require them to focus on diversification and technological upgrading within their manufacturing sectors through investment in research and development (R&D), automation, and smart and sustainable industrial practices.

Within the group of D-8, Indonesia and Türkiye account for more than half of total MVA. More specifically, Figure 3 reveals notable shifts in the shares of individual countries from 2014-18 (inner ring) to 2019-23 (outer ring). Bangladesh experienced the most significant growth, with its share rising from 7.4% to 10.8%, thanks to more than 80% growth in average MVA between two periods. Nigeria also saw an increase in its share from 6.4% to 7.2%, likely due to diversification efforts in its economy.

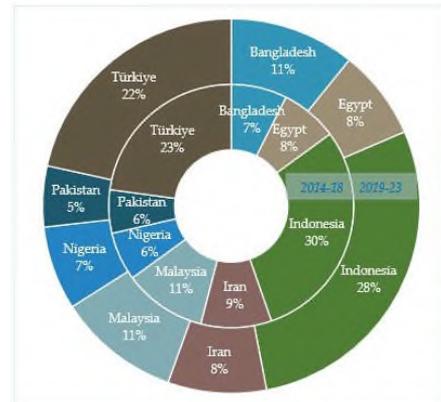
Meanwhile, Egypt's share remained relatively stable, slightly increasing from 7.5% to 7.8%. In contrast, Indonesia and Türkiye, though still the largest contributors to D-8's total MVA, saw marginal declines in their shares. Indonesia's contribution dropped from 29.8% to 28.5%, and Türkiye's from 22.8% to 21.5%, indicating slower growth compared to other member states. Iran and Pakistan also experienced declines, with Iran's share falling from 9.3% to 8.4% and Pakistan's from 5.8% to 5.3%. Evidently, while some of the smaller industrial economies within the group are gradually catching up with the larger ones, some major economies face potential challenges in maintaining competitiveness or expanding their industrial output in comparison to other D-8 countries.

**Figure 2**  
Manufacturing Value Added in Total GDP in D-8 Countries and World (%)



**Source:** Author's calculation based on the World Bank World Development Indicators. 2023 data for Iran is extrapolated.

**Figure 3**  
Distribution of Manufacturing Value Added in D-8 Countries (Average of 2014-18 vs 2019-23)



**Source:** Author's calculation based on the World Bank World Development Indicators. 2023 data for Iran is extrapolated.

While data on MVA provides insights on the capabilities of individual countries in overall industrial production, the disaggregation of these data by their technological intensity gives a wider perspective on their readiness to compete and integrate into regional and global manufacturing activities in advanced industries. Disaggregated by technological intensity, **Table 1** provides a detailed statistics of industrial activities in D-8 countries based on five key indicators: establishments, employment, output, value added, and investment. It examines the technological intensity within industrial sectors by dividing them into high-tech, medium-high-tech, medium-low-tech, and low-tech industries according to EUROSTAT and OECD aggregation of the manufacturing industry based on ISIC Rev. 4 at 3-digit level.<sup>1</sup>

Starting with industrial establishments, Bangladesh, Egypt, and Pakistan appear to be predominantly reliant on low-tech sectors, with over 70% of their industrial base concentrated in these industries. Malaysia, Indonesia, and Iran, on the other hand, show more diversified industrial structures, with a higher presence of medium-high-tech and high-tech sectors, especially in electronics and advanced manufacturing. Türkiye also demonstrates potential for further advancement, with a significant portion of establishments in medium-high-tech industries.

**Table 1**  
*Industrial Activities in D-8 Countries by Technological Intensity*

	<i>Technological Intensity</i>	<i>Establishments</i>	<i>Employment</i>	<i>Output</i>	<i>Value Added</i>	<i>Investment (GFCF)</i>
Bangladesh (2018)	<i>High</i>	0.4%	1.2%	3.2%	2.7%	3.1%
	<i>Medium-high</i>	1.4%	1.8%	3.3%	2.5%	25.2%
	<i>Medium-low</i>	18.4%	13.3%	20.2%	20.4%	7.5%
	<i>Low</i>	79.8%	83.7%	73.3%	74.3%	64.2%
Egypt (2020)	<i>High</i>	0.1%	2.0%	3.6%	4.9%	-5.1%
	<i>Medium-high</i>	2.1%	6.5%	14.9%	13.9%	18.8%
	<i>Medium-low</i>	22.0%	17.0%	25.9%	24.0%	-16.5%
Indonesia (2021)	<i>Low</i>	75.8%	74.5%	55.6%	57.3%	102.8%
	<i>High</i>	2.3%	3.7%	3.7%	4.1%	2.9%
	<i>Medium-high</i>	12.9%	12.3%	22.8%	22.7%	39.0%
Iran (2020)	<i>Medium-low</i>	24.0%	18.8%	25.1%	25.8%	13.0%
	<i>Low</i>	60.8%	65.2%	48.3%	47.4%	45.1%
	<i>High</i>	2.7%	3.7%	1.9%	3.0%	2.3%
Malaysia (2020)	<i>Medium-high</i>	22.2%	29.6%	29.0%	33.5%	46.7%
	<i>Medium-low</i>	41.7%	36.4%	54.1%	46.7%	31.7%
	<i>Low</i>	33.5%	30.3%	15.0%	16.8%	19.3%
Pakistan (2016)	<i>High</i>	3.3%	18.6%	25.3%	22.7%	38.0%
	<i>Medium-high</i>	11.8%	18.0%	18.9%	19.5%	0.0%
	<i>Medium-low</i>	31.7%	31.2%	32.5%	36.1%	43.9%
	<i>Low</i>	53.2%	32.2%	23.4%	21.7%	18.1%

<sup>1</sup>See <https://unstats.un.org/unsd/classifications/Econ/Registry/Detail/3463> for further information. UNIDO database does not include statistics for Nigeria.

	<b>Technological Intensity</b>	<b>Establishments</b>	<b>Employment</b>	<b>Output</b>	<b>Value Added</b>	<b>Investment (GFCF)</b>
	<i>Medium-high</i>	10.6%	9.5%	16.7%	17.0%	21.0%
	<i>Medium-low</i>	39.5%	24.6%	20.0%	20.9%	14.2%
	<i>Low</i>	48.4%	61.7%	58.5%	55.7%	60.3%
	<i>High</i>	0.7%	2.8%	3.3%	5.6%	2.5%
Türkiye (2022)	<i>Medium-high</i>	11.5%	19.7%	27.3%	28.7%	23.7%
	<i>Medium-low</i>	31.5%	27.0%	34.0%	31.3%	39.5%
	<i>Low</i>	56.4%	50.5%	35.4%	34.4%	34.3%

Source: Author's calculations based on UNIDO INDSTAT Database. Notes: Output data for Indonesia is for 2019, investment data Indonesia is for 2013, investment data for Türkiye is for 2015. GFCF stands for gross fixed capital formation. Data for Nigeria is not available.

Employment patterns follow a similar trend, with Bangladesh, Egypt, and Pakistan having a high concentration of their workforce in low-tech industries. Conversely, Malaysia and Iran show a more balanced distribution, with significant employment in medium-high and high-tech industries, reflecting a stronger industrial base that requires skilled labour. Indonesia and Türkiye are in a transitional phase, with growing employment in technology-intensive sectors. This shift points towards efforts to industrialize and create high-skill jobs in sectors like machinery, chemicals, and electronics in these countries.

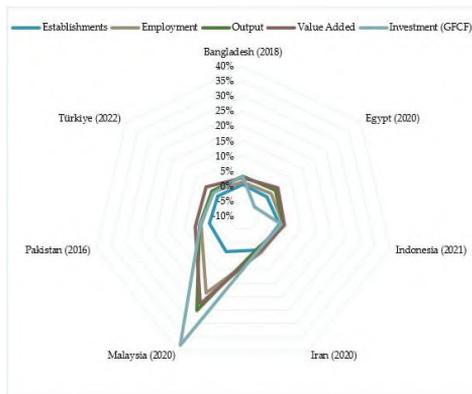
In terms of output, Malaysia, Türkiye, and Indonesia demonstrate significant contributions from medium-high and high-tech industries to output. Bangladesh and Pakistan remain dependent on low-tech industries for their industrial output. Similarly, Malaysia, Iran, and Türkiye demonstrate higher value added from medium-high and high-tech industries, highlighting their productivity in advanced sectors. Bangladesh, Egypt, and Pakistan remain reliant on low-tech industries for their economic contributions.

Malaysia and Türkiye are leading in terms of investment in medium-high and high-tech industries, showing a strategic focus on upgrading their industrial capabilities with a view to increasing productivity and economic output in advanced sectors. In contrast, Bangladesh, Egypt, and Pakistan continue to invest heavily in low-tech industries, limiting their potential for technological advancement. Having some countries focus on advancing technological sectors, while others remain dependent on labour-intensive, low-tech industries would imply opportunities for inter-industry trade. Countries with similar industrial structures and investment priorities could explore the opportunities for expanding intra-industry production and trade.

Looking at the possible correlations among these indicators, countries such as Malaysia and Indonesia show a clear linkage between their investment in medium-high and high-tech sectors and their industrial output. Malaysia, with 38% of its investment in high-tech industries, generates 25% of its output from these sectors, while Indonesia similarly reflects a strong correlation between investment and output in medium-high technology industries. Conversely, countries like Bangladesh and Pakistan, which focus heavily on low-tech industries, show dominant outputs from these sectors but lower productivity compared to their more technologically advanced counterparts. Considering the relationship between employment and value added, Malaysia and Iran demonstrate high productivity with significant portions of their workforce employed in high-tech and medium-high-tech sectors, respectively. In contrast, Bangladesh and Pakistan employ the majority of their workforce in low-tech sectors, which contributes to lower value added per worker.

Put into another perspective, Figure 4 shows the share of high-technology intensive industries in total manufacturing activities in individual D-8 countries based on the latest data available. All arrows evidently show Malaysia as a standout leader, with 25.3% of the total output originating from high-tech industries and 22.7% in value added. These impressive figures are supported by 18.6% of the workforce being employed in such sectors, demonstrating Malaysia's advanced capabilities and focus on high-technology industries. Investment in these sectors is also notably high at 38%. Other countries show more modest contributions from their high-tech industries. Indonesia's high-tech sector accounts for 3.7% of output and 4.1% of value added, while Pakistan, slightly ahead, has 4.8% of output and 6.4% in value added from high-tech industries.

**Figure 4**  
Share of High-Technology Intensive Industries in Total Manufacturing Activities



**Source:** Author's calculations based on UNIDO INDSTAT database. Data for Nigeria is not available.

In contrast, countries like Türkiye, Egypt, and Iran demonstrate much smaller shares from high technology sectors. Türkiye's high-tech output stands at 3.3%, Egypt at 3.6%, and Iran at 1.9%, with similarly low levels in value added and employment. Egypt and Türkiye also face challenges in mobilizing investments into their high-tech sectors, as reflected in Türkiye's 2.5% and Egypt's negative investment growth rate (-5.1%) in this domain.

Considering the combined share of high and medium-high technology-intensive industries across D-8 countries, Malaysia emerges as a leader, with its advanced industries accounting for 44.1% of total output and 42.2% of value added, supported by significant employment (36.6%) and huge investments (38.0%) in these sectors. Iran follows closely, with its advanced industries contributing 30.9% to total output and 36.5% to value added. Iran's high-tech sectors employ 33.3% of its workforce and see the highest investment share (49.0%). Indonesia and Türkiye present a balanced but slightly lower contribution from high and medium-high technology industries. Türkiye's output from these sectors stands at 30.7%, while Indonesia closely follows with 26.5%. Value added for Türkiye is 34.3%, while Indonesia shows 26.9%. However, while Indonesia invests considerably in these industries allocating 41.9% and Türkiye of total investment stands only at 26.2%, signalling diverging focus on strengthening their higher technology sectors.

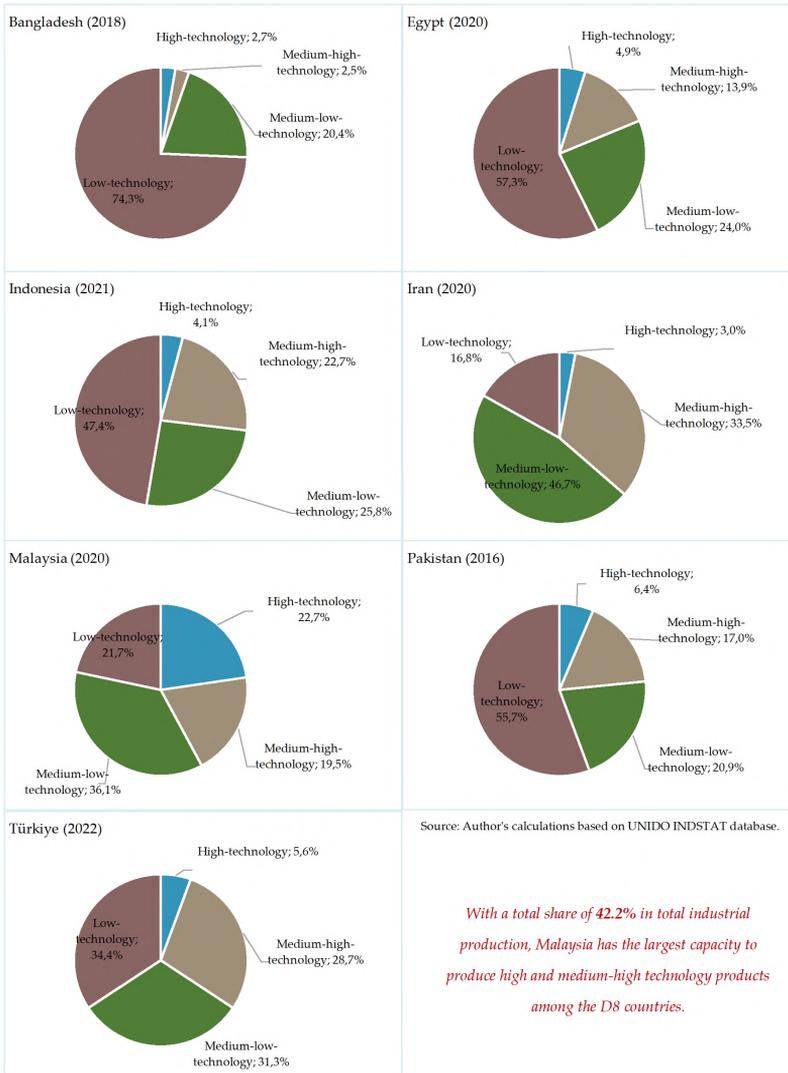
Bangladesh and Pakistan, on the other hand, lag significantly behind in terms of high and medium-high technology sector contributions. Bangladesh's advanced industries account for only 6.5% of total output and 5.3% of value added, with employment in these sectors at a low 3.0%. Similarly, Pakistan shows modest figures, with high and medium-high technology output at 21.5% and value added at 23.4%, supported by 13.7% employment. Although Pakistan has a comparatively higher share than Bangladesh, both countries face challenges in expanding their high-tech and medium-high technology sectors, as reflected in lower investment levels (28.3% for Bangladesh and 25.6% for Pakistan).

Figure 5 shows the share of industries' value added in manufacturing sector by their technological intensity based on the latest year available data. Once again, Malaysia stands out as a clear leader in high-technology manufacturing. With 42.2% of its manufacturing value added stemming from high and medium-high technology sectors, Malaysia demonstrates its robust integration into advanced industries, such as electronics, pharmaceuticals, and aerospace. This high-tech output not only enhances Malaysia's global competitiveness but also highlights its strategic investments in innovation-driven

growth. Iran, Türkiye, and Indonesia also show encouraging figures in their high and medium-high technology value added, with combined shares of 36.5%, 34.3%, and 26.9%, respectively. For these countries, the push towards high-tech industries is critical as both countries have large low-tech sectors that still dominate their manufacturing landscapes.

Bangladesh, Egypt, and Pakistan have room for improvement in high-tech sectors, with their high-technology shares at 5.2%, 18.7%, and 23.4%, respectively. While these percentages indicate a foundation for high-tech growth, the overall reliance on low-technology manufacturing in these countries calls for policy shifts toward fostering innovation, research and development, and technological upgrading. Expanding high-tech sectors in these countries could not only diversify their economies but also create more high-skilled jobs and foster long-term growth.

**Figure 5**  
Value Added in Manufacturing by Technological Intensity



**Source:** Author's calculations based on UNIDO INDSTAT database.

**Table 2**

*D8 Countries with highest Value of Output, Value Added and Number of Establishments in High and Medium-High Technology Intensive Sectors*

High Technology Intensive Sectors			Medium-High Technology Intensive Sectors		
Country	Sector	Value	Country	Sector	Value
<b>Output (Million US\$)</b>					
Malaysia	Computer & Electronics	81,262	Iran	Chemicals	117,550
Türkiye	Computer & Electronics	10,004	Iran	Motor vehicles	48,497
Iran	Pharma	9,147	Türkiye	Motor vehicles	46,919
Türkiye	Pharma	5,985	Türkiye	Chemicals	37,767
Egypt	Pharma	5,088	Türkiye	Electrical equipment	31,709
Pakistan	Pharma	4,886	Türkiye	Machinery	31,016
Iran	Computer & Electronics	4,518	Malaysia	Chemicals	29,469
Bangladesh	Pharma	3,218	Iran	Electrical equipment	22,417
Türkiye	Air & Spacecraft	2,861	Malaysia	Motor vehicles	14,050
Malaysia	Pharma	1,155	Iran	Machinery	13,879
<b>Value Added (Million US\$)</b>					
Malaysia	Computer & Electronics	16,296	Iran	Chemicals	49,604
Indonesia	Pharma	4,994	Indonesia	Chemicals	21,176
Iran	Pharma	4,668	Indonesia	Motor vehicles	14,221
Indonesia	Computer & Electronics	3,894	Türkiye	Motor vehicles	9,850
Türkiye	Computer & Electronics	3,370	Indonesia	Electrical equipment	9,709
Türkiye	Pharma	2,431	Türkiye	Chemicals	9,141
Pakistan	Pharma	2,128	Türkiye	Machinery	8,338
Egypt	Pharma	2,073	Iran	Motor vehicles	8,013
Iran	Computer & Electronics	1,724	Iran	Electrical equipment	7,297
Türkiye	Air & Spacecraft	1,432	Türkiye	Electrical equipment	6,777
<b>Number of Establishments</b>					
Türkiye	Computer & Electronics	2,379	Türkiye	Machinery	21,436
Malaysia	Computer & Electronics	1,393	Türkiye	Electrical equipment	12,769
Türkiye	Pharma	717	Türkiye	Chemicals	7,900
Malaysia	Pharma	611	Türkiye	Motor vehicles	5,982
Pakistan	Pharma	608	Türkiye	Medical instruments	4,237
Iran	Computer & Electronics	457	Malaysia	Machinery	2,676
Indonesia	Pharma	384	Egypt	Chemicals	2,582
Iran	Pharma	347	Malaysia	Chemicals	2,259
Indonesia	Computer & Electronics	329	Iran	Chemicals	1,883
Egypt	Pharma	314	Iran	Machinery	1,867

High Technology Intensive Sectors			Medium-High Technology Intensive Sectors		
Country	Sector	Value	Country	Sector	Value

Source: Author's calculation based on UNIDO IDSDB Database. Notes: The year for which the latest data available for each country is as follows: Türkiye (2022), Indonesia (2021), Egypt (2020), Iran (2020), Malaysia (2020), Bangladesh (2018), and Pakistan (2016). Full sector descriptions: Pharma (Pharmaceuticals, medicinal chemicals, etc.), Computer & Electronics (Computer, electronic and optical products), Air & Spacecraft (Air and spacecraft and related machinery), Machinery (Machinery and equipment n.e.c.), Motor vehicles (Motor vehicles, trailers and semi-trailers), Chemicals (Chemicals and chemical products), Medical instruments (Medical and dental instruments and supplies)

Finally, when the sectoral level production data on high-technology industries was looked at, it was observed that Malaysia leads significantly, with its computer and electronics sector generating a remarkable \$81.3 billion (Table 2). This reflects Malaysia's strong technological infrastructure and focus on electronics and semiconductors. The country also performs well in value added, contributing \$16.3 billion from the same sector, further solidifying its position as a leading hub for high-tech manufacturing within the D-8 countries. Türkiye and Iran also demonstrate notable output in high-technology sectors, particularly in pharmaceuticals and electronics. Türkiye's pharmaceutical industry output of \$5.99 billion and its computer and electronics sector at \$10 billion indicate a well-rounded high-tech industrial base. Iran, despite facing economic sanctions, showcases significant strength in both pharmaceuticals (\$9.1 billion) and electronics (\$4.5 billion). In terms of value added, Indonesia joins the ranks with \$4.99 billion in pharmaceuticals, revealing its growing high-tech footprint. However, Iran and Türkiye dominate in establishment numbers, particularly in pharmaceuticals and electronics, reflecting strong industrial infrastructure in these high-tech domains.

In medium-high technology, Iran takes the lead with an impressive \$117.6 billion output in chemicals and a further \$48.5 billion in the motor vehicle sector. Iran's chemicals sector also ranks first in terms of value added at \$49.6 billion. Türkiye is relatively more diversified, with motor vehicles (\$46.9 billion), chemicals (\$37.8 billion), and electrical equipment (\$31.7 billion) ranking among the top industries. Additionally, Malaysia stands out in motor vehicles (\$14.1 billion) and chemicals (\$29.5 billion). The number of establishments in medium-high technology is overwhelmingly dominated by Türkiye, which leads in machinery (21,436 establishments), electrical equipment (12,769), and chemicals (7,900). This shows a broad-based industrial sector in Türkiye capable of supporting medium-high technological manufacturing across multiple industries.

Overall, while Malaysia leads in high-technology output, particularly in the computer and electronics sector, Türkiye and Iran show substantial outputs in pharmaceuticals and electronics. In terms of medium-high technology, Iran dominates the chemicals sector and also excels in motor vehicles. Türkiye demonstrates a diversified industrial base with high outputs across motor vehicles, chemicals, and electrical equipment. The number of establishments further emphasizes Türkiye's strength in medium-high tech industries, especially in machinery, chemicals, and electrical equipment. These countries, particularly Malaysia and Türkiye, demonstrate strong contributions to value added in both technology-intensive categories.

## International Trade in High Technology Products

Countries with comparative advantage in high-technology products focus on capitalising on foreign market opportunities to enhance their technological edge. By exporting high-tech products, these countries not only tap into global demand but also benefit from economies of scale, making their production more efficient and cost-effective. In addition, exporting high-tech goods helps countries integrate into GVCs and link in industries that require specialised components or expertise. This inte-

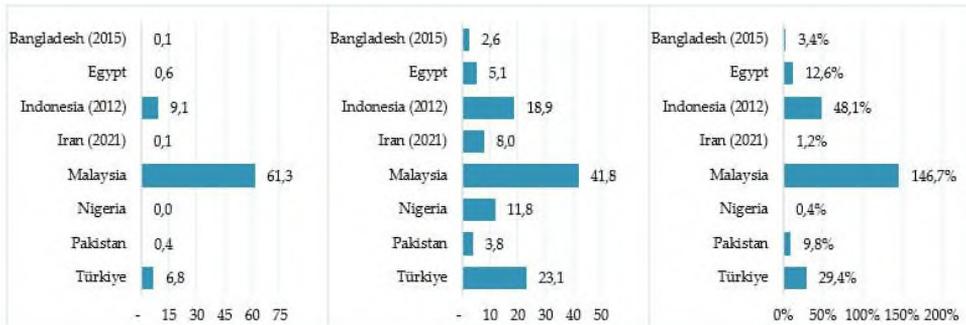
gration enhances their competitiveness and creates high-skilled jobs domestically, fostering a cycle of knowledge accumulation and technological advancement. Therefore, capacity to export and integrate into global markets is particularly important in high-tech products (Zapata et al., 2024).

Figure 6 illustrates the high-technology trade dynamics in D-8 countries by comparing exports, imports, and export-to-import ratios based on the latest available data. Malaysia is the lead exporter of high-technology products, with exports reaching \$61.3 billion, significantly ahead of Indonesia (\$9.1 billion) and Türkiye (\$6.8 billion). On the import side, Malaysia again leads, with \$41.8 billion in imports, followed by Indonesia (\$18.9 billion) and Nigeria (\$11.8 billion). The export-to-import ratio, a key indicator of trade balance in high-tech sectors, highlights Malaysia's substantial surplus at 146.7%, indicating that it exports considerably more than it imports in high-technology goods. In contrast, Indonesia's ratio stands at 48.1%, and Türkiye's at 29.4%, certain level of dependency in imported goods, while most other countries, such as Iran and Nigeria, exhibit much lower ratios, pointing to an excessive reliance on high-tech imports.

Looking at the longer term trends in trade balance, all D-8 countries except Malaysia show consistent trade deficits in high-technology products from 2010 onwards (Figure 7). These deficits indicate a significant reliance on imports to fulfil their technological needs, and highlight the insufficient development of local production capacities in high-tech industries. For example, Pakistan's deficit peaked in 2001 at \$7.9 billion, indicating its continued dependency on foreign high-tech products. Similarly, Nigeria, despite some growth in high-tech exports, recorded a deficit of \$11.7 billion in 2023, reflecting a deepened reliance on imported technology.

**Figure 6**

Exports (left, billion US\$), Imports (middle, billion US\$) and Export/Import Ratio (right, %) in High Technology Products in D-8 Countries, 2023



**Source:** Author's calculations based on World Bank WITS database. Data represents the 2023 values, unless otherwise stated.

Indonesia witnessed significant growth in imports, which expanded from \$10.2 billion in 2010 to \$19.9 billion in 2021, creating a deepening trade deficit. Despite moderate export growth during the same period (from \$6.1 billion to \$6.7 billion), its reliance on high-tech imports has led to widening deficits, peaking at \$13.2 billion in 2021. This indicates that Indonesia, although showing some potential in high-tech production, is not yet able to match its import demands with local innovation and production capacities.

Türkiye, similar to Indonesia, also faces considerable challenges, with deficits consistently exceeding \$9 billion from 2010 onwards. Türkiye's export growth, from \$1.8 billion in 2010 to \$6.8 billion in 2023, has been outpaced by its import growth. This gap points to persistent structural challenges in Türkiye's high-tech sector, possibly linked to a lack of domestic innovation ecosystems or sufficient R&D investment. Likewise, while showing export growth from \$85 million in 2010 to \$713 million in 2022,



Egypt remains constrained by high import levels, leading to significant deficits, recorded at \$4.5 billion in 2023.

On the other hand, Malaysia emerges as a notable outlier. It consistently maintained a trade surplus during the period under consideration, reflecting a robust high-tech manufacturing sector. The country's exports increased steadily, from \$53.5 billion in 2010 to a peak of \$100.9 billion in 2021. This strong export performance resulted in a significant trade surplus of \$35.7 billion in 2021, with the surplus driven by the country's competitive edge in electronics and other high-tech goods production.

## Intra-D8 Trade in High Technology Products

Considering the diversity in export and import structures, particularly in high technology products, intra-regional trade stands as a critical tool for addressing external dependency by fostering joint investment, economic cooperation, and regional integration. By enhancing the exchange of high technology goods among the countries, D-8 countries can reduce reliance on external markets, improve knowledge transfer, and spur innovation. This would also promote effective policy design and expand opportunities towards creating regional value chains and achieving industrial diversification. Furthermore, stronger intra-group trade in advanced technologies can help bridge the technological gap among the countries, boosting collective competitiveness in the global market while enhancing the D-8's strategic importance.

**Figure 7**  
Trade Balance in High Technology Products in D-8 Countries



Source: Author's calculations based on World Bank WITS database.



Within the region, Malaysia and Türkiye emerge as the dominant high-tech exporters (Figure 8). Malaysia, with exports of \$523 million and imports of \$291 million, maintains a strong trade surplus in intra-regional trade. Its capacity to export more than it imports from other D-8 countries demonstrates its technological capabilities and well-developed manufacturing infrastructure. Similarly, Türkiye shows a strong intra-D-8 trade presence with exports of \$502 million and imports of \$467 million, maintaining a relatively balanced trade relationship within the group.

This near-equilibrium in Türkiye's high-tech trade indicates that it both contributes significantly to the supply of high-tech products within the D-8 and meets a large portion of its own needs through imports from other member countries. Exports of high technology products from Bangladesh, Nigeria and Iran to other D-8 countries are at negligible levels. On import side, Indonesia and Türkiye are the countries importing the most from other D-8 countries. By having strong presence in both exports and imports of goods, Türkiye appears to be the most integrated in the region.

While the total value of exports and imports traded among the D-8 countries provides important insights, their share in total exports and imports of countries in high technology products would provide further valuable insights. As shown in Figure 9, intra-regional exports share of Egypt, Iran, Pakistan and Türkiye ranges between 7.4% and 8.8%, demonstrating stronger relations with other D-8 countries. Although Malaysia dominates intra-D-8 exports, exports to D-8 countries represent only 0.9% of its total exports in high technology products. From the import perspective, dependence on intra-D-8 high-tech products seem relatively weak.

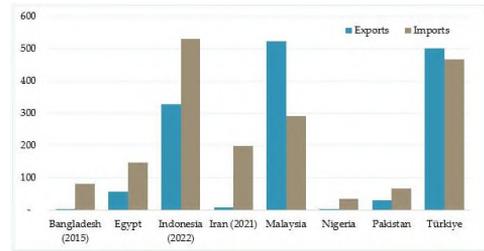
Total imports from other D-8 countries account around 3% of total imports of high technology products in Indonesia, Bangladesh, Egypt and Iran, whereas it is around 2% in Türkiye and Pakistan. With an import share of 0.3%, Nigeria appears to be the one with the weakest import relations with other D-8 countries.

The intra-D-8 trade landscape presents opportunities for countries with lower export shares to collaborate with stronger economies like Malaysia and Türkiye to boost domestic production. By promoting greater intra-group collaboration, the D-8 countries can reduce their collective reliance on non-D-8 trade partners and strengthen their economic integration in strategic industries.

## Trade Complementarity

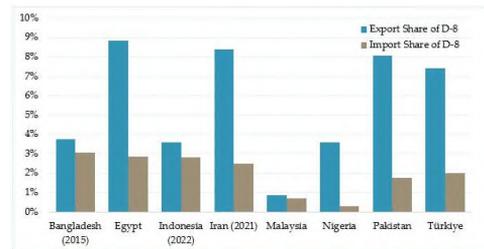
The next step in evaluating the strength of trade relations and potentials for further improvement is to estimate the trade complementarity index (TCI), which is developed to capture an aggregate statistic

**Figure 8**  
Intra-Regional Trade Flows in High Technology Products (2023, Million US\$)



**Source:** Author's calculations based on World Bank WITS database. Data is for the year 2023, unless otherwise stated.

**Figure 9**  
Intra-Regional Trade Shares in High Technology Products (2023, Million US\$)

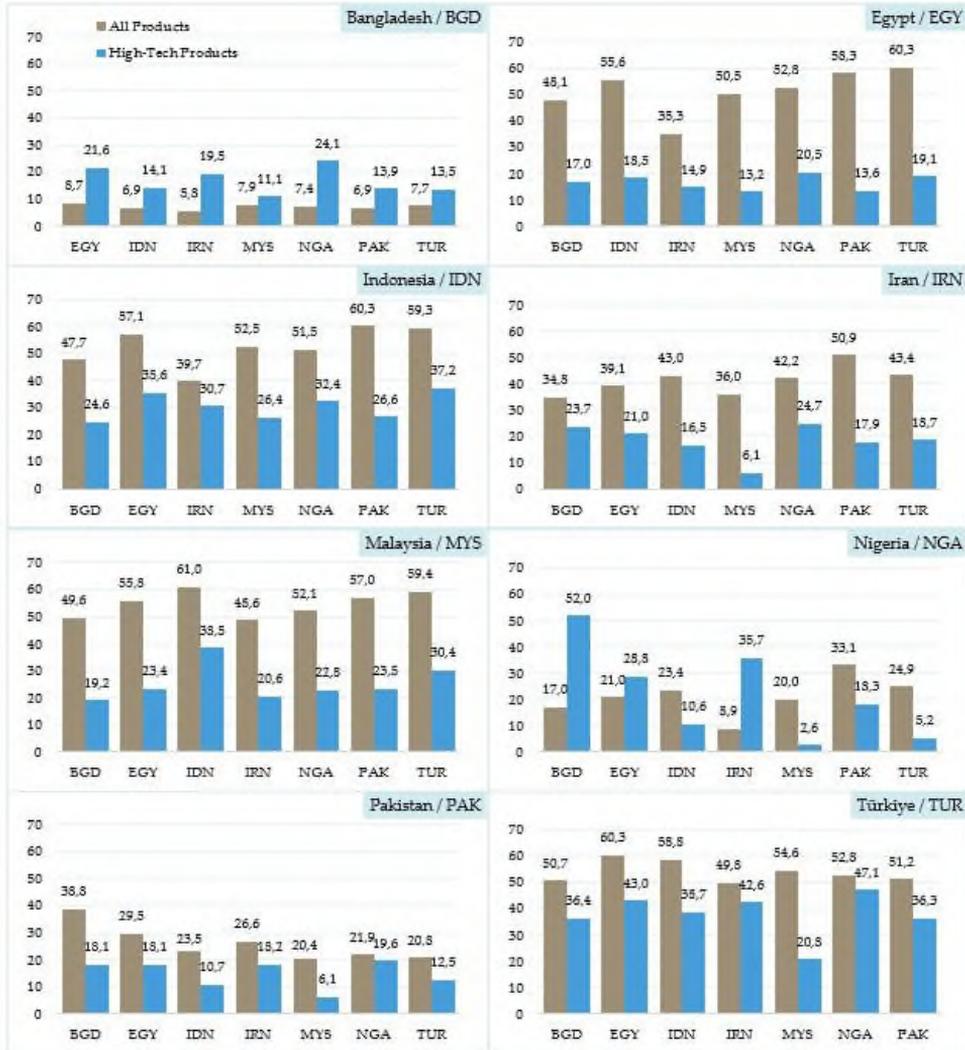


**Source:** Author's calculations based on World Bank WITS database. Data is for the year 2023, unless otherwise stated. Figure shows the share of D8 in total exports and imports of countries in high technology products.

on correspondence of the commodity structure amongst the partner countries. The TCI measures the degree to which the export pattern of one country matches the import pattern of another. It takes a value between 0 and 100, with higher values representing more favourable prospects for a bilateral trade relation. An increase or decrease over time would indicate the trade profiles becoming more or less compatible, respectively.

**Figure 10**

*Trade Complementarity among D-8 Countries, All Products vs High-Tech Products (2014-2023)*



**Source:** World Bank, Trade Complementarity Index, and author's calculations based on WITS data. Data presents the simple average of index values available between 2014 and 2023.

Figure 10 shows the TCI values for all products in comparison with the index values calculated only for high technology products, presented as the average of the period 2014-2023. When all traded products are considered, Egypt, Indonesia, Malaysia, and Türkiye tend to have the highest complementarity across their D-8 partners, suggesting significant trade synergies. For instance, Türkiye exhibits high complementarity with Egypt (60.3), Indonesia (58.8), and Malaysia (54.6), indicating a strong



match in export profiles to meet import demands in these countries. Similarly, Malaysia shows robust complementarity with Indonesia (61.0) and Türkiye (59.4), implying potential growth in bilateral trade.

In the high technology product segment, which is the focus of this study, Türkiye again represents relatively high TCIs, particularly with Nigeria (47.1), Egypt (43.0), and Iran (42.6), indicating strong potential for technology-intensive product exports to these markets. Indonesia also shows significant complementarity in high-tech products, notably with Türkiye (37.2) and Egypt (35.6). Malaysia shows the highest complementarity in high-tech trade with Indonesia (38.5). Meanwhile, Bangladesh generally reports lower complementarity in high-tech sectors but maintains respectable figures with Nigeria (24.1) and Egypt (21.6), hinting at growth potential in these relationships.

Overall, Türkiye, Indonesia, and Malaysia emerge as the strongest players in high-technology trade complementarity, especially with markets like Egypt, Nigeria, and Iran, which provides significant opportunities for tech-based trade expansion. The TCI for high-tech sectors is typically lower than for all products, showing room for improvement in technology trade between D-8 countries, but specific country pairs like Indonesia–Malaysia and Türkiye–Indonesia indicate high potential for high-tech cooperation.

This analysis demonstrates a number of policy directions to foster intra-D8 collaboration in high technology products. First of all, countries with high complementarity in high-technology products, such as Türkiye, Indonesia, and Malaysia, should explore joint ventures and technology transfer programs to increase the efficiency of their high-tech industries. Joint R&D projects could enhance technology sharing and foster innovation, particularly in sectors like electronics, pharmaceuticals, and aerospace. For countries that display lower high-tech complementarity such as Bangladesh, Pakistan, and Nigeria, it is critical to focus on industrial diversification and capacity building in high-technology sectors.

Moreover, to fully leverage the complementarity in high-technology sectors, D-8 countries should aim to strengthen regional value chains in industries such as pharmaceuticals, electronics, and aerospace. For instance, Türkiye and Indonesia could collaborate on electronic component manufacturing, where Türkiye's strong R&D capability could complement Indonesia's manufacturing capacity. The next section will investigate the potential of creating regional value chain in high technology products.

## Prospects for Creating Value Chain among D-8 Countries

Today, over two-thirds of the world trade occurs through GVCs, in which production crosses at least one border before final assembly (WTO, 2019). GVCs have constantly expanded during the 1990s and 2000s as they have brought many benefits by allowing firms to source their inputs more efficiently, to access knowledge and capital beyond the domestic economy and to expand their activities into new markets (OECD, 2013). GVCs have also played a pivotal role in reducing poverty and offering an opportunity for developing countries to grow and catch up with richer countries (World Bank, 2019). Participation in GVCs enables developing countries to transfer knowledge and know-how on production processes and business methods. If not managed well, GVCs may also lead countries to be trapped in low value-added stages of production with very limited possibilities for innovation and technology transfer. Therefore, it is critical for the D-8 countries to upgrade steadily within GVCs by creating and effectively utilizing regional value chains. Establishing highly dependent relations with external investors and foreign technology may also create additional vulnerabilities in times of shocks.

There are two key indicators to measure the degree of engagement in GVCs: i) forward participation, which measures the share of exports that form an intermediate into other countries' exports; and ii) backward participation, which measures the share of imported intermediates embedded in a country's exports. Similarly, there are two types of participation in a value chain: backward and forward

participation. Backward participation reflects the extent to which a country incorporates foreign value added into its exported products. Specifically, in the context of the D-8 countries, this represents how much individual D-8 countries rely on inputs from other D-8 members for the production of goods and services destined for export markets. This measure provides insight into the capacities of countries in adding value to raw or semi-processed products and then selling to the third countries. Therefore, a growing backward participation is evaluated more positively. Bringing backward participation to higher levels would be an indication of higher capacity to add value to foreign inputs and greater knowledge about foreign markets.

Figure 11 compares the levels of backward participation in D-8 countries for all manufacturing products. It shows that, on average, only around 3% of exports constitute inputs from other D-8 countries. When compared with the period 2010-14, average levels of backward participation during 2015-19 declined in majority of countries, suggesting that these countries either reduced its reliance on inputs from fellow D-8 countries or diversified its import sources beyond the D-8 bloc. This could be driven by multiple factors, such as efforts to increase domestic production capacity and reduce dependency on foreign inputs, strategic shift in trade policies, or better inputs from more competitive non-D8 markets.

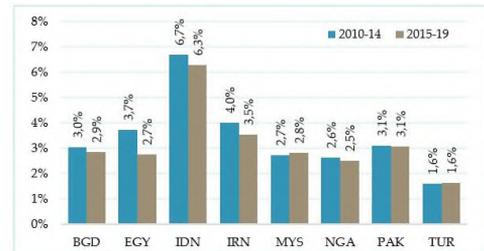
This may also reflect broader geopolitical or economic factors influencing trade relations of these countries within the D-8. Indonesia, as the most integrated member of the group, also witnessed a decrease in backward participation, from 6.7% to 6.3%. Similarly, the ratio fell in Bangladesh, Egypt, Iran and Nigeria, whereas it remained the same in Pakistan and Türkiye and slightly increased in Malaysia. This growth in Malaysia suggests a strengthening of linkages with other D8 members by importing more intermediate goods from the bloc. While it is one of the major industrialized countries of the group, Türkiye shows the least integration with other members of the organization, likely due to its more diversified trade relationships with non-D8 countries and broader global supply chain integration. However, opportunities should be explored for more intensive relations in creating production networks between Türkiye and other D-8 countries.

Another important dimension of assessing existing level of cooperation in value chains is forward participation. It measures the extent to which a country's domestic value added is embedded in the exports of other D-8 countries. In other words, it shows how much a country's inputs are utilized by its D-8 partners in their production processes for exported goods. Strong forward participation indicates that a country is contributing significantly to regional value chains. As shown in Figure 12, forward participation is much stronger than backward participation among the D-8 countries. In five countries, this rate is at 7% or higher, whereas six countries experienced an increase in their levels of forward participation.

At individual country level, Bangladesh experienced a decline in its forward participation, dropping from 7.8% to 7.1%, which may indicate that Bangladesh's role in supplying intermediate goods to other D-8 countries has diminished slightly. Türkiye also experienced a decline from 3.6% to 3.2%. These declines may be explained by several factors including growing competition from other countries, shifts in the comparative advantages and trade preferences within the D-8 trade network, changes in regional supply chains and industrial composition, or a reduced demand for inputs from other D-8 members.

**Figure 11**

*Backward Participation: Contribution of Other D8 Countries to Foreign Value Added in Exported Products (2010-14 vs 2015-19)*



**Source:** Author's calculations based on UNCTAD -Eora Global Value Chain Database.

On the other hand, Egypt showed a significant increase in forward participation, rising from 5.4% to 7.0%. This jump suggests that Egypt's domestic value added has become more integral to the exports of other D-8 countries. Iran and Malaysia also saw a notable improvement in forward participation, making them increasingly more important supplier of raw and intermediate goods in the region. While Indonesia and Pakistan continued to demonstrate forward participation over 8%, this share remained below 3% in Nigeria, reflecting varying capacities and levels of integration among the D-8 countries.

Pakistan's domestic industries, particularly textiles and related sectors, remain critical to the exports of other D-8 countries, such as Bangladesh and Türkiye. Likewise, Malaysia remains a major supplier of high-value intermediate goods, such as electronics components, machinery, and processed raw materials for other D-8 countries.

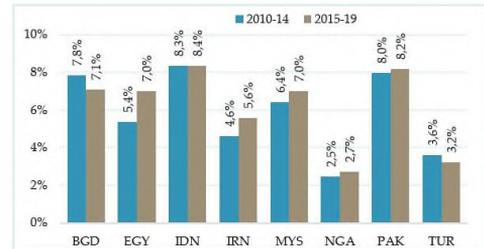
The analysis of intra-D-8 foreign value added contributions shows varying levels of backward and forward participation, with some countries well integrated into regional value chains, while some others remain less integrated. Countries with lower intra-D-8 foreign value added contributions should focus on increasing their backward participation by integrating more D-8 inputs into their export production. This can be achieved through, for example, regional supply chain agreements that reduce trade barriers and promote collaboration in sectors like textiles, electronics, and chemicals. Encouraging investment in regional trade hubs can foster greater intra-D-8 supply chain connectivity.

Before concluding the assessment on regional value chains, the value chain participation is analysed at sectors with relatively higher technological intensity. Table 3 presents the share of foreign value added in total exports as well as the contribution of D-8 countries to total foreign value added in selected sectors and commodities for which data are available. It shows the share of foreign value added in exports and the contribution of D-8 countries in various high-technology and industrial sectors. Each country demonstrates different levels of dependency on foreign value added and intra-D8 contributions. For instance, Bangladesh exhibits a 13.6% foreign value-added share in electrical and machinery exports, with 4.1% of that coming from D-8 countries. Similarly, in Egypt, the share in the electrical and machinery sector is higher at 19.6%, with a 5.6% contribution from D-8 countries.

Iran, Pakistan and Bangladesh have the lowest dependency on foreign value added in their higher technology intensive sectors. Iran, for example, shows very low foreign value-added shares in pharmaceutical products (5.5%) and motor vehicles (6.5%), both with limited D-8 contributions. Indonesia stands out in specialized machinery with an impressive 49.0% foreign value-added share, but only 3.6% comes from D-8 sources. Nigeria and Pakistan reflect lower foreign value-added shares, but Pakistan exhibits a relatively stronger intra-D8 participation, particularly in other manufacturing (7.5%).

**Figure 12**

*Forward Participation: Domestic Value Added Embodied in the Exports of Other D8 Countries (2010-14 vs 2015-19)*



**Source:** Author's calculations based on UNCTAD -Eora Global Value Chain Database.

**Table 3**  
Contribution of D8 Countries in Value Added Exported (2017)

<i>Industry or Commodity</i>	<i>Share of Foreign VA in Exports</i>	<i>Share of D8 in Foreign VA</i>	<i>Industry or Commodity</i>	<i>Share of Foreign VA in Exports</i>	<i>Share of D8 in Foreign VA</i>
<b>Bangladesh</b>			<b>Egypt</b>		
Electrical and Machinery	13.6%	4.1%	Electrical and Machinery	19.6%	5.6%
Transport Equipment	18.6%	3.8%	Transport Equipment	24.3%	5.7%
Other Manufacturing	13.0%	5.6%	Other Manufacturing	18.4%	7.3%
<b>Indonesia</b>			<b>Iran</b>		
Drugs and medicine	17.3%	4.8%	Pharmaceutical products	5.5%	5.1%
Specialized machinery	49.0%	3.6%	Electrical machinery & apparatus	12.4%	4.2%
Electronic computing equipment	19.4%	4.7%	Medical and surgical equipment & orthopedic appliances	5.1%	5.5%
Semiconductors and integrated circuits	10.3%	5.0%	Optical and precision instruments, watches & clocks	10.3%	3.3%
Precision machines	14.9%	4.3%	Motor vehicles, trailers and semi-trailers	6.2%	6.5%
<b>Nigeria</b>			<b>Pakistan</b>		
Electrical and Machinery	18.3%	2.1%	Electrical and Machinery	9.8%	5.8%
Transport Equipment	20.4%	2.0%	Transport Equipment	12.3%	5.7%
Other Manufacturing	11.2%	2.6%	Other Manufacturing	7.5%	7.5%
<b>Malaysia</b>			<b>Türkiye</b>		
Industrial chemicals	52.6%	9.1%	Chemicals, chemical products and man-made fibres	41.4%	2.6%
Drugs & medicines	41.0%	6.8%	Electrical machinery and apparatus n.e.c.	42.8%	2.9%
Industrial machinery	36.4%	4.6%	Machinery and equipment n.e.c.	36.4%	2.0%
Motor vehicles	56.6%	5.0%	Medical, precision and optical instruments, watches and clocks	46.3%	2.2%
Instruments & clocks	52.9%	5.2%	Motor vehicles, trailers and semi-trailers	46.2%	1.7%

Source: Author's calculation based on UNCTAD -Eora Global Value Chain Database.

Malaysia demonstrates high foreign value-added shares across several sectors, such as industrial chemicals (52.6%), motor vehicles (56.6%), and drugs and medicines (41.0%), with D-8 contributions

reaching up to 9.1%. This indicates that Malaysia has a strong regional integration within the D-8, especially in high-tech and industrial sectors. Türkiye, on the other hand, shows significant foreign value-added shares in sectors like chemicals (41.4%) and electrical machinery (42.8%), but the D-8 countries' contributions are relatively low, with shares below 3%. This suggests that Türkiye, while deeply integrated into global value chains, relies less on regional partners within the D-8 for value-added inputs.

## Final Remarks and Policy Recommendations

This chapter has shown that industrial production capacities of D-8 countries demonstrate significant disparities, with a few key players like Indonesia, Türkiye, and Malaysia leading in manufacturing output, while others such as Bangladesh and Nigeria are gradually increasing their share. While most D-8 countries are heavily reliant on imports for high-tech products, with increasing deficits, Malaysia stands as the only D-8 country with surplus in high-tech products. Some countries have also shown considerable growth in their share of manufacturing value-added over the last decade. However, the production and trade of high-technology products reveal that while some D-8 countries are competitive in these sectors, regional integration remains limited. Malaysia and Türkiye with their significant contributions to high-tech production emerged as the countries that have the potential to spearhead regional value chain creation in these industries.

The trade patterns within the D-8 group, particularly in high-technology sectors, indicate that while intra-D-8 trade is growing, much of the value added in exports still originates from outside the group. High-tech sectors like electrical and transport equipment, machinery, and pharmaceuticals, where countries such as Malaysia and Indonesia show substantial export capacity, offer fertile ground for strengthening regional cooperation. However, the low share of intra-D-8 foreign value-added in these sectors suggests that member countries are not yet fully leveraging each other's production strengths. Greater integration could allow D-8 countries to reduce their reliance on external suppliers and enhance regional resilience, particularly in critical industries like electronics, advanced machinery, and aerospace by encouraging backward participation (a country's use of foreign inputs for its exports) and forward participation (a country's export of inputs used by others in their export production).

In relation to semiconductor technologies, there is a global race in (re)building the domestic semiconductor manufacturing capacity in advanced countries, particularly after the COVID-19 pandemic. However, semiconductor GVCs are far more complicated in both organizational and geographical terms. As chips become ever more sophisticated with higher computational power and energy efficiency, their design and production require even more costly human capital, electronic design automation software, intellectual property, and highly specialized manufacturing equipment that only a few can afford (WTO, 2023). Absorptive capacity is a major challenge in this process (Lam et al., 2022). Though it is a question mark for D-8 countries to develop such capacity collectively, they can at least initiate a roadmap towards achieving such goals. In this process, some countries may require more proactive policies of government-business collaboration targeted at strengthening the connection between the highly productive global firms, potential local suppliers, and the domestic labour force (Rodrik, 2018).

These findings demonstrate a number of policy directions to foster intra-D8 collaboration in high technology products. First of all, fostering collaborative industrial policies will be critical, with a focus on promoting joint ventures and technology transfer agreements, particularly in high-tech industries like pharmaceuticals, electronics, and precision instruments. The rise of industrial policy is currently driven by highly industrialized countries (UNIDO, 2024), but collaborative policies aiming at shared R&D initiatives across member countries would enable the pooling of resources and expertise, driving innovation while reducing reliance on external players. Countries such as Malaysia and Türkiye, with

advanced production capacities in certain high-tech industries, could take the lead in establishing regional R&D hubs. Moreover, harmonizing standards and regulatory frameworks across the D-8, particularly in high-value industries would facilitate smoother trade, reduce transaction costs, and minimize barriers to intra-regional collaboration. These policies could also encourage the relocation of segments of global supply chains to D-8 countries, benefiting from lower costs and growing market demand. To expand the production capacity in countries with limited technological infrastructure, such as in Nigeria and Bangladesh, efforts can be made to increase collaboration between universities, research institutions, and industries to drive applied research; encourage technology parks and incubators to support start-ups and high-tech entrepreneurship; and promote joint ventures with multinational corporations in other D-8 countries.

Eliminating trade barriers and facilitating trade is another essential pillar for strengthening regional integration within the D-8. Removing tariff and non-tariff barriers, enhancing logistical networks and streamlining customs procedures, is necessary to reduce the time and costs associated with cross-border trade. Coordinated efforts to digitize trade documentation and implement e-customs systems across member countries could expedite processes and lower trade barriers. Given the promising complementarity in high-tech trade between certain D-8 pairs, countries should consider targeted bilateral or multilateral trade agreements focusing on high-tech industries. Additionally, promoting investment, leveraging advancements in smart manufacturing, and the adoption of Industry 4.0 technologies like automation, artificial intelligence, and the Internet of Things, could enhance productive capacities and boost competitiveness within D-8 industries. Governments should incentivize the adoption of these technologies to modernize their manufacturing sectors, with a focus on developing smart factories and intelligent supply chains.



#### Author Details Kenan Bağcı

<sup>1</sup> Senior Researcher at the Statistical, Economic and Social Research and Training Centre for Islamic Countries (SESRIC), Ankara, Türkiye

<sup>2</sup> Research Assistant Professor, Qatar University, Doha, Qatar

📞 0000-0002-6854-5213    ✉ kenanbagci@qu.edu.qa

## References

- Aiyar, S., Chen, J., Ebeke, C., Garcia-Saltos, R., Gudmundsson, T., Ilyina, A., Kangur, A., et al. (2023). "Geoeconomic Fragmentation and the Future of Multilateralism." IMF Staff Discussion Note, SDN/2023/01. International Monetary Fund. Washington, DC.
- Bolhuis A. M., J. Chen and B. Kett (2023). "Fragmentation in Global Trade: Accounting for Commodities." IMF Working Paper, No. WP 23/73. International Monetary Fund. Washington, DC.
- Cerdeiro, D. A., Mano, R., Eugster, J., Muir, M. D. V., and Peiris, M. S. J. (2021). *Sizing up the effects of technological decoupling*. International Monetary Fund. Washington, DC.
- IMF (2022). *Regional Economic Outlook: Asia and Pacific, October 2022*. International Monetary Fund. Washington, DC.
- Jafari, Y., Ismail, M. A., & Kouhestani, M. S. (2011). Determinants of trade flows among D8 countries: Evidence from the gravity model. *Journal of Economic Cooperation and Development*, 32(3), 21-38.
- Javorcik, B., Kitzzmueller, L., Schweiger, H., Yıldırım M. (2022). *Economics Costs of Friend-Shoring*. European Bank for Reconstruction and Development.
- Lam L.F.L., S.H. Law, W. N. W. Azman-Saini, and N.W. Ismail (2022). "High Technology Trade and the Roles of Absorptive Capabilities in Malaysia." *Millennial Asia* 14(3) 315-340.



- OECD (2013). *Interconnected Economies: Benefiting from Global Value Chains*. OECD Publishing, Paris.
- Rodrik, D. (2018). "New Technologies, Global Value Chains, and the Developing Economies." Pathways for Prosperity Commission Background Paper Series; No. 1. Oxford.
- Shah, M.H., & Samdani, S. (2015). Impact of trade liberalization on FDI inflows to D-8 countries. *Global Management Journal for Academic & Corporate Studies (GMJACS)*, 5(1), 30-37.
- UNIDO (2024). *Industrial Development Report 2024: Turning Challenges into Sustainable Solutions. The New Era of Industrial Policy*. Nations Industrial Development Organization. Vienna.
- World Bank (2019). *World Development Report 2020: Trading for Development in the Age of Global Value Chains*. The World Bank, Washington, DC.
- WTO (2019). *Global Value Chain Development Report 2019: Technological Innovation, Supply Chain Trade, and Workers in a Globalized World*. World Trade Organization. Geneva.
- WTO (2023). *Global Value Chain Development Report 2023: Resilient and Sustainable GVCs in Turbulent Times*. World Trade Organization. Geneva.
- Zapata, A.N., M. Arrazola, and J. de Hevia (2024). "Determinants of High-tech Exports: New Evidence from OECD Countries." *Journal of the Knowledge Economy* 15:1103–1117.



## Towards a Knowledge Economy: Investigating Education Systems in D-8 Countries



Adesuwa O. Erediauwa<sup>1</sup>

<sup>1</sup> The Nigerian Institute of International Affairs, Victoria Island, Lagos, Nigeria

### Abstract

An overview of advanced nations' economic development models reveals that a strong educational framework precedes any economic development experience. Countries such as United States of America, Germany, and Japan prioritized technical training, significant investments in research and development, and Science, technology, engineering and mathematics (STEM) education. Their transition to developed economies was based on a solid structure of technological innovation. These nations have proven that the shift towards a knowledge-based economy is an essential path to achieving sustainable economic growth and development, and they continue to operate a knowledge-driven development paradigm. For the D-8 Organization for Economic Cooperation, including Bangladesh, Egypt, Indonesia, Iran, Malaysia, Nigeria, Pakistan, and Turkey, the challenge of adapting education systems to support a knowledge-based economy is both significant and pressing. Education plays a crucial role in driving innovation, fostering critical thinking, and developing technological expertise, which are all essential in this transition. Recognizing this fact, the D-8 recently included education, human resource development, and ICT to its objectives. It is against this backdrop that this research aims to analyze the education systems of the D-8 countries in terms of access, quality, and alignment with the needs of a modern economy. This will require assessing the efficiency of educational institutions and analyzing the accessibility of education. A fair and equitable transition to a knowledge economy requires deep understanding of these dynamics. The research will assess the policy frameworks that govern education in D-8 countries, in addition to assessing the levels of investment in education and research from both the government and the private sector. Understanding these frameworks will offer valuable insights into the systemic strengths and weaknesses that influence the effectiveness of education systems to support economic transformation. This research seeks to expand the understanding of the role of education in economic development in the D-8 countries. The findings will provide valuable insight for policymakers, educators, and industry leaders as they aim to align educational outcomes with economic needs, enhance educational outcomes, and support the transition to a knowledge economy. Through this alignment, D-8 countries have the potential to unlock new opportunities for innovation, entrepreneurship, and global competitiveness by promoting the exchange of technology-intensive products such as electronics, pharmaceuticals, collaborating on digital transformation projects and renewable energy projects to reduce fossil fuel dependency. This will help ensure that knowledge and education play a pivotal role in driving their economic success.

### Keywords

D-8 · education · economic development · knowledge economy



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2025. Erediauwa, A. O.

Corresponding author: Adesuwa O. Erediauwa [adeuzamere@yahoo.com](mailto:adeuzamere@yahoo.com)

## Introduction

Current development dynamics are indicated by the transition of advanced economies from resource- and manufacturing-based to service-driven economies. The economic progression of both advanced and emerging economies prioritizes the acquisition of skills and the development of human capital. The economic transformation of the Asian Tigers, Singapore, Hong Kong, Taiwan, and South Korea, has at its foundation the development of a skilled workforce. They invested in human capital, education, and innovation and experienced faster economic growth and improved living standards (Birdsall et al, 1993).

The transition from a traditional economy to a knowledge economy represents a fundamental shift in the drivers of economic growth and value creation. While traditional economies rely heavily on physical resources, labor-intensive production, and tangible assets, knowledge economies prioritize intellectual capital, innovation, and information technology as primary sources of wealth generation. In the traditional model, success is often measured by the quantity of goods produced, whereas the knowledge economy values the quality of ideas and their practical applications. For instance, the health sector has benefitted significantly from technological advancements in areas such as drug discovery, genetic engineering, personalized medicine, remote patient monitoring, and AI-driven diagnostics. This paradigm shift has profound implications for human capital development, with an increasing emphasis on continuous learning, adaptability, and specialized skills rather than routine manual labor. Moreover, the knowledge economy fosters a more interconnected global marketplace, where competitive advantage is derived from the ability to create, share, and leverage knowledge (Hadad, 2017). The shift to a knowledge economy has driven prosperity in many regions and widened disparities. Global competitiveness is now based on the ability to innovate and not solely resource abundance. Resource-poor countries with efficient educational systems, infrastructure, and R&D capabilities like Singapore, South Korea, and Japan gained global economic prominence by excelling in technology and high-value industries. Consequently, those unable to adapt, though resource-abundant, lag behind. This shift toward knowledge as a primary asset is vital for nations and organizations aiming to foster sustainable growth and resilience. Numerous studies have been carried out to demonstrate the transition of these economies from mere natural resource and physical inputs to increasing levels of intellectual inputs into the economy (Stiglitz, Powell & Snellman, 2004; Hadad 2017; Thelen, 2019). While there may be no consensus on the relative importance of physical inputs in production compared to knowledge, scholars do agree on the fundamentality of the role of knowledge as a vital determinant of the standard of living (Cooke & Leydesdorff, 2006,).

A knowledge economy is created when the focal point of economic development is the continuous creation and utilisation of knowledge. First-tier developed economies of Europe and America were built on knowledge. Indeed, their transition to advanced economies was based on a solid structure of technological innovation, intellectual capabilities, and advanced technologies (Drucker, 1969; Bell, 1973, Gera & Mang, 1998). These nations typically lead in areas such as research and development, high technology industries, and knowledge intensive services. They have proven that the shift towards a knowledge-based economy is an essential path to achieving sustainable economic growth and development, and they continue to operate a knowledge-driven development paradigm. Furthermore, Stiglitz (1999) asserts that the success stories of the East Asian countries necessitated the shift in focus from capital accumulation to knowledge as a catalyzer of development. The miraculous growth of nations like Singapore, Hong Kong, South Korea, and Taiwan is attributed to closing the knowledge gap between these nations and the first tier developed economies.

The shift to a knowledge-driven economy is crucial for achieving sustainable growth and development. As nations increasingly depend on information, innovation, and a skilled labour force to enhance

economic competitiveness, a robust educational framework becomes essential (Stiglitz, 1999). However, for developing nations where educational frameworks are characterized by systemic constraints, insufficient resources, and curricula that are unaligned with the requirements of a modern economy, the path to building a knowledge economy may present significant challenges. For the D-8 Organization for Economic Cooperation (D-8) countries, comprising Bangladesh, Egypt, Indonesia, Iran, Malaysia, Nigeria, Pakistan, and Turkey, the pursuit of a knowledge economy presents both significant opportunities and obstacles. Although the D8 collectively represent a substantial and diverse demographic and economic base, their education systems exhibit varying degrees of readiness to support a knowledge economy. This disparity is compounded by factors such as unequal access to quality education, limited investment in research and development (R&D), and inadequate emphasis on skills essential for knowledge-intensive industries, such as science, technology, engineering, and mathematics (STEM), critical thinking, and digital literacy.

Hippe and Fouquet (2018) highlight the importance of an education system that fosters innovation, adaptability, and skills relevant to the 21st-century workforce. However, limited research exists on how effectively D-8 countries' education systems are aligned with these knowledge economy prerequisites. Furthermore, there is a need to understand the structural, policy, and socio-economic barriers that may prevent the D-8 countries from fully leveraging the potential of their human capital. In this regard, this research aims to investigate the education systems of D-8 countries, examining the extent to which they are equipped to transition towards a knowledge-based economy and thus achieve sustainable development. By identifying gaps in educational policies, curricula, accessibility, and budgetary allocation, this study seeks to highlight the reforms needed to build an education system capable of supporting sustainable economic development in D-8 nations. Ultimately, this research aspires to offer recommendations that can guide D-8 countries in cultivating the human capital essential for a thriving knowledge economy. To achieve these objectives, the paper commences by first reviewing the literature on the role of knowledge. It proceeds to conceptualize the knowledge economy framework, utilizing the Global Knowledge Index to highlight the knowledge economy in practice. It goes on to emphasize the knowledge framework within the ambits of theory. The paper employs a conceptual approach, relying on a critical qualitative research methodology that entails a thorough understanding and description of the nature of the phenomenon under investigation. Statistics from the Global Knowledge Index (GKI) are used to illustrate the challenges faced by the D-8 member countries in transitioning to a knowledge economy.

## Conceptualizing The Knowledge Economy

The knowledge economy is an economic system where the creation, dissemination, and utilization of knowledge and information are the main drivers of growth, productivity, and innovation. It is an economy where knowledge is obtained, produced, distributed, and utilised efficiently in order to improve economic advancement (Chen & Dahlman, 2006). Knowledge—particularly scientific, technical, and creative insights—becomes the primary asset, replacing or augmenting traditional resources like land, labor, and physical capital. The view that knowledge is now a key input in economic activity that transcends the traditional inputs in economic activity may be seen as overstated. Knowledge is an activity that has been utilized over different economic eras.

However, there is no denying that we have since entered an era where the knowledge intensity is key to speed of advancement (Gera & Mang, 1998). Economies with higher knowledge-intensive factors of production experience more growth and are characterised as 'knowledge economies' (Chen & Dahlman, 2006). Collinge and Staines (2009) define a knowledge economy as a production system that relies heavily on knowledge-intensive activities, which in turn foster an increasing pace of technological progress. The knowledge economy is marked by rapid technological innovation and associated with



an increased value placed on advanced education (Iversen & Soskice, 2015). Within this framework, the significance of human capital and intellectual property is paramount, surpassing the traditional roles attributed to physical capital and labor in conventional economic frameworks, and increasingly attributable to economic prosperity (Carayannis & Campbell, 2009; Robertson, Caruana, & Ferreira, 2023). In China, intellectual property-intensive industries contribute 13% to GDP (State council, 2025) and contributed 41% to GDP and 41% to total employment in America in 2019 (AEA, 2022). Economic prosperities from these patents are the outcome of research and innovation, and span manufacturing, wholesale and retail trade and services industries.

## Drivers Of Knowledge Economy

A successful transition to a knowledge economy requires certain core elements to drive it, creating an environment where information, innovation, and intellectual capital are the core assets of economic growth. A synergy of elements such as education, innovation and research and development, information and communication technology, collaborative knowledge sharing, knowledge protection, globalization, and supportive policies that prioritize intellectual assets over traditional resources, is self-reinforcing, creating a dynamic ecosystem where information and ideas fuel economic growth, societal progress, and competitive advantage.

More specifically, Chen and Dahlman (2006) assert that the framework of the knowledge economy includes fundamental components, which have been referred to as pillars.

- An economic and institutional regime that provides incentives for the efficient use of existing and new knowledge and the flourishing of entrepreneurship.
- An educated and skilled population that can create, share, and use knowledge well.
- An efficient innovation system of firms, research centres, universities, think-tanks, consultants, and other organizations who can tap into the growing stock of global knowledge, assimilate and adapt it to local needs, and create new technology.
- Information and Communication Technologies (ICT) that can facilitate the effective communication, dissemination, and processing of information (Robertson, 2008).

The framework posits that ongoing investments in the foundational elements of the knowledge economy will enhance the accessibility of knowledge and its efficient application in economic production (Chen & Dahlman, 2006). Hadad (2017) points out that this is likely to enhance the growth rate of total factor productivity, thereby leading to sustained economic growth. The assumption is that increasing the application of scientific knowledge to production of goods and services is sure to catalyse this process. Thus, science and technology constitutes the distinct forms of knowledge that catalyses sustained development in the knowledge economy (Collinge & Staines, 2009). The sustained application of knowledge in domestic economic activities leads to the production of high value added goods and services, ultimately increasing the probability of economic success and development. The sustained speed at which knowledge is being generated and shared has resulted in the rapid adoption of modern and effective production methods. This has also increased the chances of countries leapfrogging, ultimately leading to a more competitive global economy. As a result of the knowledge revolution and the growing trend of globalization, there are substantial prospects for driving economic and social progress. Chen and Dahlman (2006) opine that nations would run the risk of falling behind if they cannot keep up with the rapid pace of change.

## The Knowledge Economy In Practice

The Global Knowledge Index (GKI), which measures key indicators such as education, innovation, and digital infrastructure, has become a critical tool for assessing a nation's readiness and progress in adopting a knowledge-driven economic model. The GKI was created by the United Nations Development Programme (UNDP) and the Mohammed bin Rashid Al Maktoum Knowledge Foundation (MBRF). Pre-university education, technical and vocational education and training, higher education, information and communications technology, research development and innovation, and the economy are the six key sectors that are highlighted by the composite sub-indices that make up the GKI, and they are measured on a scale of 0-100 with 100 being the most knowledge-intensive economies. For many countries, the GKI serves as both a benchmark and a guide for building a foundation for sustainable economic growth in this new era.

**Table 1**  
023 GKI Top 20 ranking countries and scores

Rank	Country	GKI	Rank	Country	GKI
1	Switzerland	69.1	11	Estonia	64.2
2	Finland	68.1	12	Singapore	64.2
3	Sweden	68	13	Belgium	64.1
4	Netherlands	67.3	14	Israel	63.9
5	United States	66.9	15	Germany	63.7
6	Denmark	66.7	16	Australia	63.1
7	Luxembourg	66	17	Korea	62.9
8	United Kingdom	65.7	18	Malta	62.7
9	Austria	65.3	19	Slovenia	62.5
10	Norway	65.1	20	Canada	62.4

Source: UNDP and MBRF Global Knowledge Index

At the core of a knowledge economy is education, as a highly educated population can better adapt to and shape emerging economic demands. Countries with high GKI scores in education, such as Finland that ranks second with a score of 68.1 (See Table 1), as well as Singapore, emphasize critical thinking, problem-solving, and adaptability from early schooling, and they encourage lifelong learning to keep their workforce resilient amid technological change (Huang, 2024; Or, 2024). It is no surprise that Denmark ranks high in the GKI's lifelong learning indicator. According to Rasmussen, *et al* (2019), Denmark's comprehensive adult education and vocational training programs make citizens stay competitive in their careers. Sweden, which ranks number 3 with a score of 68, is another robust knowledge economy. Sweden prioritizes digital and entrepreneurial skills, developing these skills early on (Braunerhjelm, 2005). Sweden's emphasis on digital literacy prepares its citizens for an increasingly technically competitive workspace, creating a workforce ready to drive job creation and economic resilience (Wihlborg & Engstrom, 2017; Koca, 2023).

Under the GKI's innovation indicator, Israel ranks number 1 with a score of 55, while the US ranks 5<sup>th</sup> with a score of 51.5, two countries with a robust innovation ecosystems. The U.S. has developed prominent clusters like Silicon Valley, where universities, startups, and venture capitalists are concentrated, fueling technological and economic growth. Israel, supported by government funding and a vibrant research community, is a global leader in sectors such as cybersecurity and biotechnology (Rosenberg, 2018;

Mashal, 2023), illustrating how high R&D investment—a core GKI component—can support a competitive knowledge-based economy.

In Table 1, South Korea and Estonia score 62.9 and 64.2 respectively. These are two countries that have invested heavily in digital infrastructure. Estonia's digital government model, where nearly all public services are online, enhances competitiveness and wellbeing, and serves as a model of efficiency and citizen engagement (Espinosa& Pino, 2024). With its extensive high-speed internet and digital services, Hong, Ko, and Volynets (2007) affirm that South Korea exemplifies how strong digital infrastructure enables a knowledge economy to thrive by enhancing connectivity and accessibility (Choi, 2022), while Germany with a GKI rank 15 ranks higher in the R&D metrics (10) and allocates significant resources to advancing research across critical sectors (Thelen, 2019).

Countries progressing in the knowledge economy also invest in knowledge-intensive industries like technology, healthcare, and renewable energy, generating high-value employment and supporting continuous learning and innovation. China, for instance, though ranks 31 in the GKI, its economy and industrial performance indicators are very high. China aims to be a leader in high-tech manufacturing. By focusing on these sectors, China is transforming its economy from one reliant on traditional manufacturing to one anchored in advanced, knowledge-intensive industries. Through these targeted investments and policies, countries using the GKI framework can gauge and refine their strategies, prioritizing education, innovation, digital connectivity, and sustainable development (Li et al, 2024).

## Some Stylized Facts

### Overview Of D-8 Countries

The Developing Eight (D-8) Organisation for Economic Cooperation is a unique alliance of eight developing countries spanning across Asia and Africa. The D-8 was established officially on June 15, 1997, through the Istanbul Declaration of Summit of Heads of State/Government. The D-8 includes Bangladesh, Egypt, Indonesia, Iran, Malaysia, Nigeria, Pakistan, and Turkey, representing a diverse group of nations with significant economic potential (Hayatdavoudi et al, 2023). The D-8 organisation has several key objectives, including improving member states' positions in the global economy, diversifying and creating new opportunities in trade relations, enhancing participation in decision-making at international levels, and improving standards of living. The D-8 is a global arrangement rather than a regional one, reflecting the diverse geographical spread of its members (Developing 8, 2024; Acar&Karaagav, 2021). The descriptive statistics employed reveal significant variations in key indicators that are crucial for building a knowledge economy. This highlights the diversity and significant challenges D-8 nations face in transiting towards economic transformation and global competitiveness.

**Table 2**

2023 GKI ranking and scores for D-8 member countries

Rank	Country	GKI	1	2	3	4	5	6	7
43	Malaysia	52.4	60.8	51.0	48.0	36.3	56.8	62.3	59.3
60	Turkiye	42.7	66.7	57.0	32.8	33.5	49.3	52.5	50.8
79	Indonesia	44.7	58.0	49.5	45.2	21.4	47.2	54.6	52.4
90	Egypt	42.5	64.8	55.9	37.7	24.0	39.8	45.9	42.1
98	Iran	39.6	63.8	50.8	31.3	27.7	38.5	38.8	34.9
112	Bangladesh	36.0	48.5	49.6	33.7	17.4	31.9	44.4	40.7
117	Pakistan	32.7	42.1	41.9	33.6	15.3	29.7	43.7	35.1

Rank	Country	GKI	1	2	3	4	5	6	7
124	Nigeria*	37.6	47.3	46.8	41.9	23	25.3	43.8	33.6

1: Pre-university Education

2: Technical And Vocational Education And Training

3: Higher Education

4: Research, Development And Innovation

5: Information And Communications Technology

6: Economy

7: Enabling Environment

\* : 2021 GKI figure

Source:UNDP and MBRF Global Knowledge Index

Malaysia leads the D-8 countries in the GKI, ranking 43rd globally with a score of 52.4, which is above the world average of 47.54 (see Table 2). Türkiye and Indonesia are the only other D-8 countries scoring above the world average. Egypt, Iran, Bangladesh, and Pakistan are ranked in the lower half of the global rankings, indicating significant room for improvement in their knowledge economies.

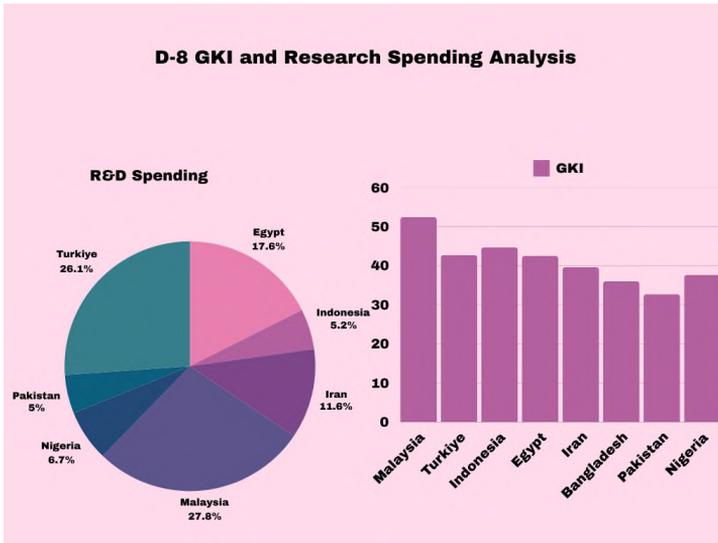
Nigeria was absent from the 2023 and 2022 GKI. This may be indicative of challenges faced in the country. However, 2021 data reveals the presence of considerable challenges in developing its knowledge infrastructure and economy. Nigeria particularly scores significantly low in ICT and R&D and innovation. The spread between the highest-ranked (Malaysia) and lowest-ranked (Pakistan) D-8 country is substantial, highlighting the diverse levels of knowledge economy development within the group.

**Figure 1**

Average public spending on R&D for D-8 Countries from 2012 – 2022

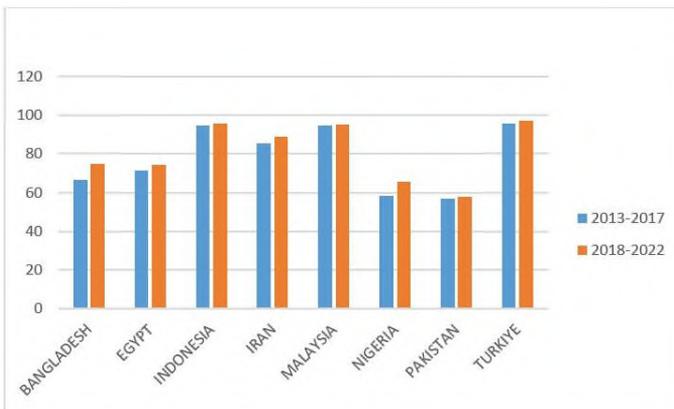


**Figure 2**  
 Analysis of Average public R&D spending and GKI scores in D-8



Parallels can be drawn from an analysis of D-8 country spending on R&D and GKI. As seen in **Figure 2**, Countries with higher R&D spending, such as Malaysia, ranks higher in GKI. Malaysia's consistent funding is reflected in its strong scores in R&D and innovation (56.8) and enabling environment (62.3) (see **Table 2**). Conversely, Pakistan and Nigeria, with lower R&D spending, show weaker GKI scores, particularly in areas like R&D. ICT infrastructure and economic scores (categories 5 and 6) show stronger performance in Malaysia and Turkey compared to other D-8 members. This aligns with their relatively higher overall investment and policies supporting digital transformation. A robust enabling environment (category 7) seems to boost higher education (category 3) and R&D (category 4) scores, as evidenced by Turkey and Malaysia. In contrast, countries with weaker enabling environments (e.g., Bangladesh and Nigeria) struggle across all metrics. The gap between top-performing countries like Malaysia and lower-ranked members like Nigeria and Pakistan, emphasizes the role of consistent and adequate funding for R&D in fostering knowledge economies.

**Figure 3**  
 Average Literacy Rate for D-8 Countries from 2013 – 2017 and 2018-2022

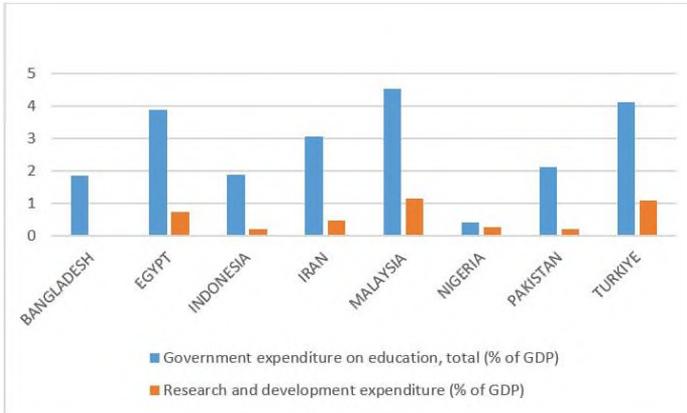


**Note:** Complete data set available for Bangladesh only. All figures are in percentages



Literacy rates, a fundamental indicator of a population's ability to participate in a knowledge economy, vary widely among D-8 nations. Türkiye and Indonesia have made substantial progress, with a literacy rate of 97% and 96% respectively (see Figure 1). However, Nigeria and Pakistan face greater challenges, with literacy rates 65% and 58% respectively. Furthermore, the data shows slight increases in literacy rate over the period, particularly for Bangladesh and Nigeria.

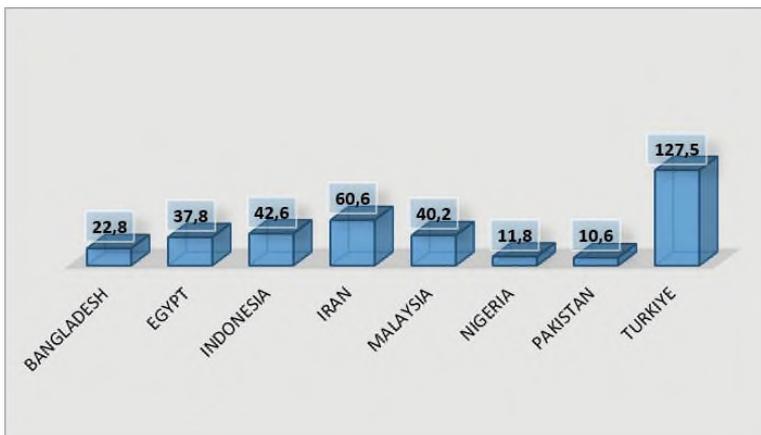
**Figure 4**  
2013-2022 Average D-8 Public Expenditure on Education



**Note:** No research and development expenditure figures were obtained for Bangladesh.

The allocation of public funds to education is a key indicator of a country's commitment to building human capital and promoting a knowledge-based economy. Figure 2 reveals varying levels of investment. Malaysia, for instance, allocated an average of 4.5% of its GDP to education over the period. This level of investment reflects a recognition of education's role in economic development and poverty reduction. However, not all D-8 countries have been able to maintain high levels of educational spending. Nigeria's rate is substantially low at an average of 0.42% over the period. These differences in public spending can have significant implications for the quality of education and the development of skills necessary for a knowledge economy. Pakistan, Indonesia, and Nigeria contribute the least to R & D public funding (See Figure 2).

**Figure 5**  
2022 School enrollment, Tertiary (% gross) for D-8 Countries



Enrolment ratios in tertiary education also show considerable disparities. Turkiye, for example, has a gross enrolment rate for tertiary education of 127.5%, which is higher than the world average. This rate of investment in human capital development is crucial to fostering innovation.

## Theoretical Perspectives

### Knowledge as a Factor of Production

This section discusses the increasing emphasis on knowledge as a production factor, in line with New Growth Theory (NGT). The NGT evolved from classical economic models, and emphasizes the importance of knowledge, innovation, and human capital as drivers of economic growth. Previous economic growth models focused on the accumulation of capital, labour, and other resources as the primary drivers of growth, with diminishing returns as the key factor (Harrod 1939; Domar 1946). The Classical Growth Theory asserts that as a nation's population expands, its economic growth is likely to diminish due to constraints imposed by finite resources. The theory suggests that a temporary increase in real GDP per capita will inevitably result in a surge in population, thereby constraining a nation's resources and ultimately diminishing real GDP.

In 1957, Solow introduced technological progress as an additional factor of production, positing that this technological change is exogenous to the economy. The criticism surrounding the origins of technological progress in these models paved the way for the development of endogenous growth models, which highlight the role of learning, investment in research, and capital accumulation in fostering technical progress (Lukasz, 2014; Kaur & Singh, 2016). Through his learning-by-doing theory, Arrow (1962) introduced the significance of knowledge creation and spillovers as mechanisms to counteract the effects of diminishing returns to capital. As a firm invests in capital stock, it simultaneously enhances its production efficiency, driven by the accumulation of knowledge gained through sustained production activities over time.

While Romer (1986) argued that knowledge, alongside labor and capital, demonstrates increasing returns and generates externalities; specifically, the knowledge produced by one firm also provides advantages to other firms that utilize that knowledge. In Lucas' (1988) endogenous growth model, the dynamics of growth are determined by the increase in human capital. Consequently, both physical capital and human capital, obtained through education and on-the-job training, are critical determinants of economic growth. Romer (1992), in this regard, highlights the importance of human capital, emphasizing the role of ideas in the economic development of nations. These ideas can significantly benefit developing countries by offsetting the limitations of physical capital.

At the core of NGT is the belief that knowledge, unlike physical capital, is a resource that can be shared and applied in different contexts without depletion. This foundational shift has paved the way for the knowledge economy, where knowledge itself becomes a pivotal asset, driving productivity, competitiveness, and overall development. Consequently, the knowledge base of leading economies has expanded rapidly, establishing knowledge as a crucial factor in the growth process. Investment in knowledge constitutes approximately 4.7% of OECD-wide GDP, while economies characterized by high knowledge intensity allocate between 5.2% and 6.5% of their GDP to such investments (Singh 2006; Kaur & Singh, 2016; Powell & Snellman, 2004). Specifically, top ranking GKI countries like Finland and Sweden in the last ten years spent on average, over 7% of their GDP on education, while Switzerland spends over 5%.

For the D-8 countries, adopting the principles of NGT and transitioning to a knowledge economy represent strategic pathways for enhancing economic resilience and sustainability. The NGT highlights the role of institutions convergence in developing countries (Islam, 2004). The theory highlights the

importance of developing human capital in developing countries and recognizing the significant link between human capital growth and the spread of technology and institutions. Many D-8 countries face challenges such as limited infrastructure, variable access to quality education, and uneven levels of technological development. Yet, by focusing on knowledge-driven growth, the D-8 can circumvent some traditional constraints by leveraging their human capital, fostering innovation, and investing in technology.

The NGT's emphasis on knowledge aligns well with the D-8 countries' ambitions to expand their knowledge economies, though each country's progress varies. The D-8 leaders, in their 2017 summit, collectively embarked on a series of initiatives in a resolute move to drive economic development by boosting the knowledge economy. These include the establishment of the D-8 Research Centre and the D-8 International University, launching the D-8 Network of Pioneers for Research and Innovation and the D-8 Technology Transfer and Exchange Network (D-8 Organization, 2021). Malaysia and Turkey have made substantial headway in strengthening higher education systems, supporting tech-focused industries and creating policies that encourage innovation (Cheng et al, 2009). Their relatively high investments in research and development (R&D), alongside solid ICT infrastructures, are reflective of knowledge economy priorities. By fostering environments where knowledge and ideas circulate freely—facilitated by robust education systems and active digital platforms—they demonstrate how NGT can be applied to create self-sustaining growth engines driven by skills and innovation.

Singh and Kaur (2016) assert that relatively affluent economies having a higher economic level tend to invest more in knowledge accumulation. However, they found that although there is a high degree of correlation between the knowledge economy index and economic level of developing economies, there is no causal link between them. This implies that there are other basic requirements for the success of the knowledge economy in enhancing the economic growth. In congruence, Al Arif et al. (2021) postulate that D-8 countries increase and maintain political stability to accelerate growth. For other D-8 countries, such as Nigeria and Pakistan, the journey toward a knowledge economy remains more challenging. In their research on the implications of the knowledge economy for Pakistan, Kalim, et al (2002) emphasises the need for Pakistan to increase investments in R&D, as well as adapt to the business norms of the knowledge economy so as to integrate its businesses in international trading system, and improve their share of high technology exports in the world market. The National Science and Technology Park (NSTP) was established in 2019 to advance Pakistan's knowledge economy and technological development. Boasting her first high-tech Special Economic Zone, over 840 knowledge-based jobs have been created, and 85 intellectual properties generated. Despite its international collaborations and recorded success, the centre requires vast technological support (Ullah et al, 2023). Similarly, Nigeria's 2022 Startup Act has fostered an enabling environment for startups by offering tax incentives, funding opportunities, and regulatory support. Arguably Africa's tech giant and home to over 80 tech hubs, Nigeria has made significant strides in digital transformation and innovation and offers some lessons for Pakistan. Issues like insufficient digital infrastructure, underfunded education systems, and limited R&D spending constrain progress though.

Nevertheless, NGT offers a compelling framework for D-8 nations to transition from resource-reliant economies to knowledge economies. By investing in education reforms, digital literacy programs and industry-specific skill development, D-8 countries can gradually build the foundational elements necessary for a knowledge economy. One crucial area of opportunity within the D-8 is the potential for collaboration and knowledge-sharing among member countries. This is in line with the research of Hayatdavoudi, et al (2023) who found disparities in the research performance of the D-8 countries, specifically in the research capacity and scientific impact of member countries. They opined that the recent scientific policy initiatives of the D-8 organization are focused on promoting knowledge sharing, technology transfer, research collaboration, and investment in R&D infrastructure among its member



countries. Such collaborations would not only foster collective growth but also reinforce the value of knowledge as a shared asset across borders.

Furthermore, aligning with NGT in the D-8 region means investing in innovation-friendly policies that remove barriers to entrepreneurship and encourage private-sector participation. Countries that streamline business regulations, support startup ecosystems, and provide funding for innovative ventures are better positioned to cultivate a vibrant knowledge economy. Gorji and Alipourian (2011) show that Iran's efforts at improving ICT infrastructure have been hampered by implementation challenges. However, Iran has continued to devote considerable effort to its science, technology and innovation system, with the goal of shifting towards a knowledge economy (UNCTAD, 2016). By leveraging knowledge as an inexhaustible resource and prioritizing education, digital infrastructure, and innovation, D-8 nations can establish resilient economies capable of sustaining long-term growth (Debroy, 2008).

## Education Systems in the D-8: Foundation for the Knowledge Economy

It is incontrovertible that education is increasingly recognized as a powerful engine for economic transformation, moving beyond traditional, industrial-based economies to those driven by knowledge, innovation, and human capital. Each of the D-8 nations faces distinct socio-economic challenges, but they share a goal to harness education as a tool for long-term growth, economic development, and global competitiveness.

Furthermore, an essential component for the knowledge economy is accessibility, which means that primary, secondary, and higher education must be available to all. Over the past few decades, D-8 countries have made notable strides in improving enrollment rates, particularly at the primary and secondary levels. According to Moustafa et al (2022), Egypt has implemented policies that support universal access to basic education. However, achieving universal access remains a challenge in nations like Nigeria (Oluwadare, 2015) and Pakistan (Kalim et al, 2002; Parveen 2019), where socio-economic disparities and regional inequalities affect educational accessibility (Ofozoba et al, 2023). Urban areas heavily concentrate resources, opportunities, and infrastructure, which explains why rural populations often lack access to quality education. This also places the poor and displaced at a disadvantage. Furthermore, women and girls in many D-8 countries face cultural and systemic barriers that limit their participation in education and the workforce. Despite Bangladesh's goal to foster a quality educational system in line with the SDG4, rural girls continue to encounter barriers, particularly in STEM education. According to Siddiqa (2020), these barriers are safety and security, poverty, teacher quality, infrastructure and resources, early marriage and childhood, and social norms. In Northeastern Nigeria, the right to education of internally displaced children is regularly canvassed; however, the displaced children continue to face barriers, particularly due to funding (Ogunode et al, 2024). These disparities hinder the inclusive growth needed for a robust knowledge economy and highlight the need for policies that close the education gap across different demographics (Omodero&Nwangwa, 2020).

With one of the highest out-of-school rates, Pakistan education quality is affected by limited teacher training, inadequate resources, and a curriculum that lacks emphasis on critical thinking and problem-solving. The government has launched initiatives to improve digital literacy and technical education, yet overall progress is hindered by socio-economic disparities and inconsistent policy implementation (Parveen, 2019; Parveen, et al, 2021). Education in Bangladesh has improved significantly over the past decade; however, the education system faces challenges, including teacher shortages, low educational quality, and a high dropout rate, especially at the secondary level. As well as inadequate organization of technical and vocational education to better align with market demands (Hoq, 2024). Iran boasts high enrollment rates in primary and secondary education and has one of the highest

literacy rates among the D-8 countries. It places a strong emphasis on scientific and technical education, producing a high number of graduates in STEM and has made considerable progress in higher education, particularly in scientific research. However, economic sanctions have impacted resource availability and limited access to global education networks. Despite these constraints, Iran's education system remains focused on producing a technically skilled workforce, although more investment in digital and soft skills training is needed (Rezaeinejad, et al 2024).

Having said that, relevance to the economy is another crucial aspect of education in the D-8. For education to fuel a knowledge economy, curricula must align with the demands of the labor market. Many of the D-8 countries are focusing on technical and vocational education and training to meet specific industry needs and reduce skills gaps (Sharma, 2020). In Indonesia, technical education has been integrated into the national curriculum to equip students with practical skills relevant to key economic sectors (Triyono&Mateeke, 2019). Malaysia has also made TVET a priority, aiming to bridge the gap between education and employment and create a skilled workforce for the digital age (Amin et al, 2023). Despite these initiatives, some D-8 countries still face significant mismatches between educational outputs and labor market demands. Ajibade (2019) bemoans the oversupply of graduates in Nigeria in fields that lack sufficient job opportunities, while critical sectors face a shortage of skilled labor. The case is similar in Pakistan (Parveen, 2019). Aligning education with market needs remains a strategic priority for the D-8 as they seek to maximize the economic impact of their education systems.

Investment in higher education and research is equally important, as universities and research institutions are engines of knowledge creation and innovation. Iran, Turkey, and Malaysia have invested significantly in higher education and research infrastructure, leading to increased scientific output and innovation potential (Chin, 2019). These investments also support entrepreneurial ecosystems, as universities often serve as incubators for start-ups and tech companies. However, the path to a knowledge economy requires not only investment in higher education but also policies that encourage collaboration between academia, industry, and government. Egypt and Indonesia, for example, are taking steps to strengthen these linkages to ensure that academic research translates into practical applications and economic growth.

Recent reforms have focused on improving education quality and promoting digital learning (Kamel, 2010). However, the system still struggles with issues related to overcrowded classrooms, outdated curricula, and insufficient teacher training. There is a pressing need for educational reforms that prioritize critical thinking and practical skills over rote memorization, which remains a predominant teaching method. Developing a strong higher education sector, supported by research and innovation funding, is essential for the D-8 countries to generate the knowledge and technological advancements that underpin a knowledge-based economy.

Finally, building a knowledge economy requires policies that promote equity, especially in education. Gender disparities, rural-urban divides, and socio-economic inequality remain challenges in many D-8 countries, hindering the full realization of human potential. Countries like Bangladesh and Egypt have implemented programs to address these disparities, particularly focusing on increasing access for girls and underprivileged groups (Rizk & Shaver, 2010; Moustafa et al 2022).

It is noteworthy that education systems in the D-8 countries are critical in laying the foundation for a knowledge economy. While significant progress has been made in expanding access and improving quality, further efforts are required to align education with labor market needs, improve funding, strengthen research and innovation capacity, and ensure inclusivity. The journey to a knowledge economy is complex, requiring ongoing commitment from governments, private sector involvement, and international collaboration (Chidambaram 2014). By addressing these challenges and building robust



education systems, the D-8 countries can create a foundation that not only fosters economic growth but also drives social progress and regional competitiveness in a dynamic global economy.

## Opportunities in Challenges

The D-8 countries share several common challenges in their education systems, such as resource constraints, quality disparities between regions, and the need for curriculum modernization to meet 21st-century demands. Digital literacy and access to technology are increasingly becoming central to education reforms, as these countries recognize the importance of preparing students for the global knowledge economy. However, access to high-quality education remains uneven. Despite these challenges, D-8 countries have significant opportunities for regional cooperation in education. The close cultural ties between the D-8 creates a solid foundation for cooperation in human capital development. D-8 nations can work to address disparities and the urban-rural divide in educational opportunities.

One area of opportunity for the D-8 is higher education and labour mobility, investing in technical and vocational education and training (TVET), which aligns education with market demands and addresses skills gaps. Additionally, education reform that emphasizes critical thinking, problem-solving, and digital skills is essential to transition toward a knowledge economy, as envisioned by the Global Knowledge Index.

Overall, the education systems of the D-8 countries reflect varying stages of development, each determined by distinct economic and social contexts. By addressing each nation's systemic challenges and implementing targeted reforms, D-8 nations have the potential to build more resilient, inclusive, and future-ready education systems that support economic growth and social development. Fostering a knowledge economy across the D-8 will require sustained commitment to education quality, equity, and innovation, making knowledge systems integral to achieving long-term, sustainable development.

## Conclusion and Recommendation

This study set out to overview the D-8 education systems as a substantial framework for becoming a knowledge economy, a prerequisite for sustainable growth and development in today's dynamic global knowledge economy. The evaluation of education systems in D-8 countries reveals both challenges and opportunities in their journey towards knowledge-based economies. While disparities in educational attainment and public spending persist, there's significant potential for regional cooperation to address these gaps. The D-8 countries may not all be making the same steps toward a knowledge economy. However, with targeted investments and regional collaboration, these countries can move toward a future where knowledge and human capital are the main drivers of economic development. Inclusive education policies are essential for creating a diverse and adaptable workforce that can sustain growth in a knowledge economy.

The role of teachers is constantly advancing and evolving. They require regular personal and professional development and retraining. Improving teacher training is essential for enhancing the quality of education. D-8 countries could establish annual professional development programs that focus on modern teaching methodologies, subject-specific expertise, and digital skills. Governments must fund teacher training institutions to equip them with modern tools and access to digital resources like e-libraries. Furthermore, teachers must be kept incentivized and motivated. Financial rewards or career advancement opportunities are also essential for teachers to pursue continuous learning.

D8 countries can learn global best practices in education from advanced countries. Governments of D8 countries should align educational curriculum with industry demands. Skills in areas such as AI, renewable energy, and fintech should be incorporated into school curricula and reviewed frequently to

ensure alignment with technological advancements. Governments must leverage technology to review instructional methodology to deliver material using digital platforms and enforce practicals over theory, such as project-based assignments and internships.

To equip the labour force for the demands of a knowledge economy, STEM education should also be a priority within the national development plans and policies of D-8 countries. Collaborative initiatives with the private sector, D-8 members, and other countries can provide access to resources.

Establishing a robust digital infrastructure development plan is imperative. Governments must make investments to guarantee broad access to digital technologies and stimulate innovation and creativity. Investments in fast internet connectivity should be widely spread covering both rural and urban areas. As a precursor to this, D-8 countries must improve universal access to primary and secondary schools in rural and disturbed areas. This includes building new schools, upgrading existing ones, providing learning resources, and incentivizing qualified teachers to teach in these areas. Governments should also leverage mobile and community-based schools to reach children in remote areas. Rural dwellers can be sensitized to allow their children to attend school, while sanctions can be enforced on those who fail to do so.

Cultural barriers that hinder access to education must also be addressed. D-8 countries should engage in multi-level advocacy campaigns to highlight the benefits of education for individuals and society. Particular effort should be directed at ensuring access for both genders, as well as special needs individuals. The government may partner with community leaders, religious organizations, and civil society groups to help shift cultural norms and build support for inclusive education.

D-8 Governments should also make significant financial commitments to education. Allocating at least 4–6% of GDP to education, as recommended by UNESCO Education 2030 Framework for Action, can significantly improve their education systems. Public-private partnerships (PPPs) can help bridge funding gaps by involving private organizations in funding infrastructure, teacher training, and the development of digital tools. Partnering with international organizations for grants and technical assistance can further channel valuable resources to the education sector. Furthermore, public spending on R&D should reach the global benchmark of 2% of GDP. Governments can also create policies or tax breaks that attract private-sector investment in research as a caveat. For instance, foreign investors seeking entrance into the Nigeria lithium market can receive some form of tax incentive in exchange for research funding to support environmental studies or enhance local expertise in lithium mining and processing. This could be carried out in partnership with a local university or research center. This network of policy makers, universities, and industries will significantly accelerate the development and commercialization of research.

Governments are at the forefront of creating a favorable ecosystem for entrepreneurship to thrive. Aside from the tax breaks mentioned above, reducing bureaucratic hurdles and improving the ease of doing business all foster an environment for entrepreneurship to thrive. Latest WorldBank statistic for D-8 countries reveal that Malaysia has the best business environment with a ranking of 12 out of 190, while Pakistan, Egypt, Iran, Nigeria, and Bangladesh rank 108, 114, 127, 131, and 168, respectively. Malaysia provides the D-8 countries with a relatable model for transitioning to a knowledge economy and improving ease of doing business. Streamlined regulatory processes, digital business registration and public systems, predictable policies, and transparency are some of the tools put in place to ease business processes. Malaysia also ingrained the transitioning to a knowledge economy into the society by engaging in cultural campaigns, promoting entrepreneurship through targeted support to SMEs, and implementing strategic trade and business policies by attracting trade and FDI. (PWC, 2024; Schaper, 2020). Finally, deepening integration among D-8 countries can enhance knowledge sharing and resource optimization. Member countries can collaborate to establish regional centers of excellence in



STEM education, digital innovation, and entrepreneurship to foster inclusivity. Bilateral and multilateral agreements that promote technology transfer, capacity building, and joint research initiatives can significantly accelerate progress.

Finally, the D-8 countries' commitment to enhancing their education systems plays a crucial role in fostering innovation, developing human capital, and ultimately driving economic transformation. By leveraging their collective strengths and addressing existing challenges, D-8 nations can work towards building robust knowledge economies. This approach has the potential to improve living standards, boost global competitiveness, and pave the way for sustainable development across the D-8 member states.

## Suggestions for Further Research

- A study on PPPs within the D-8 countries can offer insights into how governments and private sectors can collaborate to address critical gaps in infrastructure, education, and innovation.
- There is need for research into PPP and regional collaboration in technical education and the potential to amplify development outcomes.
- Case studies and comparative studies within D-8 countries to provide granular insights into strategies and policies that have driven success or faced challenges are essential.
- A critical area for further research is how D-8 countries can foster regional collaboration in technical education to build a skilled workforce capable of meeting the demands of a globalized economy is key.



### Author Details

Adesuwa O. Erediauwa

<sup>1</sup> The Nigerian Institute of International Affairs, Victoria Island, Lagos, Nigeria

📞 0000-0002-8553-7442    ✉ adeuzamere@yahoo.com

## References

- Acar, H. & Karaagav, Y. (2021). D-8 Organization for economic cooperation and Turkey within the scope of international political relations. *International Journal of Social and Humanities Sciences*, 5(3), 67-80.
- Ajibade, B. O. (2019). Knowledge and certificate based System: A critical analysis of Nigeria's educational system. *Global Journal of Human Social Science*, 19(8).
- Al Arif, M., Arisman, A.&Harahap, D. (2021). Export, political stability, and growth in Developing-8 Countries. *Studies of Applied Economics*, 39(2). DOI:10.25115/eea.v39i2.3448
- American Economic Association (2022) March 17 2022. IP-Intensive Industries in the U.S. – USPTO Chief Economist Office issues analytic report <https://www.aeaweb.org/forum/2457/intensive-industries-economist-office-issues-analytic-report>
- Amin, S. M., Suhaimi, S. S. A. & Nazuri, N. (2023). The present and future of Malaysian technical and vocational education and training (TVET). *International Journal of Academic Research in Business and Social Sciences*, 13(18), 107-117.
- Arrow, K. J. (1962). The Economic implications of learning by doing. *Review of Economic Studies*, 29(3), 155-73. doi:10.2307/2295952.
- Bell, D. (1973). *The Coming of Post Industrial Society*. Basic Books; New York.
- Birdsall, N. M., Campos, J. E. L., Kim, C., Corden, W. M., MacDonald, L., Pack, H., Page, J., Sabor, R., & Stiglitz, J. E. (1996). *The East Asian miracle : economic growth and public policy : Main report (English)*. A World Bank policy research



- report Washington, D.C. : World Bank Group. <http://documents.worldbank.org/curated/en/975081468244550798/Main-report>
- Braunerhjelm, P. (2005). Knowledge Capital and Economic Growth: Sweden as an Emblematic Example. In: A. Quadri-curzio, M. Fortis. (Eds.), *Research and Technological Innovation*. Physica-Verlag HD. [https://doi.org/10.1007/3-7908-1658-2\\_11](https://doi.org/10.1007/3-7908-1658-2_11)
- Carayannis, E.G. & Campbell, D.F.J.(2009). Mode 3 and quadruple Helix: toward a 21st century fractal innovation ecosystem. *International Journal of Technology Management*, 46 (3–4), 201-234.
- Carlaw, K., Oxley, I., Walker, P., Thorns, D. & Nuth, M. (2006). Beyond the hype: intellectual property and the knowledge society/knowledge economy. *Journal of Economic Surveys*, 20, 633-668
- Chen, D. H.C.; Dahlman, C. J. (2006). The knowledge economy, the KAM methodology and World Bank operations.Washington,D.C.: World Bank Group. <http://documents.worldbank.org/curated/en/695211468153873436/The-knowledge-economy-the-KAM-methodology-and-World-Bank-operations>
- Cheng, M. Y., Hossain, S., & Guo, J.H. (2009). Social acceptance and readiness for the knowledge-based Economy in Malaysia. *ASEAN Economic Bulletin*, 26(3), 253–265. <http://www.jstor.org/stable/41317068>
- Chidambaram, R. (2014). To become a knowledge economy. *Current Science*, 106(7), 936–941. <http://www.jstor.org/stable/24102376>
- Chin, Y. F. (2019). Malaysia: From Hub to Exporter of Higher Education and Implications. *International Journal of Business and Social Science*, 10(2), 48-54. doi:10.30845/ijbss.v10n2p6
- Choi, K.(2022). Job creation during Korea's transition to a knowledgeeconomy. *KDI Journal of Economic Policy*, 44(3), 75-99. <https://doi.org/10.23895/kdijep.2022.44.3.75>
- Collinge, C., & Staines, A. (2009). Rethinking the Knowledge-Based Economy. *Built Environment (1978-)*, 35(2), 165–172. <http://www.jstor.org/stable/23289831>
- Cooke, P. & Leydesdorff, L. (2006). Regional development in the knowledge-based economy:the construction of advantage. *Journal of Technology Transfer*, 31, 5-15.
- D-8 Organization (2021). Concept note on D-8 network of pioneers for research and innovation (D-8NPRI). Retrieved from <https://developing8.org/wp-content/uploads/2021a/01/Concept-paper-D-8NPRI.pdf>.
- Debroy, B. (2008). Adjusting to a knowledge economy. *India International Centre Quarterly*, 34(3/4), 30-37. <http://www.jstor.org/stable/23006325Developing-8>.
- Domar, E. (1946). Capital expansion, rate of growth and employment. *Econometrica*, 14 (2), 137–47.doi:10.2307/1905364
- Drucker, P. (1969.) *The Age of Discontinuity: Guidelines to Our Changing Society*. Taylor & Francis.
- Entezari,Y. (2015). Building Knowledge- Based Entrepreneurship Ecosystems: Case of Iran. *Procedia - Social and Behavioral Sciences*, 195(3), 1206-1215.
- Espinosa, V.I. & Pino, A. (2024). E-Government as a development Strategy: The case of Estonia. *International Journal of Public Administration*. DOI:10.1080/01900692.2024.2316128
- Gera, S., & Mang, K. (1998). The Knowledge-based economy: Shifts in industrial output. *Canadian Public Policy / Analyse de Politiques*, 24(2), 149–184. <https://doi.org/10.2307/3551772>
- Gorji, E.&Alipourian, M. (2011). The knowledge economy & the knowledge assessment methodology(The case study of Iran & Some other Countries). *Iranian Economic Review*, 15(29), 1-30.
- Hadad, S. (2017). Knowledge economy: Characteristics and dimensions.*Management Dynamics in the Knowledge Economy*, 5(2), 203-225. DOI 10.25019/MDKE/5.2.03
- Harper & Row;New York.
- Harrod, R. F. (1939). An essay in dynamic theory. *Economic Journal*, 49(193), 14–33. doi:10.2307/2225181
- Hayatdavoudi, J., Kaltunbrunner, W. & Costas, R. (2023). Science and research landscapes across D-8 organization member countries from a historical perspective: The policy context and collective agendas. *Quantitative Science Studies*,4(2), 466–488.[https://doi.org/10.1162/qss\\_a\\_00249](https://doi.org/10.1162/qss_a_00249)
- Hippe, R. & Fouquet, R. (2018). The knowledge economy in historicalperspective. *World Economics*, 18 (1), 75-107. <https://www.worldeconomics.com/Files/TheKnowledgeEconomyInHistoricalPerspective.pdf>
- Hong, D., Ko, S., & Volynets, A. (2007). Information and Communication Technologies for a Knowledge-Based Economy. In J. Suh, & D. H. Chen (Ed.), *Korea as a Knowledge Economy. Evolutionary Process and Lessons Learned* (pp 79-105) World Bank Institute, Washignton DC<http://dx.doi.org/10.1080/20421338.2016.1147207>



- Hoq, M. Z. (2024). Knowledge based economy (KBE) in the emerging markets: A case of Bangladesh. *Academy of Strategic Management Journal*, 23S(5), 1-13
- Huang, Y. (2024). Comparative analysis of education system between Singapore and Finland. *International Journal of Education and Humanities*, 15(1),210-213.
- Islam, N. (2004). New growth theories: What is in there for developing countries? *The Journal of Developing Areas*, 38(1), 171-212. <http://www.jstor.org/stable/20066701>
- Iversen, T. & Soskice, D. (2015). Democratic Limits to redistribution: inclusionary versus exclusionary coalitions in the knowledge economy. *World Politics*, 67, 185-225.
- Kalim, R., Lodhi, S. A., & Haroon, Y. (2002). The Knowledge-based economy: Trends and implications for Pakistan [with Comments]. *The Pakistan Development Review*, 41(4), 787-804. <http://www.jstor.org/stable/41263380>
- Kamel, S. (2010). Information and Communications Technology for Development: Building the Knowledge Society in Egypt. In N. Rizk & L. Shaver (Eds.), *Access to knowledge in Egypt* (pp. 174-197). Bloomsbury Academic.
- Kaur, M. & Singh, L. (2016) Knowledge in the economic growth of developing economies. *African Journal of Science, Technology, Innovation and Development*, 8:2, 205-212.
- Koca, D. (2023). Evaluation of digital skills development policies with the examples of Netherlands,Sweden, and Germany *Journal of the Human and Social Science Researches* , 12 (4), 2296-2322. <https://doi.org/10.15869/itobiad.1335724>
- Li, X., Ma, L., Ruman, A. M., Iqbal, N. & Strielkowski, W. (2024). Impact of natural resource mining on sustainable economic development: The role of education and green innovation in China. *Geoscience Frontiers*, 15(3). <https://doi.org/10.1016/j.gsf.2023.101703>
- Lucas, R. E., Jr. (1988). On the Mechanics of Economic Development. *Journal of Monetary Economics*, 22 (1), 3-42. doi:10.1016/0304-3932(88)90168-7
- Łukasz, P (2014). Review of theories and models of economic growth, Comparative Economic Research. *Central and Eastern Europe* 17(1), 45-60. <https://doi.org/10.2478/cer-2014-00>
- Mashal, L. (2023). Knowledge economy and educational policy in Israel in the context of globalization [Doctoral thesis, University of Moldova]. <https://anacec.md/files/Mashal-abstract.pdf>
- Metcalfe, S. & Ramlogan, R. (2005). Limits to the economy of knowledge and knowledge of the economy. *Futures*, 37(7):655-674. DOI:10.1016/j.futures.2004.11.006
- Moustafa, N., Elghamrawy, E., King, K., Hao, Y. (2022). Education 2.0: A Vision for Educational Transformation in Egypt. In: F. M. Reimers, U. Amaechi, A. Banerji, M. Wang. (Eds.), *Education to Build Back Better*. Springer, Cham. [https://doi.org/10.1007/978-3-030-93951-9\\_3](https://doi.org/10.1007/978-3-030-93951-9_3)
- Ofozoba, C. A., Nwobu, C. M. & Okechukwu, E. V. (2023). Knowledge economy and knowledge transfer in Nigeria education: A sustainable tool for global competitiveness. *Journal of Educational Research*, 8(1), 411-424.
- Ogunode, N. J., Attah, G. E., & Ebute, J., E. (2024). Investment in Education in Nigeria: Barriers and Way Forward. *Journal of Higher Education and Academic Advancement*, 1(2), 71-81. <https://doi.org/10.61796/ejheaa.v1i2.103>
- Oluwadare, A. J. (2015). Towards a Knowledge-Based Economy: Challenges and Opportunities for Nigeria. International Conference on African Development Issues (CU-ICADI): Social and Economic Models for Development Track
- Omodero, C. O. & Nwangwa, K. C. L. (2020). Higher education and economic growth of nigeria: evidence from co-integration and granger causality examination. *International Journal of Higher Education*, 9(3), 173-182.
- Or, C. (2024). Advancing workforce competency: Singapore's integration of competency-based education. *Journal of Applied Learning & Teaching*, 7(2), 1-12. <https://doi.org/10.37074/jalt.2024.7.2.3>
- Parveen, S. (2019). *Role of educational institutions in creating a knowledge economy: A case study of Pakistan*. [Doctoral Thesis, University of Faisalabad] Faisalabad. <https://pr.hec.gov.pk/jspui/bitstream/123456789/19149/1/sajida%20parveen%20Sociology%202020%20gcu.pdf>
- Parveen, S., Mahmood, B., Siddiqui, S., Ch, A., & Mushtaq, M (2021). Role of Higher Education in Creation of Knowledge Economy in Punjab, Pakistan. *Amazonia Investiga*, 9(36), 38-50. DOI:10.34069/AI/2020.36.12.3
- Powell, W. W., & Snellman, K. (2004). The knowledge economy. *Annual Review of Sociology*, 30, 199-220. <http://www.jstor.org/stable/29737691>
- PRC State Council (2025). January 22, 2025 China's patent-intensive sectors contributed 13 percent of GDP in 2023 [https://english.www.gov.cn/archive/statistics/202501/07/content\\_WS677d2bcc6d0868f4e8ee957.html](https://english.www.gov.cn/archive/statistics/202501/07/content_WS677d2bcc6d0868f4e8ee957.html)

- PwC (2024). *Doing business in Malaysia 2024*. PricewaterhouseCoopers. <https://www.pwc.com/my/en/assets/publications/2024/dbg-2024.pdf>
- Rasmussen, P. D., Larson, A., & Cort, P. S. (2019). The vocational turn of adult education in Denmark – an analysis of adult education policy from the late 1990s. *International Journal of Lifelong Education*, 38(16):1-14. DOI:10.1080/02601370.2019.1586778
- Rezaeinejad, I., Lavrov, S. N. & Simonov, A. G. (2024). Knowledge-based economic development of Iran: Mitigating sanctions and enhancing national competitiveness. *RUDN Journal of Economics*, 31(4), 814-829. DOI: 10.22363/2313-2329-2023-31-4-814-829
- Rizk, N. & Shaver, L. (2010). Access to Knowledge: Economic, Global and Local Perspectives. In N. Rizk & L. Shaver (Eds.), *Access to knowledge in Egypt* (pp. 1-12 ). Bloomsbury Academic.
- Robertson, J, Caruana, A, & Ferreira, C (2023). Innovation performance: The effect of knowledge-based dynamic capabilities in cross-country innovation ecosystems. *International Business Review*, 32(2).
- Romer, P .M. (1992). Two strategies for economic development:Using ideas and producing ideas. Proceedings of theWorld Bank Annual Conference on Economic Development.Washington, DC: The World Bank. 20433: 63–91. 10.1093/wber/6.suppl\_1.63.
- Romer, P. M. (1986). Increasing Returns and Long RunGrowth. *Journal of Political Economy*, 94 (5), 1002–37.doi:10.1086/261420.
- Rosenberg, D. (2018). Israel as a Knowledge Economy I. In: Israel's Technology Economy. *Middle East in Focus*. Palgrave Macmillan, Cham. [https://doi.org/10.1007/978-3-319-76654-6\\_3](https://doi.org/10.1007/978-3-319-76654-6_3).
- Schaper, M. T., (2020). *The 2020 Ease of Doing Business Survey: How Competitive is the Malaysian Economy?* (Report No. 35). ISEAS Yusof Ishak Institute.[https://www.iseas.edu.sg/wp-content/uploads/2020/03/ISEAS\\_Perspective\\_2020\\_35.pdf](https://www.iseas.edu.sg/wp-content/uploads/2020/03/ISEAS_Perspective_2020_35.pdf)
- Sharma, G. (2020). Conceptions of School Curriculum in South Asia. In: P. Sarangapani, R. Pappu, (Eds.),*Handbook of Education Systems in South Asia. Global Education Systems*. Springer, Singapore. [https://doi.org/10.1007/978-981-13-3309-5\\_75-1](https://doi.org/10.1007/978-981-13-3309-5_75-1)
- Siddiqi, N. & Braga, A. (2019). *Barriers to STEM education for rural girls: A missing link to innovation for a better Bangladesh*. (Policy PaperOctober2019). ECHIDNA Global Scholars Program
- Singh, L. (2006). Innovations, High-Tech Trade and IndustrialDevelopment: Theory, Evidence and Policy. UNU-WIDERResearch Paper No. 2006/27. United Nations University-World Institute for Development Economics Research,Helsinki, Finland.
- Solow, R. M. (1957). Technical change and the aggregate production function. *The MIT Press Review of Economics and Statistics*,39 (3), 312–20. doi:10.2307/1926047.
- Stiglitz, J. E. (1999). *Public Policy of a Knowledge Economy*. Department for Trade and Industryand Center for Economic Policy Research; London.
- Thelen, K. (2019). Transitions to the knowledge economy in Germany, Sweden, and the Netherlands. *Comparative Politics*, 51(2), 295–315. <https://www.jstor.org/stable/26563460>
- Triyono, M.B., Mateeke-Moses, K. (2019). Technical and Vocational Education and Training in Indonesia. In: Bai, B., Paryono (Eds.), *Vocational Education and Training in ASEAN Member States. Perspectives on Rethinking and Reforming Education*. Springer, Singapore. [https://doi.org/10.1007/978-981-13-6617-8\\_3](https://doi.org/10.1007/978-981-13-6617-8_3)
- Ullah, S., Ahmad, T., Mehmood, T. & Sami, A. (2023). Innovation and economic performance of firms in national science &technology park, Islamabad, Pakistan. Foresight, Emerald Publishing Limited, ISSN 1463-6689. DOI: 10.1108/FS-08-2021-0151
- UNCTAD. (2016). *Science, technology and innovation policy review—Islamic Republic of Iran*. Switzerland: United Nations Publication
- Wihlborg, E. &Engstrom, J. (2017). Bridging digital divides through digital media buses: An action Research study on digital inclusion in Sweden, 2017 Conference for E-Democracy and Open Government (CeDEM), Krems, Austria, 2017, 260-270.doi: 10.1109/CeDEM.2017.30.

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# Green Nexus in D-8 Integrating Climate-Smart Agriculture for Food Security



Talha Tufail Bhatti <sup>1</sup>

<sup>1</sup> Strengthening Regional Climate Resilience Program, Institute of Regional Studies, Islamabad, Pakistan

### Abstract

This chapter examines the relationship between agriculture, food security, and climate change within the context of D-8 member states, with Pakistan serving as a focal case study to highlight challenges and solutions applicable across the D-8. It explores how Pakistan's unique vulnerabilities, such as climate-driven disruptions to agriculture, food insecurity, and environmental challenges, exemplify broader issues faced by D-8 countries. The chapter outlines the scope of food security in alignment with Sustainable Development Goals and analyzes intra-state policies and institutional frameworks addressing the climate-food-security nexus. Key barriers to achieving food security, including conflicts, ineffective policy implementation, and limited community engagement, are examined through the lens of Pakistan's experiences, with an emphasis on the impacts of GMOs, climate justice, and foreign debt. Building on this analysis, the chapter proposes recommendations for strengthening food resilience through eco-centric, low-carbon technologies, including smart agriculture practices, reducing food losses and waste, and integrating nature-based solutions for land use and forestry. Recognizing the interconnected challenges faced by D-8 member states, the chapter advocates for proactive, inclusive, and innovative approaches that prioritize people-centric solutions. It proposes the development of "climate hubs" in Pakistan as a model for integrating accurate weather forecasting and facilitating transdisciplinary collaboration, offering a framework that can be adapted across the D-8 to address shared climate challenges through collective action.

### Keywords

Climate change · Agriculture · Food Security · D-8 · Nature-Based Solutions



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2025. Bhatti, T. T.

Corresponding author: Talha Tufail Bhatti [environmentalist.bhatti@gmail.com](mailto:environmentalist.bhatti@gmail.com)

## Introduction

Agriculture-based economies, food security, and climate change are deeply interwoven, particularly in developing nations like Pakistan (Syed et al., 2022), Türkiye (Tekeli, 2020), Malaysia, Iran, Indonesia, Egypt, Bangladesh, and Nigeria. The D-8 Organization for Economic Cooperation is a multilateral platform for these 8 state members, where agriculture is a key pillar of economic stability and social well-being. The establishment of the D-8 Organization for Economic Cooperation was announced officially through the Istanbul Declaration of Summit of Heads of State/Government on June 15, 1997. The objectives are to improve member states' position in the global economy, diversify and create new opportunities in trade relations, enhance participation in decision making at the international level and improve standards of living. In regions where most of the population relies on agriculture for both livelihood and sustenance, shifts in environmental conditions due to climate change have direct implications on food production, economic resilience, and societal stability.

The selection of Pakistan as the focal point in this paper is deliberate. Pakistan exemplifies the critical intersections of climate vulnerability, food security challenges, and the need for sustainable agricultural practices. By analyzing Pakistan's experiences, from irregular rainfall and glacier-dependent irrigation to frequent flooding, this paper seeks to present insights and strategies that are relevant not only to Pakistan but also to other D-8 countries confronting similar challenges. This discussion also highlights the necessity of regional collaboration within the D-8 framework to enhance climate resilience and achieve sustainable development goals. While this paper addresses the overarching climate-food-security nexus across D-8 member states, Pakistan's case provides a lens through which key issues and transformative solutions can be explored in greater depth.

### Agriculture-based economies

Agriculture-based economies are those in which agricultural activities form a substantial part of the national economy like in Pakistan, providing major share in the employment sector, gross income, and net export earnings. In the D-8 economies, agriculture not only serves as a primary livelihood source for rural population but also drives secondary industries, such as food processing, transportation and retail. Countries in South Asia and Africa exemplify this model, where smallholder farming is a dominant form of production. Here, agricultural contribution is seen in terms of GDP share (Acumen, 2021). For example, Pakistan's agriculture contributes around 24% to the GDP and has a 43% employment rate and plays a role in poverty alleviation and community development (Government of Pakistan, 2024). However, agriculture in tropical regions is often rain-glacier dependent and highly vulnerable to environmental (temperature) changes, making them particularly susceptible to climate change impacts like irregular rainfall, temperature variations, and extreme weather events like flash floods and heatwaves (Syed et al., 2022).

In the D-8 Summit Declaration (Istanbul, 1997), the main objective was to improve developing countries' position and self-resilience, creating new opportunities in trade, multilateral and bilateral relations, enhance participation in decision-making at the international level and provide a better standard for living for the people by being people-centric establishments.

### Food Security

Food security is the ability of a population to consistently access sufficient, safe, and nutritious food to meet dietary needs for a healthy life (FAO, 2003). In agriculture-based economies like Pakistan food security is both a goal and a challenge because currently, according to the World Bank, Pakistan is 40% food insecure (World Bank, 2022). Low crop yields, insufficient storage facilities, and economic

instability lead to food shortages, but now climate change is directly impacting crop security, affecting both affordability and accessibility.

Moreover, climate-driven factors such as droughts, floods, and soil degradation through heatwaves threaten the availability of staple foods and consequently in the long run (Hippler & Ahmed, 2022). The health as well as welfare of local populations is directly at stake. These challenges are compounded by a growing population and demand for food along with other natural resources. Fluctuating market prices, which place additional pressure on food systems in vulnerable regions, are highly unstable.

## Climate Change

Climate change introduces a layer of complexity to food security and agricultural productivity in the D-8 region (FAO, 2008). It disrupts traditional farming cycles, alters weather patterns, and threatens biodiversity, all of which impacts crop viability and yield stability. Increased frequency and severity of extreme weather events, such as heatwaves and storms, place unprecedented strain on ecosystems and farming communities. Adaptation to climate change requires not only shifts in agriculture practices but also broader policies and investments in technology, infrastructure, and education to build resilience among farming communities of D-8 member states (OECD, 2023). In agricultural-based economies, the intersection of climate change with food security and economic stability makes effective adaptation strategies crucial for sustainable development (FAO, n.d.).

## D8 Integration: Scope, Purpose and Goals

The integration of food-agriculture-climate nexus resilience within the D-8 organization represents a crucial collaborative approach for addressing the most urgent existential challenge in the age of the Anthropocene. The D-8 vision is to seek agro-based economies to harness collective strengths of each member state to advance self-reliance on agriculture and food system security while aligning themselves to Sustainable Development Goals 2 (Zero Hunger), 12 (Responsible Consumption and production), and 13 (Climate Action) (SDG 2, 12, and 13) by 2030.

### Scope of Food Security

Nations are in a planetary emergency, where natural loss due to climate change is the biggest threat, and biodiversity the biggest ally. Wildlife population size, according to WWF's Living Planet Report 2024, has fallen by an average of 73% since 1970 (WWF, 2024). The study also emphasized that food systems are one of the largest causes of biodiversity loss, with 70% of all biodiversity loss on land and 50% in freshwater being closely linked to how we produce food and what we eat (WWF, 2022). At the same time, food systems generate around 30% of all greenhouse gases; around 18% in 2023 alone, as per AFOLU. In the member states, achieving food security means addressing various socio-economic and environmental factors that influence food production and distribution. Governments are faced with many decisions on where to focus climate and nature action. Add things like conflict, pandemics, supply chain disruptions and cost of living crises, it can be very complex to address everything at once. Climate variability, resource scarcity, population growth, and economic disparities pose significant threat to stable food supplies (World Bank, 2022). Thus, the scope of food security in D-8 includes developing resilient agricultural systems, improving supply chain, and supporting farmers with necessary resources, knowledge, and infrastructure. It also requires short-term solutions to immediate problems to be aligned with long-term strategies for transformation (Schreuder & Horlings, 2022). Ensuring food security also involves tackling issues related to nutrition, where diverse diets must be made accessible to reduce malnutrition and health disparities.

## Agricultural Sustainability

Agricultural sustainability is critical for maintaining food security while protecting ecosystems and resources for future generations. For D-8 member states, this involves adopting sustainable farming practices that reduce environmental degradation, conserve water, protect soil health, and decrease dependence on synthetic inputs. Key strategies include crop diversification, precision farming, agroforestry and organic farming methods, which enhance productivity while reducing ecological footprints. In this regard, D-8 integration on sustainability entails knowledge-sharing platforms, technological advancements, and collaborative research efforts that could support both smallholder farmers and commercial agriculture. By fostering sustainable agricultural practices, D-8 countries can reduce their greenhouse gas emissions and support climate resilience, ensuring that agricultural productivity is maintained even as climate pressure intensifies.

### Achieving SDG 2, 12, and 13 by 2030

Achieving Sustainable Development Goals 2 (Zero Hunger), 12 (Responsible Consumption and production), and 13 (Climate Action) by 2030 requires a coordinated approach that integrates food security, sustainable agricultural practices and climate resilience. While global targets for food systems exist (for instance through Sustainable Development Goals 2 and 12) and over 150 countries committed to sustainable and equitable food systems at the United Nations Food Systems Summit in 2021, these targets can be broader and bolder (United Nations, n.d.). For D-8 countries, this means implementing policies that promote local food production, reduce food waste and encourage sustainable resource use. Countries need to build more robust national-level action plans, and ensure they are integrated with existing nature and climate commitments (WWF, 2021). Thus, it is worthy of note that collaboration among D-8 nations can drive the adoption of climate-smart practices, support technological innovation, and facilitate data sharing, allowing these countries to track progress and adapt strategies as necessary. By aligning efforts toward these shared goals, together we can address scarcity and promote sustainability in food systems and mitigate climate impacts collaboratively.

## D-8 Intra-State Policies and Institutional Agreements

### Initiatives

The first D-8 Agricultural Ministerial Meeting on Food Security was held on February 25-27, 2009 in Kuala Lumpur, Malaysia. The inaugural meeting set the stage for several initiatives. Key sectors were identified for agricultural and food security. The meeting emphasized harmonizing trade standards across member states. Additionally, the meeting established a working group on almost all the identified areas of cooperation for optimization and harmonization of operations within member states. Given this background, the D-8 has undertaken numerous strategic initiatives since 2009, focused on strengthening agricultural cooperation among member states. These initiatives span critical areas such as fertilizers, animal feed, seed security and trade, standards and trade issues, and marine and fisheries.

### Fertilizers

Following the Kuala Lumpur Initiative, the D-8 organization held several meetings focusing on the fertilizer sub-sector to encourage private sector investment for public-private partnerships for production and to ensuring competitive supply among states. In the meeting held on April 6-8, 2010 in Cairo, Egypt, the working group (WG) established Egypt as the permanent standing committee on fertilizers, which further adopted policies to strengthen cooperation in human resources and technical assistance for creating opportunities. At the WG's second meeting held on May 16, 2011 in Iran, the

private sector as well as fertilizers was the agenda. Bilateral and trilateral trade cooperation among D-8 states was finalized during this meeting. Then an ad hoc meeting took place on March 9-11, 2013, where they discussed production and distribution, leading to a resolution for an MoU on establishing a trade consortium for D-8 fertilizers. The 4<sup>th</sup> meeting of the WG was held on December 4<sup>th</sup>, 2013, in Abuja, Nigeria. It was agreed by all member states a focal point needs to be established for a D-8 fertilizer association and Istanbul was adopted as the interim headquarters for two years. During the 5<sup>th</sup> meeting on December 1-3, 2014 in Istanbul, Turkey, proposal for a D-8 DAP fertilizer plant emerged to explore Nigerian phosphate rock mining for investment. The 6<sup>th</sup> meeting held virtually in December 16, 2020 focused on sustainability and integration of D-8 into the global stage and a delegated centre of D-8 agriculture and food security was established in Faisalabad, Pakistan.

## Animal Feed

After February, 2009, Malaysia and Indonesia were the prime movers D-8 member states to secure and enhance cooperation in animal feed. The first meeting of the D-8 working group on animal feed (WGAF) was held on October 7-8, 2009, in Indonesia, aiming to enhance cooperation in animal feed production and research and development. The second meeting of WG held on May 16, 2011, in Tehran, Iran and regional focal points were appointed for further action and training developments within D-8 member states. In the third WG held on October 3, 2012, in West Nusa Tenggara, Indonesia, members agreed to form research groups on palm kernel cake, rice bran and cassava. In the 5<sup>th</sup> Ministerial Meeting held in December 1-3, 2014, in Istanbul, Turkey, the findings were shared and cassava pellets as feed were proposed.

## Seed Security and Trade

In KL 2009, seed banks were identified as crucial areas for agricultural and food security cooperation among D-8. The First Working committee meeting was held on July 21-24, 2009, in Izmir, Turkey, which focused on the establishment of seed banks backed by Iran and Turkey. In the second WG meeting held in Tehran, Iran on May 16, 2011, they decided to identify topics for seed cooperation and circulate among member states, and development is still ongoing.

## Standards and Trade Issues

During the KL 2009 ministerial meeting, standards and trade were also identified as a key area of cooperation. Similar working groups were able to improve standards to facilitate trade and boost multilateral trade within D-8 economies. The first working group meeting held in Tehran, Iran on May 16, 2011, drafted ToRs shared with D8 member states for further comments and feedback. At the second ministerial meeting held in Tehran, Iran in May 16-18, 2011. Member states adopted strategic initiatives to improve trade and revenue through unified standards and practices. The countries explored pathways for the practice of sharing information on standards and regulation within each member state for further clarity. There was also a focus on harmonization of Halal Standards and the development of D-8 labelling for agricultural commodities. In the third WG meeting held in Mataram, Indonesia on Oct 3<sup>rd</sup>, 2012, all member states considered and adopted the recommended Terms of Reference (ToRs). The vision was to enhance food trade facilities within D8 member states. The fourth agricultural meeting was held on December 1-3, 2014, in Istanbul, Turkey which finalized the feedbacks of member states on ToRs, setting the standards and trade protocols within D-8 member states. The nations also investigated the development of a digital portal for information sharing and made a list of priority products to facilitate trade within D-8.

## Marine Affairs and Fisheries

A focused working group was established during the KL 2009 summit and identified marine affairs and fishery products as an important pillar of food security. Within 3 months the consultative meeting of the WG on marine affairs and fisheries was held on May 2009 in Manado, Indonesia. The agenda centred on technology transfer with strategic initiatives like capacity building training programs in aquaculture. A year after, on April 6-8, 2010, a ministerial meeting on marine and fisheries was held in Cairo Egypt, in which the private sector was identified as a major stakeholder for trade and tariff and non-tariff barriers to trade in fisheries were identified. During the 5<sup>th</sup> D-8 agricultural ministerial meeting on food security, from December 1-3, 2014 held in Istanbul, Turkey, the host proposed to organize training courses for marine aquaculture, and Malaysia proposed to provide the technical cooperation to improve Tilapia ecosystem so it could be sustainable. All members agreed to build a “Project Basket” and D-8 secretariat to submit their proposals and enhance D-8 Secretariat activities.

## Climate-Food-Security Nexus

The climate-food-security nexus addresses the critical interdependence of climate stability, agricultural productivity, and food security (ADB, n.d.). Climate change impacts such as increased temperatures, altered precipitation patterns and more frequent extreme weather events have direct consequences on food systems, particularly in D-8 countries where agriculture is a primary economic driver. These shifts lead to reduced crop yield, soil degradation, and scarcity of water resources, which, in turn, threaten food availability and accessibility. The term “nexus”, coined for the integration of these three different yet interlinked concepts, highlights the need for urgent resilient agricultural practices that can adapt to rapidly changing environmental conditions in the age of the Anthropocene. To ensure food security the D-8 member states also need to capitalize their growing populations. Establishment of the D-8 Research Center for Agriculture and Food Security in Faisalabad Pakistan is a positive step.

## D-8 Projects: Agriculture and Food Security

The D-8 has launched several areas of coordination and collaborative projects aimed at improving agriculture and food security among its member states after 2009. These projects focus on sharing agricultural research, technology transfer, and capacity-building programs to strengthen the productivity and sustainability of food systems. Notable initiatives include the D-8 specialized working groups, which serve as platforms for member states to exchange research findings and innovations that build resilience and trust. Furthermore, D8 projects promote the use of digital information technologies, which allow agricultural communities to make data-driven decisions. Another critical area of collaboration in which Malaysia and Turkey are leading is to enhance technology and training in marine transportation networks for fisheries products. These projects empower knowledge and market access, ensuring a stable food supply chain.

## Disaster Risk Resilience Frameworks

Disaster Risk Resilience frameworks are essential for D-8 countries, which are highly susceptible to natural disasters such as floods, droughts and heatwaves can devastate agricultural production and food systems. Multi-hazard early warning systems (MHEWS) are the proven measure to reduce disaster risk and adapt to a changing climate (UNDRR, 2023). As a result, they can save lives while averting and minimizing losses and damages. MHEWS for D-8 is to involve tri-lateral dialogue to implement frameworks that focus on local risk assessment, rapid disaster preparedness and response strategies to minimize the impacts. Currently, in the context of agriculture and food security, collaborations on

establishing rapid response systems that mobilize resources and aid to affected regions are vital (CSIS, 2023). In addition, resilience frameworks emphasize the need for climate-adaptive green infrastructure, regarding food security systems such as flood resistant irrigation systems, drought and heatwave-resistant crop varieties of wheat and rice, and seed storage facilities and banks (World Economic Forum, 2023). Training is required to equip local communities and officials with skills needed to manage risks effectively and protect vulnerable populations from disaster-induced food insecurity.

## Transboundary Natural Resources

Transboundary natural resource agreements play a crucial role in managing shared resources such as minerals and fisheries that cross national borders within the D-8 region like phosphate rocks in Nigeria. The extraction of such minerals can improve the economic conditions of the local community (Naibbi & Chindo, 2020). Such agreements help prevent resource conflict among people, value and promote sustainable usage of natural resources, and support ecological preservation for natural resilience. For example, D-8 countries sharing phosphate agreements can establish fair distribution of minerals among member states, prevent over-extraction from every ore within the region, protect local community as major shareholder and protect secure biodiversity. Additionally, bilateral, trilateral, and multilateral agreements on forest conservation and sustainable practices in management of biodiversity and ecosystems are necessary. Fostering cooperative management of shared resources is our responsibility for the upcoming generations.

## Barriers to Transformation

The D-8 organization faces significant barriers that hinder its transformation and harmonization of the multilateral development regarding areas of cooperation in agriculture and food security. These are as follows:

### Natural Resource Disputes and Conflicts

One of the critical barriers to D-8 harmonization is ongoing disputes and conflicts around the world. In the past 40 years, natural resources, particularly hydrocarbons, land, and water, are the central element of conflicts around the world (IUCN, 2015). In the last 70 years of great acceleration of economic development and growth, natural resources have been taken for granted, resulting in resource scarcity which is a major factor in regional disputes that hinders food security (Shoshitaishvili, 2021). Due to intensification of natural disasters in the last 30 years, the world observes hydromel anomalies every month (WMO, 2021). This not only disrupts agricultural productivity but also strains logistical supply and chain for cooperation among D-8. It is also about resource colonization of G20-G7 that present another formidable obstacle (Klenk, 2019). Due to continuous interference through sanctions and inadequate technological transfer, peace and prosperity is unstable in the region. Without resolving disputes D-8 member states may find it difficult to achieve cohesive and sustained food security.

### Poor State of Governance

Developing states like D-8 have major issues of corruption and mismanagement of resources within state structures which has a significant impact on growth and trade. Mostly the problem lies in discontinuity of state policies and rapid shifting of practices in favour of the short-term benefits (Mueller, 2020). D-8 states have made a lot of progress on developing frameworks with help of technical working groups, but implementation of those practices is inefficient. Moreover, corruption in public offices drains financial resources, undermining investments in agriculture and food processing. This leads to food scarcity and malnutrition among D-8 member states. Pakistan is one example of being an

agro-based economy while having one of the lowest nutritional values in the world, in terms of what is available to its population. In Pakistan, more than 33% of children are underweight and 44% suffer stunted growth (Asim & Nawaz, 2018). Additionally, the burden of foreign debt further cuts the hands of member states to invest in public development in the areas of cooperation or even implement what has already developed. Many D-8 nations are heavily credited by the World Bank and International Monetary Fund due to past development and disaster recoveries. For example, Pakistan faced floods every year from 1992-2024, which directly impacted the agricultural and food security of the state. Due to debt and climate induced natural disasters financial flexibility is limited and getting weaker in the long run. These loans create a viscous cycle that will only increase vulnerability of upcoming generations.

## Lack of Community Agency

In the last 70 years the earth has seen unprecedented urbanization and industrialization expansion, decoupling humanity from traditional knowledge and practices that once supported sustainable living in the Holocene (Whitmee et al., 2015). This broken link between humanity and nature also emerged as a barrier to development. This detachment from nature erodes the intrinsic understanding of natural ecology and governing nature of earth systems. The D-8 could take on a role in promoting long-term sustainability rather than focusing solely on short-term gains. Another major challenge is fossil-backed growth which has been further catalyzed in the last 150 years by Genetically Modified Organisms (GMOs). Unfortunately, the economic growth based on short-term gains compromised the long-term environmental impacts on soil, water, and air.

## Strengthening climate resilience

Building collective resilience and economic growth are the fundamental objectives of D-8 cooperation. The existential crisis of climate change has already shaken the core of the industrial complex. To restore balance in the biota, D-8 must ensure food security and sustainable agriculture in the long run. Climate change is a multifaceted, multidimensional hazard with short, medium and long-term impacts and unknown consequences. Simply put, the effects of climate change can only be fully understood through observation. D-8 needs to rethink the entire fabric of its cooperation system in agriculture and food security, as vulnerable communities within member states are already suffering from the impacts of droughts and flooding (Azadi et al., 2021). The rapid increase in population will lead to higher demand for food and water. Soil contamination from chemical fertilizers and pests, until now, catered to human population growth, but we have reached an agricultural tipping point (PBS NewsHour, 2023).

## Improving soil health and nutrient level

Soil health is central to sustaining plant growth and production within an ecosystem. Over the past 70 years, farmers have relied on chemically synthesized fertilizers, pesticides, and herbicides to meet the growing demand for food, which have led to ecological disasters (AgroCares, n.d.). Numerous scientific studies in reputable journals have documented the harmful impacts of these fertilizers on both human health and water bodies, as well as their contribution to land degradation (Ongley, 1996). The application of slow-release nitrogen-based fertilizers offers a partial solution (Hashmi et al., 2024). Nitrogen is essential for plant growth and regulation, but excessive nitrogen in chemical fertilizers has led to soil acidification and eutrophication, negatively impacting ecosystems—a common issue across all D-8 member states. By adopting slow-release fertilizers, farmers in D8 countries can conserve soil fertility by reducing nutrient leaching and groundwater contamination, thanks to these advanced biotechnological applications. This approach not only sustains soil nutrients in the long term but also improves nitrogen uptake efficiency and significantly reduces labour costs (Govindasamy et al., 2023).



In addition to such practices, other innovations include crop rotation and phytoremediation. Soil fertility is highly influenced by seed variety, as soil's primary purpose is to incubate seeds and support growth across varieties. On the one hand, crop rotation helps maintain a balanced nutrient profile and disrupts pest cycles developed during legume cycles, thus enhancing microbial growth (VLSCI, 2024). On the other hand, phytoremediation, a nature-based method, removes heavy metal contamination by using specific plants to absorb and degrade pollutants, thus rehabilitating the soil and promoting ecosystem sustainability (Greipsson, 2011). Natural phytoextraction techniques involve plants absorbing heavy metals from the soil and storing them in their biomass, which can then be removed upon harvest. Advanced methods like phytostabilization focus on isolating contaminants within plant roots (Bolan et al., 2011).

Based on the above, livestock manure, a natural fertilizer, can improve soil health and fertility when integrated into agricultural systems (Li et al., 2023). Natural solutions like soil aeration and infiltration also promise to enhance soil health. Only by adopting comprehensive, multidimensional solutions can D-8 member states achieve long-term sustainability. D-8 cooperation should pursue practices that facilitate access to resources and training programs, ultimately leading to a climate-resilient ecosystem.

## Minimizing Food losses and wastage

Significant transformations are required across the food system to achieve climate, biodiversity, and soil health objectives (WWF, 2023). Although there is substantial evidence supporting this need, it has received far less attention at the D-8 level. Setting targets and goals provides a vital roadmap for change and emphasizes the urgency of food system transformation. According to the UNEP Food Waste Index Report (2024), one-fifth of all food produced for human consumption is lost or wasted. This represents one billion meals a day and results in economic losses of around USD 1 trillion. Food waste accounts for 10% of global greenhouse gas emissions, which is almost five times more than the aviation sector. Meanwhile 60% of food waste occurs at the household level. Post-harvest losses and insufficient cold storage facilities also continue to impact food transportation (WWF, n.d.).

## Integration of Nature-Based Solutions (NbS) for LULUCF

Nature based solutions offer an intergenerational holistic approach to Land Use, Land-use change and forestry (LULUCF) that supports climate resilience and environmental sustainability in D-8 countries (Uneathodox, 2024).

### Nature Stewardship

The central building unit of ecosystem restoration and protection revolves around the earth stewardship (Chapin III et al, 2011). D-8 could emerge as a leader in multilateral community through environment-driven initiatives like restoring wetlands, grasslands, and afforestation to manage natural order. Empowering local communities through education and financial incentives can foster a culture of environmental stewardship. (Bennett et al, 2018). D-8 member states can work to prevent the alarming rate of deforestation within their own state territories. On average, for sustainability in the long-run, states need 26% of land mass covered in forest (FAO, 1997). Unfortunately, Pakistan falls short, with only 3-4% forest cover.

### Organic fertilizers

Synthetic, fossil-backed food systems overexploit and inefficiently utilize natural resources. For example, 40% of habitable land is used for food production, consuming around 70% of fresh water. While 75% of our food comes from only 12 crops and 5 animals, 80% of deforestation and 70% of biodiversity

loss are caused by food systems (WWF, n.d.). We need to understand that there are no silver bullets or one-size-fits-all innovations for food systems. Organic fertilizers can mitigate the adverse effects of conventional chemical fertilizers; to overcome the problem of soil health, organic fertilizers are natural materials or their derivatives (EOS, n.d.). In this regard, D8 can incentivize farmers' accessibility to adopt organic fertilization practices and support locally sourced production. Capitalizing on the working group through systematic innovations around the food system can improve strategic planning in the long run.

### ***Indigenous practices***

Indigenous practices offer valuable insights about maintaining the natural order of ecosystems. Most indigenous communities align themselves closely with nature, and in some cultures land, air, and water are considered living entities (World Economic Forum, 2023). Agroforestry, a traditional yet complex management system, combines crops with trees and shrubs to enhance biodiversity and soil fertility (FAO, n.d.).

### ***Discontinue GMO seed banks***

Discontinuing GMO seed banks is a difficult yet crucial step for achieving long-term sustainability. It offers D8 several benefits, provided they are prepared to address some short-term obstacles. Currently, global diets rely on a limited range of 12 crops, which are heavily dependent on disease and pest control sprays. Since the concept of a seed bank is already under consideration, D8 would not need to start from scratch. Member states should focus on preserving traditional seeds, which can retain valuable genetic traits and enhance local agroecological resilience. GMOs are significantly more expensive, hazardous, and non-re-harvestable compared to natural seed varieties, leaving farmers dependent on biotech industries and fertilizer manufacturers.

### ***Climate Services***

According to the WMO Global Annual to Decadal Climate Update 2024-2028, the global mean near-surface temperature for each year between 2024 and 2028 is predicted to be between 1.1°C and 1.9°C higher than the average of pre-industrial years 1850-1900. It is very likely that the global mean temperature will exceed the 1.5°C threshold within the years between 2024 and 2028, with an 86% chance that each consecutive year will be warmer than the previous one. This overshoot of 1.5°C will influence international relations and lead to significant changes in the lives of people around the world. Thus, D8's key achievements represent the diversity of these deliberations and the collective commitments of member states for the present and future of the region—a collective memory of human civilization on Earth, a planet often in crisis but always hopeful. As Secretary-General António Guterres said, “there is still so much to be done” (United Nations, 2020).

### ***Connected in Science: New frontiers for right innovation and impact***

The exposure to climate change poses an existential threat to least-developed nations, as it is no longer a single disaster but a cascading polycrisis. The scientific community now has empirical evidence that each incremental temperature increase will have non-linear impacts (Franzke, 2014). Climate-related innovation is seen not only as a pathway to freedom from fear and want but also as vital to the sustainability of member states.

Science is clear: GHGs are rising, with UNEP (2024) reporting 57.1 GtCO<sub>2</sub>, and global temperatures are breaking records, as extreme weather wreaks havoc on lives and economies. D8 requires urgent and ambitious action to support agricultural sustainability and climate action for food security. Nature and innovation hold tremendous potential to help achieve these global goals. Rapid advances in artificial

intelligence and machine learning have revolutionized weather forecasting, while innovations in space-based Earth observations can improve our monitoring of greenhouse gas emission sources and sinks (WMO, 2024).

Climate models are tools that apply the physical laws governing our climate system to simulate its past, present or future states (Carbon Brief, 2018). Unlike models based on statistical extrapolations of present-day conditions, these models rely on fundamental physical laws governing atmospheric air flow, ocean water movement, and the transfer of heat and moisture on land. These laws remain unchanged even as the climate evolves. Climate processes form a complex matrix of interconnected variables; Earth itself has multiple stable states (PIK, n.d.). Useful information can be obtained by dividing ecosystems vertically and horizontally, aiming to create a reliable model that captures real-time aspects of our regional climate system.

### ***Inter and intra state projects monitoring and real time evaluation***

Efforts to combat climate change and biodiversity are viewed in isolation; however, there is a growing realization of their interconnectedness (Muluneh, 2021). There is an increasing prominence of Nature-based solutions in climate, biodiversity, government and private sector of D8 countries. The inter and intra state projects are focused only on the economic cooperation among member states while critics warn of the risks of chemical intensive fertilizers. D8 needs targets which are unorthodox and aim to food system changes with social innovation to regenerate nature, so maintain a pluralistic view of solutions for the biodiversity crisis and advocate for Nature-based solutions.

### ***Agro-tech integration with space-based observation***

Land use change is a necessary step to meet climate and nature goals. Reform will create impact on wider change in the observation perspective to make a just transition regarding agriculture and food security (IPCC, 2019). Focus should be on specific constraints in D8 that need to be addressed by the development and humanitarian communities. This is particularly relevant to the D8 member states to play an effective leadership role in assessing, improving and scaling up sustainable agriculture and food security policy tools, prioritizing resources, and taking urgent action to avoid being too late to make a difference.

### ***Boost investments in nature-based applications***

While food insecurity is likely to grow, the Food and Agriculture Organization of the United Nations (FAO) and the World Food Programme (WFP) warn that food security is likely to deteriorate further in 18 hunger hotspots across 17 countries during June to October 2024 (WFP, 2024). Transformative nature-based solutions inherently limited. That is, there are some opportunities for framing nature-based solutions towards a viable world sustaining life and regenerating human nature relation. The amount of focus on the amount of finance needs to be discussed in D8 negotiations during next ministerial meeting. There is also need to focus on quality of the finance, including who should get it, where it should be spent and who decides. Revenue will not flow naturally to vulnerable regions because of mismanagement and kickbacks. Instead of donor agencies, D8 member states should be allowed to decide their own priorities and plans. This would be a transformative shift in the conditional modes of financing. In response to the failures of market-based modes of finance to halt biodiversity loss, proposals for alternative finance mechanisms could be “conservation basic flora and fauna” and “Cool Earth” which would help local communities through people-led tropical forest protection. Mostly nature-based solutions are bottom-up mechanisms which shift responsibility from top-down structures.



## ***Accurate forecasting system***

Early warning systems exist all around the world but have unevenly progressed in the last 40 years across the D8 member states. Disaster risk knowledge, observations, forecasting, dissemination, communication, and preparedness to response are the main pillars of accurate forecasting. Limited risk knowledge, for instance, hampers early warning effectiveness which is further aggravated by the gaps in the Global Basic Observation Network (GBON) across large parts of Nigeria and Pakistan (WMO, n.d.). So, it is necessary to monitor and forecast facilities in rural and remote areas through meteorological sensors which can record, and analysis could be done on the micro-climate of agricultural lands. Despite advance in technology such as connectivity, some areas are hard to reach and support like far flung Balochistan and GB areas in Pakistan. Intensive actions are required for comprehensive outreach and engagement.

## ***Transdisciplinary approaches, co-create and implement solutions***

The climate crisis is one of the most serious risks to regional peace and stability. As global hunger intensifies, geopolitical tensions rise over access to critical resources needed for the transition to low-carbon economies. D-8 should conduct a comprehensive weather-related risk analysis that identifies multilateral initiatives and tools to understand climate-related risks to agriculture and food security. In an interconnected world facing multiple, simultaneous crises, complex issues like climate change, food insecurity, conflict, and migration must be treated holistically by leveraging synergies and connecting policies and actions.

## ***Scaling educational training in agronomy and capacity building of small farmers***

D-8 member states are already engaged in capacity building workshops and trainings for harvesting sea food and marine ecosystems, and Turkey is taking the lead in such networking. Hence, member states need to develop a correlation between climate change, agriculture and food security because it will be the big challenge for them to find common agenda. Scaling up educational training in agronomy and engagement with all small farmers will provide the opportunity to establish a comprehensive framework within areas of cooperation in agriculture and food security for D-8 member states. From artificial intelligence to cutting edge satellite technologies and virtual realities that bridge the physical and digital worlds, scientific and technological advances are enhancing agriculture practices, water management and environmental applications as well as informing strategies for responding to global challenges such as sustainable development goals.

## ***Societal value system alternations regarding agriculture and food security***

Climate justice challenges whether governments of member states are equipped to protect the most vulnerable and share the benefits and burdens of crop failures due to climate change. From the recent Global stock take (GST) at COP28, it is loud and clear that governments all around the world are failing to meet Paris commitments to reduce emissions and support adaptation, mostly impacts fall heavily on low-income and marginalized communities which is increasing societal disparities, growing political grievances (UNFCCC, n.d.). The underlying value system is based on social moral standards, and economic development is the common element which unites. The climate crisis is really a fossil fuel crisis, and the development through hydro-carbon fixation (United Nation, n.d.). There are other components will have declining trend in agricultural sustainability and food security but 80% is because of fossil fuels. Scientists around the world have a firm understanding that if humanity even decouples from fossils and achieves net zero today, the GMST will still continue to rise for a period of three to five

years. This will happen because of the positive-feedback loops, and tragically some aspects will keep getting worse.

## Lessons and Recommendations

Transformative policies and practices ensure actions address power imbalance and drive transformational implementation. To harness disintegrated data sets, establishing platforms such as "Climate Hubs" is essential, as explained below. This is focused on Pakistan but could be replicated in other member states.

### Framework for resilience

The global community faces an unprecedented challenge in the relentless impact of climate change. In the wake of historical, permanent climate breakdown, it is imperative to shift our narrative from victimhood to proactive preparedness. This proposal outlines a visionary project: establishing "Climate Hubs" across Pakistan, to transform the crisis of extreme weather events into opportunities for innovation, resilience, and self-reliance. As we witness a surge in extreme weather events in 2023, the need for readiness and preparedness becomes paramount. Staggering statistics from the EMDAT report (2023), which recorded 399 disasters globally with Pakistan experiencing 13 of them, underscore the urgency of adopting a proactive approach. Climate change is no longer an abstract threat; it requires a paradigm shift in our response to the challenges it presents.

### Climate Hubs: A Paradigm Shift

According to German Watch Pakistan (n.d.), Pakistan is one of the most impacted nations in the face of climate change and stands at the forefront of this initiative like other D-8 member states. The floods of 2022 were a stark reminder of the vulnerabilities faced by our communities (Saeed, 2022). Instead of seeking reparations, this proposal advocates for a paradigm shift, viewing impacted areas as live laboratories for interventions and innovations. It envisions Climate Hubs as strategic data entry portals for weather attribution studies, fostering self-reliance and local governance. The core concept of Climate Hubs revolves around a bottom-up approach, empowering sub-local communities and administrations. Nexus between Federal and Provincial capitals, NDMA, PDMA, MET and DDMA departments will be pivotal in running weather attribution studies, with every District Commissioner (DC) Office housing a dedicated room enriched with data harvesting equipment like small NCOCs. The following pathways outline the operational framework of Climate Hubs:

#### *Multi-Indicator Data Collection*

- Deploy sensors on mosques' rooftops to measure meteorological inputs (temperature, moisture, wind, rain) during prayer times.
- Compensate mosques for equipment safety and security, promoting community involvement.

#### *Algorithmic Data Processing*

- Develop an algorithm or computer program to collect daily data averages from mosques.
- Systematically send this meta-data to district administrative authorities for further analysis.

#### *District Meta-Analysis*

- Conduct weekly research findings of district meta-analysis.

- Share results with divisional administrative departments, specifically focusing on agencies like EPA and NDMA for statistical models and demand-based analysis.

### Monthly Provincial Reporting

- Share demand-based analysis with provincial administrative departments.
- Align development funds based on divisions' needs, promoting targeted and effective resource allocation.

### Success Stories and International Collaboration

- Share success stories derived from proactive measures and scientific meta-data with federal departments.
- Utilize the data for weather attribution studies and present findings to international donor agencies for capacity-building operations.

## Conclusion

In addressing the interconnected challenges of agriculture, food security, and climate change, this paper took Pakistan as a case study to illuminate broader vulnerabilities and opportunities across D-8 member states. Pakistan's experiences with climate-induced disruptions show the pressing need for sustainable and inclusive approaches to agricultural resilience. The paper identified significant barriers to food security, including ineffective governance, community disengagement, transboundary resource conflicts, and the compounding impacts of foreign debt and climate injustice. These challenges emphasize the urgency of adopting eco-centric solutions that can be tailored to local contexts as well as regional cooperation. The proposed recommendations centred on nature-based solutions, smart agricultural practices, and strategies to reduce food losses and waste, offering pathways to align with SDGs 2, 12, and 13. A vision of "climate hubs" was proposed as innovative models for weather forecasting and transdisciplinary collaboration, with Pakistan serving as a prototype for implementation across the D-8. These hubs would aim to integrate advanced technologies, build local capacity, and promote people-centred approaches to climate resilience. By leveraging collective action, technological innovation, and policy alignment, D-8 countries can co-develop solutions that ensure long-term food security while mitigating the impacts of climate change. This holistic approach is important for regional solidarity and adaptive strategies in addressing the existential challenges of the Anthropocene, and to ensure sustainable development for future generations.



Author Details Talha Tufail Bhatti (Assistant Research Officer)

<sup>1</sup> Strengthening Regional Climate Resilience Program, Institute of Regional Studies, Islamabad, Pakistan

0009-0007-0273-1420 ✉ environmentalist.bhatti@gmail.com

## References

- Acumen. (2021). *From apathy to action: Practical impact measurement for social change leaders*. Acumen. <https://acumen.org/reports/from-apaty-to-action/>
- AgroCares. (n.d.). *The importance of soil health*. AgroCares. <https://agrocared.com/the-importance-of-soil-health/>



- Asian Development Bank (ADB). (n.d.). *Climate, food, and nature nexus series: COP28*. Asian Development Bank. <https://www.adb.org/climatebank/cop28/climate-food-nature-nexus-series>
- Asim, M., & Nawaz, Y. (2018). Child malnutrition in Pakistan: Evidence from literature. *Children (Basel)*, 5(5), 60. <https://doi.org/10.3390/children5050060>
- Azadi, H., Hosseini, G., Taheri, F., Gebrehiwot, K., & Van Passel, S. (2021). Rethinking resilient agriculture: From climate-smart agriculture to vulnerable-smart agriculture. *Journal of Cleaner Production*, 310, 128602. <https://doi.org/10.1016/j.jclepro.2021.128602>
- Bennett, N. J., Whitty, T. S., Finkbeiner, E., et al. (2018). Environmental stewardship: A conceptual review and analytical framework. *Environmental Management*, 61, 597–614. <https://doi.org/10.1007/s00267-017-0993-2>
- Bolan, N. S., Park, J. H., Robinson, B., Naidu, R., & Huh, K. Y. (2011). Chapter four - Phytostabilization: A green approach to contaminant containment. In D. L. Sparks (Ed.), *Advances in Agronomy* (Vol. 112, pp. 145-204). Academic Press.
- Carbon Brief. (2018). Q&A: How do climate models work? Carbon Brief. <https://www.carbonbrief.org/qa-how-do-climate-models-work/>
- Centre for Research on the Epidemiology of Disasters (CRED). (2023). *EMDAT: The international disaster database 2023 report*. CRED. [https://files.emdat.be/reports/2023\\_EMDAT\\_report.pdf](https://files.emdat.be/reports/2023_EMDAT_report.pdf)
- Center for Strategic and International Studies (CSIS). (2023). *Partnership opportunities to transform food systems*. CSIS. <https://www.csis.org/analysis/partnership-opportunities-transform-food-systems>
- Chapin III, F. S., Power, M. E., Pickett, S. T. A., Freitag, A., Reynolds, J. A., Jackson, R. B., Lodge, D. M., Duke, C., Collins, S. L., Power, A. G., & Bartuska, A. (2011). Earth stewardship: Science for action to sustain the human-Earth system. *Ecosphere*, 2(8), art89. <https://doi.org/10.1890/ES11-00166.1>
- EOS. (n.d.). *Organic vs. synthetic fertilizers*. EOS. <https://eos.com/blog/organic-vs-synthetic-fertilizers/>
- Food and Agriculture Organization of the United Nations (FAO). (2008). *Climate change and food security: A framework document*. FAO. <https://www.fao.org/4/k2595e/k2595e00.pdf>
- Food and Agriculture Organization of the United Nations (FAO). (n.d.). *Introducing climate-smart agriculture (CSA): Chapter A1-1*. FAO Climate-Smart Agriculture Sourcebook. <https://www.fao.org/climate-smart-agriculture-sourcebook/concept/module-a1-introducing-csa/chapter-a1-1/en/>
- Food and Agriculture Organization of the United Nations (FAO). (n.d.). *Overview of agroforestry*. FAO. <https://www.fao.org/agroforestry/about-agroforestry/overview/en>
- Food and Agriculture Organization of the United Nations (FAO). (1997). *State of the world's forests, 1997*. FAO.
- Food and Agriculture Organization of the United Nations (FAO). (2003). *Trade Reforms and Food Security*. FAO. <https://www.fao.org/4/y4671e/y4671e06.htm>
- Franzke, C. (2014). Nonlinear climate change. *Nature Climate Change*, 4, 423–424. <https://doi.org/10.1038/nclimate2245>
- Germanwatch. (n.d.). *Global climate risk index 2021*. Germanwatch. <https://www.germanwatch.org/en/19777>
- Government of Pakistan. (2024). *Agriculture sector overview: Pakistan Economic Survey 2023-24*. Ministry of Finance. [https://finance.gov.pk/survey/chapter\\_24/2\\_agriculture.pdf](https://finance.gov.pk/survey/chapter_24/2_agriculture.pdf)
- Govindasamy, P., Muthusamy, S. K., Bagavathiannan, M., Mowrer, J., Jagannadham, P. T. K., Maity, A., Halli, H. M., G. K. S., Vadivel, R., T. K. D., Raj, R., Pooniya, V., Babu, S., Rathore, S. S., L. M., & Tiwari, G. (2023). Nitrogen use efficiency—a key to enhance crop productivity under a changing climate. *Frontiers in Plant Science*, 14, 1121073. <https://doi.org/10.3389/fpls.2023.1121073>
- Greipsson, S. (2011). Phytoremediation. *Nature Education Knowledge*, 3(10), 7.
- Hashmi, M. L. U. R., Hamid, Y., Usman, M., Luo, J., Khan, S., Sheng, T., Bano, N., Bhatti, T. T., & Li, T. (2024). Assessing the effectiveness of 3, 4-dimethylpyrazole phosphate (DMPP) inhibitor in mitigating N<sub>2</sub>O emissions from contrasting Cd-contaminated soils. *Science of The Total Environment*, 912, 169105. <https://doi.org/10.1016/j.scitotenv.2023.169105>
- Hippler, J., & Ahmed, V. (Eds.). (2022). *Global Pakistan: Pakistan's role in the international system*. Friedrich-Ebert-Stiftung (FES). <https://library.fes.de/pdf-files/bueros/pakistan/19335.pdf>
- Intergovernmental Panel on Climate Change (IPCC). (2019). *Chapter 5: Food security In Special report on climate change and land (SRCL)*. IPCC. <https://www.ipcc.ch/srcl/chapter/chapter-5/>
- International Union for Conservation of Nature (IUCN). (2015). *Addressing the role of natural resources in conflict and peacebuilding: A summary of progress from UNEP's environmental*



- cooperation for peacebuilding. IUCN. [https://iucn.org/sites/default/files/2022-11/-addressing\\_the\\_role\\_of\\_natural\\_resources\\_in\\_conflict\\_and\\_peacebuilding\\_a\\_summary\\_of\\_progress\\_from\\_uneps\\_environmental\\_cooperation\\_for\\_peacebuilding.pdf](https://iucn.org/sites/default/files/2022-11/-addressing_the_role_of_natural_resources_in_conflict_and_peacebuilding_a_summary_of_progress_from_uneps_environmental_cooperation_for_peacebuilding.pdf)
- Klenk, N. (2019). *Earth Day: Colonialism's role in the overexploitation of natural resources*. The Conversation. <https://theconversation.com/earth-day-colonialisms-role-in-the-overexploitation-of-natural-resources-113995>
- Li, X., Qiao, L., Huang, Y., Li, D., Xu, M., Ge, T., Meersmans, J., & Zhang, W. (2023). Manuring improves soil health by sustaining multifunction at relatively high levels in subtropical areas. *Agriculture, Ecosystems & Environment*, 353, 107100. <https://doi.org/10.1016/j.agee.2023.107100>
- Mueller, B. (2020). Why public policies fail: Policymaking under complexity. *Economia*, 21(2), 311–323. <https://doi.org/10.1016/j.econ.2019.11.002>
- Muluneh, M. G. (2021). Impact of climate change on biodiversity and food security: A global perspective—a review article. *Agriculture & Food Security*, 10, 36. <https://doi.org/10.1186/s40066-021-00318-5>
- Naibbi, A. I., & Chindo, M. (2020). Mineral resource extractive activities in Nigeria: Communities also matter! *Journal of Geoscience and Environment Protection*, 8(9), 123–135. <https://doi.org/10.4236/gep.2020.89013>
- Ongley, E. D. (1996). *Control of water pollution from agriculture* (FAO Irrigation and Drainage Paper No. 55). Food and Agriculture Organization of the United Nations. Rome.
- Organisation for Economic Co-operation and Development (OECD). (2023). *Agricultural policy monitoring and evaluation 2023*. OECD Publishing. [https://www.oecd-ilibrary.org/agriculture-and-food/agricultural-policy-monitoring-and-evaluation-2023\\_af245310-en](https://www.oecd-ilibrary.org/agriculture-and-food/agricultural-policy-monitoring-and-evaluation-2023_af245310-en)
- PBS NewsHour. (2023, May 25). *Tipping point: Agriculture on the brink – A PBS NewsHour special* [Video]. YouTube. [https://www.youtube.com/watch?v=soj3kXAGAmY&ab\\_channel=PBSNewsHour](https://www.youtube.com/watch?v=soj3kXAGAmY&ab_channel=PBSNewsHour)
- Potsdam Institute for Climate Impact Research (PIK). (n.d.). *Planetary boundaries*. PIK. <https://www.pik-potsdam.de/en/output/infodesk/planetary-boundaries/planetary-boundaries>
- Saeed, F. (2022, September 1). *Pakistan's floods must be a wake-up call on climate action ahead of Sharm El-Sheikh*. Climate Analytics. <https://climateanalytics.org/comment/pakistans-floods-must-be-a-wake-up-call-on-climate-action-ahead-of-sharm-el-sheikh>
- Schreuder, W., & Horlings, L. G. (2022). Transforming places together: Transformative community strategies responding to climate change and sustainability challenges. *npj Climate Action*, 1(24). <https://doi.org/10.1038/s44168-022-00024-3>
- Shoshitaishvili, B. (2021). From Anthropocene to Noosphere: The Great Acceleration. *Earth's Future*, 9(2), e2020EF001917. <https://doi.org/10.1029/2020EF001917>
- Syed, A., Raza, T., Bhatti, T. T., & Eash, N. S. (2022). Climate impacts on the agricultural sector of Pakistan: Risks and solutions. *Environmental Challenges*, 6, 100433. <https://doi.org/10.1016/j.envc.2021.100433>
- Tekeli, T. (2020). Water resources management and drought combatting strategies in Turkey. *Options Méditerranéennes, Series A*, 37, 71–85. International Centre for Advanced Mediterranean Agronomic Studies. [https://www.ciheam.org/uploads/attachments/261/018\\_Tekeli\\_WL\\_37.pdf](https://www.ciheam.org/uploads/attachments/261/018_Tekeli_WL_37.pdf)
- Unearthodox. (2024, June). *New report on nature-based solutions*. Unearthodox. <https://uneearthodox.org/2024/06/new-report-on-nature-based-solutions/>
- United Nations Environment Programme (UNEP). (2024). *Emissions gap report 2024*. UNEP. <https://www.unep.org/resources/emissions-gap-report-2024>
- United Nations Environment Programme (UNEP). (2024). *Food waste index report 2024*. UNEP. <https://www.unep.org/resources/publication/food-waste-index-report-2024>
- United Nations. (n.d.). *Food Systems Summit*. United Nations. <https://www.un.org/en/food-systems-summit>
- United Nations. (n.d.). *Key findings*. UN. <https://www.un.org/en/climatechange/science/key-findings>
- United Nations Framework Convention on Climate Change (UNFCCC). (n.d.). *Why the global stocktake is important for climate action this decade*. UNFCCC. <https://unfccc.int/topics/global-stocktake/about-the-global-stocktake/why-the-global-stocktake-is-important-for-climate-action-this-decade>
- United Nations Office for Disaster Risk Reduction (UNDRR). (2023). *Global status of multi-hazard early warning systems 2023*. UNDRR. <https://www.undrr.org/reports/global-status-MHEWS-2023>

- United Nations. (2020, December 2). *Secretary-General's remarks to the Security Council on the impact of climate change on international peace and security* [Press release]. United Nations. <https://press.un.org/en/2020/sgsm20264.doc.htm>
- Verdesian Life Sciences (VLSCI). (2024). *Crop rotation benefits*. Verdesian Life Sciences. <https://vlsci.com/blog/crop-rotation-benefits/>
- Voice of Global South The World Is One Family. (2023, September 1). *Balancing food insecurities: GMO seeds offer relief to the global south*. LinkedIn. <https://www.linkedin.com/pulse/balancing-food-insecurities-gmo-seeds-offer-relief-global-south/>
- Whitmee, S., Haines, A., Beyrer, C., Boltz, F., Capon, A. G., Ferreira de Souza Dias, B., Ezeh, A., Frumkin, H., Gong, P., Head, P., Horton, R., Mace, G. M., Marten, R., Myers, S. S., Nishtar, S., Osofsky, S. A., Pattanayak, S. K., Pongsiri, M. J., Romanelli, C., ... & Wilkinson, R. (2015). Safeguarding human health in the Anthropocene epoch: Report of The Rockefeller Foundation–Lancet Commission on planetary health. *The Lancet*, 386(10007), 1973–2028. [https://doi.org/10.1016/S0140-6736\(15\)60901-1](https://doi.org/10.1016/S0140-6736(15)60901-1)
- World Bank. (2022). *Putting Pakistan's food system on a path to greater sustainability and resilience*. World Bank Blogs. <https://blogs.worldbank.org/en/endpovertyinsouthasia/putting-pakistans-food-system-path-greater-sustainability-and-resilience>
- World Bank. (2022, October 17). *What you need to know about food security and climate change*. World Bank. <https://www.worldbank.org/en/news/feature/2022/10/17/what-you-need-to-know-about-food-security-and-climate-change>
- World Food Programme (WFP). (2024). *Hunger hotspots: June to October 2024 outlook*. WFP. <https://docs.wfp.org/api/documents/WFP-0000159235/download/>
- World Economic Forum. (2023, August). *5 ways Indigenous people are protecting the planet*. World Economic Forum. <https://www.weforum.org/stories/2023/08/indigenous-people-protecting-planet/>
- World Economic Forum. (2023). *7 ways to boost food security in the face of climate change*. World Economic Forum. <https://www.weforum.org/stories/2023/09/7-ways-to-boost-food-security-in-the-face-of-climate-change/>
- World Meteorological Organization (WMO). (n.d.). *Global basic observing network (GBON)*. WMO. <https://wmo.int/activities/global-basic-observing-network-gbon>
- World Meteorological Organization (WMO). (2024). *United in science 2024*. WMO. <https://wmo.int/publication-series/united-science-2024>
- World Meteorological Organization (WMO). (2021). *Weather-related disasters increase over past 50 years, causing more damage but fewer deaths*. WMO. <https://wmo.int/media/news/weather-related-disasters-increase-over-past-50-years-causing-more-damage-fewer-deaths>
- World Meteorological Organization (WMO). (2024). *WMO global annual to decadal climate update 2024-2028*. WMO. <https://wmo.int/publication-series/wmo-global-annual-decadal-climate-update-2024-2028>
- World Wide Fund for Nature (WWF). (n.d.). *Food and sustainable land use*. WWF. [https://wwf.panda.org/discover/our\\_focus/food\\_practice/food\\_and\\_sustainable\\_land\\_use/](https://wwf.panda.org/discover/our_focus/food_practice/food_and_sustainable_land_use/)
- World Wildlife Fund (WWF). (2023). *Food systems transformation: Ensuring regenerative and resilient food production and consumption*. WWF. <https://www.worldwildlife.org/publications/food-systems-transformation-ensuring-regenerative-and-resilient-food-production-and-consumption>
- World Wide Fund for Nature (WWF). (2024). *Living planet report 2024: Key messages*. WWF. <https://livingplanet.panda.org/living-planet-report-2024-key-messages/>
- World Wide Fund for Nature (WWF). (2021). *More countries including nature in their climate action plans, but step change still needed to secure 1.5°C pathway: WWF report*. WWF. [https://wwf.panda.org/wwf\\_news/?4248391/NDCsreport](https://wwf.panda.org/wwf_news/?4248391/NDCsreport)
- World Wide Fund for Nature (WWF). (n.d.). *Reducing post-harvest food loss at storage, transport, and processing levels*. WWF. <https://foodforwardndcs.panda.org/food-supply-chains/reducing-post-harvest-food-loss-at-storage-transport-and-processing-levels/>
- World Wide Fund for Nature (WWF). (2022). *Solving the great food puzzle*. WWF. [https://wwfint.awsassets.panda.org/downloads/solving\\_the\\_great\\_food\\_puzzle\\_wwf\\_2022.pdf](https://wwfint.awsassets.panda.org/downloads/solving_the_great_food_puzzle_wwf_2022.pdf)





## Energy Sector Dynamics and the Role of the Developing-8 in Nigeria



Stanley Uche Akachukwu <sup>1</sup>

<sup>1</sup> Stanley Uche Akachukwu Bashir Adeniyi Centre for International Trade and Investment, Research and Studies Department, Nigerian Institute of International Affairs, Lagos, Nigeria

### Abstract

The study examined the dynamics of energy sources and the role of the D-8 in Nigeria's energy sector. Nigeria is one of the members of the Developing-8 organization with great potential for renewable (hydrocarbon, biofuel, and Solar energy) and non-renewable energy resources (crude oil and natural gas). However, Nigeria faces serious energy shortages resulting from inadequate investment in energy resources, savings gap, and lack of political will to harness various energy mixes. The developing-8 organization aims to help member states to harness their energy potential for shared prosperity and sustainable development. The dynamic effect theory of economic integration provided the framework. A descriptive statistics methodology that classifies different energy mixes and shows the energy sources of Nigeria and other D-8 member states was applied. Renewable (Bioenergy, Hydropower, solar) and non-renewable (crude oil, natural gas) energy-generating sources were considered. The study found that different countries in the D-8 focused on generating one form of energy mix; countries that are rich in crude oil resources concentrate on nonrenewable energy-generating sources (Nigeria and Iran) while those with low or no crude oil resources, source their energy from renewable (Turkey, Pakistan, Bangladesh). The result showed lack of political will to invest in renewable energy by crude oil-rich countries (Nigeria and Iran), probably resulting from Eurocentric ideology on climate change. The D-8 organization established the Network of Pioneers for Research and Innovation (D-8 NPRI) to advance research and knowledge capital in Nigeria. D-8 Technology Transfer and Exchange Network (D-8 TTEN) is set up for capacity building among the member nations. Developing-8 organization needs to build a replica of the D-8 International University, Hamadan, or creates D-8 career-building centers in 2 or 3 existing universities in Nigeria to boost capacity building. Doing this will aid in creating more awareness and correct the asymmetric information concerning renewable energy.

### Keywords

Energy · Developing-8 · Nigeria · Economy · Sustainable Development



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Corresponding author: Stanley Uche Akachukwu [akachukwustan@gmail.com](mailto:akachukwustan@gmail.com)

## Introduction

The energy sector in Nigeria is a critical component of the nation's economic framework, influencing industrial growth, social development, and global competitiveness. As Africa's largest economy, Nigeria has vast energy resources, including crude oil, natural gas, and the potential for renewable energy. However, the sector faces significant challenges, attributed to infrastructural deficits, policy inconsistencies, and insufficient investment due to the savings gap. These issues hinder its capacity to meet the increasing energy demands of its population and industries. Recently, economic cooperation has emerged as a crucial mechanism in fostering economic growth and development among member states in an era characterized by globalization and interdependence. The Developing-8 Organization for Economic Cooperation (D-8 or Developing-8), comprising Nigeria and seven (7) other developing countries, List the seven other D-8 member states (Bangladesh, Egypt, Indonesia, Iran, Malaysia, Pakistan and Turkey) provides a unique framework for collaboration in critical sectors, such as energy, and aims to achieve sustainable development. The priority areas of the Developing-8 collaboration are energy and industry, agriculture and food safety, trade, transportation, health, and tourism among others.

D-8 organization acknowledges the crucial role that energy plays in the economic transformation of modern society. To this end, it has actively made efforts to mobilize resources and foster cooperation in the energy sector among the member states. Evidently, the D-8 organization contributes to about 10.07% and over 4% of world crude oil production and electricity generation from renewable sources respectively (World Bank, 2025 Developing-8, 2025). The D-8 cooperation through capacity-building programs, viable financing mechanisms, energy-use efficiency, and sustainability of supply has received increasing attention in recent years among its member states. In Nigeria, the Board of Directors of Nigerian Bulk Electricity Trading PLC (NBET) visited the Republic of Turkey to sign a partnership deal with Energy Exchange Istanbul (EXIST) in 2022, with a view to turn around the fortune of Nigerian power sector reform efforts for more improved performance (Nigeria Ministry of Power, 2022). The Secretary-General emphasized the key importance of the energy sector towards achieving the goals of economic growth in D-8 member countries and pledged the support of the organization for Nigeria's Energy Transition Plan. The establishment of the Network of Pioneers for Research and Innovation (D-8 NPRI) is another strategic investment cooperation by the D-8 that focuses on human capital development by the member states. The NPRI is a research hub that promotes collaborative innovative research in critical sectors such as biotechnology, green energy, smart agriculture, and advanced manufacturing among the member states. The last NPRI meeting was held in Nigeria at the University of Ilorin, in November 2024. NPRI promotes human capital, innovation in the energy sector, and ultimately economic development in Nigeria. Unarguably, there are other frameworks through which D-8 supports economic and social development, that aim at improving the citizens' welfare.

Therefore, as Nigeria seeks to harness its energy potential for national development, partnerships, particularly through the D-8, become increasingly vital in addressing the energy sector's multifaceted challenges. Nigeria possesses a lot of potential for development ranging, from its large demography, untapped natural resources, and inexpensive skilled and unskilled workforce. The study aims to examine the contribution of D-8 initiatives in Nigeria's energy policies, and perhaps, elucidate pathways for a more integrated and sustainable energy future for Nigeria and the D-8.

## Theoretical Perspective of D-8 Economic Integration

The study is anchored on the dynamic (new) theory of economic integration formulated by Balassa (1961). The theory rose on the heels of the limitations of the static theory of integration. One of the limitations of the static theory is the inability to prioritize the welfare of the member countries as a focal

point. Hence, Balassa (1962), and Cooper and Massell (1965) introduced the economic welfare effect as a cardinal point and the economic rationale behind the formation of economic integration especially in developing countries. This suggests that any economic integration should be centered on promoting the welfare of its member states. The theory outlines certain principles of the dynamic effect of economic integration in modern society. These include large economies of scale, technological change/transfer, productivity growth, investment activity, market structure, and competition. These principles are the factors driving the current economic integration process in the D-8. Dynamic theory acknowledges the vital role of the private sector and Foreign Direct Investment. These factors are not included in the previous theories of integration that were set up on regionalism. The dynamic theory best explains the Developing-8 formation and the roles it plays among its member countries. The mandate of the D-8 is capacity building and knowledge sharing, especially in the energy sector, which is rooted in the principles of dynamic theory<sup>1</sup>. The paper adopts descriptive statistics to analyze energy dynamics in D-8 and the roles of Developing-8 in Nigeria's energy sector.

## Energy Sources

Energy sources are divided into renewable and non-renewable energy. Renewable energy resources are those that can be replenished over time, while non-renewable energy resources cannot. Renewable energy is generated from natural and sustainable resources such as the sun, wind, and water. While non-renewable energy is generated from finite resources such as coal, oil, and natural gas. This section examines the different components of renewable and non-renewable energy across the D-8

## Non-Renewable Energy in Developing-8

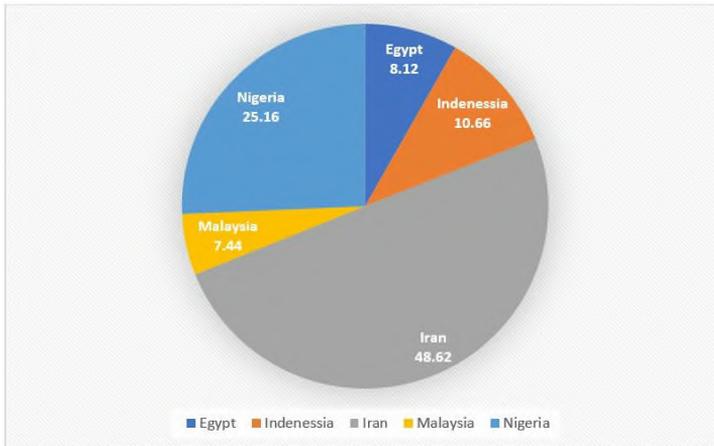
### Oil

Non-renewable energy sources, such as coal, oil, and natural gas, constitute the backbone of global energy production including Nigeria, but come with significant environmental costs. For example, the extraction process of fossil fuels, and the burning of coal for electricity generation release high levels of carbon dioxide and pollutants and contribute to climate change. Non-renewable energy has become a famous and most tradable energy source globally. Iran has the highest proven oil reserve with an average estimated value of about 182 billion barrels from 2014-2023 in the D-8 member nations. Nigeria is the next country with the highest proven oil reserve in the cooperation with an average value of 37 billion barrels in the same period. In the Developing-8, the data we collated shows that Bangladesh, Turkey, and Pakistan do not have oil reserve records; hence, the zero oil production.

Other Developing-8 member countries have varying quantities of oil production. [Figure 1](#) shows the proportion of crude oil production in the Developing-8. The Islamic Republic of Iran is the largest producer of oil with 48.62%. The data reveals that Nigeria produces one-quarter of the Developing-8 production within the period. The other countries (Egypt, Malaysia, and Indonesia) produce 8.1%, 7.4%, and 10.6% respectively as shown in [Figure 1](#). Nigeria has been an oil-dependent economy for over four decades and its foreign exchange majorly comes therein. Nigeria's overreliance on oil production and export makes it difficult to shift rapidly to renewable energy. Therefore, Nigeria presents a good opportunity as one of the countries in transition for renewable energy among the D-8. The participation of the D-8 in the ninth session of the International Renewable Energy Assembly in 2019 in the United Arab Emirates was aimed at supporting countries in transition like Nigeria in their quest to achieve a sustainable energy future.

<sup>1</sup>See: Developing 8 Network of Pioneers for Research and Innovation

**Figure 1**  
Developing-8 Crude Oil Production, 2009-2023 (%)



Source: OPEC Annual Statistics Bulletin, 2024

The study further examines the dynamics of crude oil export in these countries. It was observed that Iran, Nigeria, Egypt, and Malaysia crude oil exports were 73.6%, 88.1%, and 89.9% of their total oil production in 1990. As of 2023, the crude oil exports of Nigeria and Malaysia were more than 95% of their respective total oil production. Egypt and Iran exported 22% and 60% of their oil production respectively. These statistics imply that Egypt and Iran refined more of their crude oil locally in recent years, unlike Nigeria and Malaysia, which witnessed an increase in their share of crude oil exports to crude oil production. The above dynamics signify that Egypt and Iran had invested in local refineries and can refine more proportion of their crude domestically. In Nigeria, the rising proportion of crude oil exports compared to oil production can be attributed to the absence of functional domestic refineries. This situation forces Nigeria to export most of its crude oil to other countries, like India, Spain, France where it is often sold at relatively low prices and imported as refined petroleum.

In as much as Nigeria is expected and striving to transition to renewable energy sources, they may not quickly abandon crude oil production. Some political scholars from crude oil-rich economies have come up with a Eurocentric ideology on renewable energy and climate change. Most crude oil-rich states believe that the recent advocacy on renewable energy and its climate change impact is a ploy by the Western nations to change the global energy dynamics in their favour. Eurocentric ideologist often views advocacy on renewable energy through the lens of industrialized nations trying to dominate the global energy sources and ultimately underdeveloped the global south. They opine that indigenous knowledge and local adaptation strategies are often sidelined in favor of Western scientific and economic models. They argue that Western nations historically, are responsible for causing climate change given their historical record of burning fossil fuels. Oil-rich nations in the global south persist in crude oil exploration and are reluctant to transition to renewable energy. This could be one of the obstacles hindering renewable energy development in Nigeria. The Developing-8 needs to deal with such misconceptions and myths through investment in research and involving Indigenous experts in their programs.

There are new technological ways of oil production that are more efficient and environmentally friendly, that can be acquired. D-8 ought to complement such collaboration with Nigeria. D-8 should engage Nigeria in its oil refining modalities; ensuring that the refineries work using modern and efficient technologies. This will help in conserving foreign exchange. It will reduce the exportation of greater

amounts of Nigeria's crude oil which comes with a paltry return. Doing this will mutually help in solving D-8 petroleum demand.

## Natural Gas

Natural gas has emerged as a pivotal energy source in the quest for sustainable development and economic growth in many nations. The Developing-8 boasts vast reserves of natural gas and its production. Natural gas reserves are unevenly distributed across the D-8 countries. The latest assessment from 2023 D-8 BASEIND data for energy, shows that Iran, Nigeria, Egypt, and Malaysia account for 33,988 trillion cubic feet (tM<sup>3</sup>), 5,943 tM<sup>3</sup>, 2,209 tM<sup>3</sup> and 2,056 tM<sup>3</sup> respectively. Iran is estimated to possess the second-largest gas reserves globally.

Nigeria is the second largest country in the D-8 with proven gas reserves, estimated at over two trillion cubic feet, and a leading producer in Africa (D-8 BASEIND, 2023). The Nigeria Liquefied Natural Gas (NLNG) company is entrusted with converting Nigeria's natural gas into a liquefied form for export. While natural gas is often touted as a cleaner alternative to coal and oil, its production and consumption are not without environmental concerns. The D-8 countries are increasingly aware of green energy transitions and the need for sustainable practices in natural gas extraction and utilization. Efforts to mitigate the environmental impact of gas production include investing in more efficient extraction technologies and fostering policies that minimize methane emissions—a potent greenhouse gas associated with natural gas. Malaysia along other countries are already exploring ways to integrate renewable energy with natural gas to create a more sustainable energy framework.

From the analysis, Nigeria has a proven gas reserve greater than Malaysia, which is about to integrate its renewable energy with natural gas. D-8 is expected to take up such an initiative and see how they would help Nigeria and other D-8 member states to have cleaner natural gas. The Malaysian model of converting natural gas to renewable energy should be studied by D-8 member states such as Nigeria. Such knowledge and technical transfer should be influenced by the D-8 organization to improve sustainable energy security. The collaboration with the International Renewable Energy (IRENE) should encompass natural gas and how to make it more eco-friendly.

## Production of Natural Gas in D-8

The analysis examined natural gas production in Developing-8 from 2005-2023 as shown in [Table 1](#). The data indicates there is improvement in natural gas production in all the D-8 countries except Turkey, which has no observations. Iran is the largest natural gas producer among the D-8 member states with an average total of 257.148 billion cubic feet or 46.09% of the total natural gas production from 2019-2023. Malaysia follows with an average value of 63.31 billion cubic feet (bCF), corresponding to 12.24%. Egypt, Indonesia, Nigeria, Pakistan, and Bangladesh follow in that order and contribute 11.64%, 10.54%, 8.35%, 6.56%, and 4.5% respectively. [Table 1](#) indicates that all the countries have made progress in natural gas production over the period reviewed.

Nigeria produced 22.4 million cubic feet (mCF) in 2005. In 2023, Nigeria's natural gas production rose to 42.4mCF which is about 89.2% increase. Iran, Indonesia, and Malaysia's natural gas outputs were 103500mCF, 14500mCF, and 55980 mCF respectively in 2005. The production of Iran, Indonesia, and Malaysia increased by about 166.1%, 101.6%, and 28.2% respectively in 2023. The rise in natural gas production in the D-8 countries may be linked to the agreement they had in the 4<sup>th</sup> D-8 Working Group on Energy Cooperation in 2008 in Cairo, Egypt. In the meeting, grants were allotted to encourage all member groups to intensify action in the development of alternative and renewable energy resources, to address energy crises. Rising local demand for liquefied petroleum gas (LPG) by households and

global gas export growth driven by the energy transition also contributed to the rise in natural gas production.

For Nigeria, irrespective of the progress made in gas production, the country has struggled with turning natural gas into a domestically consumed commodity. A large proportion of the gas produced is flared—an environmentally detrimental practice where excess gas from oil production is burned off—due to inadequate infrastructure for distribution and utilization. According to the Nigerian National Petroleum Corporation (NNPC), Nigeria loses an estimated \$2.5 billion annually from gas flaring, alongside adverse environmental impacts. The infrastructure needed for natural gas distribution and utilization remains highly underdeveloped. The lack of extensive pipeline networks limits access to gas for industries and households, resulting in continued reliance on more expensive fuel sources such as diesel and firewood. The government's initiatives, such as the National Gas Policy (2017) and the Nigerian Gas Master Plan, aim to enhance infrastructure development, diversify supply sources, and encourage investments to optimize the benefits of natural gas. The D-8 collaboration with the International Renewable Energy Agency (IRENA) is a welcome development for Nigeria's gas production.

## Benefits of D-8 Collaborative Investment in the Nigeria Natural Gas Sector

- (i) Many D-8 countries, such as Turkey and Malaysia, have developed advanced technologies in the energy sector and can share expertise with Nigeria. The collaborative ventures could enhance the efficiency of gas extraction and processing through improved methodologies, innovative practices, and the introduction of renewable energy integration with natural gas. For instance, advancements in Liquefied Natural Gas (LNG) technology could improve Nigeria's ability to tap deeply into global markets.
- (ii) Nigeria can serve as a hub for D-8 countries to access energy resources in West Africa, promoting energy stability in the region. This can be achieved by strategically aligning natural gas investments with holistic regional energy policies, D-8 countries can strengthen energy security and reduce dependency on external energy sources.

**Table 1**

*Production of Natural Gas in D-8 (millions, cubic feet)*

Yrs	B/desh	Egypt	Iran	Malaysia	Nigeria	Pakistan	Indonesia
2005	14500	42,500.00	103,500.00	55,980.00	22,400.	35,500.00	71850
2006	15320	54,700.00	108,600.00	60,160.00	28,500.00	36,120.00	71140
2007	16270	55,700.00	111,900.00	59,590.00	32,500.00	36,800.00	68590
2008	17900	58,970.00	116,300.00	60,900.00	32,825.00	38,000.00	70000
2009	19600	62,690.00	175,742.00	60,400.00	23,206.00	38,710.00	72400
2010	19910	61,330.00	187,357.00	61,470.00	28,099.00	39,630.00	80460
2011	20110	61,260.00	188,753.00	61,730.00	41,323.00	39,150.00	76250
2012	22030	60,600.00	202,431.00	62,040.00	42,571.00	41,460.00	74170
2013	22800	56,900.00	199,293.00	64,900.00	38,411.00	39,400.00	73800
2014	23800	48,800.00	212,796.00	65,420.00	43,841.56	39,070.00	73450
2015	26800	44,350.00	226,673.00	63,100.00	45,148.11	39,300.00	72800
2016	26300	42,100.00	226,905.00	64,400.00	42,562.44	38,800.00	72200

Yrs	B/desh	Egypt	Iran	Malaysia	Nigeria	Pakistan	Indonesia
2017	26500	51,900.00	238,003.00	68,000.00	45,434.07	38,820.00	70400
2018	26450	62,100.00	233,060.00	66,310.00	44,250.79	38,100.00	70200
2019	25310	67,470.00	241,730.00	68,100.00	47,827.88	37,400.00	63940
2020	23500	60,740.00	249,630.00	62,900.00	49,947.29	35,800.00	56000
2021	24000	70,400.00	257,118.90	67,240.00	48,572.31	37,300.00	55770
2022	24600	67,000.00	262,261.28	71,600.00	44,307.05	36,800.00	58072
2023	29232	59,328.00	275,000.00	71,740.00	42,403.00	35,912.39	60374

Source: D-8 basic, social and economic indicator, 2024

## Renewable Energy

The escalating impacts of climate change present a pressing global challenge that demands immediate and effective action. Central to addressing the climate change crisis is the transition from fossil fuels<sup>2</sup> to renewable energy sources, a transformation that not only mitigates greenhouse gas emissions but also fosters sustainable economic growth and energy security. Renewable energy sources are cleaner, more sustainable, and environmentally friendly. Renewable energy, including solar, wind, hydropower, and geothermal, harnesses naturally replenishing resources and presents a viable alternative to oil, coal, and natural gas. Energy and environmental policymakers have encouraged the global transition to renewable energy to address climate change and promote energy sustainability. D-8 has in many fora<sup>3</sup> encouraged its member states to adapt to the new energy shift to foster robust economic development. Gains from transiting to renewable energy include improvement in the quality of air and public health, thereby enhancing the quality of life and productivity. Preservation of freshwater resources for agricultural use and the ecosystem. The adoption of renewable energy by the D-8 will drastically reduce floods, drought, and rising sea levels resulting from the burning of fossil fuels in the region. Ultimately, renewable energy will lead to the creation of green jobs and a smart economy.

## Renewable Energy and Developing-8 Countries: A Pathway to Sustainable Development

The pressing challenges of climate change, environmental degradation, and energy insecurity have necessitated a global shift towards renewable energy sources. For Developing-8 countries—renewable energy presents both a significant opportunity and a pathway to sustainable development. This section explores the potential of renewable energy to enhance energy security, drive economic growth, and promote environmental sustainability in D-8 countries.

### The Renewable Energy Landscape in D-8 Countries

Developing-8 countries are characterized by diverse energy needs. Many of these nations rely heavily on fossil fuels to meet energy demands, contributing to greenhouse gas emissions and environmental degradation, for example, Iran and Nigeria. However, with significant renewable energy resources available—such as solar, wind, hydro, and biomass—these countries have the potential to transition towards sustainable energy systems. For instance, Indonesia and Malaysia are blessed with abundant palm oil and geothermal resources, while Turkey has vast wind and solar potential. They

<sup>2</sup>Fossil fuels contribute to environmental degradation through pollution and greenhouse gas emissions,

<sup>3</sup>D-8 3<sup>rd</sup> Working Group on Energy in Bogor, Indonesia 6-7 July 2008



(Indonesia, Malaysia, and Turkey) can partner with other D-8 states (Nigeria, Iran) to meet their energy demand while protecting the environment. Such collaboration among the D-8 will positively influence the energy transition and make it very smooth and economically viable.

### ***Economic Growth and Job Creation***

Investing in renewable energy sectors can foster economic growth in the D-8 countries. Transitioning to renewables stimulates local economies by creating jobs in manufacturing, installation, and maintenance of renewable energy technologies. According to the International Renewable Energy Agency (IRENA), the renewable energy sector has already created millions of jobs globally. For instance, Malaysia's commitment to solar energy has opened avenues for local companies, driving innovation and entrepreneurship. In Nigeria, investment in off-grid solar projects is not only reducing energy poverty but also creating jobs and supporting local businesses.

### ***Energy Security and Accessibility***

Energy security remains a critical concern for D-8 nations, which often face issues associated with energy imports, fluctuating fossil fuel prices, and energy supply instability. By harnessing domestic renewable energy resources, these countries can reduce reliance on imported fuels, thereby enhancing their energy security. Moreover, renewable energy technologies, particularly distributed generation systems such as solar home systems, can improve energy accessibility in rural and underserved areas. For example, Bangladesh's solar home systems initiative has successfully brought electricity to millions of off-grid households, improving quality of life and enabling economic activities. In Nigeria, solar home energy system is taking centre stage in many homes, though, the price of acquiring it is averagely very expensive.

### ***Environmental Sustainability and Climate Change Mitigation***

Transitioning to renewable energy is essential for mitigating climate change impacts and reducing environmental degradation, both of which are pressing challenges for D-8 countries. Many of these nations are particularly vulnerable to climate risks such as flooding, droughts, and extreme weather events. The adoption of renewable energy technologies can lead to significant reductions in greenhouse gas emissions, thus contributing to global climate change mitigation efforts. Additionally, renewables can help combat air pollution, a serious health threat in many urban centres across D-8 countries, by replacing polluting fossil fuels with cleaner energy sources.

### ***Challenges and Opportunities***

Despite the clear benefits, D-8 countries face several challenges in transitioning to renewable energy. Limited financial resources, inadequate infrastructure, and institutional barriers can hinder progress. Moreover, there may be resistance from vested interests in the fossil fuel sector. However, international cooperation and investment can provide much-needed support. Collaborative initiatives, technology transfer, and capacity-building efforts can facilitate the development of renewable energy systems in these countries. Notably, partnerships with private investors and multinational organizations can drive innovation and share best practices.

Conclusively, renewable energy represents a beacon of hope for the Developing-8 countries, offering a pathway to enhance energy security, economic growth, and environmental sustainability. As these countries navigate the complexities of energy transition, embracing renewable technologies can not only address immediate energy needs but also build a resilient, sustainable future. By leveraging their unique resources and fostering international collaboration, D-8 countries can emerge as leaders in the

global renewable energy landscape while addressing the pressing challenges of our time. Emphasizing renewable energy is not just an option; it is an imperative for the sustainable development of D-8 countries and the global community as a whole.

## Renewable Energy Generation in D-8

The section considers the quantity of electricity generation through renewable energy in the D-8 countries. The data observed from 2005-2023 reveals that Turkey has the highest renewable energy capacity amounting to 31,053.01 Megawatts (MW) on average. Iran is the second highest with a capacity of 9,960.23 MW in the same period. Other countries that follow in descending order are Pakistan, Indonesia, Malaysia, Egypt, Nigeria, and Bangladesh with average values of 9228.16, 8563.41, 5846.19, 4207.63, 2179.65, and 474.73 respectively.

Considering electricity generation from these countries given their capacity<sup>4</sup>, Bangladesh, Iran, Malaysia, Pakistan, and Turkey generation declined moderately from 2006 – 2009/2010. Nigeria's data portends an interesting trend. Table 2, (column 6) indicates that electricity generation trended downwards from 2005 – 2012. This is attributed to bureaucratic bottlenecks and financial difficulty during the period before the privatization of the electricity generation plants in Nigeria. After the privatization, the data shows a moderate increase from 2013 – 2023. Since Nigeria relies heavily on fossil fuels, they were reluctant to embrace renewable energy sources. Recently, given a lot of advocacy and many protocols around renewable energy and climate change actions, Nigeria is involving and channeling resources in renewable energy. Nigeria starts promoting and disseminating renewable energy devices and technologies for their adoption, and market through organizations like Developing-8, International Electrotechnical Commission, African Union, and IRENA.

Egypt and Indonesia's renewable electricity generation have been trending upwards over the period under consideration. The improvement in renewable energy in the two countries may be connected to the fact that they are not rich in crude oil reserves, hence, they focus more on renewable energy to enjoy “a” after enjoy comparative advantage. The abundance of water could have facilitated investment in renewable energy resources in the two countries.

Generally, it is glaring that renewable electricity generation has been improving and trending upward in the D-8 countries. Interestingly, from the analysis in Table 2, Turkey has the highest renewable electricity capacity and still generates the highest electricity, totaling about 76120.84 (GW/h) on average between 2005-2023. Indonesia (37426.21GW/h), Pakistan (35681.11GW/h), Egypt (16993.88GW/h), and Malaysia (16940.78GW/h) generate higher renewable energy than Iran in the same period, even though, Iran possesses higher capacity in renewable energy. The relatively low renewable electricity generation in Iran may be connected to the high dependency of the country on fossil fuel oil and the lack of willpower to invest in renewable. Nigeria's electricity generation from renewable has been moderately improving but relatively minimal when compared to other D-8 countries. In 2013, Nigeria generated 6140.5 GW/h in renewable electricity, a decade later; it recorded 9,447.20 GW/h which is about 53.8% improvement. However, Malaysia, Turkey, Indonesia, and Egypt's renewable energy growth rate from 2013 to 2022 was 141.6%, 99%, 82.7%, and 79% respectively. The growth observed in these countries is attributed to the massive investment by the government in renewable energy which incentivized and attracted private sector participation in the sector. For example, the D-8 Human Development Centre (HDC) collaborated with Telekom, Malaysia to provide communication services and digital infrastructure (D-8, 2024). Similar partnership can be extended to Global Com Nigeria and MTN Nigeria with HDC by providing digital infrastructure in Nigeria.

<sup>4</sup>See Table 2

From the above analysis, it is glaring that Nigeria is not performing well in renewable energy production, especially when compared to some members of the D-8 such as Turkey, Indonesia, etc. The low generation of renewable energy may be connected to overly dependence of Nigeria on fossil fuel and the Eurocentric ideology on renewable energy and climate change. Observably, the two countries with the highest crude oil reserves in D-8 (Nigeria and Iran) are OPEC members and are not doing well in renewable energy generation. It suffices to deduce that the Eurocentric ideology influences crude oil-rich economies, often slowing their transition to renewable energy. Such a perspective tends to prioritize fossil fuel dependence due to historical ties and economic structures shaped by oil wealth. As a result, such countries may face obstacles like vested interests in the fossil fuel sector, regulatory challenges, and reluctance to diversify their energy portfolios. This can hinder the adoption of renewable technologies, despite the pressing need for sustainable energy solutions.

The D-8 is positioned as a platform for countries like Nigeria and Iran to leverage in order to step up their energy transition phases through knowledge sharing and capacity building from those countries in D-8 like Turkey that have done well in renewable energy. The Developing-8 Creative Economy & Financial Center (CEFC) can collaborate with Nigeria Energy Transition plan (ETP) to finance some of the renewable energy investment. Such collaboration has a mutual impact on the D-8 member states by deepening market penetration, more job creation, technological advancement, and enhancing D-8 feasibility on the global stage.

The analysis of renewable energy above is based on aggregate data. The aggregate data may not show exactly how D-8 member states have performed or utilized various renewable energy sources. It will be more informative to disaggregate the renewable energy source and examine the dynamics of D-8 member countries.

**Table 2**

*Renewable Electricity Generation in D-8 (GigaWatts/h), 2005-2022*

	<b>Bangladesh</b>	<b>Egypt</b>	<b>Iran</b>	<b>Malaysia</b>	<b>Nigeria</b>	<b>Pakistan</b>	<b>Turkey</b>	<b>Indonesia</b>
2005	1032.35	13,516.40	16,155.91	6,609.08	13,082.79	29,446.65	39,750.57	22680.17
2006	997.22	13,832.58	18,294.39	7,037.02	10,603.58	32,517.97	44,525.51	21203.41
2007	815.25	13,914.21	18,127.99	6,840.83	7,788.73	31,685.39	36,461.35	24319.16
2008	799.08	16,700.36	4,948.95	8,722.99	7,455.73	30,056.20	34,426.77	26378.88
2009	662.74	15,954.27	7,435.18	7,965.10	7,452.00	29,647.35	38,148.46	26845.13
2010	917.16	14,373.82	9,742.72	7,717.17	7,207.85	31,564.18	55,720.48	34695.97
2011	1034.05	15,114.32	12,294.18	8,693.48	5,244.38	31,806.91	58,109.78	30525.86
2012	1066.9	15,325.15	12,674.53	10,638.29	5,324.30	30,935.36	65,234.46	31193.53
2013	1016.82	14,734.48	14,701.27	12,676.30	6,140.50	33,108.54	69,249.34	35599.21
2014	886.59	15,157.09	14,107.03	14,137.58	6,168.59	34,847.76	52,632.22	34511.99
2015	1102.33	15,640.48	14,347.06	16,230.61	6,457.99	36,879.70	83,661.22	33680.8
2016	1269.37	16,120.62	16,710.05	20,920.31	8,194.63	37,913.90	90,247.70	39710.04
2017	1391.27	15,972.63	15,467.52	27,542.05	7,805.23	36,351.99	87,238.50	43330.25
2018	1265.6	15,941.96	16,596.73	28,492.67	7,761.55	37,112.50	97,770.98	48193.74
2019	1226.26	17,967.77	32,158.28	28,859.70	8,514.28	42,467.57	132,263.83	47563.2
2020	1275.78	23,971.64	23,200.05	30,596.93	7,990.52	45,607.45	128,348.13	52429.2
2021	1384.17	25,164.08	15,083.98	30,626.44	9,322.46	45,382.22	118,555.36	55766.82

	Bangladesh	Egypt	Iran	Malaysia	Nigeria	Pakistan	Turkey	Indonesia
2022	1591.91	26,488.04	15,083.98	30,627.50	9,447.20	44,928.40	137,830.49	65044.43
<b>Average</b>	<b>1096.381</b>	<b>16993.88</b>	<b>15396.1</b>	<b>16940.78</b>	<b>7886.795</b>	<b>35681.11</b>	<b>76120.842</b>	<b>37426.21</b>

Source: D-8 basic, social and economic indicator, 2024

## Components of Renewable capital case energy capital case generation in D-8

The analysis further breaks down the various components of the renewable energy sources to examine the performance of various countries in the renewable energy types. This will aid us in understanding if member countries are focusing on one source of renewable energy or otherwise.

### Bioenergy Generation in D-8 (GWh)

Renewable bioenergy is a form of energy sourced from burning biomass fuel. Biomass fuels are made from organic materials like wood residues, Farm waste energy-grown crops, and organic waste from homes, businesses, and farms. There are various types of biomass fuel which include solid fuel, liquid fuel, Biogas, and biomethane. The data we observed from Figure 2 indicates that Pakistan generates the highest bioenergy in the D-8 member states valued at 2056.27GWh on average between 2005-2023. This figure corresponds to 36.7% of the total bioenergy produced in the region. This is followed by Turkey with 33.6%. It is glaring from Figure 2 that the three countries comprising Pakistan, Turkey, and Malaysia produced about 92.3% of the total bioenergy in the D-8 cooperation. Nigeria generates a paltry 24.07GWh, which accounts for 0.42%. These statistics do not show that there is adequate cooperation in the area of bioenergy due to the uneven distribution of the member states productivity. Considering Nigeria's features regarding bioenergy sources, it has a huge potential to generate a significant amount of bioenergy. Nigeria has a big land mass and rich in various sources of biomass. Nigeria possesses 356.68sq miles with an abundance of farmland for agricultural purposes. This is more than the land mass of Turkey which is about 3022.535 sq meters. Nigeria's bioenergy output is not encouraging especially when considering output from Pakistan and Turkey. D-8 should encourage more research and awareness in bioenergy and biotechnology on Nigeria's potential. This will encourage more investment and opportunities in bioenergy. Developing-8 Network of Pioneers for Research and Innovation is a commendable initiative. Similar schemes need to be advocated to promote bioenergy awareness specifically.

**Figure 2**

*Bioenergy Generation in Developing-8 countries, 2005-2023 (%)*



Source: D-8 basic, social and economic indicator, 2024

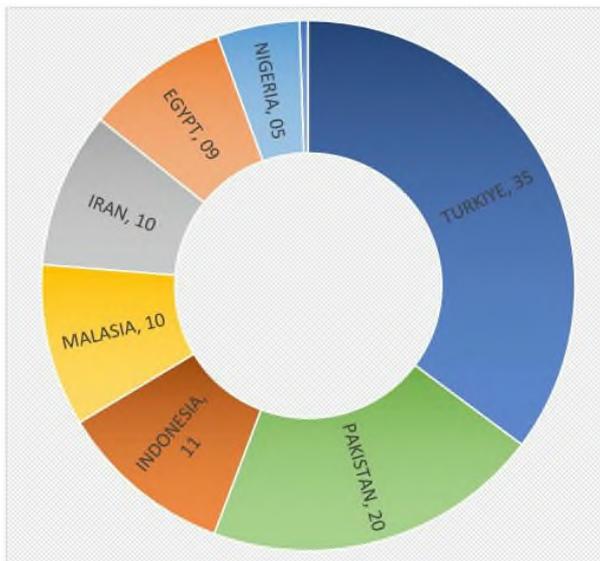
## Hydropower Energy Production in Developing-8 countries, 2005-2023 (GWh)

Figure 3 reveals that Turkey generates the largest amount of hydropower energy in D-8 immersing 35.2% on average from 2005-2023. This proportion is more than one-third of the total hydropower energy production in D-8. The proportion of hydropower generation for Pakistan, Indonesia, and Malaysia are 20.5%, 10.6% and 9.9% respectively. These four countries constitute 76.2% of the total hydropower production in the D-8. The other four countries (Iran, Egypt, Nigeria, and Bangladesh) share a paltry 23.8%.

Nigeria's percentage share of hydropower production to D-8 generation is 5%. This statistic is not encouraging. Nigeria's hydropower production should be higher than what was obtained, given many water one word surrounding Nigeria's border. Nigeria prides about over 200 rivers and 100 lakes across different regions, which is good potential for hydropower energy. Since the D-8 cooperation objective is to collaborate in energy security, the hydropower generation is expected to be higher in Nigeria. Nigeria's hydropower demands massive investment collaboration in technology, expertise, and technical expertise. The generation of hydropower should be relatively distributed among the D-8 member states rather than concentrating in a few countries, especially Turkey. Evenly distributed hydropower production will foster energy security and effectiveness of the economic body.

**Figure 3**

*Hydropower Generation in Developing-8 countries, 2005-2023 (%)*



Source: D-8 basic, social and economic indicator, 2024

## Solar Energy Generation in Developing-8 countries, 2005-2023 (GWh)

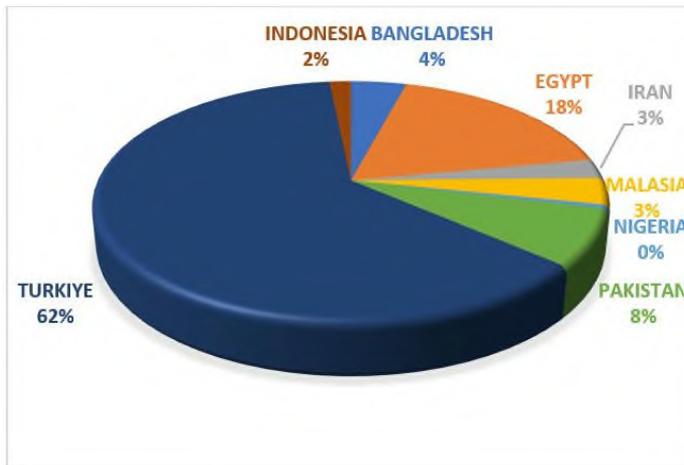
Solar energy is the energy generated from the sun. According to the Sustainable Energy Authority of Ireland (2024), the sun delivers more energy to Earth in an hour than is used worldwide in a year. This energy can be harnessed using solar panel technologies and thoughtful building designs. Turkey generated about 3504.9 gigawatts/hour (GWh) on average from 2005-2022, making about 62% of the total

solar energy produced by the Developing-8 countries. Egypt is the next highest solar energy generator in the bloc with about 18%. The two countries generate 80% of the D-8 solar energy production. Nigeria's relative production was so meager. Nigeria generates 28.3 GWh on average from 2005-2022. This value constitutes a meager 0.5% of the D-8 solar production. Solar energy is supposed to be the most abundant renewable energy available in Nigeria given the fact that Nigeria is a tropical nation with abundant sunlight (Ogunjo et al., 2021). Nigeria is in the solar belt, which heightens its solar potential but sadly, the opportunities for harnessing renewable energies remained narrow unlike most of the D-8 countries especially, Turkey and Egypt. The availability of massive radiation combined with the developments in photovoltaic technologies makes it clear that huge amounts of electricity can be generated and utilized to combat Nigeria's electricity crises that has become an obstacle to economic development (Abdullahi et al. 2017). Ozoegwu et al. (2017) assert that installing solar panels on at least one percent of Nigeria's geography can easily generate enough electricity to outdo the amount currently produced in the country given the amount of incident radiation. This assertion highlights the immense amount of energy that the country can benefit from solar energy, bearing in mind that currently, solar energy contributes less than one percent of the total power generation in Nigeria and D-8 in general. However, The inability to harness solar energy in Nigeria includes lack of technological expertise, financial gap, political/Bureaucratic risk, insecurity issues, and inadequate research in solar energy initiatives, etc. Other countries' solar energy production in the economic cooperation is low (see Figure 4 and values for Bangladesh, Iran, Malaysia, and Indonesia).

D-8 can support the Nigerian government via the Nigeria Electricity Regulatory Commission (NERC) to overcome the challenges of solar production. D-8 can provide the technical expertise required in solar and build the capacity of the skilled and semi-skilled workforce in Nigeria. Nigeria's high demography is an advantage for capacity building in the energy sector. D-8 could provide the synergy for Nigeria to understudy the Egyptian New and Renewable Energy Authority (NREA). NREA has made a significant impact on Egyptian renewable energy production, especially in solar and wind energy. This synergy is expected to be easier given the fact that the two countries are from Africa and members of the Developing 8.

**Figure 4**

*Solar energy generation in Developing-8 countries, 2005-2023 (%)*



Source: D-8 basic, social and economic indicator, 2024

## Synthesis of the Analysis

The deductions from the discussion reveal that countries that are endowed with crude oil reserves still focus on fossil fuel as a major source of energy, for instance, Nigeria (25.6%) and Iran (49.1%)<sup>5</sup>. Transition to alternative or renewable energy has not received serious investment in Nigeria (3.8%) and Iran, (7.4%) hence, energy generation from renewables are relatively low when compare to other D-8 economies like Turkey. Nigeria has potential for renewable energy (thick labour supply, located at the solar belt, abundant river basin) ranging from biomass, solar, wind, and hydropower but none has been vigorously explored. It is evident that countries like Turkey (36.7%), Pakistan (17.2%), Indonesia (18%)<sup>6</sup> that are rich in renewable than other member states are insignificantly endowed with crude oil reserve. The discussion observed that application of the D-8 integration objectives have not been fully harnessed. This is evident in the adoption of different energy sources by the different member states resulting from their comparative advantage. Each country is focusing more on the things it can do for itself. Hence, countries with comparative advantages in fossil fuels like Nigeria and Iran still depend heavily on non-renewable energy, while countries with advantages in renewable energy like Turkey and Indonesia perform greatly in renewable energy.

Most of the Developing-8 countries use natural gas. This could be attributed to the fact that natural gas is relatively a cleaner source of energy than petroleum energy and has less financial burden. Table 3 indicates that Iran generates about 40.9% of the proportion of the natural gas in D-8. Egypt, Malaysia, Indonesia, and Bangladesh generate more natural gas than their respective renewable and crude oil proportion. This may be related to natural gas eco-friendly features to petroleum, less financial stress than renewable energy, technical expertise, and the country's natural endowment.

Glaringly, Nigeria produced only 8% of the total natural gas production in the D-8 countries. The energy generation mix in Nigeria is different from what is obtained in other member states of the D-8. Natural gas seems to be a low-hanging fruit for the member states but Nigeria. The countries that are doing well in renewable energy<sup>7</sup> equally have relatively commensurable investment in natural gas production except Turkey. In the corollary, countries that generate a large proportion of crude oil in the D-8 also produce a relatively high proportion of natural gas, for example, Iran, and Indonesia. Nigeria's case is interestingly a contrasting one. Only Nigeria generates a significant proportion of crude oil (25.6%) while contributing a lower portion of natural gas (8.0%) in the D-8 community. This may be attributed to a lack of political will to diversify away from crude oil or inadequate investment in the natural gas sub-sector. Successive governments in Nigeria have advocated diversification of the economy away from petroleum or crude oil, but this has not been actualized due to institutional bottlenecks among other things.

The study identified the Eurocentric ideology on renewable energy and climate change from the crude oil-rich nations. The countries with large crude oil reserves like Nigeria and Iran are not doing well in the transition to renewable energy. They focus more on crude oil production than investing in renewable energy sources. Data from the two oil-rich economies suggests that Western countries should be responsible for climate change impact due to their historical activities that mitigate the greenhouse effect. Hence, the countries are reluctant to invest in energy transition.

Developing-8 organization has been involved in many advocacy and collaborations in the energy sector that favors the member states in general and Nigeria in specific. They are involved in capacity building (D-8 TTEN), investment financing (EXIST), technical collaboration (D-8 TTEN), and research and development (D-8 NPRI) in Nigeria. Developing-8 established industrial cooperation on machinery and

<sup>5</sup>See Table 3, row 4 below

<sup>6</sup>See Table 3, row 2 below

<sup>7</sup>Egypt, Malaysia, Indonesia, Pakistan.

task force that monitors its progress. This project utilizes the D-8 capacities to produce and share machinery for industrial and infrastructural development across D-8 member states.

**Table 3**

*Proportion of energy generation in D-8 countries (%)*

Energy type	Bangladesh	Egypt	Iran	Malaysia	Nigeria	Pakistan	Turkiye	Indonesia
% of renewable	0.5	8.2	7.4	8.2	3.8	17.2	36.7	18.0
% of natural gas	4.6	11.7	40.9	13.0	8.0	7.7		14.1
% of Crude oil prod.		7.8	49.1	7.4	25.6			10.1

Source: D-8 basic, social and economic indicator and author's computation, 2024

## Ways D-8 Cooperation could aid Nigeria in Improving Energy Security

D-8 cooperation should aid Nigeria in adopting modern energy practices (renewable energy especially) with member countries with advanced energy expertise (e.g., Turkey and Malaysia). Investing in infrastructure development by D-8, such as power plants, oil refineries, and grid expansion in Nigeria will strengthen the energy supply. Importing energy resources or technologies from D-8 nations at lower costs will promote energy affordability and ultimately improve supply. D-8 could assist Nigeria in strengthening diplomatic ties with other advanced countries to attract FDI in Nigeria's energy sector. D-8 should coordinate Trade negotiations between Nigeria (rich in fossil fuel) and member states that are advanced in renewable energy to boost energy security.

## Findings

The study finds that different countries focus on generating one form of energy mix; while those with rich fossil fuel reserves concentrate on non renewable. The study encourages the adoption of different energy mixes to improve energy security, especially in Nigeria. Obstacles to Nigeria's energy transition include lack of political will, information asymmetry (from the Eurocentric concept), savings gap, and lack of technical expertise etc. Glaringly, the D-8 organization established the Network of Pioneers for Research and Innovation (D-8 NPRI) to advance research and project development in the energy sector. This will create more awareness and sensitization on renewable energy and enhance capacity building in Nigeria. D-8 Technology Transfer and Exchange Network (D-8 TTEN) is another strategy to share knowledge among the member states to boost production. D-8 engages with relevant international organizations to promote the development and application of energy-efficient technologies and renewable energy to facilitate countries in their journey to transition to cleaner energy. There is a youth cooperation arm of the D-8 organization, where youth from member states cooperate to advance development in their respective countries. Nigeria can leverage these platforms given its high demographic potential.

## Recommendations

D-8 should intensify creating more awareness of the benefits of renewable energy using many platforms such as research development, and media. (D-8 NPRI) should be made more proactive by organizing biannual meetings in Nigeria. Developing-8 organizations should build a replica of the D-8 International University, Hamadan, or create D-8 career-building centers in 2 or 3 existing universities in Nigeria. The Nigerian government should, therefore, put in place a policy that encourages sensitization and awareness initiatives by equipping and creating more departments in renewable energy such

biotechnology department. A conscious effort must be devoted to correcting the information asymmetry concerning renewable energy using schools, most developing and crude oil-endowed countries view renewable energy transition from a Eurocentric lens. Efforts should be made to rewrite the narrative by showing the practical benefits surrounding renewable energy. Besides creating awareness, D-8 can support Nigeria via funding to develop its natural gas generation. A special fund should also be put in place to subsidize and encourage countries like Nigeria to access the raw materials needed for the installation and production of renewable energy. D-8 should strive to build more synergy among members to adopt different energy mixes. The study found that some countries focus on renewable while others concentrate on nonrenewable. Having different energy mixes will improve energy security, especially in Nigeria.

## Conclusion

Nigeria has significant potential for energy generation, both renewable and non-renewable, yet it has not capitalized on this potential to adequately meet the energy demands of its citizens and industries. Given her large demographic potential, large amounts of incident radiation, abundant waterways, moderate humidity, and large oil reserves, the country can greatly benefit and solve its energy crises if these resources are well harnessed. D-8 organization has committed a lot of resources to capacity building, knowledge transfer, research and development, and funding of projects in the energy sector for socioeconomic development in Nigeria. D-8 is encouraged to be more proactive in achieving balanced synergy in energy security between member states that focus on renewable and the ones that focus on nonrenewable like Nigeria. D-8 must leverage on Nigeria's potential (demography) to create more awareness on the advantages of renewable energy by establishing or collaborating with schools to enhance indigenous capacity. Nigeria's government should have the political will to address the challenges by integrating research recommendations from D-8 and other reputable research programs, especially the institutional and technical barriers into actionable policies.



### Author Details

Stanley Uche Akachukwu

<sup>1</sup> Stanley Uche Akachukwu Bashir Adeniyi Centre for International Trade and Investment, Research and Studies Department, Nigerian Institute of International Affairs, Lagos, Nigeria

0000-0002-9920-848X

akachukwustan@gmail.com

## References

- Abdaullahi D, Suresh, S., Renukappa, S. and Oloke, D. (2017). Key Barriers to the Implementation of Solar Energy in Nigeria: A Critical Analysis. *IOP Conference Series: Earth and Environmental Science*. 83012015
- Balassa, B. (1961). The Theory of Economic Integration. Richard D. Irwin. Homewood, Illinois Cooper, C. A., and Massell, B.F. (1965). Toward a General Theory of Customs Union for Developing Countries. *The Journal of Political Economy* 73(5) 461-476.
- Developing-8 Organization for Economic Cooperation (2024). *Second D-8 Working Group on Energy*, 30-31 January 2005 in Tehran, Iran. Energy and Minerals. Retrieved from <http://developing8.org/areas-of-cooperation/energy> on 5<sup>th</sup> November 2024.
- Developing-8 Organization for Economic Cooperation (2025). *D-8 Secretary-General addressed the Asian Natural Gas Infrastructure Conference in Singapore, Turkey*, 2015



- Developing-8 Organization for Economic Cooperation (2024). Private Sector Engagement. D-8 Creative Economy and Financial Center.
- Developing -8 Organization for Economic Cooperation (2025). *Industrial Cooperation, Machinery*. Outcomes of the Task Force on Machinery of the 5th Ministerial Meeting on Industrial Cooperation held on 09- 11 May 2016 in Egypt. <https://developing8.org/areas-of-cooperation/machinery/>
- Federal Ministry of Power (2022). *Nigeria's Power Sector signs partnership with Turkish firm*. Nigeria. Retrieved from <http://power.ng.gov> on 8 October 2024
- Nigerian National Petroleum Corporation (2024).<https://nnpcgroup.com/>
- Ogunjo, S. T., Obafaye, A. A. and Rabi, A. B. (2021). Solar Energy Potentials in Different Climatic Zones of Nigeria. *IOP Conference Series: Materials Science and Engineering*, 1032012040. DOI 10. 1088/1757-899X/1032/1/012040.
- Ozoegwu, C.G., Mgbemene, C.A. andOzor, P.A. (2017).The Status of Solar Energy Integration and Policy in Nigeria, *Renewable and Sustainable Energy Reviews*, 70, 457-471.
- World Bank, (2025). *Electricity production from renewable sources, excluding hydroelectric (KWH)* <https://data.worldbank.org/indicator/EG.ELC.RNWX.KH?end=2013&locations=1W&rt=1961&view=chart>





## Developing -8 Organization for Economic Cooperation: Synergies and Trajectory for promoting food security agenda



Sultan Habibullah Khan <sup>1</sup> & Muhammad Asif Kamran <sup>1</sup>

<sup>1</sup> D-8 Research Center for Agriculture and Food Security, Center for Advanced Studies in Agriculture and Food Security, University of Agriculture, Faisalabad, Pakistan

### Abstract

This chapter examines the role of Developing-8 (D-8) Organization for Economic Cooperation in strengthening agricultural cooperation to enhance regional food security. In the face of global challenges such as climate change and rapid population growth, this chapter highlights the critical role of agriculture in combating hunger and ensuring adequate nutrition. It provides a comprehensive contextual analysis of the D-8 bloc (Bangladesh, Egypt, Indonesia, Iran, Malaysia, Nigeria, Pakistan and Türkiye) highlighting their commonalities and unique agricultural landscapes along with the irrespective food security challenges. A systematic comparison of crop productivity across staple crops reveals significant yield gaps primarily due to differences in technology adoption, mechanization levels, and climatic conditions. To bridge these gaps, the chapter identifies several promising collaboration opportunities such as the transfer of high-quality seeds and agricultural inputs, sharing of advanced mechanization and energy technologies, the application of precision agriculture powered by data science and Artificial Intelligence along with joint research and development initiatives to promote climate-resilient farming. Furthermore, the chapter emphasizes enhanced trade and market access as the key strategies to leverage the relative strengths of each member state in order to stabilize food supply chains and promote economic resilience. Findings suggest that synergistic partnerships among D-8 nations can effectively bridge technological and productivity divides by fostering sustainable agricultural practices and reinforcing regional food security. The chapter concludes with policy recommendations emphasizing institutional cooperation, streamlined regulatory frameworks, and robust inter-country knowledge exchange mechanisms, laying a trajectory for future collaborative efforts within the bloc.

### Keywords

Agriculture · Food Security · Climate · D-8



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Corresponding author: Sultan Habibullah Khan [sultan@uaf.edu.pk](mailto:sultan@uaf.edu.pk)

## Agriculture and Food Security

Ensuring food security in a world facing climate change is one of the most pressing humanitarian and scientific challenges of the twenty-first century (Arshad et al., 2018). Food security is not only about access to food but also about ensuring adequate nutrition for a growing global population. In 2023, approximately 733 million people experienced hunger, meaning that one in every eleven people worldwide and one in five in Africa did not have sufficient food to meet their dietary needs (FAO, 2024). Because of continual population expansion in South Asia, Africa, and Western Asia, the food security issue is getting more widespread, and the chance of eradicating hunger is becoming increasingly remote (Lipton and Saghai, 2017).

The global hunger rate has been steadily rising in many regions. In order to end the hunger problem, addressing food insecurity should be a global priority (Trudell et al., 2021). The world's most hungry regions are Africa and South Asia as they continue to have the highest levels of hunger globally, with Global Hunger Index (GHI) scores of 27.4 and 27.1. Both regions are gravely behind in achieving the agenda of "Zero Hunger", outlined in Sustainable Development Goals (Wudil et al. 2022). The agriculture sector is essential for food security all over the world, especially in developing countries, as it has a direct impact on essential components of food security including; availability, accessibility, and stability. The primary source of food for humans is agriculture, which provides a variety of nutrients that are beneficial for good health. According to studies, cultivating enough crops to meet the nutritional needs of growing populations and maintain stable food supplies requires the use of sustainable agriculture practices (FAO, 2019).

The agriculture sector supports rural communities by creating income opportunities for farmers, giving them the financial means to purchase food and other necessities (World Bank, 2021). To reduce poverty and hunger, improving farming is the key component. Global goals like SDGs play an important role as a main food source to end hunger by supporting sustainable agriculture to keep food supplies steady (UN, 2015).

Due to a combination of factors such as rapid population increase, climate change, conflict and limited access to contemporary technologies for food production and climate resilience, developing nations in South Asia and Africa, such as the D8 countries, are among the most vulnerable to food insecurity. Armed conflicts further exacerbate hunger by restricting access to farmlands, disrupting food supply chains, and displacing communities, leading to malnutrition. Addressing food security in these nations requires a collaborative approach that emphasizes sustainable farming, technology sharing, and regional cooperation (Abdullahiet al., 2024). A collaborative approach that emphasizes sustainable farming, technology sharing, and project collaboration is required to address food security in these nations. These countries may increase their food production and resilience by bolstering regional agricultural cooperation, including the pooling of resources and information. For instance, by promoting regional agricultural cooperation through resource distribution and knowledge sharing, the productivity and resilience of food systems across these countries can be raised. Developing countries like D8 countries can make significant progress toward food security and poverty reduction by enhancing partnerships which will ultimately contribute to improving regional stability and sustainable development.

## Background and Contextual Analysis of D-8

The pressing issues like food security, climate change, infrastructural limitations and natural disasters can be tackled with cooperation among nations by benefiting from the relative advantage of other nations in resources and technological advances. The concept of the country or regional bloc is

useful because it enables members to address global issues like security and climate change by pooling their influence to impact international policies. According to Neo-Functionalism Theory, the integration process within blocs through nations' cooperation has spillover effects as the cooperation among countries in one area like politics naturally expands to other areas like economics (Dosenrode, 2010). This theory is particularly used to explain the evolution of the European Union (EU), where economic cooperation led to political integration and institution-building.

A country bloc is a grouping of nations coming together based on common economic, political, or ideological goals, without being limited by geographic location. This means that countries in a bloc may be spread across continents and regions. These blocs usually focus on broader global issues such as trade, security, or environmental concerns. The concept of cooperation among countries is not new. In the 1960s, developing nations formed regional groupings to establish a European common market. In recent times, the concept has been revived in the light of globalization and natural calamities. Regional organizations such as the Association of Southeast Asian Nations (ASEAN), the South Asian Association for Regional Cooperation (SAARC) and the Southern African Development Community (SADC) serve as testimonies to this concept (Bhalla, 2016). Developing-8 is a similar type of bloc initiated by 8 Muslim countries in order to create free trade area and cooperation.

The D-8 Organization for Economic Cooperation is a grouping of eight Muslim developing countries with the main aim of boosting economic cooperation and accelerating development in member nations. D-8 was formed on June 15, 1997. D-8 member states including Bangladesh, Egypt, Indonesia, Iran, Malaysia, Nigeria, Pakistan, and Türkiye represent a diverse group with a shared goal of promoting sustainable development, economic growth, resilience in agriculture, and increased trade (Almasi, 2012). They focus on trade in vital sectors such as technology, energy, agriculture, and industry. By extending trade beyond conventional industries, creating dependable supply chains, and investigating alternative energy sources in response to global issues, this collaboration seeks to strengthen their economies. Leaders at recent meetings emphasized that D-8 nations should prioritize technological innovation, increase employment opportunities for youth, and offer training to tackle emerging issues like the COVID-19 pandemic's aftereffects and the Fourth Industrial Revolution's influence (D-8 Organization, 2024).

The D-8 nations have previously sought to increase commerce among themselves, particularly in sectors like food production, textiles, and pharmaceuticals. Additionally, they have collaborated in the fields of technology and health, including working together on COVID-19 response and pharmaceutical research. However, these nations deal with issues including poor infrastructure, economic disparities, and political instability, which can occasionally impede development. Looking ahead, the D-8 intends to boost food security and agricultural resilience, as well as expand digital and tech ties, particularly in AI and e-commerce, in order to reach \$500 billion in trade among member countries by 2030. Another future objective is to increase collaboration in renewable energy.

## **Bangladesh**

Bangladesh is a South Asian nation with a population about 173 million and the per capita income of \$ 2551 with overall GDP of 509,516 million USD (World Bank, 2024). A nation well-known for its strength in rice production and has developed advanced practices for producing high-yielding rice while making effective use of scarce land. This knowledge can be valuable for other countries with a large population of small-scale farmers, helping them improve agricultural productivity and sustainability. Furthermore, Bangladesh's expertise in fish farming could also support better management across the D-8 countries. Bangladesh has a higher GHI with a score of 19.4, with malnutrition as a major issue. This country also faces climate challenges like floods, cyclones and saltwater contamination, which harm crops and make



it harder for people to have enough food. Bangladesh faces extra challenges because it depends too much on rice and there is not enough land. It has limited resources for modern farming methods that can handle climate change (Alam et al., 2015). The country needs to grow various kinds of crops to improve the water system and to minimize these risks. The country could benefit from D-8 support in resilient crop varieties, efficient irrigation systems, and technology for managing flood-prone agricultural areas.

## Egypt

Egypt is a leader in food security projects, especially in arid agricultural innovation. It collaborates with D-8 countries to share knowledge on water-saving techniques and greenhouse technology. The population of Egypt is 112.7 million and the per capita income of \$ 3457 (World Bank, 2024). It has limited farmland and a high dependency on food imports. As a major food producer in the Middle East and North Africa, Egypt's methods in irrigation and desert agriculture provide a model for arid regions that are facing water shortage issues. The country's advancements in controlled irrigation techniques and water management are highly relevant to D-8 nations dealing with similar climate issues. Egypt with a GHI score of 13.2 has fewer hunger problems, which can be helpful for other countries to deal with food security concerns. However, issues still exist because of rapid population growth and a high dependence on imported food. In Egypt, water scarcity due to reliance on the Nile River and outdated irrigation systems makes farming harder. Drought risks are increased by climate change and poor agricultural policies and limited rural infrastructure hinder sustainable food production and resilience. Egypt requires support to expand greenhouse technology, modern irrigation, and research into salt-tolerant crop varieties due to its water scarcity.

## Indonesia

Indonesia is the most populated country in the D-8, with 277.5 million people, a per capita income of \$5,016, and a total GDP of \$1.39 trillion (World Bank, 2024). It has strong expertise in fishing and tropical farming, sharing its knowledge on palm oil, rice, and fish farming with other D-8 countries it can greatly contribute in the food security of the bloc. Indonesia's skills in managing tropical crops and forests can help other D-8 countries with similar climates improve their farming. Its experience in protecting forests also provides useful guidelines for sustainable farming. Indonesia has a large farming sector but struggles with deforestation and damaged land. The government is promoting sustainable farming but needs to improve supply chain management. Food security is still a key challenge; although Indonesia's Global Hunger Index score has improved to 16.9, rural areas still face more food shortages. Support from the D-8 could help Indonesia with sustainable palm oil farming, better fishery management, and technology to reduce crop losses after harvest.

## Iran

Iran is actively involved in D-8 farming projects, focusing on crops that can withstand drought and can be cultivated using modern irrigation. It has shared its knowledge of dry-land farming with other countries. Iran's per capita income is \$4,251, which is relatively low (World Bank, 2024). The country has made big strides in agricultural biotechnology, especially in developing crops that can handle drought, which could help D-8 countries deal with climate challenges. Iran's work on seed varieties for dry areas and its greenhouse technology can be useful for other D-8 countries. Iran has a low hunger score of 7.4, but food security is still at risk. Environmental issues, along with economic sanctions that limit food imports, create challenges. Water scarcity is a major problem for Iran due to droughts and water mismanagement, especially impacting wheat farming Nouri et al., 2023). Climate change worsens these

droughts, and sanctions make it harder for Iran to get technology for sustainable farming. Iran would benefit from D-8 support for drought-resistant seeds, better water-saving irrigation, and technology suited for dry climates.

## Malaysia

Malaysia has the per capita income of \$13,382, higher than most other D-8 countries. With a population of 34.3 million and a GDP of \$447 billion, leading in adaptation of modern farming technology particularly in the production of rubber and palm oil (cite). Malaysia is among the top producers of palm oil in the world. Advanced in agricultural research and experience of managing large farms, Malaysia could help other D-8 countries to improve their cropping system and productivity. The country has a low hunger index score of 12.7, showing good food security, but rural poverty is still a problem. Malaysia could benefit from shared research on sustainable palm oil, efficient rice farming, and technology to help rural agriculture. The country's farming challenges include a lack of workers, an aging farming sector, and climate issues like floods and droughts, which affect crop production. Labor shortages, especially after the pandemic, have made it harder to keep up productivity and food security.

## Nigeria

Nigeria has a vital role in African agriculture and is among the top agriculture economies in the region. It has a population of 223.8 million and a total GDP of 506.6 billion USD (World Bank,2024). The country grows important crops like cassava, yams, and maize, which are also essential foods for other D-8 countries. Nigeria's experience in farming finance and small initiatives can help D-8 countries support smallholder farmers. Despite the large agricultural sector, Nigeria struggles with the issues of food insecurity. Nigeria has a high GHI score of 28.8, which shows serious problems with undernutrition and child mortality. The country also faces issues like poor road infrastructure, post-harvest losses and social insecurity, particularly in northern areas (Thomas and Turk, 2023). Climate change, with unpredictable rainfall and desertification, reduces crop yields. Limited access to modern farming tools and poor storage facilities makes it harder to provide food. Nigeria needs help from D-8 countries to improve infrastructure, develop pest-resistant crops, use machinery, and create better distribution systems to reach rural areas.

## Türkiye

Türkiye has a significantly high per capita income of \$11,931 with an overall GDP of \$1.03 trillion (World Bank, 2024). It is an important member of the D-8 with an advanced agricultural sector enhanced by the adaptation of advanced farming technologies like modern farm machinery, high-yielding seed and greenhouse farming. Due to its advancements in agricultural technology, Türkiye is an ideal partner for exchanging knowledge about contemporary farming equipment and techniques among the D-8 countries. It leads in agricultural exports as well, which can help other D-8 nations expand their farming industries. Türkiye has a low hunger index score and a strong agricultural sector, making it a potential leader in farming development in the D-8 bloc. However, Türkiye needs to work more with D-8 countries on farming practices that can handle climate change, using data in agriculture, and sharing technology for rural development. The country faces challenges like water shortages, unpredictable weather, and damaged land, which affect wheat and livestock production (Nugroho et al.,2023). Increasing droughts and high water use in farming are major issues. Additionally, many people are moving from rural areas to cities, leading to fewer workers available for farming.

## Pakistan

Pakistan is an important country in South Asia whose economy is based on agriculture sector with the GDP of \$375 billion in 2023-24. Agriculture sector contributed 24% to GDP of Pakistan and showed growth of 6.25 % during 2023-24. Agriculture sector is not given its due importance in Pakistan and unable to get its desired attention by the governments and policymakers, which has led to a decrease in its performance over the years. Agriculture sector in Pakistan is mainly dominated by livestock and major crops, including wheat, rice, maize, sugarcane and cotton. Among the other sectors of the economy, industrial and services sector grow by same rate of 1.21% with the overall share of 18.2% and 57.7% respectively in 2023-24 (GOP, 2024). The country is also facing severe issues of food insecurity even though it is an agricultural country. The national nutritional survey reported that around 70 percent of the total population of Pakistan had food insecurity and 50 percent of women and children were malnourished (Ali, 2019). According to Global Food Security Index (GFSI) 2022, Pakistan ranked 84th with overall score of 52.2. Global Hunger Index score shows sever level of hunger in Pakistan like other regional countries with GHI score of 27.9 with the rank of 109<sup>th</sup> out of 127 countries (GHI, 2024). Women are more vulnerable to hunger and disparities in Pakistan as Pakistan ranks 145 among 146 countries in Global Gender Gap Index (WEF, 2024).

One of Pakistan's main strengths is its wide experience in growing many different crops, such as wheat, rice, and maize, which are important staple foods for many people in the region. This variety in agriculture helps with crop rotation and keeps the soil healthy. Pakistan has also made progress in biotechnology, creating crop varieties that can survive drought and salty conditions, which is important for countries like Bangladesh and Nigeria with growing populations. Pakistan's unique irrigation system can be very helpful for other countries to develop irrigation network in order to manage its scarce water and distribute water to distant location to grow uncultivated land.

However, Pakistan is confronted with issues that are exacerbated by climate change, such as severe soil erosion, water shortages, and harsh weather (Ishauqe et al., 2024). Reliance on water-intensive crops, such as wheat and rice, strains water resources. Food security is further complicated by inadequate investment in climate adaption. There is an urgent need for R&D initiatives to attain sustainability in agriculture sector. By working with D-8 countries, Pakistan can gain access to shared knowledge and technologies that help make crops more resilient and productive.

Table 1 summarizes the GHI score of the member states for undernourishment, child wasting, child stunting, child mortality and overt GHI scores. Türkiye's performance is the best while Pakistan is among the poorest. A spread of member states on the GHI scores shows potential for collaboration and cross-country learning on different matrices of GHI and ways to tackle hunger.

**Table 1**

*GHI Score of D8 Countries for the Year 2024*

Countries	Undernourishment (% of population)	Child Wasting (% under-five)	Child Stunting (% under- five)	Child Mortality (% under-five)	Overall GHI Score
Bangladesh	11.9	11	23.6	2.9	19.4
Egypt	8.5	5.3	21.1	1.8	13.2
Indonesia	7.2	10	26.8	2.1	16.9
Iran	6.5	4.1	5.3	1.2	7.4
Malaysia	<2.5	11	21.2	0.8	12.7
Nigeria	18	6.5	31.5	10.7	28.8
Pakistan	20.7	10.1	33.2	6.1	27.9

Countries	Undernourishment (% of population)	Child Wasting (% under-five)	Child Stunting (% under-five)	Child Mortality (% under-five)	Overall GHI Score
Türkiye	<2.5	1.7	6	1	<5

Note: GHI 2024 report. Accessed from: <https://www.globalhungerindex.org/>

## Crop Productivity Gap among D-8 Members

Staple crops are essential to food security and high productivity of these crops is very vital to ensure food security in the world. Developing countries are struggling to get potential yield of these crops due to lack of advanced machinery, modern technology, climate resilience, research and development and climatic conditions. Significant yield gap exists for major staple crops among D-8 countries due multiple factors including climate, soil conditions, technological improvements and government policies. Table 2 exhibits the yield gap of major crops among D-8 countries.

In case of wheat, Egypt has the highest yield of 6.78 tons per hectare, likely due to its advanced effective agricultural practices. In contrast, Iran and Nigeria have significantly lower yields 1.67 and 1.1 tons per hectare, respectively, attributed to less favorable climate conditions and insufficient modern farming techniques. Egypt also has an upper hand in rice yield as it gets yield of 9 tons per hectare followed by Türkiye with 7.9 tons per hectare. Conversely, countries like Iran and Malaysia have lower yields of rice, partly due to varying water management practices and the reliance on traditional farming methods as compared to Egypt and Türkiye.

Türkiye and Bangladesh have achieved higher yield for maize among D-8 (9.3 and 9 tons per hectare). This high yield in these countries is the result of better hybrid seed usage and crop management strategies. Meanwhile, Nigeria stands at bottom with 2.2 tons, indicating the constraints of soil fertility and adaptation of improved farming practices. Bangladesh and Türkiye also get higher cotton yield and Egypt leading in sugarcane with 105 ton per hectare. Countries like Pakistan, Nigeria and Iran need to improve in technological advancement in order to enhance crop productivity.

**Table 2**

*Yield Comparison of Major Crops among D-8 Countries (in tons per hectare)*

Country	Wheat	Rice	Maize	Cotton	Sugarcane
Bangladesh	3.45	4.9	9	4.2	42
Egypt	6.78	9	8	2.2	105
Indonesia	-	5.3	5.8	0.22	65
Iran	1.67	3.75	6	2.6	97
Malaysia	-	3.7	7	-	20
Nigeria	1.1	1.86	2.2	0.5	17
Pakistan	2.92	3.7	6	1.1	67
Türkiye	3	7.9	9.3	4.8	-

Note: FAO State. Accessed from: <https://www.fao.org/faostat/en/#data/QCL>

The disparities in crop yields between the D-8 nations emphasize the necessity of cooperative initiatives to exchange agricultural technologies, advance farming methods, and strengthen irrigation infrastructure. This will enhance food security and boost economy of the D-8 countries. Pakistan may offer its expertise in crop diversification and pest control, while nations such as Egypt can share their sophisticated irrigation methods and procedures. The D-8 nations might endeavor to achieve increased



food security and agricultural sustainability by tackling these discrepancies through regional cooperation.

## Potential Areas for Collaboration to Enhance Food Security

### Seed and Material Transfer

Seed quality and technological advances are two areas where D-8 countries have significant disparities and can be a crucial area in collaboration in order to deal with low agriculture productivity and enhance climate resilience to ensure food security in member countries. Countries like Pakistan, Iran and Türkiye have some advanced mechanisms of seed development led by biotechnology and plant breeding and genetics and have strong institutional infrastructure for agricultural research that can support other member countries like Nigeria and Bangladesh which are struggling with the challenges of improved quality seed. Mutual projects related to the development of quality seed could be in the form of seed sharing of high-yielding, pest, and salt, heat and drought-resistant varieties of seed that could be adjustable in a diverse climate of member countries. Sharing of technologies like water conservation technologies, advanced harvesters, rebots, drones, modern sprayers could significantly reduce yield loss and overcome the labor shortage in countries like Türkiye and advance the agriculture of less advanced countries like Nigeria, Pakistan and Bangladesh. Similarly, D-8 countries can promote material transfer through MTAs (Material Transfer Agreements) to bridge the access gap to high performing genetics in the member countries.

### Mechanization

D-8 countries can significantly ensure food security among themselves by improving agriculture performance through targeted technology transfer among member countries, so country with critical shortage can be benefited from country with excessive resources. For instance, Türkiye and Malaysia are advanced in modern technology adoption and production and they could support countries like Nigeria, Pakistan and Bangladesh where agriculture productivity is hindered due to the limited availability of mechanization. This could be possible by making arrangement of technology, equipment and knowledge sharing that will ultimately address the disparities related to agriculture efficiency among D-8 countries.

On the other hand, Türkiye is advanced in solar technology and biogas and could support countries aiming to reduce their reliance on traditional energy sources like diesel and coal in agriculture, providing cleaner and more sustainable energy solutions. Similarly, Egypt is a major producer and exporter of nitrogen-based fertilizer because of the abundant availability of natural gas and fertilizer sharing with Pakistan is well-suited where production costs is high as local production is unable to meet local demand. These initiatives could reduce input costs for farmers in Pakistan and mitigate soil nutrient deficiencies, which are major contributors to low agriculture productivity and food insecurity in the region.

### Precision Agriculture and Data Science

Precision Agriculture is aimed at bringing precision in input use and resulting in reduced cost of production, input saving, resource conservation and increased farm profitability. Advances in Artificial Intelligence and Data Science have revolutionized precision farming. The member states are currently at different level levels of development and adoption of these technologies and there is an untapped potential for enhancing their agriculture resilience and food security by sharing data science capabilities with each other. Knowledge exchange could be the basis of this collaboration among the countries

having advanced infrastructure for data science including Türkiye and Malaysia, which have advanced in digital governance, data analytics and AI in the agriculture sector. The advanced member states in these technologies can help to develop the data environment in countries like Pakistan, Nigeria and Bangladesh where data science infrastructure is not much developed in general and for the agriculture sector in particular. This knowledge sharing can support development in the agriculture sector by improving crop management using data and ensuring food security. For instance, Türkiye's advancement in AI-driven smart agriculture and precision agriculture can be shared with the other member countries like Pakistan and Egypt through collaboration as there is huge potential for data-based decision making of agricultural practices and real time monitoring of crops that could be beneficial in the advancement of agriculture sector of these countries and ultimately ensure food security.

## Collaborative Agriculture and Food Security R&D Projects

Cross-country development projects can significantly reduce the issues of member countries in D-8 by knowledge sharing and mutual development. A mutual fund to initiate development projects in D-8 countries should be initiated that could help the less privileged countries like, Nigeria to achieve advancement in agriculture sector and food security approaches. Knowledge sharing programs to share successful experience in Agricultural production by advance countries like Türkiye and Malaysia could support in improving agriculture practices and technology adaptation by countries like Pakistan, Bangladesh and Nigeria. Pakistan shares the experience of its management at large scale of the world largest irrigation system and these insights can be used by countries with less developed irrigation systems. Initiating R&D projects among member countries focused on developing climate-resilient crops and modern farming techniques can be helpful in enhancing food security across the member countries. Advancements of Iran in successful dry land agriculture and expertise of Türkiye in mechanized driven agriculture could be shared with other D-8 nations struggling with similar management and climate challenges.

## Trade and Market Access

Facilitating trade among member countries can significantly reduce the food security threat and countries can benefit from relative advantage of crop productivity via agriculture trade. Member countries can get benefits from other countries' agriculture strength by reducing trade barriers through bilateral agreements and initiatives like regional trade. By reducing trade barriers, material transfer and technology transfer will be smooth and countries can decide to plan their agriculture production through forward linkages on the basis of advantageous crops in terms of productivity, available resources, climatic suitability and technological requirements.

## Conclusion and Way Forward

Agriculture and food security provides enormous potential and opportunities for collaboration among the D-8 countries. With different levels of progress in crops yields, mechanization, seed genetics and technology, and application of data science and AI in agriculture, the member states can develop collaboration through identification of complementarities in these areas. There is a need for more interaction among the agriculture and food security institutions to identify areas of collaboration and build capacity through working together. There is a need for institutional mapping, study of regulatory environments of member states for trade and technology transfer and promoting enabling environment for collaboration and trade among the member states.



### Author Details **Sultan Habibullah Khan**

<sup>1</sup> D-8 Research Center for Agriculture and Food Security, Center for Advanced Studies in Agriculture and Food Security, University of Agriculture, Faisalabad, Pakistan

0000-0002-3200-5151    sultan@uaf.edu.pk

### **Muhammad Asif Kamran**

<sup>1</sup> D-8 Research Center for Agriculture and Food Security, Center for Advanced Studies in Agriculture and Food Security, University of Agriculture, Faisalabad, Pakistan

0000-0003- 2275-720X    asif.kamran@uaf.edu.pk

## References

- Abdullahi, A. M., Kalengyo, R. B., & Warsame, A. A. (2024). The unmet demand of food security in East Africa: Review of the triple challenges of climate change, economic crises, and conflicts. *Discover Sustainability*, 5(1), 244.
- Alam, M. M., Ladha, J. K., Faisal, M. W., Sharma, S., Saha, A., Noor, S. & Rahman, M. A. (2015). Improvement of cereal-based cropping systems following the principles of conservation agriculture under changing agricultural scenarios in Bangladesh. *Field Crops Research*, 175, 1–15.
- Almasi, H. (2012). Investigating status of developing eight (D8) countries' macroeconomic indices in line with developing economic cooperation with Iran. *African Journal of Business Management*, 6(20), 6166.
- Arshad, M., Amjath-Babu, T. S., Aravindakshan, S., Krupnik, T. J., Toussaint, V., Kächele, H., & Müller, K. (2018). Climatic variability and thermal stress in Pakistan's rice and wheat systems: A stochastic frontier and quantile regression analysis of economic efficiency. *Ecological indicators*, 89, 496-506.
- Bhalla, A. S. (2016). Regional blocs: building blocks or stumbling blocks?. *Springer*.
- D-8 Organization. 2024. *Report of the 48th Session of the D-8 Commission, Cairo, Egypt*, 16 December 2024.
- Dosenrode, S. (2010). Federalism Theory and Neo-Functionalism: Elements for an analytical framework. *Perspectives on Federalism*, 2(3), 1-28.
- FAO. (2019). The State of Food and Agriculture 2019: Moving forward on food loss and waste reduction. *Food and Agriculture Organization of the United Nations*.
- Global Hunger Index (GHI). 2022. *Global, regional and national trends 2022*. Available online at: <https://www.globalhungerindex.org/trends.html>
- IPCC. (2018). *Special Report: Climate Change and Land*. Intergovernmental Panel on Climate Change.
- Ishaque, W., Tanvir, R., and Mukhtar, M. 2024. *Climate change and water crises in Pakistan: Implications on water quality and health risks*.
- Lipton, M., & Saghai, Y. (2017). Food security, farmland access ethics, and land reform. *Global Food Security*, 12, 59-66.
- Nouri, M., Homaei, M., Pereira, L. S., and Bybordi, M. 2023. Water management dilemma in the agricultural sector of Iran: A review focusing on water governance. *Agricultural Water Management*, 288: 108480.
- Nugroho, A. D., Prasada, I. Y., and Lakner, Z. 2023. Comparing the effect of climate change on agricultural competitiveness in developing and developed countries. *Journal of Cleaner Production*, **406**: 137139.
- Thomas, A., and Turk, R. 2023. Food insecurity in Nigeria: Food supply matters. *IMF Selected Issues Paper*, Washington, DC, USA.
- Trudell, J. P., Burnet, M. L., Ziegler, B. R., & Luginaah, I. (2021). The impact of food insecurity on mental health in Africa: A systematic review. *Social science & medicine*, 278, 113953.
- United Nations. (2015). *Transforming our world: the 2030 Agenda for Sustainable Development*.
- UNICEF. (2024). *The state of food security and nutrition in the world 2024: Financing to end hunger, food insecurity, and malnutrition in all its forms*.
- WEF (World Economic Forum). 2024a. *Global Gender Gap Report 2024*. Geneva: WEF.



- World Bank. (2021). *Agriculture and food security*. Retrieved from [worldbank.org](http://worldbank.org). [www3.weforum.org/docs/WEF\\_GGGR\\_2024.pdf](http://www3.weforum.org/docs/WEF_GGGR_2024.pdf).
- World Bank.(2024). GDP per capita (current US\$) - Retrieved from <https://data.worldbank.org>
- Wudil, A. H., Usman, M., Rosak-Szyrocka, J., Pilař, L., & Boye, M. (2022). Reversing years for global food security: A review of the food security situation in sub-Saharan Africa (SSA). *International Journal of Environmental Research and Public Health*, 19(22), 14836.S





## Potential role of sustainable energy in the progress and prosperity of D-8 countries: facts and prospects



Rashid Nazir <sup>1</sup>  , Abdullahi Balarabe Inuwa <sup>2</sup>  & Özgür Doğan <sup>3</sup> 

<sup>1</sup> Department of Environmental Sciences, COMSATS University Islamabad (CUI), Abbottabad Campus, Abbottabad 22060, Pakistan

<sup>2</sup> Department of Microbiology, Faculty of Life Sciences, College of Natural and Pharmaceutical Sciences, Bayero University Kano, Kano 700006, Nigeria

<sup>3</sup> The Scientific and Technological Research Council of Turkey (TUBITAK)Marmara Research Center, Climate and Life Sciences Vice Presidency, 41470 Gebze-Kocaeli, Türkiye

### Abstract

Being at important strategic locations along with cultural diversity, D-8 represents a global organization of eight developing countries for economic cooperation, exploring their collective economic potential, along with growing role in global governance and regional integration. Rapid increase in population of D-8 countries has increased industrialization, requiring more energy too. Such industrialization mainly depends on fossil fuel that has several negative impacts. Recently, alternative energy sources are becoming important to mitigate climate change (caused by fossil fuel burning), ensuring the energy security, and also promoting the sustainable development. Alternative energy sources are crucial for sustainable future, offering a cleaner, more secure, and more equitable energy system. As technologies continue to evolve and economies of scale improve, the alternative energy sources will become increasingly more viable and essential for a low-carbon future. Hence, this chapter aims to provide an understanding within D-8 countries about their role in fostering the regional integration for energy sources and for sustainable development. It provides a comprehensive report of D-8 countries' achievements in alternative energy, underscoring the essential partnerships that drive D-8 countries' overall success. Being tropical-to-subtropical and coastal countries, D-8 have vast potential for tidal, wind, solar and hydro-energy development. Pakistan and Türkiye are already excelling in wind energy alongside hydro power projects. Moreover, being populated and urbanized regions, D-8 countries have also a significant potential for biomass, biofuel and landfill gas energy. Türkiye is producing demonstrable bioenergy from anaerobic digestion of organic biomass beside solar energy in high rate. This chapter, thus, is to document the D-8 organization's milestones for sustainable energy, with particular ambition to inspire the future cooperation and innovation across D-8 countries. Technology driven new policies are recommended to harvest the clean and green energy, fulfilling the requirements of D-8 countries' economical developments.

### Keywords

D-8 · Energy · Sustainability · Renewable Energy



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 Corresponding author: Rashid Nazir [rashidnazir@cuiatd.edu.pk](mailto:rashidnazir@cuiatd.edu.pk)

## Introduction

The D-8 (Developing Eight) is a global organization for Economic Cooperation, constituting countries such as Bangladesh, Egypt, Indonesia, Iran, Malaysia, Nigeria, Pakistan and Turkiye. These D-8 countries are important for their collective economic potential, strategic location, cultural diversity, and growing role in global governance and regional integration. The global cooperation and economical importance of D-8 countries are expected in several areas, i.e., (1) collective GDP with about 3.7 trillion USD, making them a significant economic bloc, (2) vast trade opportunities, with a significant expected increase, (3) offer attractive investment opportunities in various sectors like infrastructure, manufacturing, and energy. In addition to these, strategic, social and cultural avenues may include (i) geopolitical location, covering a vast geographic area spanning across Asia, Africa, and the Middle East, (ii) rich energy resources, including oil, natural gas, and renewable energy, (iii) significant maritime trade potential, with several major ports and shipping lanes, (iv) a rich cultural diversity, with a blend of Islamic, Asian, African, and Middle Eastern cultures, (v) home to over 1 billion human population, representing about 15% of world's total population, and (vi) a growing focus on education and research, with several world-class universities and research institutions.

The rapid increase in population – globally and also in D-8 countries – has increased the industrialization process that require energy. The worldwide industrialization mainly depends on fossil fuel that has several negative impacts. Recently, the alternative energy sources – substitutes to offossil fuel – are becoming increasingly important because the world is now transitioning away from fossil fuels to mitigate the climate change (caused by fossil fuel burning), ensuring the energy security and promoting the sustainable development. Although alternative energy sources have some challenges like intermittent energy supply, high upfront costs, land requirements, technology limitations, policy and regulatory frameworks, these sources still represent a multitude of benefits. Alternative and sustainable energy sources are important for (i) climate change mitigation; because fossil fuel burning releases the greenhouse gases, contributing to climate change and alternative energy sources can significantly reduce those carbon emissions (IPCC, 2020), (ii) energy security; diversifying energy sources will reduce the dependence on imported fossil fuels, enhancing the energy security and reducing the price volatility (IEA, 2020), (iii) sustainable development; alternative energy sources can also promote the sustainable development via creating jobs, stimulating local economies, and improving the air quality (UNDP, 2020). Below are some of the currently used alternative energy sources:

1. Solar Energy - generated from sunlight, either through photovoltaic (PV) panels or solar thermal systems.
2. Wind Energy - generated from wind using the wind turbines.
3. Hydro Energy -acquired from the movement of water in rivers, oceans, or tidal currents, via using the hydroelectric power plants or tidal power turbines.
4. Geothermal Energy -produced from the heat of Earth's core, used for heating, and/or electricity generation.
5. Biomass Energy - generated from organic matter such as wood, crops, or solid waste, through combustion, anaerobic digestion, and/or gasification.
6. Hydrogen Energy -achieved from the reaction of hydrogen with oxygen, potentially produced from renewable energy sources.
7. Tidal Energy - generated from the rise and fall of oceanic tides, using tidal barrages and/or tidal stream generators.

8. Biofuels - produced from organic matter such as plants, algae, or agricultural waste, which can power the vehicles or may generate the electricity.
9. Landfill Gas Energy - generated from decomposition of wastes in landfills, used for electricity generation and/or heating.

## Energy Sources and Challenges

With a rising global energy demand surpassing the available supplies, the world is currently experiencing a historic energy crisis. Fossil fuels, which have historically served as the main source of energy, are limited and have caused several environmental problems, such as climate change and greenhouse gas emissions. Conventional energy sources, such as coal, oil, and natural gas, have long formed the basis of the world's energy output. Finding sustainable and renewable energy sources has become the focus of the world's attention to address this urgent issue. However, the hunt for alternative, renewable energy sources has been motivated by the limited nature of these resources as well as the growing worries about environmental degradation and climate change (Dresselhaus and Thomas, 2001; Zuroff and Curtis, 2012). Because of its abundance, renewability, and potential to reduce environmental consequences, lignocellulosic biofuels have become a prominent player in the field of renewable energy, which offers a promising solution to our energy demands (Rai et al., 2022).

## Renewable Energy Sources

Renewable energy, which includes solar, wind, hydropower, geothermal, and biomass-based energy, is produced from naturally regenerated resources. Solar energy uses the sun's energy to produce heat or electricity. Solar thermal systems collect the sun's heat for use in numerous applications, whereas photovoltaic cells turn sunlight directly into electric energy. Electricity is also produced by wind turbines using the kinetic energy of the wind (Sánchez et al., 2015). Particularly in areas with predictable wind patterns, wind farms are becoming more and more prevalent. According to the Türkiye Wind Energy Potential Atlas (2024), it is accepted that a wind power plant with a power of 5.3 MW per square kilometer can be established in regions where the wind speed is 6.5 m/s and at an altitude of 100 m above the ground. These assumptions show that the wind energy potential in Türkiye is 57,786 MW. Türkiye has a significant solar energy potential due to its geographical location. According to the Turkey Solar Energy Potential Atlas (GEPA) (2024) prepared by the Ministry, the average annual total sunshine duration is 2,741 hours and the average annual total radiation value is calculated as 1,527.46 kWh/m<sup>2</sup>. To create electricity through turbines, hydroelectric power is produced by capturing the energy from moving water, such as rivers or waterfalls.

To generate heat, electricity, or biofuels, biomass-based energy uses organic materials like agricultural waste, wood, and organic waste (Naik et al., 2010). According to the Biomass Energy Potential Atlas (BEPA) data prepared by the Ministry to determine the biomass energy potential in Türkiye, the total economic energy equivalent of the residues and wastes that can be collected is approximately 3.9 MTEP/year. An integrated approach is required to bring biomass resources into the economy, unlike other energy resources. There is a significant potential focused on heat and electricity production, and in addition to energy production, biomass resources offer important opportunities in protecting the environment, reducing emissions, and managing the effects of climate change. In this respect, sustainable biomass resource management is important in industry's adaptation process to climate change. The main biomass resources in Türkiye are municipal wastes (including landfill gas), as well as vegetable oil wastes, agricultural wastes without food and feed value, forest products other than industrial wood and resources obtained from by-products resulting from the processing of waste tires and wastewater treatment plant sludges.

## Lignocellulose: A Promising Candidate for Biofuel

Lignocellulosic biofuels are produced by a variety of methods from lignocellulosic biomass (LCB), including pretreatment, enzymatic hydrolysis, fermentation, and distillation. Cellulose, hemicellulose, and lignin make up a large portion of lignocellulosic biomass. One of the most prevalent biomasses on Earth is lignocellulose, a complex structure that is present in the cell walls of plants. As such, it is a preferable choice to produce bioenergy (Lora and Andrade, 2009). Lignocellulosic biomass is a very plentiful and renewable energy resource since it may be found in large quantities in agricultural waste, forest waste, and special energy crops. Unlike certain first-generation biofuels, such as corn ethanol, lignocellulosic biomass does not directly compete with food crops for resources like land and water, potentially alleviating worries about food security (Saxena et al., 2009).

### Pretreatments for Lignocellulose Degradation

To increase the digestibility of lignocellulosic material, it is essential to pre-treat (Galbe and Zacchi, 2012). The pre-treatment is essential to produce more fermentable sugars during hydrolysis step, hence increases the final bioethanol yield. Due to pre-treatment, complex chains of sugars become easily accessible for degradation (enzymatic or microbial) to produce fermentable sugars (Hendriks & Zeeman, 2009). Different methods are available for the pre-treatment of lignocellulosic biomass, which include physical, chemical and biological. In physical pre-treatment, the material is crushed to reduce the size of biomass. In practice, physical method is usually carried out in combination with chemical method (physio-chemical method). During crushing of biomass, the fibrous structure of the biomass gets open thereby increasing the surface area for microbial attack (Bruni et al., 2010). Chemical pre-treatment involves the use of acid, alkali or organo-solvent to break the complex structure of the lignocellulose, making cellulose and hemicellulose accessible for further hydrolysis. Sulfuric acid pre-treatment is used to release sugars from hemicellulose while NaOH pre-treatment and H<sub>2</sub>O<sub>2</sub> pre-treatment are used to dissolve lignin and to make the glucose available for hydrolysis (Brodeur et al., 2011).

**Biological Pre-treatment:** The efficient conversion of lignocellulosic biomass into biofuels requires breaking down the complex structure of cellulose and hemicellulose and this conversion requires group of enzymes, including cellulases, xylanases, and laccase. The cellulases and xylanases catalyze a process, known as enzymatic hydrolysis (Mood et al., 2013). Xylanases are enzymes that degrade hemicellulose and release xylose and other sugars for use in the generation of biofuel. An oxidative enzyme called laccase is essential for the breakdown of lignin and makes cellulose and hemicellulose more accessible to other enzymes (Nechita et al., 2021; Saini et al., 2016). Microorganisms can be employed as the pre-treatment agents for solid waste material, such as lignocelluloses and enhance enzymatic hydrolysis (Tsegaye et al., 2019). The subjection of LCB to microbial agents degrades cellulose and hemicellulose but lignin is quite resistant to biological attack than other parts of plant material (Shen et al., 2018). The fungal groups e.g. brown-rot, white-rot fungi and soft-rot fungi are considered the potential degraders (Kisii et al., 2001). The biological pre-treatment might not only delignify the substrate but also acts in certain other chemical reactions such as antimicrobial components like phenolics and flavonoids.

### Role of Microbial Consortia in Degradation

Communities of various microorganisms known as microbial consortia play a key role in the breakdown of lignocellulosic biomass. These consortia are made up of bacteria, fungus, and other microorganisms, and they each provide specific enzymatic activities to the process of decomposing biomass. A variety of microorganisms coexist and develop complex interactions in a natural setting,

like a forest (Poszytek et al., 2016). Different microbial species interact and depend on one another in these ecosystems, creating a dynamic environment where lignocellulosic degradation happens spontaneously. Some microbes are specialists at producing a particular enzyme, while others cooperate to speed up the entire breakdown process. A durable and effective system for lignocellulosic bioconversion is made possible by this microbial variety and cooperation, which also provides important insights for biotechnological applications (Smith et al., 2013).

## Energy and Biomass

Energy is the lifeblood of modern societies, powering our homes, businesses, and industries. The expanding world population and rapid industrialization have significantly increased the demand for energy. Global energy consumption grew by 2.3% in 2019, which is the fastest rate of growth since 2010. Biomass energy can play a role in addressing energy security concerns by promoting local and regional energy production. Fossil fuels (natural gas, coal and oil) are the primary and conventional sources of global energy consumption, accounting for around 84% of the total (Renewables Analysis- IEA, 2020). Renewable energy sources, which include solar, hydro, wind, geothermal, and bioenergy, are growing fast and compensated 11% of all energy consumed worldwide in 2019 (Global Energy Review- IEA, 2021).

Energy shortage is a pressing global issue that affects countries and regions worldwide. The increasing energy demands from various sectors, including industry, transportation, and residential areas, put more pressure on the natural non-renewable reserves of energy including coal and natural gas (Amini et al., 2017). Natural resources are depleted due to unsustainable use, which also contributes to other environmental issues, like greenhouse gas emissions (Naik et al., 2010).

Emissions of greenhouse gases cause global warming, climate change, and pollution thereby increasing global temperature by 0.8 °C approximately thus affecting the environment adversely (Saratale and Oh, 2014). USA uses 30% energy for vehicle fuels while it also consumes 25% global energy and contributing to the emission of 20% carbon dioxide globally. Studies indicate that in 2015, Singapore produced 55 trillion-megawatt energy, 96% of which was fossil fuel energy, while the rest of the energy has been produced by utilizing the municipal waste (MW) and lignocellulosic biomass (Tong et al., 2018).

The total theoretical biomass potential from agricultural crops in Türkiye is 574,234 kt dry mass, which could meet 36% of the country's energy requirement (Tumen Ozdil and Çalışkan, 2022). Agricultural waste in Türkiye represents a significant resource with diverse potential applications. Recent studies estimate that in 2022, livestock manure production reached 20.72 million tons (dry basis), while crop residues from grains and industrial plants amounted to 16.81 million tons (S. Sözer, 2023). Various agricultural wastes, including orange filter cake, pomegranate filter cake, and wood residues, have been evaluated for their potential in renewable energy generation (Mehmet Melikoğlu et al., 2023).

The amount of residue in field cultivation was calculated as 54,036 kilotons for field crops and 4,986 kilotons for horticultural crops as dry mass. The theoretical energy potential of these biomass residues is estimated to be 21.7 million TOE for arable field crops and 2.16 million TOE for horticultural crops, respectively. Agricultural products that leave more residues in the field are wheat straw, corn stalks and barley stalks, hazelnut, olive and grape pruning residues, respectively. The usable energy potential of agricultural residues for field crops is estimated to be 7.14 million TOE and 1.564 million TOE for horticultural crops. (Avcıoğlu et al., 2019). According to BEPA, the total amount of plant waste is 62.2 million tons, the theoretical energy equivalent (TEP/year) of plant waste is 25.4 million TEP, and the economic energy equivalent (TEP/year) is 1.5 MTEP (<https://bepa.enerji.gov.tr/> BEPA, 2024).

In Nigeria, the potential for renewable energy has been reported to be roughly 1.5 times higher than that of fossil-based fuels (Obada et al., 2024). The renewable resources in the country are so enormous

that if properly harnessed the nation can generate enough to even generate export. A brief survey of the prominent renewable resources of the country is given below:

1. **Hydro energy:** This has remained the primary source of electric power since 1896 (Ibrahim et al., 2021). This has been possible by the availability of nearly 200 dams in the country dedicated for power generation and irrigation activities (Obada et al., 2024). As a renewable resource, hydroelectric power accounts for nearly one-third of the total national grid power. However, the steep rise in population coupled with dilapidated infrastructure has placed untold burden on this resource. To compliment this, the federal government approved National Renewable Energy and Energy Efficiency Policy (NREEEP). This policy intends to integrate more renewable energy resources into the national supply mix to increase electricity access to the population (Yakubu et al. 2017).
2. **Wind energy:** Wind speed in Nigeria across the Southern to the Northern region ranges from 2.747 m/s to 4.57 m/s. This places the Northern part as an attractive site for wind energy generation (Chachangi et al., 2023). Despite this huge potential, however, the contribution of wind energy the overall nation's energy sector has remained insignificant. Nevertheless, the emergence of some wind energy generation and conversion unit in some Northern states is encouraging. Among these, the 10 MW and 100 MW wind projects in Katsina and Plateau states are notable.
3. **Solar energy:** The average solar radiation in Nigeria reaches around 12.6 MJ/m<sup>2</sup> /day at the Southern coastal regions to about 25.2 MJ/m<sup>2</sup> /day in the extreme Northern part. If properly harnessed, the nation can generate up to 1756 kWh/kWp of solar energy. Mega solar farm projects supported either by the governments or the private sector have started gaining ground several households and businesses have installed solar systems to complement the epileptic national grid. In many instances, governments have embraced solar energy as sustainable means of powering street lights and remote communities that are far away from the national grid. The emergence of small-scale solar skill acquisition training centers across the nation only attest to the bright future of this technology.
4. **Biomass energy:** Biomass energy represents all energy originating from non-fossil, organic materials, including plants,, animals and microbes. Nigeria is endowed with abundant biomass resources in quantities sufficient enough to complement the conventional energy sources. These include but not limited to all plant an animal wastes and residues, solid waste, sewage and industrial wastes. Among all these, firewood and charcoal represent the most popular among Nigerians, especially in the rural areas. It has been reported that an estimate of nearly 60% of Nigerians use firewood for cooking and/or heating. With the recent increase in energy prices in the country, the consumption of firewood and charcoal has only skyrocketed. The consequences include depletion of forest reserve and air pollution by smoke. Recently, attention is being geared towards the use of greener biomass and local technology for energy generation from solid waste and septic tank are becoming more popular. As the nation ranks high in terms of human resource, energy generation from solid waste may offer a sustainable platform for soild waste management, resource recovery and climate change mitigation.

By and large, generation and utilization of renewable energy in Nigeria is gaining more ground and may only keep progressing. To facilitate this, some local institutions have established renewable energy reserach centers mandated to carry out research on energy generation from local biomass resources and as well as to develop technologies for optimization and sustainable utilization of renewable energy. These include, but not limited to, Bayero University Center for Renewable Energy Reseach and Sokoto Energy Research Centre.

## Energy Challenges in Pakistan

Pakistan, like many other developing countries, faces its own unique challenges regarding energy shortage. The increasing population, industrial growth, and limited access to conventional energy resources have resulted in a considerable energy shortfall in the country, leading to frequent power outages and an imbalance in the energy supply-demand equation (Rasheed et al., 2016). Pakistan's government is spending more than 15 billion US dollars annually, for fossil fuel import (Uddinet al., 2016). Beside this, Pakistan utilizes thermal hydropower, thermal energy and nuclear power, with negligible use of renewable energy resources (Ali et al., 2017). Alternative energy sources, such as biomass, wind, and solar energy, are desperately needed to meet the country's present energy needs (Sánchez et al., 2015).

## Energy Challenges in Türkiye

The challenge regarding energy in Türkiye can be listed as 55% foreign dependency and being expensive. In order to prevent foreign dependency, utilizing solar energy, wind energy and biomass energy is considered strategically. Likewise, as a solution to high electricity prices, investing in solar, wind and biomass energy is considered as a priority solution in order to avoid being affected by price fluctuations in imported fuels, such as natural gas and oil.

While the footsteps of the European Green Deal and border carbon regulations are getting closer, all investments made in renewable energy instead of fuels such as coal and natural gas are supported in a country that has ratified the Paris Agreement and set a 2053 net zero target.

## Energy Challenges in Nigeria

Despite the bright potentials for renewable energy in Nigeria, the level of generation and utilization in Nigeria do not reflect it as a serious competitor for fossil-based fuels. This is due to a myriad of reasons including insufficient funding for research and development, poor implementation of policies on renewable energy targets among others (Obada et al., 2004, Isah et al., 2023)).

## Harnessing Biomass for Sustainable Energy Production

To overcome the ever-increasing energy crisis and related issues, renewable energy is the best option and pollution problems can be prevented by using thebioenergy as an alternative energy source (Ahmed et al., 2016). Several renewable energy options are explored with a focus on carbon-fewer renewable liquid fuels which are also economically feasible and environmentally sound. In a situation of broad and various energy crises, biomass usage is recommended among the renewable energy sources to meet both the present and future energy needs (Escobar et al., 2009).

Currently, biomass meets 10-14% of the world total energy demand and supports 80% of the rural areas of the world (Saxena et al., 2009). The developed countries have total share of 14% biomass resources and meets 40% of the total energy demands (Ozturk, 2010). Energy production by biomass in developing countries varies, like Kenya, India, Brazil generate 68%, 25%, 47%, 13% and 27% respectively (Parikka, 2004).

Biohydrogen production from food and agricultural wastes in Türkiye could reach 90 thousand tonnes by 2030, potentially generating significant economic returns (Mehmet Melikoğlu and Asli Tekin, 2024). Additionally, specific case studies, such as banana production waste in the Mediterranean region, demonstrate the potential for localized energy generation. For instance, banana waste could produce

2884.43 MWh and 2218.26 MWh of electricity over five years in Mersin and Antalya, respectively (A. Atılğan et al., 2023).

## Emerging Developments in Renewable Energy Sources

The energy production from available renewable resources varies from region to region, depending upon country's economy and its resources. Substrates are utilized to generate bioenergy during the breakdown of organic matter (Mussgnug et al., 2010). Certain biomass resources can be used as a substrate with an aim to produce energy, such as agricultural wastes including corn cob, wheat straw, sugarcane bagasse and rice husk (Mckendry, 2002). Other examples are food-waste, forestry residues, industrial wastes, paper industry pulp, sewage sludge and municipal solid wastes (Srirangan et al., 2013).

Sugar beet, wheat, corn, and sugar molasses are used for producing bioethanol in Türkiye. By 2023, Türkiye's potential bioethanol production from wheat, maize, rice, and potato waste reached 0.555 billion liters from production losses and 0.335 billion liters from consumption losses (Melikoğlu & Turkmen, 2019). This production would be sufficient to meet Türkiye's projected bioethanol (E10) demand (Melikoğlu & Turkmen, 2019).

## Energy Classification Based on Biomass Types

Renewable energy, when taken specifically; includes production of biofuels like bioethanol and biogas (Pankin et al., 2011). Energy can be produced from biomass using four different types of biomass have used this as substrates for the aforementioned purpose: the first generation used edible plants and crops, the second generation used non-edible biomass (lignocellulosic biomass), the third generation used algae, and the fourth generation used CO<sub>2</sub> capture and energy conversion (Palmer and Brigham, 2016). Plant biomass is considered the better alternative due to its low cost, ubiquitous availability, environmental sustainability and feasible operating procedures. Approximately, 205 billion tons of biomass is produced per year, and is mainly burned or disposed-off in landfills (Moodley and Kana, 2017). Among solid waste, LCB shares a large fraction of agricultural residues, livestock manure, forest residues, municipal solid waste, or dedicated energy crops (Sims et al., 2006). LCB is the chief structural component plant material and is considered the only renewable source of green energy. Two thirds of the world's energy necessity may be accomplished by agricultural wastes or other renewable resources (Marriott et al., 2016). Lignocellulosic biomass (LCB) is preferred over other types of biomasses because it is ubiquitously available throughout the year, is non-feedstock, can be grown in high yields and easily be transported from farm to industry (Naik et al., 2010).

## Conversion of Biomass into Bioethanol-Energy: Essential Steps

The bioconversion of biomass to biofuels is usually completed in five steps including biomass stock, pretreatment, enzymatic hydrolysis, fermentation and distillation (Chaturvedi and Verma, 2015), but this linear conversion scheme is hindered by the recalcitrance of the biomass (Hassan et al., 2018). Such first generation bioproducts like ethanol produced by the direct fermentation of sucrose has been widely used across the world especially in US and Brazil, since last three decades, as a blend to gasoline or as definite proportion in petrol (Limayem & Ricke, 2012). Lignocellulosic pretreatment modifies biomass to improve its conversion into biofuels or other valuable products. The main objectives of pretreatment are to increase cellulose accessibility, reduce the inhibitory effects of lignin and hemicellulose, and enhance downstream conversion efficiency. The choice of pretreatment method depends on factors such as biomass type, desired products, and economic considerations. Overall, pretreatment is a crucial step in unlocking the potential of lignocellulosic biomass for sustainable biorefineries (Mankar et al., 2021).

**Enhancing Lignocellulosic Biomass Degradation: Pretreatment Techniques:** To increase the digestibility of lignocellulosic material, it is essential to pre-treat (Galbe and Zacchi, 2012). Due to pre-treatment, complex chains of sugars become easily accessible for degradation (enzymatic or microbial) to produce fermentable sugars (Hendriks and Zeeman, 2009). In the pre-treatment the lignocellulosic biomass, different methods are available which includes physical, chemical, and biological. In the physical pre-treatment type, material is grinded to reduce the size of biomass. Physical methods are usually carried out in combination of chemical methods known as physio-chemical methods. When grinding of biomass is performed, fibrous structure of material gets open and surface area for microbial attack also increases (De-angelis et al., 2013).

Chemical pretreatment involves the use of chemicals to modify lignocellulosic biomass for improved conversion. It can enhance enzymatic hydrolysis and offers scalability and versatility. However, it has drawbacks such as the generation of inhibitory byproducts and potential environmental impacts. The choice of method depends on biomass characteristics and economic factors, and integration with other processes is often necessary for optimal conversion (Kumar and Sharma, 2017).

## Biological Pre-treatment

Microorganisms can be employed as the pre-treatment agents for solid waste material, such as lignocelluloses and enhance enzymatic hydrolysis (Tsegaye et al., 2019). The subjection of LCB to microbial agents degrades cellulose and hemicellulose but lignin is quite resistant to biological attack than other parts of plant material (Shen et al., 2018). The biological pre-treatment might not only delignify the substrate but also acts in certain antimicrobial components such as phenolic and flavonoids (Cragg et al., 2015).

Biological pretreatment is a method used to modify lignocellulosic biomass using biological agents such as enzymes or microorganisms. It is considered an environmentally friendly and sustainable approach for biomass conversion. In biological pretreatment, specific enzymes or microorganisms are employed to break down the complex structure of biomass, targeting components such as cellulose, hemicellulose, or lignin. This selective breakdown improves the accessibility and digestibility of the biomass, facilitating subsequent processing steps such as enzymatic hydrolysis or fermentation (Sindhu et al., 2016).

Biological pretreatment method operates under mild conditions, requiring lower energy inputs compared to physical or chemical methods. They also have the advantage of minimizing the formation of inhibitory byproducts that can interfere with downstream processes. Moreover, biological pretreatment can be integrated with other bioprocesses, allowing for synergistic and efficient biomass conversion (Sharma et al., 2019). Biological pretreatment is favored over physical and chemical methods for lignocellulosic biomass due to its environmentally friendly nature, selectivity in targeting specific biomass components, mild operating conditions, reduced inhibitor formation, integration potential with other bioprocesses, and the ability to generate valuable byproducts. This approach offers a sustainable and efficient way to break down biomass while minimizing environmental impact and maximizing economic viability (Saritha et al., 2012).

The lignocellulose being comprised of lignin, cellulose and hemicellulose requires different sets of various enzymes acting synergistically through oxidation and reduction process (Masran et al., 2016). The hydrogen bonding in the LCB structure offers great hinder in enzymatic action (Arora et al., 2015). The enzymatic hydrolysis of glucose to ethanol by the hydrolytic enzymes is the key step in this bioconversion process (Avci et al., 2013). The inherent recalcitrance lignocellulosic structure poses the major hinder in the conversion process, requiring immense quantity of the enzymes to disrupt the

sophisticated structure, then starch hydrolysis which only requires the amylases to produce bioethanol (Ko et al., 2015).

## Microbial Consortia for Lignocellulosic Degradation

Professor Teruo Higa pioneered the concept and technique behind effective microorganisms (EM) in the 1970s. This technology's main tenet was the introduction of a variety of favorable microorganisms to enhance soil quality, control putrefying (disease-causing) microbes, and increase the efficiency of organic matter utilisation by crops. Especially in organic farming systems, EM can considerably increase the beneficial impacts of soil and crop management measures (Lokman et al., 2013). Through fermentation, the solution aids in the breakdown of organic materials and generates healthy organic acids, bioactive compounds, and vitamins. Organic matter, which is provided through recycling agricultural wastes, green manures, and animal manure, is a crucial component in this process (Khan et al., 2010).

Che and Men (2019) discussed the basic microbe-microbe interaction types within consortia. Six basic interaction modes are identified: mutualism, commensalism, parasitism/predation, competition, amensalism, and neutralism. Stable growth is more likely in consortia based on cooperative relationships like mutualism and commensalism, where cross-feeding and exchange of metabolic products occur. Communication and division of labor within consortia enable them to perform complex functions and utilize resources efficiently. Consortia also exhibit diversity of metabolic pathways, allowing them to survive in sub-optimal environments and resist environmental fluctuations. This resilience and diversity are crucial for maintaining desired functions in bioremediation and bio production processes.

The use of microbial consortia for degradation of lignocellulosic biomass has recently been proven as an efficient strategy for enhanced saccharification in minimum time (Poszytek et al., 2016). The consortia are the combination of different species of the microbes including bacteria and/or fungi, which show synergistic or antagonistic effect when grown together (Arora et al., 2015). For degradation and enzyme activity, Hu et al. (2017) designed a composition of synthetic fungal microbial consortium, using fungal strains including *Trichoderma reesei*, *Penicillium decumbens*, *Aspergillus tubingensis*, and *Aspergillus niger* were devised in different combinations.

## Comparing Natural and Engineered Microbial Consortia

There are two types of microbial consortiums: naturally occurring wild forms and purposefully created artificial consortia (Bernstein and Carlson, 2012). The biomass is broken down by the natural microbial consortia, but they can also produce specific metabolites that can interfere with the fermentation process (Sabra et al., 2010). Therefore, it is necessary to engineer the microorganisms in the essential manner to maintain the development of additional activities (Tanouchi et al., 2012).

The natural consortia have certain drawbacks to be used for the pretreatment at industrial level, such as culturing problems, less saccharification capability, longer time requirement, instability, and incompetency with environmental constraints (Ding et al., 2016; Purnick and Weiss, 2009). As contrast, the engineered microbial consortia could be proved to perform the complicated services in the consortium system and combating the environmental fluctuations, by acting synergistically and maintaining stability of dynamic system (Brenner et al., 2008).

Among advantages of the microbial consortia, the engineered consortia perform the functions which individual cultures cannot perform, like interaction among the strains brings about the sharing of metabolites, molecular signaling, compensating the nutrient demands, division of labor and resistance to the environmental constrains (Mee and Wang, 2012). The consortia might include two or more members of the same species, or different species such as bacteria-bacteria consortia, fungi-fungi

consortia and bacteria-fungi consortia. For construction of synthetic microbial consortia, two ways have been adopted, (1) the re-engineering of the existing natural consortia and (2) to design synthetic microbial consortia which is also known as the “Engineered microbial consortia”, the former being known as the bottom-up approach (Ding et al., 2016).

## Advantages of Microbial Consortia in Lignocellulosic Degradation

The consortia for degradation of complex recalcitrant substrates offer advantage as different microbial population secrete different hydrolytic enzymes including Endo-1, 4- $\beta$ -glucanases, Exo-1, 4- $\beta$ -glucanases and  $\beta$ -glucosidases,  $\beta$ , 1, 4-endoxylanase and laccases. To date several bacteria-bacteria consortia have been used for degradation purposes. Bacterial genera *Clostridium* and *Thermoanaero* bacterium with aerobic/facultative anaerobic *Rhodocyclaceae* bacterium and *Bacilli* have been proven an efficient strategy to degrade the lignocellulosic biomass for yielding the valuable products (Wong-wilaiwalin et al., 2010). In addition, the use of consortia on mixture of substrates provides advantage as it provides diverse nutrients and avoids interspecific microbial community species competition, providing multiple nutrient sources (Mello et al., 2016).

Municipal solid waste (MSW) management is a pressing issue in metropolitan cities worldwide, particularly in underdeveloped countries. The rate of solid waste production often exceeds the pace of urbanization, and it is projected to increase significantly in the future, especially in developing countries. Despite allocating a significant portion of their municipal budgets (up to 50%) to waste operations such as collection and disposal, the performance of waste management in these countries is unsatisfactory (Abdel-Shafy and Mansour, 2018).

From 2002 to 2012, waste generation increased from 0.6 kilograms (kg) per capita per day to 1.2 kg per capita per day in urban areas with a 3.45% increase in population, resulting in an 87.5% increase in waste production. It is estimated that by the time the urban population reaches 4.3 billion, waste generation will reach 1.42 kg per capita per day. Furthermore, low-income countries are expected to experience a higher increase in MSW production compared to high-income countries over time (Schuler et al., 2012).

In Pakistan, MSW management is a growing problem due to urbanization, leading to massive waste generation and straining municipal budgets. Waste collection in the country is inadequate, with only 51-69% of the produced waste being gathered, while the rest remains on roads or dumping points. It is estimated that Pakistan produces 55,000 tons of solid waste per day, based on an estimated per capita waste production of 0.6-0.8 kg per day (Iqbal et al., 2022).

Improper solid waste management in Pakistan causes significant economic losses. The scarcity of sanitary landfill facilities in Pakistan is a major hurdle for municipal authorities to achieve proper waste disposal standards, leading to environmental degradation as leachate from open dumpsites infiltrates groundwater and releases greenhouse gases, as most sites lack gas extraction systems (Khan et al., 2011). Additionally, the lack of modern waste treatment techniques such as composting and biofuel production results in the burning of a significant amount of open-dumped waste, contributing to the absence of a sound system and action plan for solid waste management further compounds the challenges faced in waste management in the country (Leong et al., 2021).

To tackle the growing challenges of solid waste management, various waste-to-energy treatment options have been explored globally. These technologies aim to convert waste into valuable resources or energy while minimizing environmental impacts. Examples include anaerobic digestion, incineration, pyrolysis, gasification, landfill gas production, bioreactor landfill, and fermentation. These technologies offer opportunities for waste reduction, energy recovery, and resource recycling (Ghumra et al., 2022).

## Key Steps of Bioethanol-Energy Production

Ethanol is a resourceful chemical which has multi applications such as utilization of fuel purely, to be blended with gasoline or as a predecessor of many reactions (Maki *et al.*, 2009). It was reported that about 93% ethanol was formed by fermentation process while synthetic method contribution is about 7% (Badger, 2002). Two different methods are used for its production. In first method, ethanol is formed thermo chemically (Fig.7). During this method syngas is produced through gasification of raw material. In this process feedstock was subjected to steam and oxygen and temperature was set above 700 C. As a result, mixture of gases including CO<sub>2</sub>, H<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub> are produced. Tar and ash are then separated from syngas (Dwivedi, *et al.*, 2009). Purification can be carried out by changing conditions of gasifier or hot gas cleaning after gasifier. Different techniques can be used in hot gas cleaning process such as filters, separator containing rotating particles and chemical method includes cracking through heat or catalyst. At the end ethanol formation occurs by fermentation method or synthetic method (Maki, *et al.*, 2009).

Secondly, ethanol can be produced from crops which are enriched with starch through biochemical method (Fig.2.3). Steps involve in this method are pre-treatment, enzymatic hydrolysis, fermentation using yeast or bacteria, and a final product recovery step to utilize sugar molecules and to produce ethanol. Ethanol produced through this method can be categories as first or second generation. The pathways of ethanol production of first and second generation are significantly different (Dwivedi, *et al.*, 2009).

Bioethanol production involves a series of key steps that are crucial for the efficient conversion of biomass into ethanol. Ethanol, a versatile chemical, finds applications as a standalone fuel, as a blend with gasoline, and as a precursor for various chemical reactions. Most of the ethanol production, approximately 93%, is achieved through the fermentation process, with the remaining 7% contributed by synthetic methods (Badger, 2002).

Two primary methods are employed for ethanol production, namely thermochemical and biochemical methods. In the thermochemical method, ethanol is produced through the gasification of raw materials. This process involves subjecting the feedstock to steam and oxygen at temperatures exceeding 700°C, resulting in the production of a mixture of gases such as CO<sub>2</sub>, H<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>. The subsequent separation of tar and ash from the syngas is necessary (Dwivedi *et al.*, 2009). Purification can be achieved by modifying gasified conditions or implementing hot gas cleaning techniques, which may involve filters, rotating particle separators, or chemical methods such as heat or catalyst-induced cracking. Finally, ethanol is formed either through fermentation or synthetic routes (Maki *et al.*, 2009). The biochemical method of ethanol production involves utilizing crops enriched with starch. This process comprises several steps, including pre-treatment, enzymatic hydrolysis, fermentation using yeast or bacteria, and the recovery of the final ethanol product. Ethanol produced through this method can be classified as either first or second generation, with distinct pathways for each (Dwivedi *et al.*, 2009).

Pre-treatment is a critical step in the biochemical method, accounting for approximately 25% of the total processing cost in obtaining valuable products (Zheng *et al.*, 2009). Different pre-treatment processes, such as physical, chemical, biological, or combinations thereof, are employed. These processes cause structural deformations and disrupt the composite polymer structure of lignocellulosic biomass, thereby exposing the sugar content for downstream processes (Shen *et al.*, 2018). Examples of pre-treatment techniques include physical methods like elevated temperature exposure and grinding, chemical methods like acid digestion and gasification, and biological approaches involving the use of microbes and enzymatic systems (Huang *et al.*, 2010). While physico-chemical pre-treatments may be costly and unsustainable, potentially yielding toxic compounds, biological pre-treatment strategies

offer a cost-efficient and logistically feasible means of converting lignocellulosic polymers into free sugars (Agbor et al., 2011; Mood et al., 2013).

Enzymatic hydrolysis is another important step in bioethanol production, aimed at breaking down the remaining undigested polysaccharides into monomers that can be fermented. This process involves the use of various enzymes. Cellulases, a group of enzymes, act on cellulose, breaking it down into oligosaccharides. Subsequently, the enzyme  $\beta$ -glucosidase completes the decomposition by hydrolyzing the oligosaccharides into monomeric sugars. Enzymatic hydrolysis takes place when water and appropriate enzymes are added to the polysaccharide (Galbe and Zacchi, 2012). It is important to note that  $\beta$ -glucosidase can be inhibited by the product glucose, impacting its activity when excessive glucose is formed. While enzymatic hydrolysis enables the decomposition of biomass into monomer units, it is relatively costly compared to acid hydrolysis, which has lower operational costs and higher effectiveness. However, acid hydrolysis may produce toxic substances that can affect process efficiency (Garcia et al., 2015). By keeping in view, the above discussion, a research study is designed to manage solid waste properly and to evaluate their potential for bioethanol production.

## Overcoming Challenges in Bioethanol Production from Biomass

Although biofuel production from lignocellulosic biomass is the potential alternative, there are certain technological barriers, like inefficient enzymatic hydrolysis, as the bioconversion requires efficient synergetic actions among released enzymes (Behera et al., 2017). The cellulases are used at commercial scale to produce the fermentable sugars but are considered challenging as well due to high saccharification cost of induction agents like cellulose and controlling the dynamics of whole conversion system (Arora et al., 2015a). Besides this, microbes in conventional conversion process needs high enzyme loading and more incubation time (Matsakas et al., 2017). Optimum conditions are required in the cost-efficient media for smooth conversion process, like suitable amount of glucose is needed to overcome feedback inhibition of the environment (Zhang and Zhang, 2013). But lytic enzyme producing microbes also require special growth conditions and prevention measures to stop actions of other unwanted biproducts (Tsegaye et al., 2019)

Furthermore, the presence of microbes in mixture is obvious because they are degrading the complex biomass of varying chemical composition. Looking forward to the green future using sustainable technologies, there is an ultimate need to identify the possible means to enhance saccharification for bioethanol production without compromising environment (Patel and Bhaskaran, 2016).



### Author Details

#### Rashid Nazir

<sup>1</sup> Department of Environmental Sciences, COMSATS University Islamabad (CUI), Abbottabad Campus, Abbottabad 22060, Pakistan

0000-0002-1948-969X ✉ rashidnazir@cuiatd.edu.pk

#### Abdullahi Balarabe Inuwa

<sup>2</sup> Department of Microbiology, Faculty of Life Sciences, College of Natural and Pharmaceutical Sciences, Bayero University Kano, Kano 700006, Nigeria

0000-0002-9134-1470 ✉ abinuwa.mcb@buk.edu.ng

#### Özgür Doğan

<sup>3</sup> The Scientific and Technological Research Council of Turkey (TUBITAK)Marmara Research Center, Climate and Life Sciences Vice Presidency, 41470 Gebze-Kocaeli, Türkiye

0000-0002-7415-5369 ✉ ozgur.dogan@tubitak.gov.tr



## References

- Abdel-Shafy, H. I., & Mansour, M. S. M. (2018). Solid waste issue: Sources, composition, disposal, recycling, and valorization. *Egyptian Journal of Petroleum*, 27(4), 1275–1290
- Agbor, V. B., Cicek, N., Sparling, R., Berlin, A., & Levin, D. B. (2011). Biomass pretreatment: Fundamentals toward application. *Biotechnology Advances*, 29(6), 675–685
- Agnelli, A., Ascher, J., Corti, G., Ceccherini, M. T., Nannipieri, P., & Pietramellara, G. (2004). Distribution of microbial communities in a forest soil profile investigated by microbial biomass, soil respiration and DGGE of total and extracellular DNA. *Soil Biology and Biochemistry*, 36(5), 859–868. <https://doi.org/10.1016/j.soilbio.2004.02.004>
- Agrawal, D., & Matkar, K. (2016). Enhancement of cellulase production by substrate manipulation in three *Aspergillus* sp. *Indian Journal of Applied Research*. 7(2), 149–156
- Ahmed, S., Mahmood, A., Hasan, A., Sidhu, G. A. S., & Butt, M. F. U. (2016). A comparative review of China, India and Pakistan renewable energy sectors and sharing opportunities. *Renewable and Sustainable Energy Reviews*, 57, 216–225.
- Akçin, M., Keles, C., Kaygusuz, A., & Karabiber, A. (2015). recent energy trends in energy policies: clean and renewable energies. *Researchgate*. <https://doi.org/10.13140/RG.2.1.3851.5285>
- Ali, U., James, A., Riaz, R., Li, J., Zhang, G., Jones, K. C., & Naseem, R. (2017). Sedimentary black carbon and organochlorines in Lesser Himalayan Region of Pakistan: Relationship along the altitude. *Science of The Total Environment*, 9(2), 149–156
- Alikhani, H. A., Saleh-Rastin, N., & Antoun, H. (2006). Phosphate solubilization activity of rhizobia native to Iranian soils. *Plant and Soil*, 287(1–2), 35–41. <https://doi.org/10.1007/S11104-006-9059-6/METRICS>
- Álvarez, C., Reyes-Sosa, F. M., & Díez, B. (2016). Enzymatic hydrolysis of biomass from wood. *Microbial Biotechnology*, 9(2), 149–156.
- Amini, Z., Ilham, Z., Ong, H. C., Mazaheri, H., & Chen, W. H. (2017). State of the art and prospective of lipase-catalyzed transesterification reaction for biodiesel production. *Energy Conversion and Management*, 141, 339–353.
- Anand, A. A. P., Vennison, S. J., Sankar, S. G., Gilwax, D. I., Vasan, P. T., Raghuraman, T., Geoffrey, C. J., & Vendan, S. E. (2017). Isolation and characterization of bacteria from the gut of *Bombyx mori* that degrade cellulose, xylan, pectin and starch and their impact on digestion. *Bioresource Technology*, 10(107), 1–20.
- Andlar, M., Rezić, T., Marđetko, N., Kracher, D., Ludwig, R., & Šantek, B. (2018). Lignocellulose degradation: An overview of fungi and fungal enzymes involved in lignocellulose degradation. *Engineering in Life Sciences*, 18(11), 768–778
- Anwar, Z., Gulfracz, M., & Irshad, M. (2014). Agro-industrial lignocellulosic biomass a key to unlock the future bio-energy: A brief review. *Journal of Radiation Research and Applied Sciences*, 7(2), 163–173.
- Arora, R., Behera, S., Kumar Sharma, N., & Kumar, S. (2015). Bioprospecting thermostable cellulosomes for efficient biofuel production from lignocellulosic biomass. *Bioresources and Bioprocessing*, 2, 38. <https://doi.org/10.1186/s40643-015-0066-4>
- Asia Nosheen, Asghari Bano, Faizan Ullah, Uzma Farooq, Humaira Yasmin and Ishfaq Hussain (2011) Effect of plant growth promoting rhizobacteria on root morphology of Safflower (*Carthamus tinctorius* L.). *African Journal of Biotechnology* Vol. 10 (59), 21-27.
- Atılgan, A., Krakowiak-Bal, A., Ertop, H., Saltuk, B., and Malinowski, M. The Energy Potential of Waste from Banana Production: A Case Study of the Mediterranean Region. *Energies*, 2023.
- Avcıoğlu, A.O., Dayioğlu, M.A., Türker U. Assessment of the energy potential of agricultural biomass residues in Türkiye. *Renewable Energy*, Volume 138, Syf. 610-619, ISSN 0960-1481, 2019.
- Avci, A., Saha, B. C., Dien, B. S., Kennedy, G. J., & Cotta, M. A. (2013). Response surface optimization of corn stover pretreatment using dilute phosphoric acid for enzymatic hydrolysis and ethanol production. *Bioresource Technology*, 130, 603–612
- Chanchangi, Y. N., Adu, F., Ghosh, A., Sundaram, S., & Mallick, T. K. (2023). Nigeria's energy review: Focusing on solar energy potential and penetration. *Environment, Development and Sustainability*, 25(7), 5755–5796.
- Ibrahim, I. D., Hamam, Y., Alayli, Y., Jamiru, T., Sadiku, E. R., Kupolati, W. K., ... & Eze, A. A. (2021). A review on Africa energy supply through renewable energy production: Nigeria, Cameroon, Ghana and South Africa as a case study. *Energy Strategy Reviews*, 38, 100740.

- Isah, A., Dioha, M. O., Debnath, R., Abraham-Dukuma, M. C., & Butu, H. M. (2023). Financing renewable energy: policy insights from Brazil and Nigeria. *Energy, Sustainability and Society*, 13(1), 2.
- Leong, H. Y., Chang, C. K., Khoo, K. S., Chew, K. W., Chia, S. R., Lim, J. W., Chang, J. S., & Show, P. L. (2021). Waste biorefinery towards a sustainable circular bioeconomy: a solution to global issues. *Biotechnology for Biofuels*, 14(1), 1–15. <https://doi.org/10.1186/S13068-021-01939-5/TABLES/3>
- Li, X., Xu, Q., Cheng, J., & Yuan, Y. (2016). Improving the bioremoval of sulfamethoxazole and alleviating cytotoxicity of its biotransformation by laccase producing system under coculture of *Pycnoporus sanguineus* and *Alcaligenes faecalis*. *Bioresource Technology*, 220, 333–340. <https://doi.org/10.1016/j.biortech.2016.08.088>
- Li, Y., Adams, J., Shi, Y., Wang, H., He, J.-S., & Chu, H. (2017). Distinct Soil Microbial Communities in habitats of differing soil water balance on the Tibetan Plateau. *Renewable and Sustainable Energy Reviews*, 33, 188–203
- Li, Y., Zhang, L., Xian, H., & Zhang, X. (2019). Newly isolated cellulose-degrading bacterium *achromobacter xylooxidans*L2 has deinking potential. *BioResources*, 14(1), 2256–2268. <https://doi.org/10.15376/biores.14.1.2256-2268>
- Melikoğlu, M., Ozdemir, M., and Ateş, M. Pyrolysis kinetics, physicochemical characteristics and thermal decomposition behavior of agricultural wastes using thermogravimetric analysis. *Energy Nexus*, 2023.
- Melikoğlu, M., and Tekin, A. Biohydrogen production from food and agricultural wastes: A global review and a techno-economic evaluation for Türkiye. *International Journal of Hydrogen Energy*, 2024.
- Melikoğlu, M., and Turkmen, B. Food waste to energy: Forecasting Türkiye's bioethanol generation potential from wasted crops and cereals till 2030. *Sustainable Energy Technologies and Assessments*, 2019.
- Obada, D. O., Muhammad, M., Tajiri, S. B., Kekung, M. O., Abolade, S. A., Akinpelu, S. B., & Akande, A. (2024). A review of renewable energy resources in Nigeria for climate change mitigation. *Case Studies in Chemical and Environmental Engineering*, 9, 100669.
- Ozturk, I. (2010). A literature survey on energy–growth nexus. *Energy Policy*, 38(1), 340–349. <https://doi.org/10.1016/J.ENPOL.2009.09.024>
- Palmer, J. D., & Brigham, C. J. (2016). Feasibility of triacylglycerol production for biodiesel, utilizing *Rhodococcus opacus* as a biocatalyst and fishery waste as feedstock. *Renewable and Sustainable Energy Reviews*, 56, 922–928.
- Pandey, A. (2003). Solid-state fermentation. *Biochemical Engineering Journal*, 13(2), 81–84.
- Pankin, K. E., Ivanova, Y. V., Kuz'Mina, R. I., & Shtykov, S. N. (2011). Comparison of the physicochemical characteristics of biofuels and petroleum fuels. *Chemistry and Technology of Fuels and Oils*, 47(1), 7–11
- Parikka, M. (2004). Global biomass fuel resources. *Biomass and Bioenergy*, 27(6), 613–620. <https://doi.org/10.1016/J.BIOMBIOE.2003.07.005>
- Partowmah, S. H., Collins, R., & Soares, A. (2019). Investigating the Structure of Laccases for Biofuels. *Biophysical Journal*, 116(3), 60a. <https://doi.org/10.1016/J.BPJ.2018.11.370>
- Thakur, V., Kumar, V., Kumar, S., & Singh, D. (2018). Diverse culturable bacterial communities with cellulolytic potential revealed from pristine habitat in Indian trans-Himalaya, *Journal of soil Microbiology* 64(11), 798–808
- The World Bank. (2016). Urban solid waste management. Retrieved July 21, 2016, from <http://web.worldbank.org>
- Tong, H., Yao, Z., Lim, J. W., Mao, L., Zhang, J., Ge, T. S., Peng, Y. H., Wang, C. H., & Tong, Y. W. (2018). Harvest green energy through energy recovery from waste: A technology review and an assessment of Singapore. *Renewable and Sustainable Energy Reviews*, 98, 163–178.
- Tsegaye, B., Balomajumder, C., & Roy, P. (2019). Alkali pretreatment of wheat straw followed by microbial hydrolysis for bioethanol production. *Environmental Technology*, 40(9), 1203–1211. <https://doi.org/10.1080/09593330.2017.1418911>
- Tumen Ozdil, N.F., and Çalişkan, M. Energy potential from biomass from agricultural crops: Development prospects of the Turkish bioeconomy. *Energy*, 2022
- Uddin, D. A. Z. (2019). BPT bone versus Quadruple Hamstring Tendon Graft for Reconstruction of ACL injury based on the Clinical Outcome of the Patients. *Journal of Medical Science and Clinical Research*, 7(10), 456–461. <https://doi.org/10.18535/jmscr/v7i10.78>
- Van Den Brink, J., & De Vries, R. P. (2011). Fungal enzyme sets for plant polysaccharide degradation. *Applied Microbiology and Biotechnology*, 91(6), 1477–1492. <https://doi.org/10.1007/S00253-011-3473-2>

- Velasco-Rodríguez, Ó., Fil, M., Heggeset, T. M. B., Degnes, K. F., Becerro-Recio, D., Kolsaková, K., Haugen, T., Jønsson, M., Toral-Martínez, M., García-Estrada, C., Sola-Landa, A., Josefsen, K. D., Sletta, H., & Barreiro, C. (2022). Characterization of Microbial Diversity in Decayed Wood from a Spanish Forest: An Environmental Source of Industrially Relevant Microorganisms. *Microorganisms*, 10(6), 1249.
- Ververis, C., Georgioudis, K., Danielidis, D., Hatzinikolaou, D. G., Santas, P., Santas, R., & Corleti, V. (2007). Cellulose, hemicelluloses, lignin and ash content of some organic materials and their suitability for use as paper pulp supplements. *Bioresource Technology*, 98(2), 296–301.
- Wang, Q., Li, Y., & Wang, Y. (2011). Optimizing the weight loss-on-ignition methodology to quantify organic and carbonate carbon of sediments from diverse sources. *Environmental Monitoring and Assessment*, 174(1–4), 241–257.
- Wongwilaiwalin, S., Rattanachomsri, U., Laothanachareon, T., Eurwilaichitr, L., Igarashi, Y., & Champreda, V. (2010). Enzyme and Microbial Technology Analysis of a thermophilic lignocellulose degrading microbial consortium and multi-species lignocellulolytic enzyme system. *Enzyme and Microbial Technology*, 47(6), 283–290.
- Woo, H. L., Hazen, T. C., Simmons, B. A., & DeAngelis, K. M. (2014). Enzyme activities of aerobic lignocellulolytic bacteria isolated from wet tropical forest soils. *Systematic and Applied Microbiology*, 37(1), 60–67.
- Wu, Y. R., & He, J. (2015). Characterization of a xylanase-producing *Cellvibrio mixtus* strain J3-8 and its genome analysis. *Scientific Reports*, 5, 1–11. <https://doi.org/10.1038/srep10521>
- Yousuf, M. S., & El-Shafei, M. (2007). Power Line Communications: An Overview - Part I. 2007 *Innovations in Information Technologies (IIT)*, 218–222. <https://doi.org/10.1109/IIT.2007.4430363>
- Yuan, X., Li, P., Wang, H., Wang, X., Cheng, X., & Cui, Z. (2011). Enhancing the Anaerobic Digestion of Corn Stalks Using Composite Microbial Pretreatment. *J. Microbiol. Biotechnology*, 21(7), 746–752.
- Zhang, X.-Z., & Zhang, Y.-H. P. (2013). Cellulases: Characteristics, Sources, Production, and Applications. *Bioprocessing Technologies in Biorefinery for Sustainable Production of Fuels, Chemicals, and Polymers*, 131–146. <https://doi.org/10.1002/9781118642047.ch8>
- Zheng, Y., Pan, Z., & Zhang, R. (2009). Overview of biomass pretreatment for cellulosic ethanol production. *International Journal of Agricultural and Biological Engineering*, 2(3), 51–68
- Zuroff, T. R., & Curtis, W. R. (2012). Developing symbiotic consortia for lignocellulosic biofuel production. *Applied Microbiology and Biotechnology*, 93(4), 1423–1435
- Intergovernmental Panel on Climate Change (IPCC). (2020). *Climate Change 2020: Mitigation*.
- International Energy Agency (IEA). (2020). *World Energy Outlook 2020*.
- United Nations Development Programme (UNDP). (2020). *Sustainable Development Goals*.
- National Renewable Energy Laboratory (NREL). (2020). *Renewable Energy Data Book*.
- International Renewable Energy Agency (IRENA). (2020). *Global Renewables Outlook*.
- <https://bepa.enerji.gov.tr/> BEPA, 2024.
- <https://enerji.gov.tr/bilgi-merkezi-enerji-biyokutle>, 26.12.2024.
- <https://enerji.gov.tr/bilgi-merkezi-enerji-gunes>, 26.12.2024.
- <https://enerji.gov.tr/bilgi-merkezi-enerji-ruzgar>, 26.12.2024.



## Legal and Policy Frameworks of the Developing-8 Organization for Economic Cooperation: An Analytical Perspective



Chinyere Rita Agu<sup>1</sup>

<sup>1</sup> Senior Research Fellow at the Nigerian Institute of International Affairs, Lagos

### Abstract

The Developing-8 Organisation for Economic Cooperation (the D-8) is an assembly of intergovernmental eight developing countries - Bangladesh, Egypt, Indonesia, Iran, Malaysia, Nigeria, Pakistan and Turkey- primarily founded to maintain economic collaboration and development to improve trade, investment, and technological cooperation. The D-8 runs under intergovernmental agreements and a founding charter outlining its objectives, organisational structure, and operational principles. This legal base provides a framework for coordinated economic policies and sets the ground rules for cooperation among member states. This chapter provides a comprehensive analysis of the D-8, centring on its legal and policy frameworks. This study examines the foundational legal documents and policy structures that steer the D-8's operations and objectives. The chapter highlights how the D-8 addresses common economic challenges and promotes sustainable development among member states by exploring the organisation's treaties, agreements, and institutional arrangements. The analysis also evaluates the efficacy of these frameworks in facilitating regional integration and economic growth, offering insights into the strengths and limitations of the D-8 approach. Through a comprehensive review, this chapter aims to clarify how legal and policy considerations shape the D-8's strategic direction and impact its member countries' economic trajectories.

### Keywords

Developing-8 · Legal Framework · Policy Framework · Sustainable Development



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Corresponding author: Chinyere Rita Agu [ritachichiben@yahoo.com](mailto:ritachichiben@yahoo.com)

## Introduction

In the environment of an increasingly globalised economy, the necessity for cooperation among developing nations has become paramount. Economic cooperation as defined by *Agencia Chilena de Cooperacion Internacional para el Desarrollo* “is a component of international cooperation that seeks to generate the conditions needed to facilitate the processes of trade and financial integration in the international arena by implementing actions to obtain indirect economic benefits in the medium and long term” (*Agencia Chilena de Cooperacion Internacional para el Desarrollo*, 2024). This definition implies that no nation is an island and that most nations will rely on each other, especially where there are comparative advantages that will benefit nations bound by economic cooperation objectives.

Developing-8 (D-8) Organization for Economic Cooperation, established in 1997, is a crucial platform for fostering collaboration among its member states: Bangladesh, Egypt, Indonesia, Iran, Malaysia, Nigeria, Pakistan, Turkey and most recently Azerbaijan (D-8 Cairo Declaration, 2024). This intergovernmental organization seeks to enhance economic ties, promote trade, and support sustainable development within the framework of cooperation. As a response to the challenges posed by globalization, the D-8 emphasizes the importance of collective strategies to address socio-economic disparities and enhance regional integration (D-8 Secretariat, 2024). Its main objectives as stipulated in the Charter are to improve Member States' position in the global economy, diversify and create new opportunities in trade relations and improve standards of living (D-8 Secretariat, 2024). This is done by creating new opportunities in trade relations and enhancing participation in decision-making at the international level (D-8 Secretariat, 2024).

The D8 further expanded areas of cooperation to Science and Technology, health, innovation, and the environment (Wikipedia, 2024). The creation of D-8 was communicated officially via the Istanbul Declaration of Summit of Heads of State/Government on June 15, 1997. It is pertinent to note that the D-8 has a global flavour rather than a regional flavour, according to the composition of its members. It is intended to be a forum with no adverse impact on bilateral and multi-lateral commitments of the member countries, emanating from their membership to other international or regional organizations. (Agbu, 2021). Ambassador Isiaka Abdulqadir Imam, a Nigerian, is currently the Secretary General of the D-8 Organization with its Secretariat based in Istanbul-Turkey. He is the fifth Secretary-General (D-8 Secretariat, 2025). The idea of cooperation among major Muslim developing countries was mooted by Necmettin Erbakan, the then Prime Minister of Turkey, during a Seminar on “Cooperation in Development” which was held in Istanbul in October 1996. The group envisioned cooperation among countries stretching from South East Asia to Africa. Representatives from Bangladesh, Egypt, Indonesia, Iran, Malaysia, Nigeria and Pakistan attended the Seminar. This conference was the first step towards the establishment of the D-8 and it was only after a series of preparatory meetings that D-8 was officially set up and began its activities with the Istanbul Declaration issued at the end of the Summit of Heads of State and Government held in Istanbul on June 15, 1997 (D-8 Secretariat, 2025)..

According to the First Summit Declaration (Istanbul, 1997), the main objective of D-8 was stated to be socio-economic development per the following principles:

- Peace instead of conflict
- Dialogue instead of confrontation
- Cooperation instead of exploitation
- Justice instead of double-standard
- Equality instead of discrimination
- Democracy instead of oppression (Wikipedia, 2024).



Thus, the D-8 cardinal objectives are to improve developing countries' positions in the world economy, diversify and create new opportunities in trade relations, enhance participation in decision-making at the international level, and provide a better standard of living. The following three phrases are quotations from the D-8 fifth Summit Declaration (Bali, 2006) which illustrates some application of the principal objectives:

- “We commit ourselves to working together to solve the problem of economic disparities within our countries.
- We reaffirm our commitment to enhance cooperation in the field of energy to develop alternative and renewable energy resources.
- We emphasize the importance of D-8 in contributing to the economic development of its member countries and ensure that it promotes global trade’.

The principal organs of D-8 are The Summit, The Council and The Commission. The Summit, which is the supreme organ of D-8, is composed of the Heads of State/Government of member states and it is convened once every two years. The Council is composed of the Ministers of Foreign Affairs of member states. It is the political decision-making organ of D-8 and acts as a forum for thorough consideration of issues at hand. The Commission is the executive body of D-8. It is composed of senior officials appointed by their respective governments. Each Commissioner is responsible for the national coordination in his/her respective country. The D-8 Secretariat is composed of Directing Staff of the Secretariat as follows: Secretary General (Nigeria); Director I (Administrative, Legal and Internal Issues) (Pakistan); Director II (Economy, Implementation and External Relations) (Indonesia) (D-8 Secretariat, 2025).

The vision behind the D-8 as an organization is to encourage economic cooperation and collaboration between member countries and how they can use their interventions to enhance the economies of member countries. The D-8 Member countries have a lot of potential and capabilities, and collaboration would bring prosperity to member states. Although, they have their weaknesses and strengths if they genuinely cooperate there could be a win-win situation all around. This is because each country has its merits and demerits, and if they cooperate, through teamwork, each country can benefit from the capabilities of other countries. For example, it is expected from discussions that Nigeria, Iran and Turkey would establish a fertilizer plant in the country, in anticipation that Nigeria would then export phosphate to these partners. Opening access to the international markets of the D-8 countries among themselves is also another area of cooperation that is yet to be exploited. The D-8 as an organisation is expected to encourage inter-trading between member countries in other to supersede its five million dollar set target in the health sub-sector for example.

According to Pricewaterhouse Coopers, a noted global auditing firm, D-8 countries have the potential to become the leading economic powers by 2050. The Firm ranked D-8 Member states among the top 24 out of 30 for economic ranking. Indonesia was ranked number 4, Turkey 11, Nigeria 14, Egypt 15, Pakistan 16, Iran 17, and Bangladesh 23. The combined GDP of these countries will be \$40 trillion. This will make the D-8 as a group, the third strongest economic power apart from China and India (Daily Trust, 2019). Furthermore, to boost trade and enhance development the D-8 preferential trade agreement came into force for six out of the then-eight D-8 countries which are namely Iran, Pakistan, Malaysia, Indonesia, Nigeria and Turkey (D-8 Secretariat, 2024). Invariably, with the enforcement of the agreement, the D-8 countries speed up in terms of volumes of trade and development.

A detailed analysis of the legal and policy frameworks governing the D-8 is essential to understanding its effectiveness and impact. These frameworks not only facilitate cooperation but also provide the necessary legal infrastructure for the implementation of various initiatives aimed at boosting trade and investment among member states. This chapter will explore the existing legal instruments, policy directives, and their implications for economic cooperation, focusing on the D-8's role in promoting



sustainable development and addressing global economic challenges. By critically examining these frameworks, this chapter aims to highlight both the achievements and the limitations of the D-8 in navigating the complexities of international economic relations.

## Historical Background: The Developing-8 Organization for Economic Cooperation

Historically, the Developing-8 (D-8) Organization for Economic Cooperation was established in 1997 in Istanbul, Turkey, with the primary goal of enhancing economic cooperation among member states and addressing the challenges faced by developing nations in the global economic landscape. The founding members—Bangladesh, Egypt, Indonesia, Iran, Malaysia, Nigeria, Pakistan, and Turkey—shared common interests in fostering economic development, reducing poverty, and enhancing trade among themselves (D-8 Secretariat, 2025).

The concept for the D-8 emanated in the 1990s, a period characterised by significant geopolitical shifts and increasing globalisation. Developing countries were facing mounting pressures from both economic competition and the need for sustainable development. The D-8 was envisioned as a response to these challenges, emphasizing solidarity and cooperation among nations with similar socio-economic contexts. The founding conference in Istanbul marked a pivotal moment, as member states committed to collaborating on various sectors, including trade, finance, agriculture, and technology.

Over the years, the D-8 has convened multiple summits and meetings to address critical issues and outline strategies for economic collaboration. The organization has established various legal frameworks and policy initiatives to facilitate trade agreements, investment flows, and joint projects. For instance, the D-8 Preferential Trade Agreement (PTA), signed in 2006, aimed to reduce tariffs and promote intra-D-8 trade, reflecting the organization's commitment to economic integration (D-8 Secretariat, 2024). Notwithstanding its ambitious goals, the D-8 has faced challenges, including differing political interests, economic disparities among member states, and external pressures from larger global economies. However, the organization continues to evolve, seeking to strengthen its legal and policy frameworks to better serve its member states and adapt to changing global dynamics.

The D-8 continues to play a pivotal role in fostering economic collaboration among its member countries: Bangladesh, Egypt, Indonesia, Iran, Malaysia, Nigeria, Pakistan, Turkey and most recently Azerbaijan.

## Legal Framework of the Developing-8 Organization for Economic Cooperation

The legal framework of the D-8 is integral to its mission of fostering economic collaboration among its member states. Established to enhance cooperation in various sectors, the D-8's legal structure is grounded in several foundational documents and agreements that facilitate its operations and initiatives.

### Foundational Treaty and Governance

The primary legal document governing the D-8 is the D-8 Charter, adopted at its inaugural summit in 1997. This charter outlines the objectives, principles, and structure of the organization, emphasizing cooperation in economic, social, and technological fields. It provides the foundational governance



framework, establishing the roles of the Council of Ministers and the D-8 Secretariat, which coordinates the organization's activities and initiatives (D-8 Secretariat, 2024).

The charter in Article 3(3) provides for the admission of new members which is to the effect that Any developing country that is a member of the United Nations, shares common values and friendly relations with the founding members, and commits to upholding the objectives and principles of the D-8 as outlined in this Charter, may apply for membership through the Secretary-General. The admission process requires a recommendation from the Council of Ministers and final approval by consensus at the Summit. Membership becomes official once the applying country formally accedes to the Charter by submitting its instrument of ratification to the Secretariat" (D-8 Anniversary Booklet, 2012). Based on the above provision the D-8 in the Cairo Declaration 2024 unanimously welcomed the Republic of Azerbaijan's accession as the 9<sup>th</sup> and a full member of the D-8 organisation(D-8 Secretariat, 2024), (TGO News Service, 2024). It is submitted that this move has been a turning point for the Organisation since its inception. It is also pertinent to note that this organisation has doubled its visibility under the leadership of the current Secretary General, Ambassador Isiaka Abdulqadir Imam.

However, in addition to the D-8 Charter, there are three main frameworks which regulate the administration and conduct of the D-8 and they are Preferential trade agreements, Multilateral Agreements on Administrative Assistance in Custom matters and Agreements on Simplification of Visa Procedures for Businessmen of D-8 Member States, Sectoral Cooperative Agreements(Alam, 2008).

## Preferential Trade Agreement (PTA)

Preferential trade agreements (PTAs) have been defined as agreements that liberalize trade between two or more countries but that do not extend this liberation to all countries (or at least to a majority of countries) and are mushrooming across the globe (Dur & Elsig,2015). The Cardinal objective of the PTA is to provide special or selective trade advantages to the detriment of non-members (Peinhardt, 2025). Simply put, PTAs are predominantly regional or bloc arrangements. However, (Dadush and Prost, 2023) are of the perception that "the most prominent and systemically significant PTAs are mega-regional agreements" such as The European Union or NAFTA. According to the United Nations as of 2021, about half of the world trade has taken place under some form of PTA (United Nations, 2023). It is noteworthy that many of the foundational guidelines or rules that the EEC, EFTA, EEA, and the Schengen agreement operate with have been integrated into EU law, making the EU the biggest PTA currently in existence. Subscription of the EU by any of the states through PTA must make the states oblige the laws and policies of the organisation in exchange for favours or benefits that come in the form of currency stabilization, economic market access, labour and economic capital and other related benefits. This arrangement makes it possible for the EU to foster trade creation for the states that subscribe to it while isolating those who do not. As of 2024, the EU had PTA agreements with 74 countries around the world. In respect of trade deals in 2023 the EU made over 2 trillion euros (European Commission 2023). However, for this chapter, the EU PTA example is not to be used to compare that of the D-8 PTA since the EU PTA is more constituted and bigger but it is used as an illustration of which the D-8 PTA can draw important lessons, although it is submitted that the D-8 will eventually welcome new member states because of the excellent results that the organisation will yield. This is evidenced by two of the D-8 members (Indonesia and Turkiye) joining the G20 (Imam, 2023).

In respect of D-8, one of the most significant legal instruments established under the D-8 framework is the D-8 Preferential Trade Agreement (PTA), signed in 2006. The PTA aims to enhance intra-D-8 trade by reducing tariffs on a range of goods and facilitating trade relations among member states. This agreement is pivotal in promoting economic integration and aims to bolster trade volumes, which have historically lagged among D-8 countries. The PTA exemplifies how legal frameworks can support



economic objectives, allowing member countries to benefit from reduced trade barriers and increased market access. To show commitment to the success of the D-8 PTA the Member countries supported the PTA with a dispute settlement mechanism which is in line with international law and standards (Annex to the PTA D-8 on Dispute Settlement Mechanism, 2017). Subsequently, the Protocol on Dispute Settlement Mechanism of the D-8 PTA was adopted at the Dhaka Declaration on D-8 Trade Cooperation (3<sup>rd</sup> D-8 Trade Ministers Council Meeting, 2024).

## Sectoral Cooperation Agreements

In addition to the PTA, the D-8 has developed various sectoral agreements that address specific areas of cooperation, such as trade, agriculture & food security, industry and small and medium enterprise, transportation, tourism, health, social protection and human resources & education and information & communication, energy, and technology. These agreements provide a legal basis for collaboration and joint initiatives, facilitating knowledge sharing and resource pooling. For instance, the D-8 Cooperation in Agriculture framework encourages member states to work together in agricultural development, food security, and technology transfer, thereby enhancing their agricultural productivity. The Visa and the Customs Agreement, Multilateral Agreement on Administrative Assistance in Customs Matters were signed and reaffirmed at the Dhaka Declaration on D-8. (3<sup>rd</sup> D-8 Trade Ministers Council Meeting, 2024).

## Challenges and Opportunities

While the legal framework of the D-8 has established essential structures for cooperation, it is not without challenges. Differences in legal systems, economic policies, and political priorities among member states can complicate the implementation of agreements. Additionally, the effectiveness of the D-8's legal frameworks often depends on the political will of member countries to adhere to their commitments. However, the D-8's adaptability and willingness to revise its frameworks in response to changing circumstances can enhance its effectiveness in promoting economic cooperation. The D-8 Nations espouse a complex perspective where challenges in harmonising legal and policy frameworks coexist with significant opportunities for deeper regional integration. These challenges range from legal inconsistency, harmonisation and institutional diversity to implementation and enforcement gaps. However, there are opportunities that the D-8 states will be leveraging to enhance stronger economic and legal integration. It is glaring that the post-pandemic reforms improved dispute resolution mechanisms and aligned with international trade norms and standards thereby promoting avenues for overcoming these obstacles. Also one of the major challenges is the limited resources to achieve the organisation's objectives enshrined in the charter entities is important to curb this challenge (Imam, 2023).

## Policy Framework of the Developing-8 Organization for Economic Cooperation

The concept of policy has been defined by many scholars and not all the definitions are tandem with reality. For instance, the concept of policy is defined by Dye as "whatever governments choose to do or not to do" (Dye, 1992). This definition cannot be universally acceptable because is not all policies that require government action or implementation. However, a preferable definition is that of Jenkins and his perception of policy is that "it is a set of interrelated decisions taken by a political actor or groups concerning the selection of goals and the means of achieving them within a specified situation" (Jenkins, 1978). Moreover, it could be deduced that a policy exhibits basic components, such as goals, objectives, settings and instruments (Casore and Howlett, 2007) which are also present in



policy frameworks. Thus, policy frameworks may be used in institutional settings (for example, they can regulate internal rules and practices) and also for larger policy endeavours (when they exceed institutional borders and have a wider significance (Lakhno, M., 2023). This definition invariably gives the suitable meaning of the context in which the policy framework is used in this chapter.

The policy framework of the D-8 is crucial in guiding its objectives and initiatives aimed at enhancing economic collaboration among its member states. This framework encompasses various policies that address trade, investment, technology transfer, and sustainable development, reflecting the D-8's commitment to promoting shared growth and regional integration.

## Strategic Objectives and Policies

The D-8's overarching policies are rooted in its strategic objectives, which include fostering economic cooperation, enhancing trade and investment, and improving the living standards of its population. At the core of its policy framework is the D-8 Decennial Roadmap for 2020-2030, which outlines specific initiatives and projects across various sectors. This plan serves as a roadmap for member states to align their national policies with the D-8's collective goals (D-8 Secretariat, 2024).

One of the prominent policy areas is trade facilitation, aimed at increasing intra-D-8 trade, which remains relatively low compared to global averages. The D-8 Trade Ministers Meetings focus on identifying barriers to trade and developing policies that promote the implementation of the Preferential Trade Agreement (PTA). These meetings have led to initiatives that encourage cooperation in customs procedures, regulatory standards, and trade logistics, thereby enhancing the efficiency of intra-regional trade (3<sup>rd</sup> D-8 Trade Ministers Council Meeting, 2024).

## Analysis of Legal and Policy Effectiveness in the Developing-8 Organization for Economic Cooperation

The effectiveness of the legal and policy frameworks of the Developing-8 (D-8) Organization for Economic Cooperation can be evaluated through various lenses, including trade facilitation, investment promotion and growth. This analysis assesses how well these frameworks have translated into tangible benefits for member states, as well as the challenges they face.

### Trade Facilitation and Economic Integration

One of the primary objectives of the D-8 is to enhance intra-regional trade through the D-8 Preferential Trade Agreement (PTA). The effectiveness of the PTA is hindered by several factors, including varying tariff structures and non-tariff barriers among member states. While the D-8 has implemented initiatives to streamline customs procedures and harmonize regulations, these efforts require sustained political will and commitment from all member countries. The establishment of regular trade ministerial meetings has helped identify and address these barriers, but progress remains incremental. At the 3<sup>rd</sup> D-8 Trade Ministers Council Meeting the D-8 Trade Facilitation Strategy was adopted which will enhance trade and development (3<sup>rd</sup> D-8 Trade Ministers Council Meeting, 2024).

### Investment Promotion and Economic Growth

Furthermore, the legal framework protecting investors' rights is not uniformly applied, leading to uncertainties that can impede investment. Enhancing legal protections and creating a more predictable regulatory environment would significantly improve investment attractiveness within the D-8. While some progress has been made, the effectiveness of these initiatives often hinges on securing adequate



funding and political backing. Greater commitment to shared research agendas and funding mechanisms is essential for fostering genuine technological cooperation. Effective policy implementation in this area requires robust monitoring and accountability frameworks, which are currently underdeveloped within the D-8. Strengthening these mechanisms could enhance member states' compliance and foster a more cohesive approach to sustainable development.

## Recent Status of the D-8 Legal Framework and Policy Framework

The D-8 Organization for Economic Cooperation has made significant strides in establishing its legal and policy frameworks to facilitate economic cooperation among its member states: Bangladesh, Egypt, Indonesia, Iran, Malaysia, Nigeria, Pakistan, Turkey and recently Azerbaijan. Recently, the status of these frameworks reflects ongoing efforts to enhance regional collaboration, address challenges, and align with global standards.

### Legal Framework

#### *Preferential Trade Agreement (PTA)*

The D-8 Preferential Trade Agreement, initially established to promote intra-regional trade, has seen gradual implementation. Recently, approximately 80% of the agreed-upon tariff reductions have been enacted across member states, with ongoing discussions aimed at addressing non-tariff barriers (D-8 Secretariat, 2024). Recent assessments have identified areas for improvement, including the need for more harmonised customs regulations and better trade facilitation measures.

#### *Investment Agreements*

The D-8 has developed a framework for bilateral investment treaties (BITs) among member states to protect and promote foreign direct investment. However, recently, only a few member countries have fully ratified these agreements, leading to inconsistencies in investor protections. Efforts are underway to standardise legal protections for investors, which is crucial for building investor confidence and encouraging cross-border investments (D-8 Investment Forum, 2022).

#### *Framework for Cooperation*

The D-8 has established various legal frameworks for cooperation in specific sectors, including agriculture, technology, and sustainable development. These frameworks aim to facilitate joint projects and knowledge sharing among member states (D-8 2030 Decennial Road Map, 2022).

### Policy Framework

#### *D-8 Decennial Roadmap for 2020-2030*

The current Roadmap serves as a strategic guide for enhancing economic cooperation and development among member states. It focuses on several key areas: trade facilitation, agriculture and food security, industrial cooperation and SMEs, energy, transportation, tourism, blue economy, enhanced private sector involvement, health and social protection program, cooperation and joint approaches in international and regional issues and other related issues. Progress is being monitored through regular reviews and ministerial meetings (D-8 2030 Decennial Road Map, 2022).

## **Trade and Investment Policies**

Member states are increasingly aligning their trade and investment policies with the goals outlined in the D-8 2030 Decennial Road Map. Recent initiatives have aimed to reduce trade barriers, improve the business environment, and enhance the investment climate. The D-8 is also working on creating a common investment framework to facilitate smoother investment flows among member states and provide greater protection for investors.

## **Alignment with Global Standards**

The D-8 seeks to align its policies with international standards, particularly concerning sustainable development and trade regulations. This alignment is crucial for enhancing the global competitiveness of member states and ensuring compliance with international trade agreements.

## **Future Directions for the Developing-8 Organization for Economic Cooperation**

The D-8 has significant potential to enhance economic collaboration among its member states. However, to achieve its objectives and overcome existing challenges, the D-8 must adopt strategic future directions. This section outlines key areas for development: enhancing intra-regional trade, strengthening investment frameworks, fostering technological innovation, and promoting sustainable development.

### **Enhancing Intra-Regional Trade**

To boost intra-D-8 trade, the organization should prioritize the implementation of the D-8 Preferential Trade Agreement (PTA) by addressing non-tariff barriers and harmonizing customs regulations. Additionally, increasing outreach to the private sector can facilitate a better understanding of trade opportunities and challenges.

Future Direction: Implement targeted trade promotion initiatives, including trade fairs and business forums, to connect businesses across member states and enhance awareness of the benefits of intra-regional trade.

### **Strengthening Investment Frameworks**

To attract more foreign direct investment (FDI), the D-8 should focus on creating a unified investment framework that provides clear guidelines and protections for investors. Developing an Investment Treaty that standardizes protections across member states can enhance investor confidence. Moreover, member countries should collaborate on a shared platform for investment opportunities to facilitate cross-border investments.

Future Direction: Establish a D-8 Investment Forum that brings together policymakers and investors to discuss challenges, share best practices, and identify investment opportunities.

### **Promoting Sustainable Development**

As global awareness of environmental issues grows, the D-8 must strengthen its commitment to sustainable development by integrating environmental considerations into economic policies. Developing a D-8 Sustainable Development Strategy that aligns with the United Nations' Sustainable Development



Goals (SDGs) can guide member states in implementing eco-friendly policies. Regular monitoring and reporting mechanisms should be established to track progress in achieving sustainability targets.

Future Direction: Organize annual D-8 Sustainability Conferences to share knowledge, experiences, and strategies for promoting sustainable practices among member states.

## Enhancing Political and Economic Cohesion

The D-8's success will depend on fostering greater political will and economic cohesion among member states. Establishing a D-8 Political Dialogue Platform can facilitate discussions on common challenges and objectives, enhancing mutual trust and cooperation. Regular summits and high-level meetings can help align policies and strategies across member states.

Future Direction: Create a D-8 Governance Framework that includes mechanisms for conflict resolution and policy alignment, thereby enhancing stability and cohesion within the organization.

The future directions for the D-8 should focus on enhancing intra-regional trade, strengthening investment frameworks, fostering technological innovation, promoting sustainable development, and enhancing political and economic cohesion. By strategically addressing these areas, the D-8 can significantly improve its effectiveness and fulfil its mission of promoting economic collaboration among developing nations.

## Conclusion

The D-8 serves as a crucial platform for fostering economic collaboration among its member states, all of which face similar developmental challenges. While the D-8 has made notable progress through its legal and policy frameworks aimed at enhancing trade, investment, technological innovation, and sustainable development, it continues to encounter significant obstacles. Low levels of intra-regional trade, inconsistent foreign direct investment flows, and disparities in technological capabilities highlight the areas requiring urgent attention. To strengthen its effectiveness, the D-8 should adopt strategic initiatives that focus on key areas. Enhancing intra-regional trade through streamlined customs processes and targeted trade promotion initiatives can significantly improve economic ties.

However, below are recommendations for improving both the policy and legal frameworks to the D-8 nations and they are as follows:

## Policy Framework

### Fortify Coordination and Evaluation

Through developed policies, all member states will be at the same equilibrium when monitored and evaluated adequately and this can be done through a widely accepted mechanism. Capacity building programme is another area that should be invested in for policymakers and administrative staff to improve policy enforcement and execution.

### Update Consensus-Based Decision Making

There is a need to introduce digital tools and collaborative platforms to hasten the consensus process without offering up inclusivity. It is also imperative that there should be implementation of time limits for deliberations and decision-making processes and ensuring that most decisions are reached more efficiently while obliging diverse viewpoints.

## Alignment of Policies with International Standards

It is strongly recommended that domestic policies should be harmonised with international trade and investment standards to enhance investor confidence and ensure compatibility with global economic norms and standards

## Changing Policy Reforms

There must be regular review cycles to update policies in tune with emerging global patterns and regional needs.

## Legal Framework Recommendations

### Enhance Legal Harmonisation among Member States

The D-8 Member States are saddled with the responsibility of promoting legal harmonisation among member States through developing common legal guidelines and encouraging Member States to benchmark their legal frameworks against international standards and each other, promoting uniformity where possible.

### Revision of Outdated Legislation

The D-8 States should undertake a thorough review of existing laws to identify and reform outdated or obstructive legislation, particularly in trade and investment sectors. It is pertinent to note that legal instruments are important for enhancing dynamic economic activities.



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Author Details Chinyere Rita Agu

<sup>1</sup> Senior Research Fellow at the Nigerian Institute of International Affairs, Lagos

0009-0004-1616-287X

ritachichiben@yahoo.com

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## References

- Agbu, O. (2021) "Nigeria and the D-8 under President Muhammadu Buhari's Administration (2015-2019)" in Bukarambe, B., Osita, A., Wapmuk, S., and Ilesanmi, O (Ed) (2020) *Nigeria's Foreign Policy under the Administration of President Muhammadu Buhari (2015 – 2019)*, Lagos, NIIA
- Agencia Chilena de Cooperacion Internacional para el Desarrollo (2024), *Economic Cooperation* accessed on the 3<sup>rd</sup> of November 2024
- Alam, D.(2008) A Glimpse at D-8 Achievements. *Uluslararası Ekonomik Sorunlar Dergisi* 32) [dipoalam.pdf](#) accessed February 21, 2025
- Annex to the PTA D-8 on Dispute Settlement Mechanism, (2017) [https://Annex-to-the-PTA-D-8-on-Dispute-Settlement-Mechanism developing8.org](https://Annex-to-the-PTA-D-8-on-Dispute-Settlement-Mechanism-developing8.org) accessed February 2025
- Cashore, B., & Howlett, M., (2007) "Punctuating which Equilibrium? Understanding Thermostatic Policy Dynamics in Pacific NorthWest Forestry" *American Journal of Political Science* 51(3):532-551
- Dadush, U. & Prost, E., (2022) "The Problem with Preferential Trade Agreements." *Bruegel | the Brussels-Based Economic Think Tank*. Bruegel. <https://www.bruegel.org/analysis/problem-preferential-trade-agreements> accessed February 21, 2025
- D-8 Decennial Roadmap for 2020-2030 <https://developing8.org/document/d-8-decennial-Roadmap-for-2020-2030> accessed 14<sup>th</sup> February 2025



- D-8 Secretariat (2024) <https://developing8.org/wp-content/uploads/2024/12/Adopted-Cairo-Declaration-2024.pdf> accessed 14<sup>th</sup> February 2025
- D-8 15<sup>th</sup> Anniversary Booklet (2012) on the Occasion of the 15<sup>th</sup> Anniversary 3<sup>rd</sup> D-8 Trade Ministers Council Meeting (2024) [https://mincom.portal.gov.bd/sites/default/files/files/mincom.portal.gov.bd/news/5f7c908f\\_c3f9\\_413e\\_8b8e\\_cbdd43e9e163/TMC%20Annex-11%20Dhaka%20Declaration%20on%20Trade%2005%20March%202022](https://mincom.portal.gov.bd/sites/default/files/files/mincom.portal.gov.bd/news/5f7c908f_c3f9_413e_8b8e_cbdd43e9e163/TMC%20Annex-11%20Dhaka%20Declaration%20on%20Trade%2005%20March%202022) accessed on 19<sup>th</sup> February 2025
- Dur, A., & Elsig, M.,(2015) [ff:///c:/users/Downloads/CUP-Introduction\\_16042014.pdf](ff:///c:/users/Downloads/CUP-Introduction_16042014.pdf) accessed 18<sup>th</sup> February 2025
- Dye, T., (2021) *Understanding Public Policy*, 15<sup>th</sup> edition, Published by *Pearson*
- European Commission (2023). "Value of EU Trade Deals Surpasses E2 Trillion" *European Commission* [http://ec.europa.eu/commission/presscorner/detail/en/IP\\_23\\_5742](http://ec.europa.eu/commission/presscorner/detail/en/IP_23_5742) accessed 29<sup>th</sup> November 2025
- Imam, I., A., (2023) "Achieving D-8 Decennial Target in 2030" *Vanguard*<https://www.vanguardngr.com/2023/06/achieving-d-8-decennial-target-in-2030/> accessed 12 February 2025
- Lakhno, M., (2023) What is a Policy Framework? An Attempt at Conceptualisation, *Socialni Studia/Social Studies researchgate.net/profile/MarynaLakhno* accessed 20<sup>th</sup> January 2025
- Peinhardt, C. (2025) "Trade Preferential Trade Agreements" *Open International Political Economy pressbooks.pub* accessed 19<sup>th</sup> February 2025
- TGO News Services (2024) Azerbaijan joins D-8 as New Member at Cairo Summit <https://thegulfobserver.com/azerbaijan-joins-joins-d-8-as-new-member-at-cairo-summit> accessed 10<sup>th</sup> February 2025.
- United Nations. 2023. "Key Statistics and Trends in Trade Policy 2022" *United Nations Conference on Trade and Development* <http://unctad.org/publication/key-statistics-and-trends-trade-policy-2022> accessed 20<sup>th</sup> February 2025
- Wikipedia (2024) D-8 Organisation for Economic Cooperation, [https://e.wikipedia.org/wiki/wiki/D-8\\_Organisation\\_for\\_Economic\\_cooperation](https://e.wikipedia.org/wiki/wiki/D-8_Organisation_for_Economic_cooperation), accessed on the 28<sup>th</sup> November 2024.





## A Pathology of D-8 Cooperation: Organization's Challenges and Opportunities in the Global Economic Dynamics



Morteza Damanpak Jam <sup>1</sup>

<sup>1</sup> Senior Fellow, Researcher Institute for Political and International Studies, Tehran, Iran

### Abstract

D-8 Cooperation Organization is a multilateral institution for economic cooperation and convergence among eight developing Muslim countries that came into being in 1997 in Istanbul to strengthen trade cooperation among member states and enhance their position in the global economy. During nearly three decades of activity, D-8 has taken significant steps to institutionalize cooperation, and strive to achieve the objectives set in its roadmap, including the increase in the volume of intra-regional trade. This study seeks to analyse the activities of D-8 through a pathology of its efforts to achieve the set objectives and assessing their level of realization. The conceptual framework of the research is the eclectic theory, which emphasizes the use of a set of variables and criteria of classical and modern theories of regionalism to analyse the subject of the study. The research method is descriptive-analytical, and the data are collected through library, documentary, and cyberspace sources, as well as field experiences. The main findings of the research suggest that despite its extensive activities, D-8 has not been able to fully achieve its main goals, and a series of internal and external challenges and obstacles have prevented its success. For D-8 to better achieve its fundamental objectives in a dynamic global economy, it should identify main obstacles and challenges facing the organization and seek workable problem solving methods, avoid expanding areas of cooperation, ensure financial sustainability, adopt new solutions and initiatives to advance cooperation and revisit its priority areas to focus on specific and feasible areas in which most member countries are more interested to participate.

### Keywords

Regionalism · Regional convergence · Regional Organizations · D-8 Cooperation Organization · Islamic cooperation



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Corresponding author: Morteza Damanpak Jam [morteza.jami63@gmail.com](mailto:morteza.jami63@gmail.com)

## Introduction

International relations have witnessed a growing expansion of multilateralism and regionalism in the past century, especially after the World War II. These phenomena now constitute the essential and main elements of contemporary global governance (Söderbaum, 2015:27). Regionalism is an inseparable form or process of multilateralism, in which, according to classical and rational analyses, a group of political actors located in a geographically interconnected region, relying on historical, cultural, social and economic similarities, voluntarily renounce the exercise of their full authority and submit to a supranational organization in order to achieve common goals (Qavam, 1991: 35). However, in the current literature of international relations, the definition of regions has faced challenges due to the differences in the understanding of conflicting state-centric or ideational theories. Contrary to the views that consider geographical proximity as a central factor of regional convergence, in many new theories on regionalism, geography does not play a major and determining role and, instead of geography, the intensity and quality of interactions, the role of identities and inter-subjective ideas, and the degree of intra-regional cohesion and solidarity are considered more important in the construction or reconstruction of regions (Katzenstein, 1996 and 2005:12; Buzan, 2003: 48). According to Ohlson, a purely geographical definition of regionalism does not deserve accuracy, because depending on whether the main criterion for defining a region is geographical proximity or economic cooperation or cultural relations, the regional border line can be different (Ohlson, 1993). (1)

In general, the creation of regional and multilateral organizations, alliances, and pacts is not new; such institutions have been formed since the foundations of states and nations. However, regarding the history of regionalism in the modern time, there is a general understanding among international relations experts and theorists that the relations between world powers after the Second World War and the new conditions in the international arena provided the basis for the creation and expansion of regional organizations and unions in the political, security, and economic fields (Mosffa, 1995: 600). In this regard, the first efforts of regionalism focused on military-security, economic, and multipurpose issues. However, as argued by Fawcett, under the influence of the Cold War conditions, the security aspects of this cooperation prevailed over their other dimensions (Fawcett, 2013: 3). The formation of NATO in the Western Bloc, the Warsaw Pact in the Eastern Bloc, and the Baghdad Pacts (1955), CENTO<sup>1</sup> (1959), and CEATO<sup>2</sup> (1954) were in this direction.

As international conditions moved away from the dominant post-war security environment, particularly from the 1960s, the idea of convergence and cooperation in different geographical regions gradually gained importance, with a view to the experience of regionalism in Europe, to promoting their prosperity and economic development. In this regard, by the mid-1980s, regional and intergovernmental organizations and arrangements were formed outside the European region, to mention ASEAN<sup>3</sup>, ECOWAS<sup>4</sup>, SAARC<sup>5</sup>, OPEC<sup>6</sup>, ECO<sup>7</sup>, the Organization of African Unity, the Andean Community, and the Persian Gulf Cooperation Council. The end of the Cold War unleashed a new wave of regionalism in various political, security, economic, and trade areas which, although formed based on the revision and expansion of the early idea of regionalism during the Cold War, encompassed a variety of regional actors, issues, and organizations in different regions (Ibid,4). Therefore, one of the most prominent characteristics of the post-Cold War international environment is the expansion and deepening of

<sup>1</sup>Central Treaty Organization.

<sup>2</sup>Southeast Asia Treaty Organization.

<sup>3</sup>The Association of Southeast Asian Nations.

<sup>4</sup>The Economic Community of West African States.

<sup>5</sup>The South Asian Association for Regional Cooperation.

<sup>6</sup>Organisation of Petroleum Exporting Countries.

<sup>7</sup>Economic Cooperation Organization.



regional cooperation in its various forms. A second wave of regionalism began in the mid-1990s, and a significant number of regional organizations were established during this period.

The Developing-8 Organization for Economic Cooperation (D-8) came into being in the context of growing regionalism and an increasing focus by developing countries to regional convergence and cooperation. The D-8, officially established as a group of Developing Eight Muslim Countries, was an initiative of the late Turkish Prime Minister Necmettin Erbakan in Istanbul on June 15, 1997. According to the Declaration of the First Summit, its main aim is to "improve developing countries' positions in the world economy, diversify and create new opportunities in trade relations, enhance participation in decision-making at the international level, and provide better standard of living for its people" (Istanbul Declaration, 1997). To achieve these goals, members of the organization, in their initial agreements and two roadmap documents for 2008-2018 and 2020-2030, decided to expand their cooperation in various fields by increasing intra-regional trade and creating an Islamic Common Market to become an influential bloc in the global economy (D-8 Road Map, 2008-2018).

Against this backdrop, this essay seeks to evaluate and analyse the achievements of D-8 and examine the challenges and opportunities facing it in the context of the global economic dynamics. The primary questions are whether, after nearly 28 years since the establishment of the D-8, has the organization succeeded in achieving its key objectives for regional convergence? What tangible accomplishments have emerged from this cooperation? What factors have influenced its successes and failures? What obstacles and challenges does the D-8 face? And how can the organization's existential significance and utility be preserved amid the current global economic dynamics? The primary hypothesis of the research is that, despite its extensive activities, D-8 has not succeeded in achieving its main goals due to various internal and external challenges and obstacles that have hindered its success.

In this research, an eclectic approach served as the framework. This theoretical framework guided the collection and analysis of necessary data to evaluate the cooperation process in D-8, based on selected indicators and criteria derived from various theories of regionalism. Through this approach, we aimed to identify the obstacles and challenges confronting the D-8 and to provide recommendations for enhancing and promoting the status of cooperation within the organization. The research method is descriptive-analytical, and information and data have been collected through library, documentary, and internet sources, as well as field experiences.

## **Analytical Framework**

### **The Nature and Evolution of Regionalism in the Context of Global Economic Dynamics**

As mentioned in the introduction, regionalism and regionalization are specific phenomena that expanded after the Second World War as part of the multilateralism process by countries situated in contiguous geographical areas or countries with convergence motives in non-adjacent regions. The significance of regionalism is highlighted in Articles 51-54 of the United Nations Charter, which regard regional organizations and arrangements as vital instruments for maintaining international peace and security while enhancing cooperation among nations (UN Charter, VIII, 1945). The crucial role of these arrangements in fostering trade relations between countries has also been underscored in the GATT Agreements (GATT, 1994: Article XXIV).

The most significant effort for regional integration in the post-World War II era began in Europe with the establishment of the Coal and Steel Community in 1952 and the European Economic Community in 1957. The initial wave of regional integration gradually expanded to developing regions, modelling the integration process in Europe and influenced by various factors such as Cold War dynamics, the rise of



new nations globally, and the initiatives of the United Nations. However, regionalism in non-European areas has not exhibited the same characteristics, processes, and objectives as in Europe, primarily for two reasons:

(a) Regionalism in Europe emerged from functional objectives aimed at fostering convergence among several countries with a relatively similar level of economic development and advanced industrial structures. It gradually expanded from functional and economic domains to encompass political and security aspects. This phenomenon is known as the principle of spill-over, which plays a crucial role in the integration process (Haas, 1958: 16; Schmitter, 1971: 243).

(b) Regionalism in developing countries, such as Southeast Asia, Africa, Latin America, West Asia, and even Europe, until the mid-1980s, was primarily driven by political and security motivations within the context of Cold War relations and is referred to as old regionalism.

With the collapse of the Soviet Union and the intensification of globalization, alongside the establishment of the World Trade Organization, many countries in both the developed and developing worlds began to embrace new forms of regionalism in the political, economic, and trade spheres from the mid-1990s onward. This shift led to the emergence of a new economic order characterized by the expansion of economic regionalism (Killer et al., 2017: 9). In the following decades, this phenomenon increased significantly across the globe. According to statistics from the World Trade Organization, the number of regional economic and trade arrangements registered with this organization rose from 124 in 1995 to 594 in January 2024, with over 360 considered active (WTO, RTAs: 2024). From this perspective, the new wave of regionalism following the Cold War is referred to as the new regionalism, which has emerged within the context of globalization, the establishment of new foundations for trade cooperation, and advancements in communication technologies.

Meanwhile, the most recent wave of regional organization expansion, which we can refer to as the third wave of regionalism, can be traced to the economic crises in Asia and the growing influence of emerging economies in international politics. The Asian financial crisis of 2008-2009, along with the failure of the IMF and other international institutions to address this crisis, resulted in the establishment of the Chiang Mai Initiative (CMI) to provide financial support for ASEAN activities, with backing from China and Japan (Cioricar, 2011). On the other hand, the disappointment of emerging economies in gaining a greater role and influence in the Bretton Woods Institutions after the global financial crisis, prompted them to seek alternative solutions, ultimately leading to the formation of the BRICS group in 2009 and the subsequent establishment of new financial mechanisms and initiatives, such as the Asian Infrastructure Investment Bank (AIIB) and the New Development Bank (of BRICS). Thus, the most recent wave of regional arrangements' expansion was primarily driven by the demands of governments, non-governmental organizations, and multinational corporations, which were frequently dissatisfied with the existing global options (Killer, 2017: 19).

## Evolution of Regional Integration and Convergence Theories

Regional integration and convergence theories aim to elucidate the formation and evolution of regional cooperation organizations and entities. The roots of regional integration theory can be traced to Jacob Viner's study (1950), which established a framework for analysing the effects of creating a customs union. Viner developed the static concepts of trade creation and diversion. From the 1960s onward, with the formation of the European Economic Community (EEC), the issue of regional integration gained a prominent place in the studies of international relations theorists. Consequently, the initial theories of regional integration were grounded in the experience of regionalism in Europe, also referred to as Eurocentric theories. The most significant Eurocentric theories include federalism, functionalism, neo-functionalism, and communication, which are associated with the works of Altiero Spinelli (1972), David

Mitrani (1966), Ernst Haus (1958), and Karl Deutsch (1957, 1968), respectively. The perspectives of Cantori and Spiegel (1970) can also be categorized within the Eurocentric theories.

As the second wave of regionalism emerged in the 1980s and 1990s, new theories regarding it also developed, significantly influencing international relations (Hunggi et al., 2013:2). In this context, the growing multidimensionality of regionalism and its de-Europeanization prompted the establishment of a comprehensive research program within scientific and academic circles in both the West and the East. This resulted in the formulation of new theories and perspectives on regionalism, including neoliberal institutionalism, neorealism, economic integration theories, as well as ideational theories such as constructivism, post-modernism, and critical approaches (Mansfield and Mills, 1997). Nevertheless, during the second wave of theorizing on regionalism, studies in this field remained dominated by a series of rationalist and state-centric theories that elucidate the political aspects and the role of state agents in the process of regionalism within an anarchic international system. A key characteristic of this period is the emergence of constructivism and reflective approaches to regionalism, which challenge the primary rationalist assumptions, such as state-centric ontology and the concepts of reality and value, while emphasizing the role of norms, identities, and inter-subjective ideas in the construction of regional society, or what is termed "cognitive regionalism" (Hurrel, 1995: 64-72). (3)

However, the rapid changes in the global economy and its dynamics, particularly in developing regions and emerging economies, have become so complex that theorizing about the second wave of regionalism has struggled to capture all its dimensions. Consequently, many contemporary theorists of regionalism argue that despite the revisions made to classical theories on one hand and the introduction of new ideational theories on the other, none of these frameworks can adequately explain this multi-dimensional and multi-layered process. As a result, newer theoretical efforts, which can be viewed as the third wave of theorizing about regionalism, have proposed two new and practical strategies in response to the dominant theoretical camps of international relations:

1. *The context-specific approach* necessitates new analytical frameworks capable of explaining various regional contexts. This approach posits that the prevailing paradigms of international relations stem from deductive theorizing rooted in the European experience; however, we require new theoretical tools for other regions that align more closely with their local conditions. (Acharya and Buzan, 2017).
2. *The eclectic approach* is a theoretical stance that interrogates the intricate connections between power, interests, norms, and analytical comprehension through a singular paradigm. It selectively and eclectically employs the assumptions and elements inherent in various research traditions in international relations to articulate complex and nuanced arguments (Katzenstein and Okawa, 2001). Trans-functionalism is one of the eclectic theories that aims to integrate aspects of neofunctionalism, statism, realism, neoliberalism, and constructivism to elucidate regionalism (Hooghe and Marks, 2006).

Overall, it should be emphasized that while many theories on regional integration and convergence were initially synonymous with and focused on European convergence, the rise of regionalism in non-European areas has led to these theories being shaped by the experiences of integration in other regions. Consequently, new ideas have emerged to explain this regional convergence. Although these theoretical attempts may not have been as effective or desirable as the dominant paradigms, they possess greater explanatory power than both modern and classical theories of regionalism. Key features of these new theories in exploring and explaining regionalism include de-Europeanization, non-territorialization of geography, attention to ideational parameters, and eclecticism (Hout, 1999:14-15; Plamer, 1991:6).

## Selected Criteria for Accessing Convergence in D-8 based on Eclectic Theory

Considering the above explanations, one might inquire which criteria and assumptions of the dominant theories of international relations can be employed to evaluate the performance and process of regional cooperation in the D-8, an organization made up of countries with varying economic levels and diverse political systems in distant developing regions?

As previously mentioned, the diversity and complexity of modern regionalism, along with the debates surrounding regional integration theories over recent decades, have hindered the development of a comprehensive and broadly applicable theory that can explain all facets of this process (Abbasi Ashlaghi and Damanpak Jami, 2013: 68). Moreover, the concepts and elements of many of these theories, which have been formulated based on the European Union experience, cannot be effectively applied to regional organizations in non-European areas such as the D-8, ECO, and even ASEAN.

Therefore, to evaluate the activities of the D-8 more concretely, this research employs an eclecticism approach, combining selected elements and criteria from various theories on regionalism such as neo-functionalism, theories of economic and trade integration that elucidate the gradual liberalization of trade, criteria on political and organizational cohesion from Cantori and Spiegel's perspectives, Neo-Classical Realism approach to the role of hegemon and pivotal states, as well as ideational elements highlighted in the epistemological perspectives of constructivism. To gain a clearer understanding of the theoretical perspectives these theories offer on regionalism, we will provide a brief introduction to their key assumptions.

### Neofunctionalism Theory

Neofunctionalism is a synthesis of federalism and functionalism. While federalism serves as a framework aimed at establishing a transnational political union as the final goal of convergence, functionalism is a normative approach to peacemaking that suggests addressing shared needs and functions in low politics—particularly in economic and social areas—can unite states through international functional institutions (Moshirzadeh, 2010: 60). Ernest Haas has coherently processed the neofunctionalism theory based on the experiences of the European Coal and Steel Federation and the European Economic Community. According to Haas, neofunctionalism emphasizes the importance of economic, social, and technological factors in the process of regional convergence. In this context, convergence begins with welfare and functional areas, gradually extending to various specialized domains, ultimately leading to political convergence (Haas, 1958: 16).

Joseph Nye, a notable theorist of regional convergence, in his neo-functionalist model, identifies several mechanisms that contribute to the establishment of a common market. These include increased trade, elite socialization, shared identity and ideological values, as well as the involvement of foreign actors in the convergence process. He outlines four conditions or variables that are crucial for the acceptance of the initial convergence plan and its subsequent advancement: symmetry or equality of economic units, complementarity of elite values, pluralism, and the capacity and ability of converged members to adapt and respond. In his convergence model, Nye outlines three perceptual conditions influenced by the convergence process: the perception of equality among members regarding the distribution of benefits and interests, the sense of external coercion and necessity, and the perception of incurring minor costs to achieve the convergence process (Dougherty and Pfaltzgraff, 2005: 681). Neo-functionalism theory identifies three variables within the context of process mechanisms that sustain and broaden this process. These are: spillover, politicization, and externalization. Spillover refers to the

expansion of the convergence process from specialized and economic fields to higher levels (Schmitter, 1971: 243).

### **Cantori and Spiegel's Theory**

Cantori and Spiegel define regions as subordinate systems within the international system. They view the international system as comprising multiple regional subordinate systems, each of which structures the interactions among political units within the region. Regions are areas of the world where the constituent units are geographically adjacent, exhibiting a concentration of operations, a shared institutional framework, and common cultural identities (Cantori and Spiegel, 1973: 408-412). According to Cantori and Spiegel, four key pattern variables can elucidate the various regional trends and their distinctions from one another (Seifzadeh, 2005: 386).

1. The nature and level of coherence, or the degree of similarity and complementarity among political systems, as well as the extent of exchanges between them.
2. The nature of intra-regional relations, characterized by either cooperation or conflict.
3. The level of power within the subordinate system, primarily assessed in terms of material conditions such as GDP, military strength, and scientific and technological capabilities.
4. The structure of intra-regional relations in the subordinate system comprises three components: central, peripheral, and the interventionist segment or the dominant power outside the region. The central part plays the main role in the formation of a regional institution. The intervening power is the link between the international system and the subordinate system, whose intervention in most cases plays an important role in limiting cooperation (Ramazani and Mehrabi, 2010: 25).

### **Regional Economic Integration Theory**

Regional studies in the economic field have been significantly shaped by the theory of regional economic integration. This theory posits that the stages of regional economic integration advance in a linear and incremental fashion as follows: preferential trade area, free trade area, customs union, common market, monetary and economic union, and ultimately, full economic integration (Balassa, 1961). In the preferential trade agreement, which represents the initial stage of economic integration, member countries are required to maintain lower tariffs on intra-regional trade compared to those imposed on non-member states. Full economic integration is the final stage of regional integration, where the coordination and oversight of economic and political programs and policies are managed by a central supranational institution accountable to a common parliament (Sudriyam, 2015: 62-63)

### **Neoclassical Realism Theory**

The neoclassical realism approach seeks to merge elements of classical realism and neorealism. On one hand, it accepts the core assumption of neorealism regarding the influence of the anarchic international system on state behavior. On the other hand, like classical realism, it considers the effects of country characteristics and unit-level or intermediary variables on state actions (Haghshenas, 2013: 660). By focusing on unit-level variables, neoclassical realism aids in understanding the varying roles that states assume at different levels of the international system, including the regional level.

In general, neoclassical realism, like other forms of realism, emphasizes the primacy of power. According to neoclassical realism, the potential for transitioning from areas of intermittent conflict to regions of relative stability is partly a function of the strategic choices made by the regional hegemon and the pivotal state within these areas. Thus, while the international system is characterized by the

interactions among great powers, a regional subsystem is similarly defined by the interactions between key regional states and the great powers that are broadly engaged in regional affairs (Lake, 1997: 45-67). In this context, the relative distribution of power and the clarity of emerging threats, both at the systemic and regional levels, create incentives for the transregional hegemon and the pivotal state(s) in specific regions to align their foreign and security policies (Taliaferro, 1997: 114). Taliaferro defines a transregional hegemon as a significant power in the international system that possesses both the capability and the interest to exert influence in geographically distant areas (Taliaferro, 1400: 120-119). A pivotal state is one that, due to factors such as geography, relative capabilities, or revisionist ideals, can emerge as the primary source of cooperation or tension within the region. According to Taliaferro's criteria, China, Indonesia, South Africa, Egypt, Iraq, Iran, Turkey, Mexico, and Brazil are identified as pivot states in their respective regions (Chase et al., 1996: 37-38).

### **Walter Mattli's Views on Convergence**

Walter Mattli is also linked to the concept of regionalism in international relations. He underscores the significance of regional cooperation and integration as a response to globalization and its associated challenges. His work frequently emphasizes how regional arrangements can promote governance and ensure stability among states. He contends that regionalism enables better integration of diverse political, economic, and social systems within closely connected geographical boundaries, fostering cooperation while honoring local differences. Mattli has identified several conditions necessary for achieving regional convergence, three of which are particularly crucial for our research:

1. Convergence should yield distributable benefits such that membership in a regional organization results in tangible economic advantages for members, fostering greater cooperation.
2. The presence of necessary political will among the leaders of political units, along with sufficient motivation and capability to execute the required coordination at each stage of convergence, is crucial.
3. The existence of a pivotal state in convergence is vital for establishing coordination among member states. This state plays a significant role in addressing problems and issues between countries and covers the initial costs of convergence. (Matli, 1999: 44).

### **Constructivism Theory**

Constructivism is a metatheory that posits all knowledge, and phenomena are constructed through human mentalities, social experiences, and social conventions. Ontologically, this theory asserts that both the world and global politics are socially constructed. According to constructivists, actors and structures mutually influence each other. The interactions of actors lead to the construction of identities. Identities also determine national interests (Guzzini, 2000). In the context of regionalism, constructivism believes that the region is what is constructed. Therefore, regionalism is defined in terms of shared regional identities in which territory, geography, and material elements play a minor role. In contrast, what brings countries and nations together in a region are cultural, social, value, and historical commonalities (Adler and Barnett, 1998: 31). Therefore, according to constructivist theory, in the process of regional identity formation, alongside international normative variables, the internal assumptions and values of convergent societies—such as political culture, language, demographic characteristics, and geography of a country or specific region—play a constructive and consistent role (Dehghani Firouzabadi, 2015: 43-2014: 476).

By combining selected elements and assumptions from the above theories, and organizing a set of material, state-centered, normative, and ideational assumptions, the eclectic framework of this research attempts to enable a more realistic assessment of the process of regional integration in D-8.

Consequently, the selected parameters and criteria that form the theoretical framework of this research are the following:

1. The level and structure of the power of D-8 member countries and the role of objective and material factors in the convergence process. (based on Neo-functionalism and the views of Cantori and Spiegel)
2. The level of social and cultural cohesion and the role of common historical, cultural and religious values in convergence.(based on Constructivism, Cantori& Spiegel Theory)
3. The level of development and similarity and compatibility of economic systems ofD-8 countries.(based on Neo-functionalism)
4. Consideration and observation of common interests, equal distribution of benefits and satisfaction with the usefulness of cooperation. (based on Neo-functionalism and Mattli's views)
5. The capacity and ability of members for political coordination and organizational cohesion. (based on Mattli's views and Neofunctionalism)
6. The role of the pivotal state and the transregional hegemon in advancing cooperation. (based on Neoclassical Realism as well as Mattli's views)

## **Evaluation of the activities and regional integration in D-8**

Within the framework of the theoretical assumptions, the formation of D-8 in 1997 resulted from the needs and aspirations of its members, as well as the exigencies of the time, influenced by the collapse of the bipolar international system and the transition of the world system into a new period. The primary characteristic of this transitional phase in the economic sphere was the dominance of the neoliberal world economy and economic globalization. In this context, new regionalism is viewed as a form of open regionalism that highlights the synergy between regional and global levels, facilitating the increasing liberalization of trade and investment (Robson, 1993: 33). With this understanding of regionalism and considering the selected assumptions and variables we have chosen to evaluate regional integration; we will assess the achievements and shortcomings of the D-8 during its 28-year existence and examine the extent to which this organization has succeeded in fulfilling its intended objectives.

### **The level and structure of power of countries and the role of objective and material factors in the convergence process**

Based on a set of objective and fixed factors outlined in Ernst Hass's neo-functionalism theory, along with the variable of power levels and structures in Cantori and Spiegel's theory, significant geographical and economic factors, as well as the political will of the members, drive the establishment and persistence of cooperation within the D-8 and its progression towards regional integration. Concerning the D-8, some of the most crucial factors (for convergence) are:

1. The D-8, covering an area of over 7.6 million square kilometres, represents more than 24 percent of the land area of Islamic countries and 15.5 percent of the total land area of the world. It forms a developing crescent stretching from Southeast Asia to West Africa. With 15.3 percent of the global population and 60 percent of the population of Islamic countries, the organization is viewed as a potentially powerful market for enhancing trade exchanges within the Islamic world and the international economy.
2. The D-8 member states represent 4.5 percent of global GDP, 6.8 percent of international trade, and 59 percent of the GDP of Islamic nations, positioning it as the 5th largest economic bloc

in the world and the most significant economic cooperation group within the OIC with all its member states among the top ten exporters of the OIC.

3. Proximity to and access to the world's major waterways, including the Persian Gulf, the Sea of Oman, the Caspian Sea, the Indian Ocean, the Mediterranean Sea, and the Black Sea; control over crucial international straits such as Hormuz, the Bosphorus, the Dardanelles, Malaga, and the Suez Canal; along with borders shared with emerging economies like China, India, and Russia, enhance and expedite trade exchange opportunities among these countries and with trading partners outside the organization.
4. Furthermore, the extensive multi-modal transportation networks, including active ports and shipping lines, railways, roads, telecommunications, fibre optic infrastructure, and electricity transmission networks in member countries, provide the organization with unmatched capabilities for communication and transportation along vital maritime and land corridors.
5. The D-8 countries also possess dynamic, capable, and youthful human resources; the potential to produce significant and strategic agricultural products such as wheat, rice, sugar, corn, saffron, palm oil, jute, etc.; notable scientific and technological advancements; and vast reserves of raw materials and minerals, particularly oil and gas, including in the Persian Gulf and West African basins, which account for over 15.8% of the world's oil reserves and 24.4% of the world's gas reserves.

**Table 1**

*Key Economic Indicators of D-8 Countries & Distribution of Resources (2023-2024)*

Indicators Country	GDP (nominal) \$ Billion	Growth Rate (%)	Share of Sectors in GDP (%)	Inflation (%)	World Rank of Oil & Gas (%)	Main Natural Resources	Industrial & Agricultural Products
Azerbaijan	72.3	1.1	Agr: 5.5 Ind: 46.6 Serv: 39.1	8.8	Oil: 0.4% Gas: 1%	Petroleum, Gas, Shale, Peat, Gold	Cotton, Fresh & Dried Fruits
Bangladesh	437.4	5.4	Agr: 11 Ind: 34.6 Serv: 51.1	10	Oil: 0% Gas: 0.105%	Coal, Stone, Gas, Forest, Copper, Wheat, Rice	Garments, Fish, Crops, Rice, Plastic, Leather, Tobacco
Egypt	357.8	5	Agr: 11.6 Ind: 32.1 Serv: 51.3	32.2	Oil: 1% Gas: 0.3%	Petroleum, Gas, Iron Ore, Stone, Zinc	Fish, Crops, Basic Metal, Cotton, Textile, Food & Dairy, Ceramic
Indonesia	1371	5	Agr: 12.5 Ind: 40.2 Serv: 42.9	3.7	Oil: 0.2% Gas: 1%	Steam Coal, Tin, Lead, Gold, Gas, Petroleum, Zinc, Copper, Bauxite	Shrimp, Cacao, Coffee, Textile, Footwear, Paper, Automotive,
Iran	401.5	5	Agr: 7 Ind: 38.6	44.6	Oil: 10% Gas: 18%	Petroleum, Gas, Ston, Copper, Coal, Iron	Petrochemical, Steel, Textile, Automotive, Copper, Crops,

Indicators Country	GDP (nominal) \$ Billion	Growth Rate (%)	Share of Sectors in GDP (%)	Inflation (%)	World Rank of Oil & Gas (%)	Main Natural Resources	Industrial & Agricultural Products
			Serv: 54.2			Ore, Lead, Zinc, Gold	Fruits, Basic Metals, Construction Material
Malysia	399.6	3.7	Agr: 7.8 Ind: 37.7 Serv: 53.4	2.5	Oil: .2% Gas: 1%	Iron Ore Tin, Gold, Copper, Bauxite, Gas	Electronics, Automotive, Pharmaceuticals, Microchips, Palm Oil, Fruits, Paper
Nigeria	362.8	2.9	Agr: 23.7 Ind: 30.8 Serv: 44	24.7	Oil: 2.2% Gas: 3%	Petroleum, Gas, Tin, Iran Ore, Lead, Zic, Stone, Limestone,	Chemicals, Crops, Cacao, Palm Oil,
Pakistan	338.4	0.2	Agr: 23.4 Ind: 20.7 Serv: 50.6	30.8	Oil: .022% Gas: 0%		Steel, Sugar, Rice Tobacco, Paper, Fertilizer, Fruits, Crops, Textile
Türkiye	1108	5.1	Agr: 6.2 Ind: 28.4 Serv: 54	59.5	Oil: 0.02% Gas: 0.002%	Iron Ore, Coal, Bauxite, Copper, Gold	Textiles, Food, Electronics, Crops, Cotton, Poultry, Electronics, Automotive, Construction,
Total /Average D-8	4,848.8	3,7	Agr: 8.2 Ind: 34.4 Serv: 49	24.1	Oil: 15.84 Gas: 24.4	Iron Ore, Oil, Gas, Stone, Copper, Coal, Zin	Electronics, Basic Metals, Crops, Textiles, Automotive, Palm Oil, Paper, Fruits, Cacao, Construction

Sources: IMF, WB, Statista, Global Financial Magazine

Table 1 offers a clearer view of the substantial material capacity and power level of these countries, which enhances the prospects and incentives for their economic cooperation.

The D-8 member states lack geographical continuity, which, according to classical theories of regionalism, presents a challenge to their economic cooperation. However, when considering ideational theories that aim to de-territorialize regionalism, if other convergence factors are effectively utilized and the economic development of the member countries is enhanced, geographical dispersion will not pose a significant barrier to convergence. Furthermore, regarding the elements of semantic and motivational power, D-8 member countries are classified as developing nations striving to improve their position and bargaining power in the global economy. Over the past three decades, they have made substantial efforts to establish and approve cooperation frameworks and tools, demonstrating their



strong political will to maintain collaboration within this organization. In short, D-8 has accumulated enormous potential capabilities in terms of quantity and quality; and its capacities, along with the high-level political support for the organization, are significant in the development of regional cooperation.

## The level of social and cultural cohesion and role of shared historical, cultural and religious values in integration

Based on the constructivist theory and the cultural solidarity variable in Cantori and Spiegel's perspective, the process of regional identity formation involves the level of social and cultural cohesion, along with non-material factors such as ideas and values within societies, including social culture, language, religion, history, and common heritage. These elements play a constructive and consistent role in the development and construction of regional society (Newmann, 2003; Dehghani Firouzabadi, 2015: 43). Thus, the greater the cohesion and similarity among these factors, the higher the likelihood of successful convergence. All member countries of D-8 belong to the community of Islamic nations, which is regarded as a significant factor in fostering social solidarity among them.

Historically, these countries possess a rich cultural heritage and a shared identity that evolved over centuries within the Islamic empire, spanning from Southeast Asia to North Africa, where the Silk Roads facilitated trade, cultural exchanges, and interpersonal connections among them. Conversely, the D-8 members are developing countries situated in the global south. These nations are discontent with the Western order and values that prevail in the international system and aim to reform existing structures while enhancing their share and role in the global economy and governance. This is clearly reflected in the fundamental principles and objectives of D-8. Consequently, the organization benefits from a high level of social cohesion and cultural solidarity among its members. If these capacities are effectively harnessed through the enhancement of cultural interactions, the expansion of people-to-people ties, and the development of tourism exchanges, this will serve as a crucial factor for convergence within the organization, which also lays the groundwork for strengthening economic convergence.

## Level of development and symmetry or compatibility of economic structures

Regional convergence theorists such as Ernst Haas, Cantori, and Spiegel argue that the level of development and symmetry or equality of political and economic structures, along with the capacity and ability of members to adapt and respond to convergence, are crucial for the initial acceptance of the convergence plan and its subsequent progress (Dougherty and Pfaltzgraff, 2005: 683). The degree of symmetry or equality of economic structures and economic cohesion among D-8 members can be assessed using indicators such as the level of development, similarity of economic systems, the degree of economic complementarity, and the distribution of resources in the region.

**The level of development** - one of the factors influencing the increase in intra-regional trade is the level of development and economic progress of the countries involved in the convergence process. In this context, the higher the level of development and economic strength of the members, the greater the trade elasticity among them, which ultimately leads to a higher level of convergence. As the data in [Table 1](#) and [Table 2](#) indicates, D-8 member countries exhibit varying levels of economic development and capacities. Given that many of their agricultural products and mineral and energy resources are exported to markets outside the region while manufactured goods and finished products are imported from developed countries, a significant portion of the region's trade occurs with developed nations.

**Similarity of economic systems** - the more alike the structure of countries' economies is, the greater the likelihood of successful regional convergence. A review of the economic indicators of D-8

member countries reveals significant differences among them. On one hand, there are countries like Turkey, Indonesia, and Malaysia that maintain more open economies and engage in free trade with the outside world; on the other hand, there are economies transitioning from state-centric to market-oriented systems in Iran, Egypt, and Nigeria. Lastly, there are two countries, Pakistan and Bangladesh, that possess relatively weak economies. These diverse economies have faced and continue to face challenging conditions for convergence (Aral, 2005: 92).

**Economic complementarity** - Complementary economies within a region foster trade relations, while competitive economies tend to diverge (Cantori and Spiegel, 1970: 12). In the D-8 region, Iran, Nigeria, and Indonesia are producers and exporters of oil and gas, leading to competition among them for access to consumer markets. Generally, the fact that D-8 member countries produce and export similar products—such as petroleum, gas, agricultural goods, minerals, and raw materials—which also constitute the largest share of their exports, results in limited trade between them.

**Distribution of resources** - Another factor illustrating economic cohesion in a region is the distribution of economic resources among member countries. A fair distribution of resources fosters convergence, while asymmetry in wealth and poverty among the countries heightens the potential for conflict and divergence. [Table 1](#) presents the dispersion of natural and economic resource distribution in the D-8 region. As shown in this table, disparities in resource distribution may lead to inequality and asymmetry in the economies of these countries, resulting in those with oil resources or technological capabilities experiencing better economic growth compared to their counterparts. This situation divides the member countries into two groups: the affluent and the impoverished. Economic inequality and asymmetry hinder convergence, as the disparities allow some members to gain more from economic convergence while others benefit less, prompting them to seek compensation from countries outside the region.

In summary, the fundamental differences in GDP volume, levels of development, and competition in certain economic sectors such as energy and agriculture contribute to a significant heterogeneity in the economic situations of D-8 members, which creates barriers to trade exchanges among them. Nevertheless, despite these heterogeneous capacities making convergence in the D-8 region quite challenging, favourable economic conditions and strong political motivations still enable them to pursue beneficial trade cooperation. Each of these countries possesses considerable capabilities in the production and export of various goods, raw materials, as well as industrial and technological products. Therefore, if trade and customs agreements are fully implemented, the volume of trade exchanges among them could increase. To achieve this, the members of the organization should make sacrifices and offer concessions to one another.

## **Common interests (or productivity), equal distribution of benefits and the level of usefulness of cooperation**

Based on neo-functional theory and the principles outlined in Matlli's theory, recognizing shared benefits and ensuring their equitable distribution during regional cooperation is essential for sustaining the convergence process. The establishment of D-8 was driven by specific economic objectives, which are articulated in strategic documents such as the Istanbul Declaration, Roadmap, D-8 Vision, and various agreements of the organization. It is crucial to assess the extent to which these expectations have been fulfilled over nearly 30 years of collaboration. In the last two decades, alongside the development and implementation of agreements and strategic documents, initiatives and efforts have also been directed toward priority areas of cooperation. Analysing the realization of these initiatives can serve as a valuable criterion for evaluating member states' satisfaction with the organization's cooperation and their sense of shared interests. We will explore these activities in the priority areas



of trade, industry and technology, agriculture and food security, transportation and communications, tourism, and collaboration in other significant sectors.

### Trade Cooperation

Many studies in political economy and economic regionalism have revealed a strong connection between economic growth and trade liberalization. The increasing expansion of world trade volume in recent decades and its reciprocal impact on the assumes that preferential trade agreements are the lowest stage of integration that are

**Table 2**

*Status of Foreign and Intra-Regional Trade of the D-8 Member Countries (2023)*

Country	Export bn \$	Import bn \$	Total Trade- bn \$	Intra D-8 Trade- bn \$- %	Main Exports	Main Import	Main Trade Partners
Azerbaijan	33.8	17.2	51	8.5 bn 16,6%	Crude Oil, Natural Gas, Fruits & Nuts, Plastics	Cars & Parts, Machinery, Medical Items, Cereals, Metals, Electronics	Italy (30.7%), Turkey (13.9%), Russia (8.5%), China (5.8%), Germany (3.5%), Greece (2.6%)
Bangladesh	54.8	82.7	137.5	17.4 bn 12,7%	Garments, Plastic, Aquacultures, Jute, Leather, Ceramic,	Machinery, Soya, Petroleum, Sugar, Electronics, Plam Oil	China (13.3%), US (10%), India (7.8%), Germ (5.5%), UK(4.5%), Singapore(3.4%)
Egypt	32.6	72.1	104.7	7.1bn 6.8 %	Petroleum, Cotton, Minerals, Textiles Fertilizers Gold,	Machinery, Mineral, Fuels, Cereals, Electronics, Plastics	UAE (8.9%), US (7.1%), Saudi (6.8%), China (6.8%), Germ. (4.9%), UK(4.5%)
Indonesia	258.8	221.9	480.7	40 bn 8.3%	Coal, Palm Oil, Natural Gas, Textiles, Paper, Electronics, Coffee Shrimp, Rubber,	Crude & Refined Oil, Vehicles, Basic metals, Machinery,	China (26.5%), Japan(7.7%), US (7.2%), Singapore (6.4%),Malaysia (4.8%), India(4.2%), S. Korea(2.2%)
Iran	86.9	66.3	153,2	16.8 bn 9%	Cude Oil, Gas, Auto, Nuts, Iron Ore, Stone, Petrochemicals, Ceramics, metals	Auto Parts, Gold, machinery, Corn, Soya Beans, Vegetable Oil, Cell Phone	China (21.2%), UAE(17.9%) Iraq (6.4%), Türkiye (6.2%), India(2.7%), Germany (1.4%), Pakistan(1.40%)
Malaysia (Data for 2024)	344.4	313.2	677.6	35.2 bn 5.2%	Electronical Products, Palm Oil, Machinery, Parts, Rubber,	Cude Oil, Vehicles Machinery, Metals, Chemicals, Plastic Resins,	China(30.2%), Singapore(27.2%), US (24.2%), Japan (19.1%), Indonesia( 3.7%), S. Korea(1.8%),

Country	Export bn \$	Import bn \$	Total Trade- bn \$	Intra D-8 Trade- bn \$- %	Main Exports	Main Import	Main Trade Partners
Nigeria	63.4	60.6	124	6.2 bn 5%	Crude Oil, Gas, Fertilizers, Gold, Cacao, Ship & Boat	Refined Petroleum, Crops, Automotive, Medical Equipment, Medicine, Plastics	China (11.85), India 10%), Netherlands (6.6%), Spain (4.5%), US (4.2%), France (3.4%), Indonesia (1.8%), Turkey(1.7%), Malaysia(1%)
Pakistan	27.7	55.2	82.9	9.1 bn 11.8%	Garments, Rice, Fish, Fresh Fruits, Refined Petroleum	Crude Oil, LNG, Machinery, Metals, Palm Oil, Raw Cotton, Plastic, Medicine, Electronics	China (33%), US (21.3%), UAE (15%), Saudi A. (9%), Indonesia (7.8%), UK (7%), Germany (5.6%), Bangladesh (2.4%), Malaysia(1.6%)
Türkiye	232	339	571	31 bn 5.4%	Car & Spare Parts, Ceramic, Jewelry, Garments, Refined Petroleum, Auto, Electronics	Natural Gas, Crude Oil, Iron Ore, Metals, Precious Stones, Machinery,	Russia (9.2%), China (7.8%). Germany (7.3%), Italy (4.4%), Swiss(3.6%), US(3.5%), France(3.5%), UK(3.1%), Iraq(2.3%), Iran(1.6%), Egypt(1.1%)
D-8	1,133,6	1,246,8	2,382	171,2 bn7.2%	---	---	---

Sources: World Bank, WTO, tradingeconomics.com, statista.com, BBS of Bangladesh, pbs.gov.pk, data.tuik.gov.tr, TURKSTAT

economic growth of countries, clearly demonstrate the importance of this issue (Movahedi, 2006: 173). As briefly explained, the theory of economic regionalism mainly adopted by developing countries to coordinate tariff policies and provide tariff concessions in stages with the aim of increasing trade. In this method, the contracting members of the agreement are required to have lower tariffs among themselves for a list of selected goods than those applied to non-member countries. In the next stage, tariffs and quotas are eliminated between members by creating a free trade area. Full economic integration constitutes the last stage of economic integration, when all common economic policies are controlled by a supranational authority (Söderbaum, 2015: 62-63). Given the importance of regional trade agreements and preferential trade in reducing intra-regional trade costs, the WTO has granted privileges to such arrangements based on GATT Article 24. (4)

As in other developing regions, trade is regarded as the backbone of cooperation in D-8 and has been a primary focus of the member countries since the organization's inception. This focus enables collaboration in other priority sectors, which can also contribute to the overall expansion of trade in the region. The most significant D-8 initiative in the realm of trade is the establishment of the Preferential Trade Agreement, signed in 2006. Under this agreement, trade tariffs between member countries for 8 percent of tradable goods, or approximately 260 negotiated items, will be reduced according to a



specific formula, aiming for a ceiling of 10 to 25 percent within 4 to 8 years following the agreement's implementation. Also, according to Articles 9 and 10, para-tariffs and non-tariff barriers for goods on the list subject to tariff reduction will be eliminated from trade transactions following the agreement's entry into force (D-8-PTA, 2006:5-7). According to Article 34, the agreement officially came into effect on August 25, 2011, between Iran, Malaysia, Nigeria, and Turkey, and by February 2012 for Indonesia and Pakistan. Egypt and Bangladesh joined the agreement with a delay of over 10 years, and Egypt is still in the process of ratifying it in its parliament. A Supervisory Committee was established in accordance with Article 27 of the agreement in 2011 and is overseeing its implementation process (Report of the 1st SC-PTA, 2012).

The most significant challenge facing the agreement is the incomplete implementation by all member countries. The Supervisory Committee has convened seven times since 2012, while the Council of Trade Ministers has met three times, each occasion establishing and agreeing on a new cut-off date for the definitive implementation of the agreement, the most recent being July 1, 2016 (Report of the 4th SC-PTA, 2016: 2-4). Nevertheless, the implementation process has encountered various challenges. Ultimately, during the seventh meeting of the Committee, after extensive discussions regarding the proposed cut-off date for the operationalization of the PTA, it was concluded that the five Contracting Members—Bangladesh, Indonesia, Iran, Malaysia, and Türkiye—that had completed the necessary preparatory steps may commence implementation and operationalization immediately (Report of the 7th SC-PTA, 2024: 2-4). At the third meeting of the Council of Trade Ministers (CTM), two additional documents to facilitate the implementation of the PTA, including the Dispute Settlement Mechanism Protocol (DCMP) and the Trade Facilitation Strategy (TFS), were approved, with the former requiring endorsement by the legislative authorities of the member countries (Report of the 3rd CTM, 2024). Conversely, two complementary agreements to the PTA, namely customs cooperation and visa facilitation for traders, have yet to be implemented despite having entered into force in 2012, and this issue remains a significant barrier to facilitating trade and the free movement of goods and people among member countries.

Thus, it seems that the D-8 member states, 28 years after the organization was established and 18 years after the ratification of the PTA, are not yet ready to implement the most important trade facilitation agreements among themselves. In fact, the contracting countries of the agreement did not act as expected both in the process of ratification and in the operationalization of its provisions in their domestic economic and trade structure. These problems caused the implementation of the agreement to be delayed and one of the main goals of the organization, which is the development of intra-regional trade. Therefore, one of the main reasons for the shortcoming to achieve the goal of the 2008-2018 roadmap to increase intra-D-8 trade to 15-20 percent or \$500 billion by 2018 can be attributed to the delays to implement the PTA and other agreements. Although the volume of intra-regional trade increased from \$15 billion at the time of the organization's establishment to \$110 billion in 2018 and more than \$170 billion in 2023-2024, as seen in Table 2, this same rise in intra-regional trade volume should also be credited to the bilateral relations between neighbouring member countries, such as Iran-Turkey, Indonesia-Malaysia, or Pakistan-Bangladesh.

### **Agriculture and Food Security**

In the roadmap and other organization decisions, members of the D-8 made cooperation in the agriculture sector one of the most important priorities for cooperation among themselves, given the high share of the agricultural sector in the GDP and labour force of most of these countries. Between 2012 and 2023, they held seven meetings of the ministers of agriculture, several meetings of senior officials, and dozens of working group meetings focusing on developing cooperation in the field of food security, expanding agricultural exports, and improving agricultural trade standards. The outcome

of the discussions and decisions of these meetings has been the formulation of several cooperation programs and strategies in this area, including the formulation of D-8 Food Security Program, creation of an Animal Feed Information Site, establishment of the D-8 Fertilizer Association, and the establishment of a Seed Bank, which, if all member countries actively support and participate, can greatly contribute to the development of regional cooperation in the agricultural sector and food security and facilitate the improvement of their economies.

### **Industry and technology**

Cooperation in the field of industry and technology has concentrated on developing an industrial strategy and enhancing collaboration in this area, particularly in technology transfer, training, experience exchange, scientific and research cooperation, strengthening small and medium-sized enterprises, and fostering innovation. However, despite some D-8 members achieving remarkable levels of industrial and technological advancement, the six meetings of industry ministers and numerous gatherings of senior officials and the industry and technology working group have not resulted in significant progress in industrial cooperation among members or in the expansion of trade exchanges and services in this domain. Perhaps the most successful cooperation project in the realm of industrial collaboration and innovation is the establishment of the D-8 Technology Transfer and Exchange Network (TTEN), domiciled in the Pardis Science and Technology Park in Iran. This network engages in valuable activities aimed at enhancing cooperation and the exchange of experiences and technical knowledge among member countries.

Two or three additional initiatives, including the D-8 Network of Pioneers for Research and Innovation (D-8NPRI), D8 University, and the newly launched Small and Medium Enterprise Centre, are also aiming to bolster collaboration in the field of science and technology. However, due to constrained financial resources and the low level of intra-regional trade, these innovative projects are not expected to significantly impact D-8's primary agenda at this time.

### **Connectivity and Communications**

As the D-8 member countries are not geographically connected, the development of land and railway connections between them may not be relevant. However, given the increasing importance of connectivity and the role of economic and transit corridors, as well as the rising role of multimodal transport in facilitating trade between production and supply centres and consumption markets, cooperation in this sector is crucial for the organization. In this regard, enhancing air travel, connecting ports, strengthening shipping lines, and improving telecommunications can significantly bolster cooperation in the transport and communications sector.

One area of growing collaboration among D-8 members is in shipping and maritime activities, considering the member countries' substantial coastlines and the importance of maritime activities in their national economies. This cooperation has been actively pursued through the formation of an Expert Working Group (EWG) and the implementation of sustainable measures in shipping and maritime. As a result, proposals have emerged to establish a joint company for operating container terminals, the Automated Maritime Data Access (AMDA), a network of multi-purpose piers, and the potential for joint investments in constructing ships and specialized ports (Report of the EWG on shipping, 2024: 1-4). It is hoped that member states will give due attention to these ideas and ensure that all necessary support and financial solutions are provided for their realization.



## Tourism and Cultural Cooperation

D-8 member countries possess excellent conditions for fostering cooperation in tourism, thanks to their rich natural and historical resources, cultural similarities, and shared Islamic heritage. The inclusion of countries like Egypt, Turkey, and Iran, recognized as significant global tourist destinations, enhances these capabilities. Consequently, tourism has been identified as a primary priority for collaboration. The roadmap outlines key objectives for cooperation in this sector, aimed at promoting economic development, reducing poverty, and creating jobs. To realize these goals, member countries have agreed on a Comprehensive Strategic Plan for Tourism following three ministerial meetings and discussions among senior officials in the tourism sector. The ministerial meetings also decided on supporting joint cultural events, such as sports tournaments, establishing a tourism house, promoting health tourism, and facilitating tourist visas (Report of the 3rd MMT, 2023). The successful execution of this program will bolster tourism prosperity in D-8 countries, enhance solidarity among their populations, and improve their economic relations.

## Cooperation in other important areas

In addition to identifying the main priorities of cooperation, some of which are divided into several sub-sectoral areas, D-8 members engage in a diverse range of cooperative efforts. The 2008-2018 Roadmap outlined 13 areas of cooperation, and specialized working groups have been established for several of these areas to monitor progress, identify, and adopt operational plans and programs. The 2020-2030 Roadmap has further expanded the scope of this cooperation. The outcomes of such extensive activities to date include the adoption of the D-8 Charter and five cooperation agreements, the expansion of external relations, the formation of eight affiliated institutions and programs, the establishment of the Federation of Chambers of Commerce, and the approval of three private sector initiatives. (6) However, the breadth of these activities and the creation of numerous affiliated bodies—some of which are in the early stages of establishment—leads to a deviation from addressing the main goals and priorities of cooperation and hampers the optimal and proportional utilization of the limited resources available in the member countries. This concern has not gone unnoticed by the member states, as the Commission, in response to new proposals presented by the Secretariat, emphasized at its 47th session the need to concentrate on the main priorities of cooperation (Report of the 47th Commission, 2023: 10).

An overview of the D-8's main and sectoral objectives, alongside a comparison to its achievements, is reflected in [Chart 1](#) below. As observed in this chart, the areas where the organization has seen successful outcomes are limited, while many other areas show negligible results. Overall, when considering the outcomes of D-8 activities—particularly in priority sectors such as trade, transportation, energy, technology, financing, and investment—it is evident that cooperation within the organization has been delayed, slow, or not executed. Thus, we can conclude that the D-8 has not succeeded in meeting the expectations of its members to establish a powerful economic bloc of significant OIC member countries and to exemplify a model of an Islamic Common Market.

Chart 1

Comparison of Objectives and Achievements of the D-8

	Objectives	Achievements
Basic Objectives	Socio-economic development of D-8 countries, promote welfare and improve quality of life of their people	Overall activities & efforts in D-8 has not led to achieve this goal
	Political consultation and co-ordination at the international to play an effective role in the global economy	D-8 has not been able to achieve this objective as expected and compared to similar entities like BRICS, G7 or G20
	Co-operate with other countries, regional & international organizations to promote the concerns and interests of the developing countries	D-8 has not been able to achieve this objective as expected. D-8 is not actively involved in South-South dialogue
	D-8 to be a global forum whose membership will be open to other developing countries	After 28 years, only Azerbaijan joined D-8, But no observer state admitted so far
Sectoral Objectives (non-exhaustive areas of co-operation)	Establish an appropriate mechanism to liaise with member states and other relevant international organizations	D-8 has established a full-fledged Secretariat since 2008. The Charter of the Organization, Hq. Agreement and Statutory Documents for the Secretariat have been signed & implemented
	Trade & Investment: Conclude PTA & related Agreements - Intra- D8 trade to reach 15-20 % of total trade by 2018 & 10% by 2030	D-8 PTA and RoO, Customs and Visa agreements entered into force during 2010-2011- PTA enforced only by two members -Intra Trade reached 6.6% by 2015 & 8.4% by 2023.
	Industry: development of SMEs, Coop. on Standards and Conformity	Center for SMEs established in Abuja in 2024, D8 SMEs Bank to be established.
	Communication & Connectivity: Cooperation in civil aviation & air transportation, joint ventures on maritime, road & railways connectivity, ICT cooperation, harmonize policies & regulations on IT	Priority areas decisions not resulting to specific project or joint program in these sectors
	Finance, Banking and Privatization: Cooperation on Islamic finance and banking (IB), coordination of regulations, coop. on financial markets	Exchanges of information and experiences, seminars and training in finance & IB, Project Support Fund established in 2017
	Science and Technology: Establishment of D-8 Net, D-8 NANONET, D-8 institute/university, S&T indicators, capacity building	D8-TTEN successfully launched and is very active, D8-International University Established, AI Network initiated
	Agriculture & Rural Development: R&D on food, agriculture & forestry; food security; irrigation development; tech. transfer; exchange of data & experience, cooperation on rural development	Establishment of D8-PCAIFS, Seed Bank, Program for Food Security, D-8 Fertilizer Association, Food Security Data Base.
	Health: coordinate the accelerated drive to attain SDGs 1, 2 & 3 by D-8 Member States, promoting trade in health value chain products	D-8 HSP program launched
	Energy & Environment: D-8 Energy Database, renewable energy, Mining and Minerals,	D8-Energy Data Base Initiated, Renewable Energy Mapping, Blue Economy, Petrochemical Association to be established
	Private Sector Involvement: Private sector should be the main engine of growth, to establish BF & CCI	D8-CCI, BF established and are active. D8-CEFC established. D8-NPRI initiated, pilot Payment Card launched-NGBT initiated
Tourism, Culture and Sports: D-8 region as a tourist destination, D-8 tourism package, heritage award, sport tournaments, cultural cooperation	Comprehensive Strategy & Road Map on Tourism, D8 Tourism City of the Year Award launched, Youth Council established. D-8 has signed MoUs with more than 30 regional & intl. entities and NGOs. incl. UN, OIC, IsDB, ECO, BSEC, ISC, IOFS, UNCTAD, AARDO, TIKAI, ARDGS, ECOWAS, etc. - However, E.R. did not promote D8 visibility or mobilized resources.	
Intl. Cooperation & External Relations: with others regional & international organizations, international finance organizations and NGOs		

- Satisfactory Achievements
- Meager or No achievement
- Encouraging but Insufficient Achievements

Sources: Istanbul Declaration 1997, Road Maps, D-8 Charter

On the other hand, the expansion of external cooperation, ratification of agreements, and the formulation of the roadmap indicate that, despite the extensive activities undertaken by the organization, these efforts have not been translated into practical and tangible results, nor have they yielded distributable achievements for the members. Consequently, one of the primary conditions for convergence, as outlined by the theory of neo-functionalism and Walter Matlli's perspectives, has not been adequately fulfilled. This concern can also be inferred from the remarks of several D-8 commissioners during the 47th commission meeting. (7) Given the obstacles and challenges ahead, the organization has a considerable journey ahead before it can realize its fundamental objectives and achieve the convergence stage. We will explore these obstacles in the next section.

## The capacity and ability of member countries for political convergence and organizational cohesion

Regionalism theorists, such as Hass, Cantori, Spiegel, and Walter Matlli, regard the political cohesion and solidarity of members, along with organizational cohesion, as one of the most significant and influential variables in the convergence process. We will explore the impact of this factor on convergence among D-8 members in three areas: the degree of convergence of political systems, the structure of mutual relations, and organizational cohesion.

**The Cohesion of Political Systems:** Drawing from the successful experiences of the European Union and, to some extent, ASEAN, the more similar and compatible countries are within a region regarding political and democratic structures and values, the greater the cohesion and compatibility among them. The member states of D-8 exhibit diverse and heterogeneous political systems; some experience political instability, while others are embroiled in political disputes, either within the region or with external actors, which have hindered the convergence process within the organization. The political systems in the region encompass a variety of democratic and para-democratic governments, religious democracies, and secular democracies. This heterogeneity of political systems is why D-8 does not



demonstrate a tendency toward political activities, externalization, or coordination of political or even economic positions on the international stage. This situation contradicts one of its principles of cooperation, as highlighted in the first statement of the leaders in Istanbul, which emphasizes “political consultation and coordination in international forums” (Istanbul Declaration, 1997).

**Structure of mutual relations:** Another factor that hinders an organization's ability to implement cooperation programs is the political issues and tensions among its members at both domestic and international levels. Since the establishment of the D-8, member states have never engaged in direct military conflict or severe turbulent relations with one another; thus, the relationships among members of this organization have consistently been grounded in mutual respect for each other's national sovereignty and a preference for cooperation over conflict. This can serve as a positive factor in the convergence process of the member states. However, the strained or low-level relations of some significant and influential members, such as Iran and Egypt during the early stages of the D-8's existence, or the diplomatic tensions between Turkey and Egypt following the fall of the Morsi government in 2013, have hindered the enhancement of their trade and economic relations over the past two decades. Internal issues and conflicts in Nigeria since 2002, along with political instability in Pakistan and Bangladesh, have consumed part of their national capacity and strength. Additionally, regional conflicts, such as the Israel-Gaza war, the war in Ukraine, and tensions in the Caucasus, have also impacted regional cooperation in the adjacent areas.

On the other hand, U.S. and Western sanctions against Iran, both before and after the nuclear agreement, have hindered the country's economic development and foreign trade since a nation facing severe sanctions cannot engage in normal regional cooperation. According to the fourth variable of Cantor and Spiegel's theory, internal and external tensions and conflicts within a region's countries will obstruct the success of the convergence project (Soleimanpour and Soleimani, 2016: 75). This issue, despite the political will and desire of the member countries, has relatively overshadowed cooperative relations in D-8 over the past two decades.

**Protectionism and organizational cohesion:** Walter Mattli identifies the presence of necessary political will among leaders as a crucial condition for fostering cooperation and convergence. This will appear to be present among the organization's highest-level members, as evidenced by the ongoing activity and vitality of the organization despite various obstacles and limitations that have hindered the convergence process. This is demonstrated by the regular convening of meetings of the heads of state and foreign ministers, the significant participation of member countries in these gatherings, the continuous organization of sectoral ministerial meetings (including seven meetings of agriculture ministers and six meetings of industry ministers), the annual meetings of the Commission, as well as meetings of senior officials and numerous EWGs. All these factors indicate the existence of the necessary political will among members to support the organization's activities and work towards realizing its programs. This aspect is regarded as a key strength for promoting cooperation within the organization.

Another manifestation of organizational cohesion and support for the organization is the institutionalization of cooperation and the consolidation and strengthening of the secretariat. In this regard, the approval of the roadmap, D-8 Vision, and other documents and agreements, along with the formation of monitoring and follow-up working groups, demonstrate that the organization has envisioned long-term plans and diverse cooperation programs across various fields to achieve its goals. This indicates institutional coherence and the presence of an appropriate structure within the organization to realize the provisions of the Istanbul Declarations (Kandahari, 2019: 75). Furthermore, members of the organization made significant decisions at the sixth Summit to enhance organizational coherence. By approving key administrative and legal documents, they established the permanent secretariat of D-8 in Istanbul and appointed a secretary general to ensure that the organization can pursue the cooperation process more effectively. The approval of the central budget structure, the system for

paying the salaries of the secretariat staff from this budget, the timely payment of membership fees, and the allocation of a suitable building for the organization's headquarters by the host government, all indicate a high level of support for the organization.

Therefore, it appears that the D-8 organization does not encounter organizational limitations in promoting convergence, as an appropriate structure and specific programs have been established to achieve the outlined goals. The secretariat also possesses the necessary and flexible capacity to foster cooperation. However, the core issue is that contrary to the conditions proposed in neo-functional theory regarding the status and powers of supranational institutions, the D-8 secretariat lacks independence beyond executing the decisions of the member states. If the organization aims for tangible and reliable growth, the secretariat must be granted greater operational autonomy—like how ASEAN and European Union members have delegated some decision-making and execution powers to these institutions. Furthermore, D-8 agreements should include necessary enforcement guarantees, and members should demonstrate greater self-sacrifice to ensure the success of the decisions made within the organization.

### **The role of the transregional hegemon and pivotal state**

As we explained in the theoretical section, neoclassical realism views regions as sub-systems within an anarchic international system that are influenced by the global distribution of power. Consequently, the potential for regions to transition from conflict and tension to relatively stable and cooperative areas largely depend on strategic choices and cooperation between the transregional hegemon and the pivotal state or states within the region (Taliaferro, 2012: 119). The transregional hegemon is one of the great powers in the international system that possesses the ability and interest to exert influence in distant geographical areas (Waltz, 1979: 131). During the Cold War, the United States and the Soviet Union fulfilled this role in Europe and many other regions. Currently, China is assuming this role in Africa and areas that are part of the main periphery of the Belt and Road Initiative.

Regarding the potential for a transregional hegemon to support D-8 cooperation, it should be noted that in the post-Cold War era and the current transitional phase in international relations—marked by the decline of traditional powers and the rise of emerging ones, alongside the emergence of new regionalism—it is generally unrealistic to discuss the intervention of a transregional hegemon. Nevertheless, we have observed new forms of protectionism from foreign actors and emerging powers within regionalism. A clear example of this issue is the adoption of the AGOA program by the US Congress in 2000, the European Union's backing of market-oriented and outward-looking regionalism in Asia and Africa (EC Commission, 1995: 3), including the establishment of the ASEM mechanism for cooperation with Southeast Asia, as well as China's initiatives to enhance cooperation with Asian and African countries through the Belt and Road Initiative and the China-Africa Cooperation and Partnership Mechanism.

Regarding the D-8 region, it must be acknowledged that a significant factor contributing to the slow integration process within the organization may be the negative influence of foreign powers and their attempts to hinder the organization's progress, particularly concerning its contentious objectives in relation to the G7 and the involvement of key Islamic countries in this organization. In fact, some analysts argue that the D-8, comprising leading Islamic countries, was formed to pursue a dual objective: establishing a Common Islamic Market and serving as a revisionist forum for developing states seeking reform in the international economic system. These ambitious objectives may have prompted adversaries of the Islamic world, such as Israel, and the guardians of the existing international system, like the United States, to obstruct the successful realization of the noble goals of the D-8 (Ghandehari, 2019: 124). However, there is no documented evidence to support this assertion.



A pivotal state, according to Mattli, is one that, due to factors such as geography, relative capabilities, or revisionist ideals, can become a primary source of conflict or convergence in a region. Based on this definition, among the members of D-8, Turkey, Iran, and Egypt are identified as pivotal states (Chase et al., 1996: 37-38). Concerning the role of a pivotal state in D-8, Turkey may have aimed to fulfil this role at the outset of the organization, initiated by the late Prime Minister of this country. However, Erdogan's departure from power significantly altered the situation, leading some members to view the continuation of D-8 activities without his presence as unjustified. This role was not replicated within the D-8 family, and none of the members succeeded in embodying a pivotal state model in the organization. We will discuss this phenomenon further in the next section.

## Challenges and obstacles facing D-8 cooperation and possible solutions

Assessing the status of cooperation in D-8 and acknowledging the organization's lack of success to achieve its primary goals aimed at establishing itself as a powerful bloc of significant Islamic countries in the Islamic world and the global economy, it becomes evident that the organization is encountering serious obstacles and challenges. Therefore, unless the member states and the secretariat take the necessary steps to eliminate these barriers and address the challenges, we cannot expect progress in cooperation or in achieving the objectives outlined in the 2020-30 Roadmap. In this section, we will discuss the most critical challenges and offer suggestions and recommendations for overcoming these obstacles.

### Limitation of trade due to geographical factor

In traditional theories of regionalism, geographical continuity is regarded as one of the influential factors in the process of cooperation and convergence. However, as elaborated earlier, within ideational theories that emphasize the de-territorialization of convergence, the geographical distance or proximity of members cannot be a determining factor in the convergence process. Nevertheless, the impact of geographical dispersion and the inverse effect of area on trade in slowing down the process of cooperation in D-8 cannot be overlooked. Although geographical distance has largely diminished in significance for trade due to technological advancements and the diversification of communication methods, where goods are transported swiftly and at minimal cost, for D-8 members—who differ in size, levels of economic development, and infrastructure—distance and transportation costs or limitations can pose significant obstacles to intra-regional trade expansion. In this context, examining the status of trade between D-8 members can yield interesting insights regarding the effect of geographical factors on intra-regional trade. As Table 2 illustrates, the primary trading partners of D-8 member states are located outside the organization, and contrary to the goals of the roadmap, a substantial portion of the foreign trade of member states occurs with external regions. As shown in this table, the largest volume of intra-regional trade within D-8 is between Iran-Turkey and Indonesia-Malaysia as trading pairs, which is more attributable to their geographical proximity and the sanctions on Iran than to the impact of cooperation in D-8 (Issa pour, 2019: 90).

### Delay in the implementation of agreements

Despite the strong political will among members to support the organization, D-8 faces delays in implementing its agreements. These delays are evident both in the ratification stages by the legislative bodies of member states and in the process of operationalizing the agreements while ensuring compliance with domestic laws. A concrete example is the implementation status of the most significant cooperation agreement, namely the PTA, which achieved the necessary quorum for implementation five

years after its signing. However, its implementation has been postponed for at least 10 years, despite several cut-off dates set by the Council of Trade Ministers and the Supervisory Committee.

On the other hand, today, despite the enforcement of the agreement among five member countries, its implementation may not enhance intra-regional trade. In fact, even if the PTA is fully executed, two fundamental issues hinder its effectiveness in boosting intra-regional trade: First, despite the potential implementation of this agreement, numerous non-tariff barriers will persist between member countries. Second, as the Secretary General of D-8 stated at the seventh meeting of the Supervisory Committee (SC), the list of goods provided by the contracting countries comprises low-importance or non-tradable items that do not significantly impact their national economies; thus, reducing tariffs cannot lead to an increase in regional trade (Report of the 7th SC, 2024: 3). Therefore, it is essential to update this list to include more significant goods for trade among members. However, at the 7th SC, the participating representatives opted to postpone the revision of this list until the agreement is fully operationalized by all D-8 member states.

A similar situation exists for the other agreements of the organization. To address the issue of implementing agreements, D-8 should seek new solutions and initiatives. One such solution is a mechanism for the expedited implementation of the agreements with the participation of the minimum required interested member states. This mirrors the decision made at the 7th meeting of the PTA Supervisory Committee, where those ready to implement them now can proceed, while the remaining members can join later.

## Membership in similar regional arrangements

Membership in similar regional arrangements is also viewed as both an obstacle to divergence and an opportunity for regional organizations. In other words, this is akin to a double-edged sword. On one hand, a country that is a member of various regional arrangements may not wait for the slower-moving one to thrive and may instead seek other options. For instance, Turkey conducts a significant portion of its trade with European countries within the framework of the Customs Union. As [Table 3](#) illustrates, Turkey is also a member of other regional arrangements such as ECO and the Black Sea Cooperation Organization (BSEC). On the other hand, some D-8 members are also part of ASEAN (Malaysia and Indonesia), SAARC (Pakistan and Bangladesh), STO (Iran and Pakistan), and ECO (Azerbaijan, Iran, Turkey, and Pakistan). Given that most of these arrangements have reached similar agreements on trade, transport, or energy, which may overlap, the options for similar members to concentrate on one will be paradoxical. For example, ECO has entered the implementation phase of ECO Trade Agreement (ECOTA), through which four countries can enhance trade among themselves within the framework of this agreement, which encompasses a broader list of tradable goods. Therefore, further delays to implement D-8 Preferential Trade Agreement will not stop their trade cooperation in another organization. A similar situation prevails between Malaysia and Indonesia, both members of the ASEAN Free Trade Area (AFTA). This agreement has been implemented since 1992 and its member countries began moving towards the complete elimination of tariffs and non-tariff barriers among themselves (Sazmand, 2009: 54-52). For this reason, the highest volume of trade among D-8 member countries occurs between these two nations. The most immediate solution to address this challenge is for D-8 members to accelerate the actual implementation of their key agreements, namely the PTA, Visa for Businessmen, and Customs, while fully operationalizing its affiliated bodies.

**Table 3**  
*Status of Foreign and Intra-Regional Trade of the D-8 Member Countries (2023)*

Country	D-8	OIC	ECO	ASEAN	SCO	SAARC	BSEC	G20	BRICS
Azerbaijan	■	■	■				■		
Bangladesh	■	■				■			
Egypt	■	■							■
Indonesia	■	■		■				■	
Iran	■	■			■				■
Malaysia	■	■		■					
Nigeria	■	■							
Pakistan	■	■			■	■			
Turkey	■	■					■	■	

However, membership in other international institutions and arrangements is not always challenging, as these platforms can be leveraged to enhance D-8 visibility and support its activities. For instance, the membership of all D-8 member states in the Organization of Islamic Cooperation and its affiliated institutions, coupled with the active participation of some member states in significant and influential international arrangements such as the WTO (all members except Iran), the Group of 20 (Turkey and Indonesia), and BRICS (Iran and Egypt), presents an opportunity to utilize these institutions to further the goals of D-8. This aspect has been overlooked thus far, but considering the fundamental principles of D-8 that advocate for the active participation of its member states in the global economy, the strengthening of involvement in international decision-making, and a collective commitment to cooperate with both developing and developed countries, member states should capitalize on the opportunities available to enhance the organization's position and increase its bargaining power in crucial international forums. It is also conceivable that a regional organization like D-8 could become an independent member of influential intergovernmental bodies such as G20, OIC or BRICS. This mirrors the admission of the African Union and EU as members of the G20 during the 2023 summit. The Secretariat should also effectively utilize its relatively expanded international relations to leverage international resources and experiences to aid in the implementation of D-8 regional programs.

### Lack of the pivotal state

Given the successful experience of convergence in Europe and the roles of countries such as France and Germany in this context, the presence of one or two pivotal states in a regional organization is essential as a driving force behind cooperation and coordination among member states. A pivotal state plays a significant role in resolving issues within the organization and can bear the initial costs of convergence (Mattli, 1999: 44). As noted, one of the limitations faced by D-8 is the absence of a pivotal state (or states) within the organization that can take the necessary measures and coordinate the implementation of projects and operationalize agreements beyond the non-binding recommendations and approvals of the summits and decision-making bodies or the routine follow-up of the secretariat. Such a country should make efforts beyond those of a typical member state and, if necessary, incur costs to help advance the cooperation process. If this responsibility is too challenging for a single member state to assume, a Troika consisting of the former, current, and future rotating chairpersons could be established for a period of three to six years. This council of pivotal states would prioritize the affairs of the organization while maintaining continuous consultation with other D-8 members.



## Broadness of the scope of activities

The breadth of the areas of activity presents another significant challenge for the organization. According to the first Summit declaration and roadmap, D-8 has concentrated on six primary areas for economic cooperation. The Commission, EWGs, and sectoral ministerial meetings monitor the progress of collaboration in these domains. Undoubtedly, cooperation in vital economic sectors such as trade, transport, agriculture, energy, industry, and tourism can enhance collaboration and bring members closer together. However, due to the extensive range of cooperation areas and their sub-sectors, key priority areas like intra-regional trade have largely been side-lined. Consequently, while the main D-8 agreement has yet to be operationalized after 13 years, the organization is encumbered by numerous agreements, plans, projects, affiliated bodies, schemes, working groups, and meetings, resulting in the capacities of the secretariat and member states falling short of meeting this volume of expectations and aspirations.

To ensure timely implementation of the main agreements and realization of the fundamental goals of D-8, the organization must return to the primary track. As emphasized in the 2020-2030 Roadmap, it should adopt a comprehensive and transformative approach to achieve its goals in priority areas, which will enhance the efficiency and productivity of cooperation. Some suggestions in this regard could focus on the following:

1. **Re-prioritizing the activities:** Member States must re-prioritize areas of cooperation outlined in the Road Map by adopting a minimalist approach and agreeing to freeze half of the ongoing activities for the remaining five-year period of the Roadmap. This will allow for a focused implementation of priority items while utilizing all national, regional, and international resources and capacities, particularly financial and development arrangements, to ensure their success. As cooperation advances in a few limited areas, based on spill-over criteria, the successful cooperation model established in these areas will be extended to other functional areas and to members that have not yet participated in this endeavour.
2. **Minimalism in participation:** Another proposed solution is to adhere to the principle of "participation based on preferences," meaning that member states, considering their interests and readiness, select immediate priorities based on minimalism. They commit to prioritizing participation in these cooperative efforts over other similar commitments and priorities at regional and international levels, and to eliminating any internal or organizational barriers to its implementation.
3. **D-8 Special Payment System:** Another initiative adopted by new intergovernmental groupings such as BRICS, aimed at addressing the dominance of existing international bureaucratic financial and development structures, is the implementation of a special payment system known as BRICS Pay. This could enhance economic and trade relations among participating member states. The 2030 Roadmap of D-8 also envisions the establishment of an international payment mechanism to facilitate financial transactions between members. Malaysian companies are developing a D-8 Payment Card, which could serve as the foundational element of a D-8 International Payment System.
4. **Active role of the private sector:** Recognizing the undeniable significance of private sector involvement in the advancement of D-8 cooperation, member states must eliminate all barriers to this participation, enabling the sector to become the driving force behind collaboration within the organization. Among the urgent measures in this context is the swift implementation of the Visa Facilitation Agreement for Businessmen by all member states. The D-8 Chamber of Commerce, serving as a suitable institutional framework for cooperation among private sector



companies, has adopted its charter and developed a roadmap for private sector engagement in D-8 cooperation. Additionally, several private sector initiatives in member states, such as D-8 NPRI, have been initiated, providing a promising framework for the advancement of technology and knowledge among D-8 research and scientific communities.

## The challenge of lack of financial resources

One of the primary challenges facing D-8 is the insufficient financial resources to support various cooperation projects. This concern has also been highlighted in the D-8 Roadmap for 2020-2030, which emphasizes that implementing the roadmap will necessitate significant financial resources, the mobilization of which poses a challenge for the organization. According to the Roadmap, member states will take the necessary steps to prioritize D-8 programs in their investment plans and public expenditures; however, the financial needs of D-8 clearly far exceed the resources available to the governments of the member countries, necessitating active support from other sectors, including the private sector both within and outside the organization, as well as international financial institutions and development banks (D-8 Roadmap for 2020-2030: 16). To achieve this objective, D-8 has the following options available:

### *Enhancement of the Project Support Fund*

One of the new initiatives in the organization is the establishment of a D-8 Project Support Fund (PSF) since 2017, which will initially operate within the framework of the Secretariat to support pre-feasibility and feasibility studies of the projects. Despite the importance of the scheme, the actual operationalization of this fund has been delayed. At the 47th session of the Commission, the Secretary-General presented a plan along with a comprehensive study on the establishment of the Fund and requested member states for the rapid establishment of the Fund and the provision of its resources. However, given the Commission's decision to postpone consideration of this issue to one of its future sessions and its emphasis on the need to focus on attracting financial resources from outside the organization, it seems that member states are not yet ready to enter this stage of cooperation. However, member states should reconsider their approach toward the functioning of the PSF by upgrading it to the level of a robust regional scheme, akin to a development bank, for investing in infrastructural projects and programs that have been realized in various working groups.

### *Better utilization of international resources*

Despite the necessity to prioritize the quicker establishment of the Support Fund or its potential enhancement, the Commission's focus on ongoing efforts to mobilize resources from existing international mechanisms to support the implementation of D8 projects deserves significant attention (Report of the 47th Commission, 2023). This matter has also been effectively tackled in other regional arrangements. Currently, alongside financial institutions and development assistance frameworks with a proven international track record, such as the World Bank Group—whose resources can only be utilized under specific conditions and within the context of bilateral relations between governments and these institutions—numerous other arrangements, including the BRICS Bank and the Asian Infrastructure Investment Bank (AIIB), are functioning to support development and infrastructure projects in developing countries. The Secretariat and member states, particularly those that are part of BRICS or AIIB, should exert considerable efforts to facilitate D-8 access to these mechanisms to secure financial backing for D-8 projects by engaging with their decision-making bodies. The organization should also better leverage its extensive network of international partners to benefit from their technical and financial support. To date, this opportunity has not yet been fully capitalized on by the organization.

## Lessons from other regions to solve financial constraints

D-8 should also better leverage the experiences of other regional arrangements and consider the supportive roles of external actors and the private sector of member states in its activities. Now that the D-8 decision-making organs in their last meetings in Cairo have adopted a modality for granting observer states and partnership status, the organization should contemplate approaching potential development partners, in the form of D-8+, who could support its regional projects. Reviewing successful examples of other regional financial arrangements to back regional projects may be beneficial for the D-8 in this endeavour. The Chiang Mai Initiative (CMI), BRICS New Development Bank (NDB), Latin American Reserve Fund (LARF), and the European Stability Mechanism (ESM) are some effective regional mechanisms that promote the development of these regions and member countries by providing low-interest loans and supporting regional infrastructure projects.

1. Chiang Mai Initiative: One of the well-established regional financial mechanisms is called the Chiang Mai Initiative that was established by ASEAN+3 with an initial capital of \$80 billion, payable by member countries and regional development partners to provide financial assistance and contingency facilities to member countries. Established at a meeting of ASEAN+3 finance ministers in Chiang Mai, Thailand in May 2000, CMI is a swap arrangement involving ASEAN member countries, Japan, South Korea and China that works within a network of bilateral swap and repurchase agreement facilities among the participating countries (Frost, 2008:170-172).
2. The New Development Bank is a multilateral development bank established in 2015 by BRICS countries with the purpose of mobilising resources for infrastructure and sustainable development projects in emerging markets and developing countries (EMDCs). NDB has the initial authorised capital of USD 100 billion, which is divided into one million shares that have a par value of one hundred thousand dollars each. NDB's founding members made an initial subscription of five hundred thousand shares totalling USD 50 billion, which include one hundred thousand shares corresponding to a paid-in capital of USD 10 billion and four hundred thousand shares corresponding to a callable capital of USD 40 billion.

NDB prioritizes infrastructure and sustainable development projects that propel economic growth and enhance the lives of people in its member countries. To achieve this goal, the bank supports initiatives in both the public and private sectors through loans, equity investments, and other customized instruments. It actively expands its impact on EMDCs by financing infrastructure and sustainable development projects. As of December 2022, NDB has approved a total of 96 projects across various sectors in its member states, valued at 32.8 billion US dollars, with transport and Covid-19 emergency assistance leading the list (<https://www.ndb.int/overview>). Membership in the bank is open to all UN member states that align with its objectives. Among the D-8 member countries, Egypt and Bangladesh have joined the bank, while others, including Turkey, Iran, and Indonesia, may follow suit.

It is notable that the most important motivation behind the establishment of new development financial institutions is the initiative of their founding nations, such as China and the BRICS, to reform global governance and diminish the US dollar's dominance in financial markets. Specifically, the Asian Infrastructure Investment Bank and the BRICS Development Bank aim to achieve this objective. With the initial capital of both banks, their potential loan portfolios are projected to grow to \$45-65 billion for the NDB and \$70-90 billion for the AIIB, respectively. This trend suggests that in the future, the lending capacity of each of these banks will reach levels comparable to the ADB, which is expected to be \$73 billion by 2025, and will surpass the

lending capabilities of the Latin American Reserve Bank and the African Development Bank (Killer, 2017: 104-105).

3. European Stability Mechanism:ESM is an intergovernmental financial organization created by euro area member states in 2011, with a capital pledge of 704.8 billion euros, of which 80 billion is paid in several stages, while the remainder is available to applicants as needed. With this capital, the fund can access bond markets or secure loans.The lending capacity of this mechanism is 500 billion euros (<https://www.esm.europa.eu/about-us>). The ESM's mission is to help euro area countries avoid and overcome financial crises while maintaining long-term financial stability and prosperity. It fulfils this mission by providing loans and other forms of financial assistance to member states facing or threatened by severe financial distress. In essence, the ESM serves as a “lender of last resort” for euro area nations unable to refinance their government debt in financial markets at sustainable rates. Member states can also utilize it to inject capital into private banks. Since its inception, this mechanism has disbursed over 295 billion euros in financial resources to five member states (Gocaj and Meunier, 2013: 247-248).
4. Latin American Reserve Fund: In 1987, the central banks of Bolivia, Colombia, Peru, and Venezuela established the Andean Community Reserve Fund. This fund was renamed the Latin American Reserve Fund in 1988 and has since expanded to include three additional Latin American countries. With an initial capital of \$3.6 billion, since its inception till 2013, the fund has offered three-year balance of payments and one-year liquidity control loans to borrowing members amounting to \$4.9 billion and \$4.4 billion, respectively (Titelmanet.all, 2012). The LARF is somewhat unique among similar regional arrangements as it operates independently of the International Monetary Fund and does not impose any political conditions on its members' financial statements.

In brief, regional financial arrangements today play a crucial role in the global financial network, primarily established in developing regions. Emerging economies and developing countries (EMDCs) have created such arrangements for various reasons, one of which is to reduce reliance on the IMF. A notable advantage of these new regional financial arrangements is that, on one hand, they diminish the influence of powerful countries such as the United States, in IMF, in providing financial assistance, and, on the other hand, they offer support based on local expertise while respecting the national sovereignty of the recipient countries (Killer, 2017: 42). Examining the goals and actions of several of these new arrangements can offer a clearer understanding of the significance of the G8 members' focus on creating a comparable financial institution with the assistance of their development partners, as well as investigating methods to utilize the resources of these institutions to execute their regional projects.

## Conclusion

This paper reviewed and evaluated the activities undertaken over nearly three decades since the D-8 establishment. Findings indicate that D-8 has successfully progressed beyond its initial formation phase and has made significant strides in compiling various cooperation documents and plans, establishing priorities, creating mechanisms, and drafting key agreements. By leveraging these capabilities, the organization has laid the necessary frameworks and preparations for member countries to advance towards economic convergence and integration. Based on the available data and statistics reviewed, D-8 possesses the potential to become a powerful economic bloc that embodies crucial elements of regional convergence. The organization boasts a gross domestic product of \$4.8 trillion, representing over 4.5 percent of the global economy. In 2023, the region's total trade share of world merchandise trade reached \$2.38 trillion, accounting for 6.8 percent of global trade. These two factors position the D-8 region to play a significant role in the global economy. However, if we consider one of the most



critical indicators for assessing the success of convergence in a region to be the volume of intra-regional trade among its members, the share of intra-regional trade in D-8's total foreign trade is only 7.2 percent, which falls short of the target of 15 to 20 percent projected in the 2008-2018 Roadmap.

In our analytical framework, we examined the factors and variables influencing convergence and cooperation in D-8 based on criteria selected from various theories of regionalism. An analysis of these variables reveals that, despite the lack of economic symmetry and similarity hindering the establishment of beneficial trade relations, member countries still possess relatively compatible economic interests and strong political incentives to maintain cooperation. Within the D-8 framework, they have established nearly all the necessary capacities and institutions for this collaboration. However, the presence of obstacles and challenges—such as a lack of economic complementarity in key sectors, the absence of a pivotal state, insufficient territorial cohesion, limited financial resources, and the extensive scope of activities—has led to cooperation within the organization being restricted to holding meetings and issuing statements without a clear prospect for implementation. Additionally, certain political issues in the region, along with the involvement of member countries in similar regional arrangements and their inability to leverage their presence in significant international institutions to advance D-8, have further hindered the progress of cooperation.

D-8 has undertaken various measures on multiple occasions to assess the process of activities, enhance decision-making, and improve implementation mechanisms through ongoing negotiations at high decision-making levels, commission and expert meetings, and even by establishing an Eminent Persons Group in 2014, which recommended the foundation for the Decennial Road Map for 2020-2030. However, the current cooperation process examined in this study indicates that the organization needs to reassess its goals and priorities, focusing instead on specific and feasible areas in which most member countries are interested in participating. Presently, alongside a multitude of previous agreements and programs, numerous new projects and ideas are also under consideration. As emphasized in the 47th session of the Commission, the organization should avoid expanding the volume and scope of tasks and activities and instead concentrate on implementing a limited number of key priorities. To this end, the organization must identify the main obstacles and challenges it faces and seek solutions for them.

By assessing the organization's activities and acknowledging the swift trends in global economic dynamics, there is an increasing expectation among member states that D-8, by leveraging the abundant existing capacities, the strong political will of its members, the foundations that have been established, and by implementing new measures, should be able to advance the process of regional integration more rapidly to achieve the noble objectives outlined in the Istanbul Declaration and its roadmap.

Considering the evaluation of the progress of activities and the extent to which the established goals have been met, it is time for the organization to reassess the activities and priorities of its agenda. The D-8, while reviewing its priorities and narrowing the scope of cooperation for a specific period, should adopt new solutions and initiatives to enhance collaboration and ensure the attainment of the primary goals that yield tangible and distributable benefits for its members. In this context, the author has offered practical and actionable suggestions in the fourth section of this study, including the following:

- Implementation of Agreements through a Fast-Track Approach.
- Pursuing minimalism in the prioritization of sectoral activities and their implementation which would rely on the principle of partnership by Preferences for the participation of Member States in the projects.



- Selection of one or more Pivotal States to coordinate the expeditious implementation of the projects and agreements.
- Establishing the Troika of D-8 comprising previous, current and next rotating chairmen to coordinate regional projects.
- Rapid establishment of the D-8 Project Support Fund, upgrading the Fund and seeking internal and external financial resources for its active involvement in supporting the implementation of regional projects.
- Engaging potential development partners of D-8, such as China, the EU, BRICS+, etc., to promote their involvement in creating a new development finance mechanism within the D-8 framework, including a D-8 Development Fund or a D-8 Development Bank.
- D-8 should adopt a more flexible and professional structure than the current bureaucratic organization, which has largely been modeled after similar regional entities. Additionally, it would be beneficial to alleviate the excessive burden on the secretariat and delegate primary responsibilities to the member states and potential pivotal states.
- Finally, promotion of D-8 extroversion and visibility by the Secretariat and member states using their participation in the prominent international fora such as: G20, OECD, BRIC+, etc. is an essential approach that should be given top priority.

#### **Notes.**

1. In the present study, the reference to regionalism is defined based on this perception of regionalism, which is more consistent with the conditions and situation of D-8 organization.
2. According to Article 24 of the GATT Agreement, Regional Trade Arrangements, including Customs Unions or Free Trade Areas, which are formed by a group of WTO members with the aim of further economic integration and which grant special trade and tariff privileges to themselves, are excluded from the scope of the principle of Most Favoured Nations and these countries are not required to grant the privileges granted in a regional cooperation to other GATT members. See: GATT, 1994: Article XXIV.
3. For further information on regional reflexive theories, see: Berger and Luckman, 1966, Adler and Barnett, 1998, Hettne et al., 1999.
4. For more information, see: Paul, 1400: 170-168. Also, Mansfield and Reinhardt have provided a useful explanation of the benefits of regional trade agreements in this source: Mansfield and Reinhardt, 2003.
5. The period for fulfilling these commitments for least developed members will be three years.
6. For Information about these affiliated bodies and Institutions see: [www.d8secretariat.org/areas of cooperation/affiliated bodies](http://www.d8secretariat.org/areas%20of%20cooperation/affiliated%20bodies).
7. In this meeting, commissioner from Iran stated that member states must re-arrange D-8 activities in a way to align them with their resources and capabilities. Commissioner of Türkiye also said that the economic agenda should rather focus on reducing trade barriers, enhancing investment opportunities, and promoting innovation. For further information see: Report of the 49<sup>th</sup> Commission: 2023: 49 - 64.
8. The Extraordinary Meeting of the D-8 Council of Foreign Ministers to Discuss the Situation in Gaza, which was held on June 8, 2024, and issues a joint Declaration in this regard, is an exception.

9. For detailed information about the Secretary General's proposal and discussion by the Commission see: SG Statement at the 49<sup>th</sup> Commission, 2023: 10 and Report of the 49<sup>th</sup> commission, 2023: 7-8.
10. The most concrete achievement of ASEAN + 3 as a group is the so-called Chiang Mai Initiative (CMI). Established at a meeting of ASEAN + 3 finance ministers in Chiang Mai, Thailand, in May 2000 as a swap arrangement involving ASEAN as well as a network of bilateral swap and repurchase agreement facilities among the ASEAN + 3 countries. Once existing commitments are put in place, the sum of all swap arrangements will exceed \$80 billion. For further information about this mechanism see: Frost, 2008:170- 172.
11. For an insight about regional financial mechanisms, see: Kahler, Miles et al., *Global Order and the new Regionalism*, New York: Council on Foreign Relations, 2016.



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**Author Details** Morteza Damanpak Jam

<sup>1</sup> Senior Fellow, Researcher Institute for Political and International Studies, Tehran, Iran

0009-0001-2720-4412 ✉ [morteza.jami63@gmail.com](mailto:morteza.jami63@gmail.com)

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## References

- Abbasi Ashlaghi, Majid and Damanpak Jami, Morteza. (1392/2013, Winter). Economic Cooperation Organization: 20 Years After Expansion. *Quarterly Journal of Central Asia and Caucasus*, No.84, 63-100.
- About New Development Bank. Retrieved 15 January 2025 from: <https://www.ndb.int/overview>.
- Acharya, Amitav and Buza, Barry. (2017). Why is there no Non-Western International Relations Theory? Ten Years On. *International Relations of the Asia -Pacific*, 17(3), 341-370.
- Adler, E. and Barnett, M. (1998). *Security Communities*. Cambridge University Press.
- Aral, Bedral. (2005). An Inquiry into the Experiment: An Incipient Model of an Islamic Common Market? *Turkish Journal of International Relations*, 4(1/2), 1-5.
- Balassa, B. (1961). *The Theory of Economic Integration*. Allen and Unwin.
- Berger, P.L. and Luckman, T. (1966). *The Social Construction of Reality: A Treatise in the Sociology of Knowledge*. Doubleday and Company
- Bangladesh Bureau of Statistics (BBS). (2023). *Foreign Trade Statistics*. Published on 28th February 2024. Digital copy retrieved from: [https://bbs.portal.gov.bd/sites/default/files/files/bbs.portal.gov.bd/page/8643ec8b\\_27a3\\_41cd\\_bbd9\\_9be3479f578e/2024-02-28-08-10-9f0f7f5941fbbc0352eb4d79d6b4a0ab.pdf](https://bbs.portal.gov.bd/sites/default/files/files/bbs.portal.gov.bd/page/8643ec8b_27a3_41cd_bbd9_9be3479f578e/2024-02-28-08-10-9f0f7f5941fbbc0352eb4d79d6b4a0ab.pdf)
- Buzan, Barry. (2003). *Regional Security Complex Theory in the Post- Cold War World*. In Soderbaum, Fredrick and T.M. Shaw. (eds). *Theories of New Regionalism*. Basingstoke: Palgrave.
- Cantori, L.J., and Spiegel, S.L. (1970). *The International Politics of Regions: A Comparative Approach*. Prentice-Hall.
- Cantori, Louis J. & Spiegel, Steven L. (1973). The Analysis of Regional International Politics: The Integration Versus the Empirical Systems Approach. *International Organization*. Cambridge University Press, vol. 27(4), 465-494, October.
- Chase, Robert S., Hill, Emily B. and Kennedy, Paul. (1996). Pivotal States and its Strategy. *Foreign affairs*, 75(1), 37-38.
- Cioricar, John, D. (2011, September/October). Chiang Mai Initiative Multilateralization. *Asian Surveys*, 51, 926-952.
- Declaration of the 9<sup>th</sup> D-8 Summit. (2017). Retrieved on 2 November 2024 from: <https://developing8.org/report-categories/summit-meeting/>
- DehghaniFiroozabadi, Syed Djalal. (1394/2015). *Theory and Metatheory in International Relations*. Mokhtab Publications.



- DehhhaniFiroozabadi, Syed Djalal. (1393/2014). *Theories of Regional Integration and International Regimes*. Tehran: Kokhatab Publications.
- Deutsch, Karl. (1957). *Political Economy and the North Atlantic Area*. Princeton University Press.
- Deutsch, Karl. (1968). *The Impact of Communication Upon International Relations Theory: The crisis of relevance*. Printice-Hall.
- D-8 Road Map for 2008-2018. (2006). D-8 Secretariat Website/ Documents and Resources. Retrieved on 23 October 2024 from: <https://developing8.org/document/page/2/>.
- D-8 Decennial Road Map for 2020-2030. (2020). D-8 Secretariat Website/ Documents and Resources. Retrieved on 23 October 2024 from: <https://developing8.org/wp-content/uploads/2022/01/D-8-Decennial-Roadmap-2020-2030.pdf>
- D-8 Fact Sheet. (2018). D-8 Secretariat Informative Document, Retrieved on 15 October 2024 from: <https://developing8.org/document/>
- Economic Indicators and Trade Status of Countries. Retrieved on 15 January 2025 from: <https://tradingeconomics.com/indicators>
- European Commission. (1995). European Community Support for Regional Economic Integration Efforts among Developing Countries. Communications from the Commission: Com (95) 219.CEC.
- Fawcett, Louise. (2013). History and Concept of Region: A call for a Post-Revisionist Synthesis. *United Nations University*. Working Paper No. W-2013/5.
- Fawcett, Louise, The History and Concept of Regionalism, NU-CRIS Working Papers No. W-2013/5, *United Nations University Institute on Comparative Regional Integration Studies*, Available at: [www.cris.unu.edu](http://www.cris.unu.edu).
- Foreign Trade Statistics of Türkiye. (2024). Retrieved 12 January 2025 from: <https://data.tuik.gov.tr/Bulten/Index?p=Foreign-Trade-Statistics-December-2023->
- Ghavam, Ahmad. (1370/1991). *The Principles of Foreign Policy and International Relations*. Tehran: Samt Publication.
- General Agreement on Tariffs and Trade (1994). Retrieved 8 February 2024, from: [https://www.wto.org/search/search\\_e.aspx?search=basic&searchText=GATT+1994&method=pagination&pag=0&roles=%2Cpublic%2C](https://www.wto.org/search/search_e.aspx?search=basic&searchText=GATT+1994&method=pagination&pag=0&roles=%2Cpublic%2C).
- Ghandehari, Majid. (1398/2019). Evaluation of Developing -8 Islamic Countries. School of International Relations. Thesis of master's degree.
- Gocaj, Ledina and Gocaj Sophie Meunier. 2013. Time will tell: The EFSF, the ESM, and the Euro crisis. *Journal of European Integration*, 35(3), 239-253.
- Haghsheenas, Mohammad R. (1392/2013). Neoclassical Realism: From International Politics to Foreign Policy. *Foreign Politics*, 27(3), 559-678.
- Hass, Ernest. (1958). *The Unifying of Europe: Political, Social and Economic Process (1950-1957)*. Stanford University Press.
- Heiner, Roloff, Ralf and Rüländ, Jürgen. (1392/2013). Inter-regionalism and international relations. (Eds.). (Elaheh, Kulaei and M. Kazem Shojaei, Translators). *Institute for Political and International Studies*. (2006)
- Hettne, Bjorn, Inotai, A. and Sunkel, O. (1999). *Globalization and the New Regionalism*. Macmillan.
- Hettne, Bjorn, Inotai, A. and Sunkel, O. (1391/2012). Comparing regionalism: Implications for Global Development. (Alireza Tayyeb, Translator). *Institute for Political and International Studies*. (2001)
- Hout, Wil. (1999). *Theories of International Relations and the New Regionalism*. In Jean Grugel and Will Hout. (Eds.). *Regionalism Across North- South Divide*. Routledge.
- Hurrell, A. (1955). Explaining the Resurgence of Regionalism in World Politics. *Review of International Studies*, 21(4), 331-58.
- Hooghe, Liesbet and Gray Marks. (2006, April). Europe Blues: Theoretical Soul-Searching After the Rejection of the European Constitution. *Politics and the Political Science*, 39(02):247 - 250
- Hveem, H. (2000). *Explaining the Regional Phenomenon in an Era of Globalization*. In Stubbs, R. and Underhill, G.R.D. (Eds.). *Political Economy and the Changing Global Order*. Oxford University Press.
- Isapour, Farshid. (1398/2019). Economic Diplomacy of I.R. Iran in D-8 Organization. School of International Relations. Thesis for master's degree.



- Istanbul Declaration. (1997). D-8 Secretariat website/Documents and Resources. Retrieved on 13 October 2024 from: <https://developing8.org/report-categories/summit-meeting/>
- Katzenstein, Peter. (1996). *Regionalism in Comparative Perspective*. Cooperation and Conflict. Vol.31(2). PP. 132-159.
- Katzenstein, Peter. (2005). *A world of regionalism: Asia and Europe in the American Imperium*. Ithaca, NY: Cornell University Press.
- Katzenstein, Peter J., Okawana, Nobuo. (2001). Japan, Asia -Pacific Security and the case for Analytical Eclecticism. *International Security*.Vol.26(3). PP. 153-185.
- Killer, Milles, Hamming, Rendall, and Baven, Chad, Vang, Haming, Vutten, Erick, and Williams, Paul. (1396/2017). *Global Order and the New Regionalism*. (Eds).(Ali Sabaghian and M. Javadi, Trans.). KhorsandiPublication.(2016)
- Mattli, Walter. (1999). *The Logic of Regional Integration, Europe and Beyond*. Cambridge University Press.
- Mansfield, Edward D. and Reinhardt, Eric.(2003). Multilateral Determinations of Regionalism: The Effects of GATT/WTO on the Formation of Preferential Trading Agreements. *International Organization*, 57(4), 829-862.
- Mitrani, David. (1966). *A Working Peace System*. Quadrangle Books.
- Moshirzadeh, Homayra. (1389/2010). *Evolutions in the Theories of International, Relations*. (Third Edition). Samt Publications.
- Mowahedi, Fatemeh. (1385/2006). Regionalism and WTO. *Ravand Journal*, 17(50/51), 171-203.
- Neumann, I.B. (2003).*The Region-Building Approach*. In Soderbaum, Fredrick and Show, T.M. (Eds.).Theories of New Regionalism. Palgrave.
- Ohlsen, Thomas. (1993). *Conflict, Conflict Resolution, Security and Development in Post- Apartheid Southern Africa*. Upsala University.
- Pfaltzgraff, Robert L. and Dougherty, James E. (1384/1985). *Contending Theories of Internatioinal relations*. (Vahid, Bozurgi and Alireza Tayyeb, Trans.). GhomesPublications. (1971).
- Plamer, Norman D. (1991). *The New Regionalism in Asia and the Pacific*. Lexington Books.
- Ramezani, S. Rahmat and Mehrabi, Alireza. (1389/2010). Geopolitics of the Caspian Sea and Divergence among the Littoral States. *Central Asian Studies*, 72, 19-50.
- Regional Trade Agreements. (2024). Retrieved 5 January 2024, from: [https://www.wto.org/english/tratop\\_e/region\\_e/region\\_e.htm](https://www.wto.org/english/tratop_e/region_e/region_e.htm).
- Frost, Ellen L. (2008). *Asia's New Regionalism*. Lynne Reinner Publications, Inc.
- Report of the 1<sup>st</sup> Sc-PTA.(2012).D-8 Secretariat Documents Retrieved on 12 October 2024 from <https://developing8.org/report-categories/technical-meeting/>
- Report of the 4<sup>th</sup> SC-PTA. (2016). D-8 Secretariat Documents Retrieved on 12 October 2024 from <https://developing8.org/report-categories/technical-meeting/>
- Report of the 7<sup>th</sup> SC-PTA. (2024). D-8 Secretariat Documents Retrieved on 12 October 2024 from <https://developing8.org/report-categories/technical-meeting/>
- Report of the 3<sup>rd</sup> D-8 Council of Trade Ministers.(2024).D-8 Secretariat Documents. Retrieved on 14 October 2024 from: <https://developing8.org/report-categories/sectoral-ministerial-meeting/>
- Report of the 3<sup>rd</sup> D-8 Ministerial Meeting on Tourism. (2023).D-8 Secretariat Documents. Retrieved on 14 October 2024 from: <https://developing8.org/report-categories/sectoral-ministerial-meeting/>
- Report of the 47<sup>th</sup> D-8 Commission Meeting. (2023).D-8 Secretariat Documents. Retrieved on 22 October 2024 from: <https://developing8.org/report-categories/commission-meeting/>
- Report of the WGM on Shipping. (2024).D-8 Secretariat Documents. Retrieved on 22 October 2024 from <https://developing8.org/report-categories/technical-meeting/>
- Robson, P. (1993). The New Regionalism and Developing Countries. *Journal of Common Market Studies*, 31(3), 329-348.
- Sazmand, Bahareh. (1389/2009). Economic realism in east Asia: ASEAN+3; Challenges and Opportunities.*Quarterly Journal of World Trade Research*, 5(14.15), 49-81.
- Schmitter, Philippe. (1971).Three Neo-Functional Hypotheses about International Integrations. *International Organizations*, 23(1), ...
- Scott, James. (2024). What is Multilateralism? Retrieved 25 September 2024 from: <https://www.britannica.com/topic/multilateralism>.



- Seifzadeh, S. Hossein.( 1384/2005). Different theories and approaches in individual-globalized international relations: relevance and effectiveness. Tehran: IPIS.
- Shahabi, Sohrab,and Nematloahi, Sheida. (1395/2016). Flexible Structure, A Key to the Success of D-8 in the Foreseen Future. *Rahboard Quarterly*, 25(79), 71-91.
- Soderbaum, Fredrick. (1397/2016). Rethinking Regionalism. (Bahareh Sazmand, Translator).Tehran: Mokhatab Publications.(2015)
- Soleimanpour, Hadi and Soleimani, Maryam. (1395/2016). Economic Integration in Central Eurasia in Comparison with the Cantori and Spiegel Model. *Quarterly of Central Asia and Caucasus*. (93), 69-98.
- Statement of the Secretary General of D-8 at the 47<sup>th</sup> Commission Meeting. (2023). Retrieved on 2 November 2024 from: <https://developing8.org/report-categories/commission-meeting/>
- Summery records of the 10<sup>th</sup> D-8 Summit. (2021). Retrieved on 22 October 2024 from: <https://developing8.org/report-categories/summit-meeting/>
- Taliaferro, Charles. 1997. Possibilities in the philosophy of mind. *Philosophy and Phenomenological Research*, 57 (1), 127-37.
- Taliaferro, Jeffrey W. (1400/2021). New Classical Realism and the Study of Regional Order. In T.V. Paul. (Ed). *International Relations Theory and regional transformation*. (M. Ghahremai, Translator). (pp.74-104). IPIS. (2012)
- Titelman Daniel A., Vera Cecilia, Carvallo, Pablo andCaldentey, Esteban Perez. (2012). UnFondo de Reservas Regional para América Latina (A Regional Reserve Fund for LatinAmerica). United Nations - Economic Commission for Latin American and the Caribbean (ECLAC). Electronic version available at: [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2175713](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2175713)
- United Nations Charter, San Francisco: UN, 1945, Retrieved 11 January 2024, from: <https://treaties.un.org/doc/publication/ctc/uncharter.pdf>.
- Viner, Jacob. (2014). *The Customs Union Issue*. Paul Oslington. (ed.). Oxford University Press. (1950).
- Waltz, Kenneth. (1979). *Theory of International Politics*. Addison-Wesley.



## Foundations of Science, Technology, and Innovation Cooperation in the D-8



Rasoul Rajaei <sup>1,2,3</sup> , Salar Ghadiri Alamdari <sup>3</sup> & Soroush Ghazinoori <sup>1,4</sup>

<sup>1</sup> School of Management and Accounting, Allameh Tabataba'i University, Tehran, Iran

<sup>2</sup> Pardis Technology Park, Tehran, Iran

<sup>3</sup> D-8 Technology Transfer & Exchange Network, Tehran, Iran

<sup>4</sup> National Research Institute for Science Policy, Tehran, Iran

### Abstract

In the contemporary era of rapid technological advancement and globalization, Science, Technology, and Innovation (STI) cooperation has emerged as a fundamental driver of sustainable development, economic resilience, and geopolitical influence. This chapter explores the theoretical foundations and strategic importance of STI cooperation, emphasizing its role in bridging the technological divide among nations and fostering knowledge exchange. It examines key theoretical models, including the National Innovation System (NIS), the Triple Helix Model, and Open Innovation frameworks, which provide insights into the mechanisms that facilitate international STI collaboration. Furthermore, the chapter highlights the economic and technological benefits of STI partnerships, illustrating how they enhance industrial competitiveness, promote technology transfer, and strengthen innovation ecosystems. Additionally, it analyzes formal and informal pathways for STI cooperation, such as science diplomacy, research networks, and cross-border collaborations. By understanding these foundational concepts, policymakers, researchers, and industry leaders can develop more effective strategies for fostering STI cooperation, particularly within the framework of the D-8 Organization for Economic Cooperation.

### Keywords

STI cooperation · National Innovation System · Triple Helix Model · science diplomacy · technology transfer · knowledge exchange · innovation ecosystems



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Corresponding author: Rasoul Rajaei [r\\_rajaei@atu.ac.ir](mailto:r_rajaei@atu.ac.ir) Soroush Ghazinoori [ghazinoori@atu.ac.ir](mailto:ghazinoori@atu.ac.ir)

## Introduction

In the contemporary era of rapid technological advancement and globalization, Science, Technology, and Innovation (STI) cooperation has emerged as a critical driver of sustainable development, economic resilience, and geopolitical influence. Nations that invest in robust STI ecosystems not only enhance their industrial competitiveness but also position themselves as key actors in shaping global scientific and technological landscapes. Within this context, developing economies, particularly those in regional alliances such as the D-8 Organization for Economic Cooperation, face a dual challenge: bridging the technological divide with industrialized nations while fostering indigenous innovation capacity to drive long-term economic growth. This book chapter explores the multifaceted dimensions of STI cooperation among D-8 member states, examining its structural models, policy frameworks, and strategic implications in a rapidly evolving global innovation landscape.

The strategic importance of STI cooperation has been extensively recognized by both policymakers and scholars. According to the OECD (2023), countries that prioritize R&D investment and international research collaborations experience an average GDP growth rate of 2.3% higher than those that do not, highlighting the direct correlation between innovation-driven policies and economic prosperity. The European Union, through its Horizon Europe program, has demonstrated how structured and well-funded STI cooperation can foster breakthrough innovations, strengthen industrial ecosystems, and drive scientific excellence. Similarly, organizations such as ASEAN and BRICS have developed region-specific STI strategies that reflect their unique political, economic, and industrial dynamics. However, while these models offer valuable insights, they cannot be applied wholesale to developing economies such as those within the D-8 framework, which face unique structural challenges, including limited R&D expenditure, fragmented regulatory systems, and asymmetric technological capabilities among member states.

At the heart of this analysis lies the question of how D-8 countries can leverage STI cooperation to achieve sustainable development and technological self-sufficiency. The D-8 Technology Transfer and Exchange Network (D-8 TTEN) was established with the vision of facilitating knowledge exchange, promoting joint R&D projects, and enhancing technology transfer mechanisms. However, despite its ambitious objectives, its impact has remained limited due to fragmented institutional coordination, inconsistent funding mechanisms, and regulatory misalignments across member states. This book chapter critically evaluates the strengths and weaknesses of the D-8 STI cooperation model in comparison to other regional frameworks, identifying best practices and strategic recommendations for optimizing innovation-led growth within developing economies.

A major point of contention in STI cooperation debates is the extent to which government intervention versus market-driven innovation should dictate national and regional research agendas. Proponents of state-led STI models, as seen in China and South Korea, argue that strong governmental support, public R&D investments, and industrial policies are essential to achieving technological breakthroughs, particularly in sectors such as artificial intelligence (AI), renewable energy, and biotechnology. Empirical data support this argument: China's state-led R&D spending reached 2.4% of GDP in 2022, surpassing the EU average of 2.2% and driving its dominance in critical technologies such as 5G and semiconductors (World Bank, 2023). Conversely, critics contend that top-down approaches stifle competition, slow commercialization processes, and lead to bureaucratic inefficiencies. They advocate for open innovation ecosystems where private sector leadership, venture capital investments, and cross-border research collaborations drive innovation more efficiently. This chapter explores how D-8 countries can balance state-driven and market-driven STI strategies, ensuring that public policies complement private-sector innovation dynamics rather than constrain them.

One of the most pressing challenges facing STI cooperation within the D-8 framework is the lack of harmonized intellectual property (IP) regulations and inconsistent technology transfer policies across member states. Unlike the European Union, which operates under a unified regulatory system for research and innovation, D-8 countries have disparate legal structures governing patents, R&D incentives, and foreign direct investment (FDI) in high-tech industries. This regulatory fragmentation creates barriers to cross-border collaborations, discourages private sector investments, and hinders the commercialization of research outputs. Addressing these gaps requires strategic alignment of STI policies, establishment of regional IP protection mechanisms, and promotion of standardized technology transfer agreements among D-8 countries.

Beyond regulatory and policy challenges, STI cooperation is also deeply influenced by geopolitical factors and economic asymmetries. Unlike ASEAN and the EU, where economic interdependencies and shared regional objectives create incentives for deeper collaboration, D-8 countries exhibit significant economic and technological heterogeneity. Malaysia and Turkey, for instance, have relatively advanced high-tech sectors, ranking among the top emerging economies in global innovation indices, whereas Nigeria and Bangladesh face severe infrastructure and funding constraints that limit their innovation capabilities. This innovation divide complicates the establishment of a one-size-fits-all STI strategy and calls for differentiated policy approaches that cater to the specific needs and capacities of each member state.

Furthermore, this chapter explores the role of emerging technologies in reshaping the landscape of STI cooperation. With the rise of artificial intelligence, blockchain, quantum computing, and biotechnology, the global innovation ecosystem is undergoing a fundamental transformation. These disruptive technologies are no longer confined to traditional high-tech economies; developing nations, including some D-8 members, are increasingly participating in these frontier industries. Turkey, for example, has made significant advancements in defense technology and AI research, while Indonesia is investing heavily in smart city solutions and blockchain-based governance systems. However, without structured regional STI policies and a coordinated investment strategy, D-8 countries risk falling behind in global technology leadership. This chapter examines how D-8 nations can harness emerging technologies to enhance regional competitiveness, ensuring that they are not merely consumers but also producers and exporters of advanced technologies.

The final sections of this chapter provide strategic recommendations for optimizing STI cooperation within the D-8 framework. Key policy interventions include:

- The creation of a centralized D-8 Innovation Fund, modeled after Horizon Europe, to support joint research initiatives and industrial R&D collaborations.
- Harmonization of IP and technology transfer policies to facilitate seamless cross-border innovation activities.
- Strengthening of public-private partnerships (PPPs) to mobilize private sector investments and accelerate technology commercialization.
- Investment in digital infrastructure and STEM education to build a highly skilled workforce that can drive future innovation.

These policy recommendations are grounded in a comparative analysis of STI governance models across multiple regional frameworks, highlighting both successes and limitations that can inform D-8 policymaking.

**Table 1**  
Key STI Concepts

Term	Definition	Authors
Open Innovation Networks	Collaborative frameworks where firms, universities, and research institutions share external knowledge to drive technological advancements and product development.	Chesbrough (2003, 2021)
Science Diplomacy	The use of scientific collaborations between nations to strengthen international relations, address global challenges, and facilitate cooperative research.	UNESCO (2022), Turekian et al. (2015)
Technology Transfer	The process of transferring scientific knowledge, patents, and innovations from research institutions to industry for commercialization and societal impact.	OECD (2023), Bozeman (2000)
IP Rights	Legal frameworks that protect inventions, patents, trademarks, and research outputs, ensuring innovation incentives and cross-border collaboration.	WIPO (2023), Maskus (2000)
NIS	A framework describing how government policies, industry, and academia interact to foster research, development, and technological innovation in a country.	Lundvall (1992, 2020)

In conclusion, STI cooperation is no longer an option but a necessity for developing nations seeking to compete in the global knowledge economy. For the D-8 Organization, the opportunity to leverage STI as a catalyst for economic transformation has never been more critical. By addressing regulatory barriers, funding constraints, and technological asymmetries, D-8 countries can unlock new pathways for sustainable development, industrial diversification, and global scientific leadership. The insights presented in this chapter aim to contribute to the ongoing discourse on how developing economies can create effective STI ecosystems, positioning themselves as both innovation leaders and collaborative partners in the global economy.

## The Strategic Importance of Science and Technology Cooperation Among Nations

STI cooperation is a critical driver of economic development and technological progress in the global economy. At its core, STI cooperation enhances the ability of countries to compete on the international stage by fostering innovation, improving industrial productivity, and accelerating technological advancements. For developing countries, access to global knowledge networks, technologies, and expertise can significantly reduce technological gaps, providing them with the tools needed to modernize industries, enhance educational systems, and improve public services (Archibugi & Iammarino, 2002).

STI collaboration serves as a catalyst for industrial competitiveness by facilitating the transfer of advanced technologies. By integrating innovative processes and products into local industries, countries can improve efficiency, reduce operational costs, and create high-value products. For instance, technology transfer in fields such as renewable energy or agriculture can enable developing countries to address their unique socio-economic challenges while contributing to global sustainability efforts (UNCTAD, 2020). Furthermore, STI partnerships are key to driving economic growth by fostering new markets and industries, creating jobs, and attracting investment.

The D-8 Organization plays a crucial role in these dynamics. By promoting cooperation in sectors such as renewable energy, agriculture, and ICT, the D-8 countries can address common regional challenges while contributing to global technological progress. Malaysia's advancements in ICT, Turkey's

leadership in industrial technologies, and Iran's renewable energy initiatives demonstrate how each D-8 country brings unique capabilities that, when pooled together, can enhance regional competitiveness and foster sustainable development.

In an increasingly interconnected world, STI partnerships are central to achieving sustainable development. International cooperation in science and technology enables nations to collectively address pressing global issues such as climate change, poverty, and public health. Collaborative STI initiatives promote the development and diffusion of green technologies, medical innovations, and sustainable practices that benefit both developed and developing economies. In particular, the United Nations Sustainable Development Goals (SDGs) underscore the importance of STI in fostering inclusive growth, reducing inequalities, and promoting environmental sustainability (United Nations, 2021).

The D-8 countries, with their shared commitment to sustainable development, are ideally positioned to lead efforts in these areas. For example, the D-8's emphasis on cooperation in renewable energy technologies and sustainable agricultural practices can help the member countries address regional challenges such as food security and energy access. By fostering cross-border knowledge exchange and joint investments in green technologies, the D-8 countries can contribute significantly to achieving the SDGs, particularly those related to affordable clean energy (SDG 7), responsible consumption (SDG 12), and climate action (SDG 13).

Science and technology diplomacy (STD) is an emerging field that seeks to leverage scientific collaboration as a tool for advancing international relations and addressing global challenges. STD integrates scientific expertise into diplomatic processes, fostering international cooperation and facilitating problem-solving through knowledge-sharing and technology transfer. This form of diplomacy is particularly important in regions where political or economic tensions may impede traditional diplomatic channels (Flink & Schreiterer, 2010).

In the context of developing countries, STI diplomacy offers a powerful mechanism for gaining access to critical technologies and enhancing collaboration across borders. For instance, the D-8 Organization utilizes STI diplomacy to build trust among its member countries, creating a platform for cooperation that transcends political and ideological differences. This approach not only strengthens diplomatic ties between the member states but also helps ensure that technological advancements are harnessed for the benefit of society at large. Through joint initiatives and multilateral agreements, the D-8 has the potential to influence global STI policies and contribute to shaping international standards, particularly in emerging sectors such as digital transformation and AI.

## The Evolution of STI Cooperation Theories

The field of STI collaboration has evolved considerably over the decades. Initially, STI cooperation was often understood in terms of a linear model: science leads to technology, and technology leads to innovation. This model, however, failed to capture the complexities of modern technological systems and the ways in which global cooperation facilitates innovation. Today, a more nuanced understanding of STI collaboration has emerged, taking into account the roles of networks, actors, and institutions that facilitate the exchange of knowledge and technologies across borders.

The shift from linear models to more interactive and systemic approaches can be seen in the development of theories such as the NIS, Triple Helix Model, and the growing emphasis on open innovation. These new theories provide frameworks that acknowledge the complex relationships between various actors—governments, industries, universities, and research institutions—and their roles in fostering innovation. Furthermore, these theories recognize that collaboration between these actors is increasingly happening at the international level, driven by globalization and the interconnectivity enabled by digital technologies.

As technology becomes more global, and challenges like climate change, pandemics, and energy sustainability transcend national borders, STI cooperation models are continuously adapting to incorporate new forms of transnational cooperation. This ongoing evolution underscores the significance of collaborative efforts across countries, especially for developing nations that lack sufficient technological infrastructure but can benefit greatly from participation in international innovation ecosystems.

The Triple Helix Model (Etzkowitz & Leydesdorff, 2000) provides one of the most influential frameworks for understanding STI collaboration. This model posits that innovation is driven by the interactions between three primary spheres: universities, industries, and governments. Each of these actors plays a distinct role but must work together in synergy to foster technological progress.

- Universities contribute research, new knowledge, and highly skilled human capital.
- Industries commercialize this research and convert knowledge into products and services.
- Governments create favorable policies and funding mechanisms that support both research and industry activities.

In the Triple Helix Model, these three spheres are not isolated but form a dynamic network, where the boundaries between them are increasingly blurred. This model has been adapted in the context of international STI collaboration, where countries form cooperative networks with each other to promote technological advancements. For example, in the context of the D-8 Organization, which includes countries such as Malaysia, Turkey, and Nigeria, the Triple Helix framework can be applied to foster cooperation between universities in different countries, companies working on similar technological solutions, and governmental bodies that create policies to promote innovation.

The model has been particularly influential in shaping the innovation policies of countries that wish to enhance their global competitiveness. For instance, D-8 member countries can apply the Triple Helix approach by promoting university-industry-government partnerships both domestically and across borders. These partnerships can leverage the strengths of each actor to facilitate technology transfer, share research outcomes, and build sustainable innovation ecosystems.

The National Innovation System (NIS) theory (Lundvall, 1992) focuses on the role of national institutions in fostering innovation. According to this theory, innovation is not merely the result of individual inventions but is a product of the interactions between various national actors and institutions. These include not only businesses and universities but also government policies, financial systems, and cultural contexts.

In NIS, the key elements are:

- Institutions that provide the legal and regulatory frameworks for innovation (e.g., IP rights, research funding policies).
- Actors such as firms, universities, and research centers that create and apply new knowledge.
- Interactions between these actors that lead to innovation outcomes, such as the commercialization of research.

The NIS theory is particularly relevant for developing countries, where strengthening the innovation system is a crucial step toward closing the technological gap with developed economies. For D-8 countries, NIS could guide the development of stronger national systems for innovation by enhancing R&D infrastructure, improving educational systems, and fostering greater collaboration between industry and academia.

For instance, Turkey's focus on increasing its R&D expenditure and Malaysia's emphasis on technological capacity-building are examples of how the NIS framework has been integrated into national policies. By supporting the development of a robust NIS, D-8 countries can create more effective

innovation ecosystems that support both local and international collaborations, facilitating knowledge exchange and the acceleration of technological development.

Open innovation (Chesbrough, 2003) represents a paradigm shift in how companies and institutions approach the innovation process. Unlike the traditional, closed model of innovation—where organizations develop technologies internally and protect their IP—open innovation emphasizes the external flow of knowledge. In this model, firms and institutions actively seek knowledge from external sources, such as universities, research consortia, and other companies, to complement their internal R&D efforts.

Open innovation enables greater collaboration across organizational boundaries and encourages the sharing of ideas, research results, and technological advancements. The rise of distributed knowledge networks further enhances open innovation by utilizing digital tools and platforms to enable global collaboration. Distributed knowledge networks allow researchers, businesses, and governments from different countries to work together on common challenges, regardless of geographical distance.

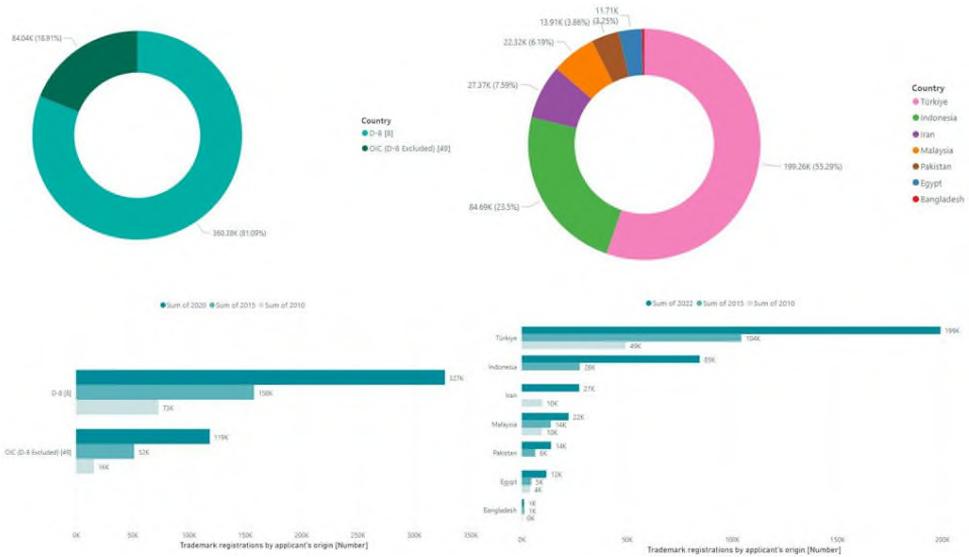
In the context of developing countries, open innovation and distributed knowledge networks provide an opportunity to overcome resource limitations and access global knowledge ecosystems. D-8 countries can benefit from open innovation by participating in international research consortia and leveraging digital platforms to connect with researchers and companies around the world. For example, Malaysia's participation in the Global Innovation Exchange and Turkey's involvement in various EU-funded R&D programs illustrate how D-8 nations can integrate into global open innovation networks. Open innovation networks refer to collaborative frameworks where firms, universities, and research institutions engage in external knowledge-sharing to accelerate technological advancements and product development (Chesbrough, 2021).

While the above models provide valuable frameworks for STI cooperation, their application in developing countries faces several challenges. One of the primary barriers is the lack of sufficient R&D infrastructure and human capital to engage effectively in these collaboration models. Many developing countries still face gaps in technological infrastructure, access to research funding, and the availability of skilled labor.

Another challenge is the institutional capacity of governments to implement STI policies effectively. Developing countries often struggle with bureaucratic inefficiencies, political instability, and insufficient public funding for innovation activities. These factors can slow down the process of establishing effective innovation systems, hindering participation in global STI networks.

Finally, IP issues remain a significant barrier to cross-border collaboration. Differences in IP protection mechanisms between countries can create tensions, particularly in industries such as biotechnology, pharmaceuticals, and information technology. Ensuring equitable and transparent IP agreements is crucial for facilitating successful international collaborations.

**Figure 1**  
**Trademark Registrations by Applicant's Origin**



**Source:** WIPO Sum of Trademark Registrations by Applicant's Origin, Abroad and Trademark Registrations by Applicant's Origin, Resident

This series of charts in Figure 1 presents the total trademark registrations by applicant's origin, highlighting the significant contributions of D-8 member states in the global trademark landscape.

The first chart illustrates that D-8 countries account for 84,040 trademark registrations, representing 18.91% of the total registrations, while the broader Organization of Islamic Cooperation (OIC) countries, excluding D-8, account for 360,380 registrations (81.09%). This data underscores the growing importance of D-8 nations in the realm of IP and trademark registrations. The second chart compares trademark registrations from 2010 to 2023. D-8 countries have shown a notable increase in registrations, rising from 73,000 in 2015 to 158,000 in 2020, and further to 327,000 in 2023. This upward trend indicates a strengthening of brand recognition and IP protection among D-8 nations.

The third chart provides a detailed view of trademark registrations by individual D-8 countries:

Turkey leads with 199,000 registrations, reflecting its robust economic environment and emphasis on protecting IP. Indonesia follows with 28,000 registrations, showcasing its growing market and entrepreneurial activities. Iran and Malaysia contribute 14,000 and 10,000 registrations, respectively, indicating their active participation in trademark registration. Pakistan, Egypt, and Bangladesh have lower figures, with 5,000, 5,000, and 1,000 registrations, respectively, suggesting opportunities for growth in IP protection.

The data highlights the critical role of D-8 member states in the global trademark registration landscape. By enhancing their IP frameworks and encouraging innovation, these countries can foster economic growth, attract foreign investment, and strengthen their positions in international markets.

The figures emphasize the importance of collaboration among D-8 nations to improve trademark registration processes and promote awareness of IP rights, which are essential for sustainable economic development and competitiveness in the global economy.

For D-8 countries, addressing these challenges requires comprehensive reforms to strengthen national innovation systems. This could include investing in R&D infrastructure, improving educational

systems, and fostering stronger ties between industry and academic institutions. Additionally, regional cooperation, such as that promoted by the D-8 TTEN, can help overcome these barriers by sharing best practices and resources.

Science diplomacy (SD) involves leveraging scientific collaborations among nations to foster international relations and address global challenges through cooperative research and technological exchange (UNESCO, 2022). The SD is a crucial aspect of STI collaboration at the international level. It involves the integration of scientific knowledge into diplomatic processes, helping countries navigate complex global issues through collaborative research and technology transfer initiatives (Turekian et al., 2015). The SD has become particularly important in managing global challenges such as climate change, health crises, and conflict resolution, where scientific expertise is critical in formulating effective international agreements.

For D-8 countries, SD offers a platform for fostering greater cooperation in research and technology. By engaging in SD, D-8 nations can leverage their collective knowledge and technological capabilities to address common challenges, such as sustainable energy development and climate change adaptation. Furthermore, SD helps D-8 countries engage with other international organizations, enhancing their voice in global STI governance and policy-making.

Through initiatives such as joint research projects and multilateral agreements, SD helps to establish frameworks that facilitate knowledge exchange, technology transfer, and collaborative policy development. For example, D-8 countries can use SD to establish collaborative projects on renewable energy or water management, promoting both regional cooperation and global sustainability.

## Mechanisms and Pathways for International STI Cooperation

In the landscape of international STI cooperation, formal mechanisms are foundational in establishing structured frameworks for collaboration. These mechanisms typically involve legally binding agreements, joint research initiatives, and long-term partnerships between countries, industries, and research institutions. These formal arrangements ensure that resources are pooled effectively, risks are mitigated, and IP rights are respected.

One of the most prominent formal mechanisms for STI cooperation is the international agreement. These agreements can take the form of bilateral treaties or multilateral conventions, and they typically define the terms of cooperation, including areas of focus, funding sources, timelines, and technology transfer protocols. Such agreements are crucial for ensuring that participating countries have a clear understanding of their roles and commitments within the partnership. For instance, the Paris Agreement on climate change is a notable example of an international treaty where nations cooperate on scientific research related to environmental sustainability, renewable energy technologies, and climate adaptation strategies (United Nations, 2015).

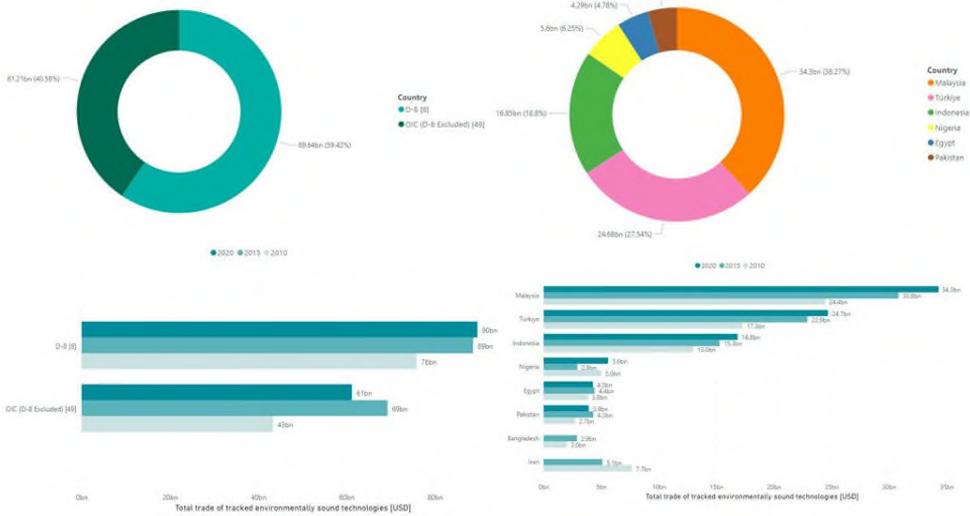
Research consortia are another key formal mechanism that facilitates international STI cooperation. These consortia are collaborative networks of universities, research institutes, and industries working together on large-scale, interdisciplinary projects. Through these consortia, countries can share knowledge, infrastructure, and funding to tackle complex global challenges. A prime example of a research consortium is the European Organization for Nuclear Research (CERN), which involves numerous countries in collaborative research on particle physics, facilitating both scientific discovery and technology transfer (CERN, 2021).

Similarly, joint ventures between governments and private industries are powerful tools for fostering technological innovation and economic development. Joint ventures provide a platform for countries to collaborate on R&D projects, share technological expertise, and commercialize new innovations.



These ventures are particularly valuable in sectors such as information technology, biotechnology, and energy, where cutting-edge technologies require significant investment and expertise. For instance, the collaboration between Germany and India in the field of renewable energy research demonstrates how joint ventures can accelerate technology development and deployment, benefiting both countries economically and environmentally (Tiwari & Sood, 2019).

**Figure 2**  
 Trademark Registrations by Applicant's Origin



**Source:** WIPO Sum of Trademark Registrations by Applicant's Origin, Abroad and Trademark Registrations by Applicant's Origin, Resident

Environmentally Sound Technologies (ESTs) are technologies that have the potential for significantly improved environmental performance relative to other technologies. ESTs protect the environment, are less polluting, use resources in a sustainable manner, recycle more of their wastes and products, and handle all residual wastes in a more environmentally acceptable way than the technologies for which they are substitutes. ESTs are not just individual technologies. They can also be defined as total systems that include know-how, procedures, goods and services, and equipment, as well as organizational and managerial procedures for promoting environmental sustainability. This means that any attempt to provide an assessment of investment into ESTs on either a global or national level must incorporate ways to track funding flows into both hard and soft technologies.

The purpose of this indicator is to develop a methodology for tracking the total amount of approved funding to promote the development, transfer, dissemination and diffusion of environmentally sound technologies. A two-pronged approach is suggested:

Level 1: Use globally available data to create a proxy of funding flowing to countries for environmentally sound technologies, or of trade in environmentally sound technologies

Level 2: Collect national data on investment in environmentally sound technologies.

There are five crucial elements which make up Goal 17 - finance, capacity building, systemic issues, technology and trade-all of which must be aligned for the Goal to be achieved. One of the key lessons over the last couple of decades has been that in order to achieve potential growth, measurement of financial flows (in terms of amount, type, geography, donor, recipient and investors) is a necessary step in such a transformation. In order to understand systemic issues, trade, capacity building, tech-



nology lock-in, innovation and deployment, we must understand how, why and where finance is being deployed. Only then we can begin to realign its flows.

In deciding which technologies are most appropriate, there will always be trade-offs between cost and a range of economic, social, health and environmental impacts, to be determined based on national or local contexts and priorities. It would also not be feasible for all countries to strive towards the best available technologies globally if these are not appropriate in a domestic context. Given the highly contextual nature of ESTs, it is therefore something that is better defined at the national level, taking into account the national context and mainstream technologies nationally. However, there is a real need to support national, sub-national governments and other actors with decision-making and defining the most nationally or locally appropriate technologies.

This series of figures 17 [Figure 2](#) illustrates the total trade of tracked environmentally sound technologies (ESTs) among D-8 member states and highlights their significant role in promoting sustainable development. The first chart shows that D-8 countries account for 61.21billion. This indicates that D-8 nations are substantial contributors to the global trade of ESTs, reflecting their commitment to sustainable practices. The second chart provides a detailed view of the contributions from individual D-8 countries:

Malaysia leads with \$34.3 billion (38.27%), showcasing its strong position in the EST market and its proactive approach to environmental sustainability. Turkey follows with \$17.3 billion (18.1%), indicating its growing investment in environmentally sound technologies. 15.3 billion, respectively, highlighting their emerging roles in the EST sector.

Pakistan and Bangladesh have lower contributions at 2.7billion and 2.0 billion, respectively, suggesting potential for growth in their environmentally sound technology trade.

The third chart illustrates the growth in total trade of ESTs from 2010 to 2020. D-8 countries have seen an increase from 76 billion in 2015 to sound technologies. In comparison, the OIC countries (excluding D-8) also experienced growth, but D-8 nations are clearly making significant strides.

The data underscores the critical role of D-8 member states in the global trade of environmentally sound technologies. By prioritizing investments in sustainable technologies, these countries can enhance their economic resilience, promote environmental sustainability, and contribute to the achievement of the SDGs. The figures highlight the importance of collaboration among D-8 nations to further develop and trade environmentally sound technologies, which is essential for addressing global environmental challenges and fostering sustainable economic growth.

While formal mechanisms provide the structural foundation for STI cooperation, informal mechanisms play a crucial role in facilitating the exchange of knowledge, fostering innovation, and building long-term relationships between countries and institutions. These informal pathways are typically more flexible and adaptable than formal agreements, allowing for the rapid exchange of ideas and the formation of dynamic networks.

One of the most effective informal mechanisms is academic mobility, which enables researchers, scientists, and students to work and study in different countries. Academic mobility fosters cross-cultural exchange, facilitates the sharing of research findings, and allows for the integration of diverse perspectives on global challenges. Programs such as the Erasmus Mundus program in Europe have successfully promoted academic mobility, enabling students and researchers to gain exposure to different academic environments and collaborate on international research projects (Erasmus Mundus, 2020).

Research networks are another essential informal mechanism for international STI cooperation. These networks are often decentralized and rely on digital platforms to facilitate communication and collaboration between researchers from different countries. By participating in global research

networks, scientists can gain access to the latest research, share data, and collaborate on solving common problems. A prime example of a research network is the Global Health Network, which connects researchers from around the world to address global health challenges such as infectious diseases, pandemics, and malnutrition (The Global Health Network, 2021).

Additionally, knowledge exchange platforms allow institutions and organizations to share expertise and best practices. These platforms often take the form of conferences, webinars, and collaborative online spaces where experts from different countries can exchange ideas and discuss the latest technological advancements. Knowledge exchange is particularly valuable in emerging fields such as AI, where rapid advancements require constant learning and adaptation from all stakeholders. Initiatives such as the Global Innovation Exchange and the Open Data Network provide platforms for researchers and innovators to share knowledge and collaborate on new solutions (Global Innovation Exchange, 2021).

Institutional and policy-based pathways are central to ensuring the sustainability and success of international STI cooperation. These pathways typically involve the creation of specialized institutions and the development of policies that encourage long-term collaboration between countries, industries, and research organizations.

One of the key institutional mechanisms for fostering STI cooperation is the establishment of international organizations and regulatory bodies that oversee the implementation of collaborative research projects and the development of international standards. Organizations such as the World IP Organization (WIPO) and the International Telecommunication Union (ITU) play a vital role in ensuring that international collaborations are conducted in accordance with established standards, and they provide a platform for negotiating and resolving IP issues (WIPO, 2020; ITU, 2021).

Furthermore, policy alignment between participating countries is crucial for the success of international STI projects. Effective policies that promote research and innovation, such as funding mechanisms, tax incentives, and IP protections, create an enabling environment for collaboration. The Horizon Europe program, the European Union's largest R&D initiative, is an example of how coordinated policies can drive STI cooperation by offering funding and resources to researchers across Europe and beyond (European Commission, 2020).

For developing countries, particularly those in the D-8 organization, institutional and policy-based pathways can help overcome barriers to STI cooperation, such as limited research infrastructure, lack of skilled labor, and insufficient funding. By fostering regional cooperation through institutions like the D-8 TTEN, these countries can create a supportive environment for innovation, capacity building, and technology transfer. This network provides a platform for D-8 countries to collaborate on key areas such as renewable energy, ICT, and agriculture, thereby enhancing regional integration and contributing to the achievement of the United Nations SDGs.



## Author Details

### Rasoul Rajaei

<sup>1</sup> School of Management and Accounting, Allameh Tabataba'i University, Tehran, Iran

<sup>2</sup> Pardis Technology Park, Tehran, Iran

<sup>3</sup> D-8 Technology Transfer & Exchange Network, Tehran, Iran

0000-0002-5661-316X ✉ r\_rajaei@atu.ac.ir

### Salar Ghadiri Alamdari

<sup>3</sup> D-8 Technology Transfer & Exchange Network, Tehran, Iran

0009-0007-4117-7047 ✉ d8tten@gmail.com

### Soroush Ghazinoori

<sup>1</sup> School of Management and Accounting, Allameh Tabataba'i University, Tehran, Iran

<sup>4</sup> National Research Institute for Science Policy, Tehran, Iran

0000-0001-6356-0257 ✉ ghazinoori@atu.ac.ir

## References

- Archibugi, D., & Iammarino, S. (2002). *The globalization of technology and innovation: The role of international cooperation and the new models of innovation*. Oxford University Press.
- Chesbrough, H. (2003). *Open innovation: The new imperative for creating and profiting from technology*. Harvard Business Press.
- Cornell University, INSEAD, & WIPO. (2021). *Global Innovation Index 2021: Tracking innovation through the COVID-19 crisis*. World Intellectual Property Organization. <https://www.wipo.int>
- Etzkowitz, H., & Leydesdorff, L. (2000). The dynamics of innovation: From national systems and "Mode 2" to a triple helix of university–industry–government relations. *Research Policy*, 29(2), 109-123. [https://doi.org/10.1016/S0048-7333\(99\)00055-4](https://doi.org/10.1016/S0048-7333(99)00055-4)
- European Commission. (2020). *Horizon Europe: The EU's research and innovation program (2021-2027)*. <https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/home>
- Flink, T., & Schreiterer, U. (2010). Science diplomacy: A new approach to international cooperation in science and technology. *International Journal of Global Science and Technology*, 7(2), 77-91. <https://doi.org/10.1080/2152477X.2010.10884913>
- Hagedoorn, J. (2002). Inter-firm partnerships and alliances: An overview of the literature and a research agenda. *Journal of Management Studies*, 39(5), 561-584. <https://doi.org/10.1111/1467-6486.00323>
- Lundvall, B. (1992). *National innovation systems: Towards a theory of innovation and interactive learning*. Pinter Publishers.
- Maskus, K. E. (2004). Intellectual property rights in developing countries: The role of policy and the international system. *Journal of World Trade*, 38(2), 237-266.
- OECD. (2020). *OECD Science, Technology and Innovation Outlook 2020*. Organisation for Economic Co-operation and Development. <https://www.oecd.org/sti/outlook/>
- OECD. (2021). *Science, technology and innovation outlook 2021: The impact of digital transformation on innovation*. Organisation for Economic Co-operation and Development. <https://www.oecd.org/sti/>
- Turekian, V. C., et al. (2015). *Science diplomacy: A new approach to international cooperation in science and technology*. American Association for the Advancement of Science (AAAS).
- UNCTAD. (2020). *Technology and Innovation Report 2020*. United Nations Conference on Trade and Development.
- United Nations. (2015). *Paris Agreement*. <https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement>



- United Nations. (2021). The 2030 Agenda for Sustainable Development. <https://www.un.org/sustainabledevelopment/>
- UNESCO. (2021). Science diplomacy: The importance of collaboration in a globalized world. United Nations Educational, Scientific and Cultural Organization. <https://www.unesco.org/en/science-diplomacy>
- WIPO. (2020). World Intellectual Property Organization: International cooperation for innovation. <https://www.wipo.int>
- World Bank. (2021). Building a competitive innovation economy in developing countries. <https://www.worldbank.org>





## Insights on the Current and Future Perspectives of D-8 STI Cooperation



Rasoul Rajaei <sup>1,2,3</sup>  , Salar Ghadiri Alamdari <sup>3</sup>  & Soroush Ghazinoori <sup>1,4</sup> 

<sup>1</sup> School of Management and Accounting, Allameh Tabataba'i University, Tehran, Iran

<sup>2</sup> Pardis Technology Park, Tehran, Iran

<sup>3</sup> D-8 Technology Transfer & Exchange Network, Tehran, Iran

<sup>4</sup> National Research Institute for Science Policy, Tehran, Iran

### Abstract

As the global landscape of Science, Technology, and Innovation (STI) continues to evolve, D-8 member countries face both opportunities and challenges in strengthening their cooperation frameworks. This chapter provides an in-depth analysis of the current state of STI governance, institutional structures, and policy mechanisms within the D-8 Organization. It examines the role of innovation networks and strategic alliances in fostering collaborative research, technology transfer, and industrial development among member states. Additionally, the chapter assesses key performance indicators such as R&D investment, high-tech exports, and patent activity to evaluate the effectiveness of existing STI initiatives. Looking ahead, the chapter explores emerging trends in global STI cooperation, including digital transformation, sustainability-driven research, and post-pandemic technological shifts. It also discusses the regulatory and policy adjustments necessary to enhance collaboration, emphasizing the importance of harmonized intellectual property rights, funding mechanisms, and public-private partnerships. The chapter concludes by outlining strategic policy recommendations to ensure that D-8 nations remain competitive in the global innovation ecosystem while addressing their unique economic and technological challenges.

### Keywords

STI cooperation · governance · innovation networks · digital transformation · high-tech exports · policy frameworks · sustainable development



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 2025. Rajaei, R., Ghadiri Alamdari, S. & Ghazinoori, S.

 Corresponding author: Rasoul Rajaei [r\\_rajaei@atu.ac.ir](mailto:r_rajaei@atu.ac.ir)

## Introduction

The evolving landscape of Science, Technology, and Innovation (STI) cooperation among D-8 countries presents both opportunities and challenges in fostering sustainable development and technological advancement. As global competition intensifies, the need for stronger governance structures, strategic policy alignment, and efficient collaboration mechanisms becomes more critical for ensuring meaningful STI cooperation. This chapter provides an in-depth analysis of the current institutional frameworks, regulatory policies, and collaborative efforts shaping STI interactions within the D-8 Organization. It explores the role of innovation networks, strategic alliances, and knowledge-sharing platforms in enhancing cross-border partnerships while addressing challenges such as disparities in R&D investment, intellectual property (IP) protection, and technology transfer policies among member states. Furthermore, the chapter assesses key STI performance indicators, including patent activity, high-tech exports, and global innovation rankings, to evaluate the effectiveness of existing initiatives. Looking ahead, it examines future trends influencing STI cooperation, such as digital transformation, sustainability-driven research, and post-pandemic policy shifts, offering strategic recommendations to enhance collaboration and drive innovation-led economic growth among D-8 nations.

### The Role of Innovation Networks and Strategic Alliances in STI Collaboration

In today's rapidly evolving global landscape, innovation networks and strategic alliances have become fundamental components of successful international STI collaborations. These networks and alliances allow countries, research institutions, and industries to pool resources, share knowledge, and accelerate technological advancements across borders. By working together in these cooperative frameworks, stakeholders can address complex global challenges that no single entity could solve alone.

Innovation networks are dynamic systems of interrelated actors—including universities, industries, research institutions, and governments—that collaborate to drive technological progress. These networks facilitate the flow of knowledge, ideas, and technologies across organizational boundaries, enabling partners to develop innovative solutions. According to Chesbrough (2003), open innovation is central to the functioning of these networks, as it emphasizes the use of external knowledge to complement internal capabilities.

Strategic alliances, on the other hand, are partnerships formed between organizations (including corporations, governments, and universities) to achieve shared objectives. These alliances are typically long-term and involve mutual commitments to research, technology development, and market expansion. Strategic alliances are particularly valuable in sectors such as biotechnology, information technology, and energy, where technological expertise and market access are essential for success (Hagedoorn, 2002).

**Figure 1**  
D-8 countries' membership in other similar organization

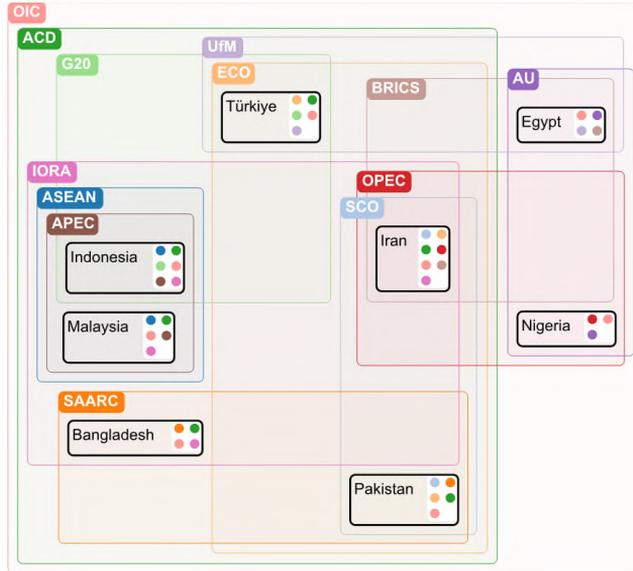


Figure 1 illustrates the active participation of D-8 member countries in various international organizations, highlighting their collaborative potential in STI. Notably, Turkey and Indonesia emerge as influential players within the G20 and ASEAN, showcasing their roles in shaping economic policies and regional stability. Iran's involvement in the OIC and ECO emphasizes its strategic focus on fostering economic and cultural ties among Islamic nations. The diagram also highlights joint initiatives among D-8 countries, such as trade agreements and cultural exchanges, which facilitate collaborative responses to global challenges. By engaging in these diverse platforms, D-8 members can strengthen their networks, amplify their collective voice, and leverage shared interests, ultimately fostering economic growth, technological innovation, and political stability for both the member states and the broader international community.

In the context of D-8 countries, innovation networks and strategic alliances can play a critical role in overcoming barriers to development. By establishing and strengthening collaborative networks across the D-8 region, countries can enhance their technological capacities and address shared regional challenges, such as food security, energy sustainability, and public health.

The D-8 Organization represents a unique collective of nations that can greatly benefit from innovation networks and strategic alliances. The diverse technological strengths and capabilities of the D-8 countries—ranging from Malaysia's advancements in ICT to Iran's leadership in renewable energy technologies—offer a strong foundation for collaboration.

One of the primary benefits of research networks in the D-8 context is the ability to share resources and expertise across countries. For example, Indonesia and Nigeria, both of which have large agricultural sectors, could collaborate with Turkey and Iran on agricultural technologies, including smart irrigation systems and sustainable farming practices. Similarly, Malaysia's expertise in ICT could be leveraged to enhance digital connectivity and e-governance initiatives across the region.

Research networks within the D-8 can be enhanced by focusing on specific technological areas such as renewable energy, agriculture, and healthcare. By establishing cross-border research initiatives, D-8

countries can promote innovation in these critical areas while addressing pressing regional and global challenges. For instance, a collaborative project on renewable energy could enable D-8 countries to share knowledge on solar and wind energy technologies, as well as develop joint R&D projects that align with the United Nations SDGs, particularly those related to affordable clean energy (SDG 7) and climate action (SDG 13).

In addition, D-8 countries can benefit from forming strategic alliances with organizations and networks outside the region. Partnering with leading global research institutions, multinational corporations, and international organizations can provide access to additional funding, technological expertise, and markets. For example, collaborations with entities like the European Union or United Nations Environment Programme (UNEP) could help D-8 countries access cutting-edge technologies and gain international recognition for their innovations.

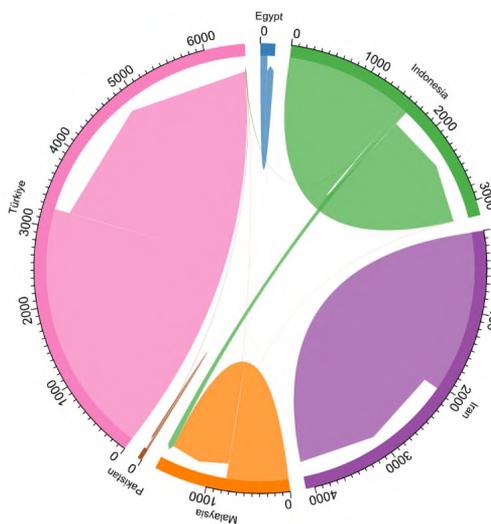
To better understand the dynamics of innovation networks and strategic alliances, the use of Social Network Analysis (SNA) provides a valuable framework for evaluating the relationships and interactions among different actors in STI collaborations. SNA involves mapping and analyzing the connections between entities (such as universities, companies, and governments) to identify key players, knowledge hubs, and patterns of interaction.

In the context of international STI cooperation, SNA can be used to analyze the effectiveness of collaboration networks, identify gaps in knowledge flow, and assess the impact of different actors on innovation outcomes. By using SNA to examine the D-8 innovation network, for example, we can identify the most influential organizations, measure the density and connectivity of research partnerships, and evaluate how effectively knowledge and technology are being exchanged across the region.

Moreover, SNA can help to optimize STI collaboration by identifying potential areas for improvement, such as enhancing communication between underrepresented countries or strengthening partnerships in high-impact sectors. It can also assist in measuring the collaboration's success by tracking the production of joint publications, patents, and commercialized products resulting from research networks. Through this analysis, D-8 countries can optimize their collective efforts, align resources more effectively, and maximize the potential impact of their STI collaborations.

**Figure 2**

*Total Patent Grants by D-8 Countries*



Source: WIPO, 2023

Figure 2 presents an overview of total patent grants granted to member countries of the D-8 (Developing-8) organization, illustrating the innovation landscape within these nations. The data highlights the significant roles that each D-8 country plays in the field of IP and technological advancement. It visually represents the total number of patents granted to each D-8 member, showcasing the level of innovation and technological development achieved within these countries. The varying heights (or sizes) of the bars indicate the volume of patents, reflecting each nation's capacity for research and development. Turkey emerges as a leading nation in terms of patent grants, indicative of its robust innovation ecosystem and investment in research and development. This positions Turkey as a key player in fostering technological growth among the D-8 countries.

Indonesia and Malaysia also show significant patent activity, highlighting their commitment to advancing technology and innovation. These countries are recognized for their efforts in promoting IP rights and supporting entrepreneurial activities. It is revealed that certain member countries, such as Bangladesh and Nigeria, are beginning to increase their patent activity. This upward trend reflects their growing focus on innovation, signaling potential growth in their respective technology sectors. The visualization in Figure 4 emphasizes the importance of collaboration among D-8 countries in the realm of innovation and IP. By sharing best practices and resources, member states can enhance their capacities for technological advancement, strengthen their economies, and improve their competitive positions in the global market. Thus, Figure 4 highlights the vital role of patent grants as a measure of innovation within D-8 countries, illustrating how each member contributes to the overall technological landscape. The data underscores the need for continued support for innovation policies, collaboration, and knowledge sharing within the D-8 framework to foster sustainable economic development and increase competitiveness in an increasingly technology-driven world.

## Regulatory and Institutional Frameworks for Facilitating STI Cooperation

The successful implementation of international STI cooperation relies heavily on robust governance frameworks at both global and regional levels. These frameworks ensure that international STI collaborations are guided by clearly defined principles, policies, and regulations, facilitating effective coordination, resource mobilization, and knowledge exchange. Additionally, governance frameworks help manage risks related to IP, technology transfer, and funding allocation, ensuring that STI cooperation is equitable, transparent, and sustainable.

At the international level, organizations such as the United Nations Educational, Scientific and Cultural Organization (UNESCO) and the Organisation for Economic Co-operation and Development (OECD) play a central role in shaping global STI policies and promoting international cooperation. UNESCO, for example, is instrumental in fostering SD, encouraging the free flow of knowledge, and ensuring that technological advancements are used to address pressing global issues such as poverty, climate change, and health (UNESCO, 2021).

Similarly, the OECD has established the Global Science Forum (GSF) to support cooperation among governments, research organizations, and private industries in areas such as research infrastructure, data sharing, and knowledge exchange (OECD, 2020). The GSF's collaborative initiatives help align the STI strategies of member countries, fostering collective efforts to tackle global challenges.

In regional STI governance, organizations such as the European Union (EU), the African Union (AU), and the Association of Southeast Asian Nations (ASEAN) have developed policies and frameworks that promote STI collaboration among member states. These regional governance mechanisms provide an essential platform for smaller countries to pool their resources, engage in joint research, and benefit from the collective technological expertise of the larger group.



For D-8 countries, regional governance frameworks can be pivotal in driving STI cooperation across the developing world. By creating a unified policy and institutional structure for STI collaboration, D-8 countries can promote mutual trust, align their technological capabilities, and reduce disparities in research and development infrastructure. The D-8 TTEN is an example of how a regional framework can help member countries enhance their collective innovation capacity, particularly in sectors such as energy, ICT, and agriculture .

At the national level, STI policies are crucial in shaping the direction and priorities of a country's innovation system. These policies set the framework for investment in research and development (R&D), the development of human capital, and the promotion of innovation in industries. Effective national STI policies also determine how countries engage in international cooperation, manage IP, and allocate resources for joint research initiatives.

Countries with strong STI policies often create national research agendas that prioritize specific sectors or technologies, such as renewable energy, biotechnology, or artificial intelligence. These agendas help coordinate the activities of universities, research institutes, and private companies, aligning their efforts with national development goals. For example, South Korea and Singapore have developed comprehensive STI policies that have successfully propelled them to the forefront of technological innovation, particularly in fields such as semiconductors, renewable energy, and medical technologies (OECD, 2021).

For developing countries, crafting effective STI policies is particularly important in overcoming the barriers to innovation and fostering international collaboration. A strong STI policy can help ensure that national research efforts are aligned with global research trends and that countries are actively participating in international collaborations. For instance, Iran's national strategy on renewable energy has positioned the country as a leader in solar and wind energy technologies in the Middle East, and its participation in international STI partnerships has helped it share its innovations globally (Kazemi, 2020).

In D-8 countries, national STI policies are essential for fostering inter-country collaboration. By creating policies that incentivize joint R&D, technology transfer, and the commercialization of innovations, D-8 countries can enhance their collective innovation capacity. For example, creating a unified policy on IP protection across D-8 countries could help streamline international collaborations by addressing concerns about IP rights and ensuring that all members benefit equitably from research outcomes.

IP plays a central role in knowledge exchange and technology transfer. The protection of IP ensures that creators and innovators can commercialize their work and receive recognition for their contributions. However, in international STI cooperation, the management of IP rights can also be a point of contention, particularly when different countries have varying levels of IP protection, enforcement mechanisms, and legal frameworks.

For instance, developed countries typically have stronger and more comprehensive IP laws, which may encourage innovation but can also create barriers to the free flow of knowledge and technology. In contrast, many developing countries have weaker IP protection systems, which may hinder their ability to participate fully in international research collaborations (Maskus, 2004). Therefore, harmonizing IP policies is essential for fostering international STI cooperation.

At the global level, organizations like WIPO (World IP Organization) have worked to establish international agreements that facilitate the protection of IP across borders. The Patent Cooperation Treaty (PCT), for example, enables innovators to file for patents in multiple countries simultaneously, reducing the complexity of international IP protection.

For D-8 countries, addressing IP issues is critical for promoting technology transfer and knowledge exchange. By adopting common IP frameworks and encouraging open access to research data, D-8 countries can increase their participation in global STI networks. Additionally, the D-8 countries could benefit from establishing regional IP centers that offer training, dispute resolution, and support for technology commercialization. This would help mitigate concerns about IP theft and ensure that technology transfer agreements are mutually beneficial.

The effective functioning of STI cooperation also depends on the roles played by regional and national institutions. These institutions are responsible for coordinating research initiatives, providing funding, and ensuring that STI policies are effectively implemented. In developed countries, institutions such as National Science Foundations and Innovation Agencies have been instrumental in promoting scientific research and fostering industry-academia collaborations.

In the context of D-8 countries, the role of regional institutions like the D-8 TTEN is crucial for facilitating cooperation across national borders. By acting as central hubs for research coordination, capacity building, and technology transfer, these institutions can help streamline STI cooperation in the region. Additionally, national institutions such as research councils, technology parks, and universities play a vital role in ensuring that domestic policies align with regional and international STI strategies.

For example, Malaysia's innovation agencies have been pivotal in fostering public-private partnerships and driving investments in R&D, especially in the ICT sector. By aligning its national STI policies with global standards and regional cooperation frameworks, Malaysia has become a leader in technological innovation in Southeast Asia (OECD, 2021).

These national policies and institutions enable the member states to engage in meaningful collaboration with other countries, particularly in the field of sustainable energy, and they help the states share its expertise and technologies within regional networks like the D-8.

## Key Indicators for Evaluating STI Cooperation and Development

To assess the effectiveness of international STI cooperation, it is essential to establish a set of indicators that can measure the progress of collaborative initiatives, technological development, and the impact of innovation on social and economic growth. These indicators allow policymakers, researchers, and international organizations to track the success of STI policies, identify areas for improvement, and allocate resources more efficiently.

STI metrics are multifaceted and cover a range of factors, including research output, patent activity, R&D investment, industrial innovation, and the application of new technologies. These indicators can be categorized into quantitative and qualitative measures. Quantitative measures typically include statistics such as the number of patents filed, the amount of public and private investment in research and development (R&D), and the number of scientific publications. Qualitative measures, on the other hand, focus on the quality of research outputs, the impact of innovation on society, and the effectiveness of cross-border collaborations.

International organizations such as the World Bank, OECD, and the United Nations have developed standardized frameworks for measuring STI performance. These frameworks allow for cross-country comparisons and help identify best practices that can be adopted globally. One of the most widely recognized indices is the Global Innovation Index (GII), which ranks countries based on their innovation capabilities and outcomes. The GII includes measures such as R&D expenditure, the quality of research institutions, and the ease of doing business (Cornell University, INSEAD, & WIPO, 2021).

In the context of D-8 countries, STI indicators play a critical role in assessing the performance of regional collaboration and identifying the most promising areas for development. By utilizing these

metrics, D-8 countries can evaluate the effectiveness of initiatives such as the D-8 TTEN, assess the impact of technology transfer, and measure improvements in innovation capacity and economic competitiveness.

The assessment of STI cooperation relies on a number of key performance indicators (KPIs) that provide insight into the success of collaborative initiatives, technological innovation, and R&D activities. The most common KPIs for evaluating STI cooperation include:

The GII is one of the most comprehensive tools for assessing a country's innovation performance. The GII evaluates countries based on more than 80 indicators, grouped into categories such as institutions, human capital, research, infrastructure, market sophistication, and business sophistication. The index provides a detailed overview of a country's innovation capacity and compares it to global leaders in innovation.

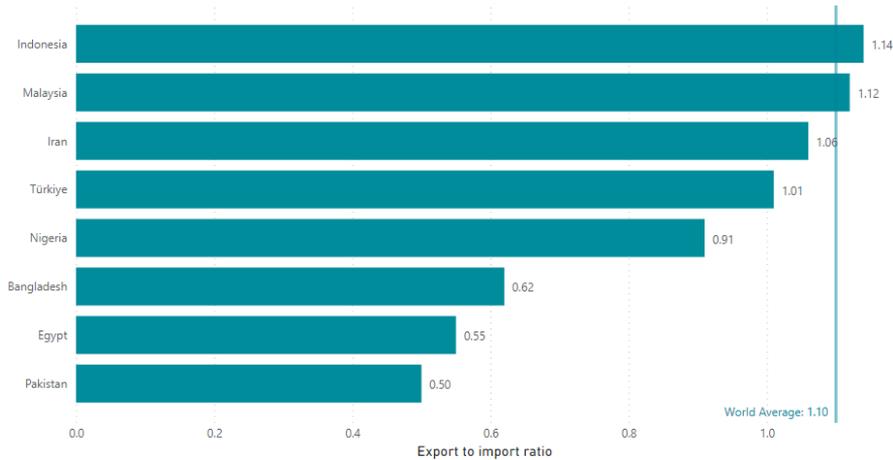
For developing countries, including D-8 countries, the GII can be particularly useful for identifying strengths and weaknesses in their innovation systems. By tracking their GII rankings over time, D-8 countries can monitor their progress in areas such as R&D investment, infrastructure, education, and IP protection. Countries with higher GII scores typically have stronger innovation ecosystems and greater capacity to drive technological progress and economic growth (Cornell University, INSEAD, & WIPO, 2021).

Another key indicator for evaluating STI cooperation is the level of Research and Development (R&D) expenditure. R&D investment reflects a country's commitment to advancing scientific knowledge and technological innovation. As a percentage of GDP, R&D expenditure provides a measure of how much a country is investing in future innovation. According to the OECD, countries that invest heavily in R&D tend to have more competitive industries, greater technological capabilities, and higher levels of economic growth (OECD, 2020).

For D-8 countries, monitoring R&D expenditure is crucial for understanding the financial commitment to innovation and technology development. Low levels of R&D investment may indicate barriers to innovation, such as limited funding, lack of skilled labor, or inadequate research infrastructure. Increasing R&D expenditure and prioritizing public-private partnerships can help address these challenges and improve the overall innovation capacity of D-8 countries.

The value of high-technology exports is another important KPI for assessing the effectiveness of STI cooperation. High-tech exports, which include products such as computers, telecommunications equipment, and pharmaceuticals, are indicative of a country's ability to innovate and create value-added products. High-tech exports are closely linked to industrial innovation and the development of competitive industries. Countries that excel in high-tech exports often have robust innovation ecosystems, advanced R&D facilities, and strong IP protections (OECD, 2021).

**Figure 3**  
Export to Import Ratio

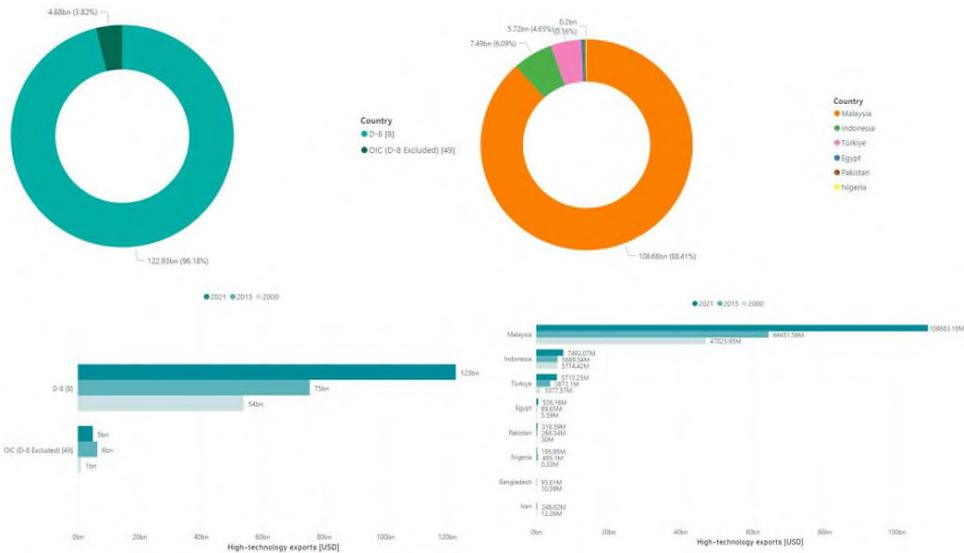


Source: UNSD, 2023

The export to import ratios of D-8 countries in Figure 3 demonstrates a promising landscape for international collaboration in STI. With Malaysia and Indonesia leading the group at ratios of 1.12 and 1.14, respectively, these nations demonstrate strong export capabilities that can facilitate partnerships in technological advancements and innovative practices. Turkey and Iran also show balanced trade performances with ratios of 1.01 and 1.04, indicating their competitiveness in global markets. While Bangladesh contributes with a ratio of 0.91, suggesting room for growth, countries like Egypt and Pakistan face challenges with lower ratios of 0.55 and 0.50. Overall, the D-8 countries' relatively strong export performance positions them well for enhanced cooperation in various sectors, fostering economic growth and innovation across the region.

For D-8 countries, increasing high-tech exports is a key indicator of successful STI cooperation. By collaborating on research and technology transfer, D-8 countries can boost their capacity to innovate and develop new products that are competitive in global markets. For instance, Malaysia's strong presence in the ICT sector and Turkey's growing export base in automotive technologies reflect the positive outcomes of STI cooperation in these countries. Similarly, Iran's innovations in renewable energy technologies and Nigeria's focus on biotechnology offer opportunities for cross-border collaboration that can increase high-tech exports and contribute to sustainable development.

**Figure 4**  
High-Technology Exports



**Source:** World Bank (Value of exports of products with high R&D intensity)

Figure 4 presents the value of high-technology exports from D-8 member states, highlighting their contributions to the global market for products with high research and development (R&D) intensity. The D-8 countries collectively exported 4.88 billion. This indicates that while D-8 nations are making strides in high-tech exports, there remains significant potential for growth and increased market share. Malaysia stands out as the leading exporter within the D-8 group, with high-technology exports valued at \$108.68 billion, representing 88.41% of the total D-8 exports. This positions Malaysia as a key player in the high-tech sector, driven by its robust manufacturing and innovation capabilities. Turkey follows with \$7.15 billion in high-tech exports, showcasing its growing technological advancements and export potential. Nigeria and Bangladesh have lower export values, at 2.49 and 9.61 million, respectively, suggesting opportunities for these countries to enhance their high-tech export capabilities. The data illustrates a significant increase in high-technology exports from D-8 countries over the years, with a notable rise from 1 billion in 2000 to 4.88 billion in 2021. This upward trend reflects the growing emphasis on innovation and technology development within these nations. The series underscore the critical role of D-8 member states in the high-technology export sector. By fostering collaboration in research and development, enhancing technological capabilities, and investing in innovation, these countries can significantly boost their presence in the global high-tech market. This focus on high-technology exports is essential for driving economic growth, improving competitiveness, and achieving SDGs within the D-8 framework.

Scientific publications and their citation impact are key indicators of a country's research output and its influence in the global scientific community. The number of publications reflects the amount of research being produced, while citation impact indicates the quality and influence of that research. High citation impact suggests that a country's research is highly regarded by the international scientific community and has contributed significantly to advancing knowledge in a particular field (OECD, 2020).

In D-8 countries, increasing the number of scientific publications and improving citation impact are critical goals for enhancing regional and global cooperation in STI. Countries like Turkey and Iran have made significant strides in producing high-quality research in areas such as engineering, medical

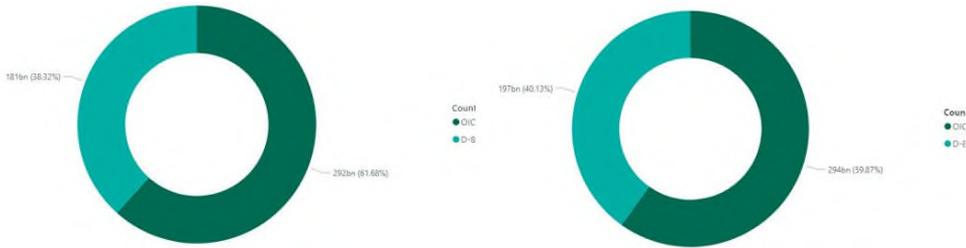


sciences, and renewable energy. By improving research infrastructure, fostering academic collaborations, and enhancing the quality of education, D-8 countries can further increase their contribution to global scientific knowledge and strengthen their position in international STI networks.

To evaluate the performance of D-8 countries in the global STI landscape, it is useful to conduct a comparative analysis of their rankings in key indicators, such as the GII, R&D expenditure, high-tech exports, and scientific publications. This analysis helps identify areas where D-8 countries are excelling and areas where improvement is needed.

**Figure 5**

*Intra-OIC Merchandise Export and Imports*

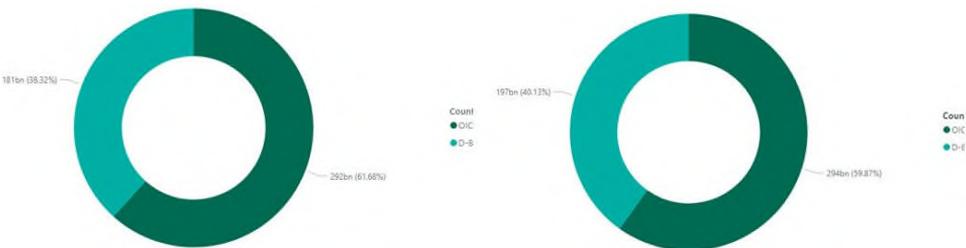


Source: DOTS, 2023

The trade dynamics among D-8 countries within the broader context of the Organization of Islamic Cooperation (OIC) in Figure 5 highlight their significant role in fostering economic collaboration, particularly in STI. Collectively, D-8 countries account for 181 billion in intra-OIC trade, with exports reaching \$197 billion and imports at \$181 billion. This indicates a robust trade relationship that facilitates not only the exchange of goods but also the sharing of technological advancements and innovative practices. Approximately 62% of imports and 60% of exports among OIC countries are attributed to trade with D-8 nations, underscoring their vital contribution to intra-OIC commerce. The strong economic interdependence among D-8 countries suggests a foundation for deeper collaboration in scientific and technological initiatives, enhancing their collective capacity for innovation and development. As these countries continue to strengthen their trade ties, they are well-positioned to leverage their unique strengths and resources to advance cooperation in science and technology across the OIC.

**Figure 6**

*Intra-OIC Merchandise Export and Imports*



Source: DOTS, 2023

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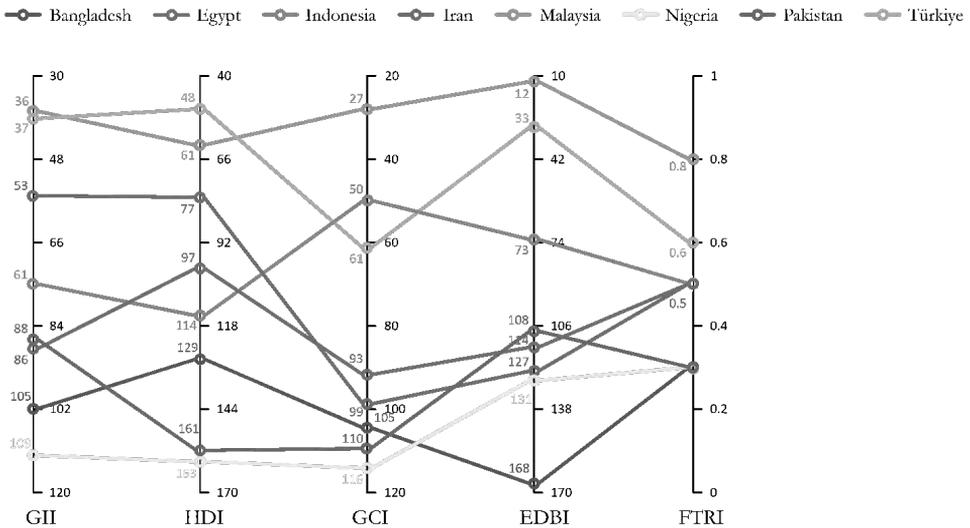


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For example, according to the Global Innovation Index (2021), Malaysia and Turkey are among the top-performing D-8 countries, with strong innovation ecosystems and high levels of R&D investment. Malaysia ranks highly in terms of ICT infrastructure, human capital, and knowledge transfer, while Turkey excels in industrial innovation and high-tech exports. In contrast, countries like Bangladesh and Nigeria face challenges related to lower R&D investment, limited infrastructure, and weaker industrial innovation capabilities. However, these countries are making progress in areas such as agricultural technology and renewable energy, and with the right investments in R&D and education, they can improve their STI performance.

**Figure 7**

*Comparative Analysis of D-8 Countries: Performance Across GII, HDI, GCI, EDBI, and FTII Indices*

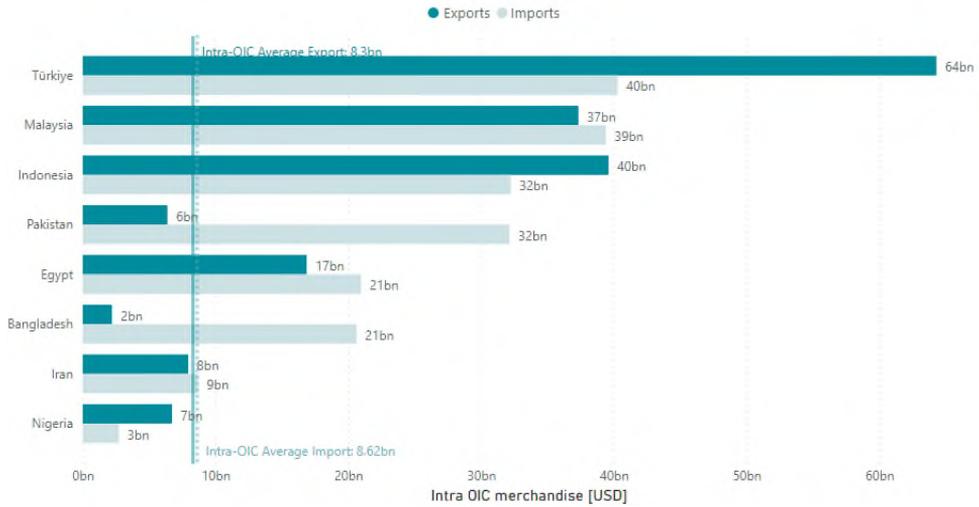


The comparative analysis of D-8 countries across key indices such as the Global Innovation Index (GI), Human Development Index (HDI), Global Competitiveness Index (GCI), Ease of Doing Business Index (EDBI), and Foreign Trade and Investment Index (FTII) in Figure 7 reveals significant insights into their collaborative potential in STI. Turkey stands out with high rankings in GCI and EDBI, showcasing its competitive edge and conducive business environment, while Malaysia excels in HDI and GI, reflecting its dedication to innovation and human development. Notably, countries like Bangladesh and Nigeria are making strides in GI and FTII, indicating a growing emphasis on innovation and trade. This diverse performance across the indices underscores the importance of collaboration among D-8 nations, as sharing best practices and fostering partnerships can enhance their collective competitiveness and drive sustainable development, ultimately contributing to the overarching goals of the D-8 organization.



**Figure 8**

Trade dynamics among D-8 countries with respect to their interactions with OIC member states



Source: DOTS, 2023

The trade dynamics among D-8 countries, particularly in their interactions with OIC member states in **Figure 8**, reveal significant insights into their positions in STI collaborations. Turkey, Indonesia, and Malaysia lead in trade with Islamic nations, with Turkey's export value being approximately eight times higher than the average trade level among OIC countries, underscoring its pivotal role in fostering intra-OIC commerce. This strong export orientation not only enhances Turkey's trade balance but also positions it as a key player in technological and innovative exchanges. Meanwhile, Malaysia and Indonesia also demonstrate robust trade activities, indicating their potential for collaboration in science and technology initiatives. In contrast, Pakistan and Bangladesh's high import levels from OIC member states suggest a reliance on external resources, which may impact their capacity for innovation. This disparity highlights the varying roles of D-8 countries in the broader context of Islamic trade relations and their potential for enhancing cooperation in science and technology.

A comparative analysis of D-8 countries' performance in STI can also inform policy decisions and strategic initiatives for enhancing regional collaboration. By focusing on the areas where they have a competitive advantage and addressing existing gaps, D-8 countries can create a more cohesive and effective regional innovation ecosystem.

## Trends and events on STI Cooperation

The COVID-19 pandemic has had a profound effect on the global landscape, including the way countries approach STI cooperation. Initially, the pandemic highlighted significant weaknesses in national health systems, global supply chains, and the capacity for rapid technological innovation. However, it also underscored the importance of international cooperation in responding to global crises. In this context, STI cooperation became a pivotal factor in addressing the pandemic through the development of vaccines, medical technologies, and digital tools.

The COVID-19 crisis accelerated technological advancements in several areas, particularly in the fields of healthcare, digital technologies, and biotechnology. The speed at which vaccines were developed (e.g., mRNA vaccines) and the global collaboration between researchers, pharmaceutical companies, and governments demonstrated the power of cross-border STI cooperation. Initiatives

like COVAX, a global coalition aimed at equitable vaccine distribution, emphasized the importance of solidarity and knowledge sharing in tackling global health challenges (World Health Organization, 2021).

In terms of digital technologies, the pandemic necessitated the rapid adoption of remote work, e-commerce, online education, and telemedicine. These shifts in societal behavior were facilitated by advancements in 5G networks, AI, and cloud computing. Countries with stronger digital infrastructure were able to pivot more easily to remote work and e-learning, while others faced significant challenges due to gaps in access to technology and broadband (OECD, 2021).

For D-8 countries, the COVID-19 pandemic highlighted both the challenges and opportunities of STI cooperation. On one hand, the pandemic exposed weaknesses in healthcare systems and technological infrastructure, particularly in countries with limited access to medical technologies and digital resources. On the other hand, it also provided an opportunity for regional collaboration and knowledge transfer. For example, several D-8 countries, including Malaysia and Turkey, have developed indigenous technologies for managing COVID-19, such as diagnostic kits and mobile apps for contact tracing. By enhancing regional collaboration, these countries could create shared digital platforms for healthcare, data exchange, and research collaboration in response to future crises.

As the world transitions into a post-COVID era, there are several critical factors that will shape the future of STI cooperation, particularly for developing countries and regional networks like the D-8 Organization. The pandemic has redefined the way international collaborations operate and has emphasized the importance of flexible, agile mechanisms for global STI cooperation. Moving forward, several key trends will likely dominate the STI landscape:

The pandemic has accelerated the digital transformation across sectors, particularly in healthcare, education, and commerce. Digital tools such as AI, machine learning (ML), big data, and blockchain are converging to provide innovative solutions to complex global challenges. For instance, the use of AI in healthcare has led to more accurate diagnostics, faster vaccine development, and predictive models for disease outbreaks. Similarly, blockchain technology has been utilized to ensure transparency and trust in global supply chains, particularly in the distribution of vaccines and medical supplies.

In the post-COVID world, D-8 countries can leverage digital technologies to overcome traditional barriers to innovation, such as limited access to expertise and infrastructure. By embracing smart city technologies, IoT (Internet of Things), and telemedicine, D-8 nations can enhance their ability to innovate and address regional challenges such as urbanization, food security, and healthcare access. Collaborative digital platforms that promote open innovation and crowdsourced solutions can also enable D-8 countries to pool their resources and collaborate more effectively on global challenges.

The COVID-19 pandemic revealed the gaps in global health systems and underscored the need for stronger global health innovation networks. The rapid development of COVID-19 vaccines, particularly the mRNA vaccines, was an unprecedented achievement in global health collaboration. However, disparities in access to vaccines, medical equipment, and healthcare technologies remain a significant challenge, particularly in developing countries.

As part of the post-COVID recovery, there is a growing recognition of the need to strengthen global health innovation networks, particularly for vaccine development, pandemic preparedness, and health technologies. In the future, D-8 countries can enhance their involvement in these networks by fostering collaborations in areas such as biotechnology, public health infrastructure, and epidemiological research. For instance, countries like Turkey and Indonesia could play a key role in developing vaccines and medical technologies tailored to the needs of low-resource settings. Regional networks such as D-8 TTEN could facilitate knowledge exchange and technology transfer, ensuring that health innovations are accessible and adaptable to the regional context.

The COVID-19 pandemic highlighted the importance of multilateralism in addressing global challenges. While national efforts to control the pandemic were crucial, the global nature of the crisis required a coordinated international response. Organizations such as the World Health Organization (WHO), the World Trade Organization (WTO), and the United Nations played pivotal roles in coordinating responses and facilitating access to vaccines and medical supplies. Additionally, initiatives such as COVAX and ACT-A (Access to COVID-19 Tools Accelerator) demonstrated the power of multilateral collaborations in achieving global public health goals.

In a post-COVID world, strengthening multilateral STI cooperation will be crucial for addressing complex challenges such as climate change, food security, and sustainable development. D-8 countries, by participating more actively in multilateral forums and fostering South-South cooperation, can enhance their collective influence and access to global knowledge networks. Regional STI frameworks like D-8 TTEN could be strengthened to promote shared R&D efforts, technology transfer, and capacity building among member countries, fostering greater regional integration and resilience.

The COVID-19 pandemic underscored the need for greater focus on sustainability and green technologies. As the world begins to recover from the economic shock of the pandemic, there is an increasing demand for green recovery plans that focus on renewable energy, circular economies, and sustainable agriculture. The pandemic revealed the interconnectedness of global environmental challenges, from climate change to the degradation of ecosystems, and the need for collective action to address these issues.

For D-8 countries, the development and adoption of green technologies are key to achieving sustainable development and economic growth. The D-8 countries have significant potential to innovate in sectors such as solar energy, wind power, sustainable agriculture, and energy efficiency. By collaborating on green technologies and sharing best practices, D-8 countries can contribute to global sustainability goals (SDG 7, SDG 12, SDG 13) while advancing their own economic development. Regional initiatives such as the D-8 Energy Efficiency Program could help member countries reduce energy consumption, increase the use of renewable energy, and enhance environmental protection.

## **Building Innovation Ecosystems in Developing Countries**

An innovation ecosystem refers to the interconnected network of various actors and institutions that work together to foster innovation and drive technological development. These actors include governments, universities, research institutes, private companies, venture capitalists, and entrepreneurs. An innovation ecosystem provides the necessary conditions for the development and diffusion of new ideas, products, and services by promoting collaboration, resource sharing, and knowledge exchange.

In the context of developing countries, creating a robust innovation ecosystem is particularly important because it provides a framework that facilitates technology transfer, capacity building, and entrepreneurship. Unlike developed countries, where the innovation process often occurs in well-established systems of research and industry collaboration, developing countries often face challenges such as limited resources, weak infrastructure, and low levels of education. These challenges necessitate the creation of inclusive and adaptive innovation ecosystems that can support the unique needs of developing countries while fostering global competitiveness.

For D-8 countries, building a comprehensive innovation ecosystem is essential for addressing regional challenges such as sustainable development, energy access, agriculture, and healthcare. By leveraging regional cooperation and aligning their innovation policies, D-8 countries can create ecosystems that promote inter-country collaboration, technology development, and economic growth.

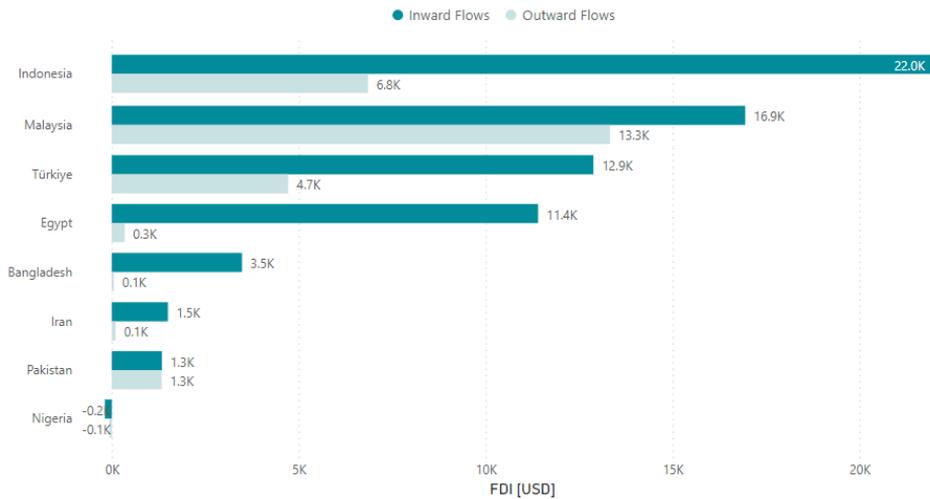
An effective innovation ecosystem in developing countries must be composed of several key components that enable collaboration and sustainable development. These include:

### Research and Development (R&D) Infrastructure

A strong R&D infrastructure is foundational for innovation ecosystems. This includes well-equipped laboratories, research centers, and technology parks that foster scientific discovery and technological development. In developing countries, investing in R&D infrastructure is essential for enabling domestic innovation and facilitating international cooperation. R&D facilities enable researchers to collaborate with international partners, exchange knowledge, and translate research into tangible products and services.

For D-8 countries, the creation and enhancement of technology parks and innovation hubs could be key drivers of regional collaboration. For example, Iran’s Pardis Technology Park has become a significant center for technology-driven innovation in the region, supporting startups in areas such as biotechnology, IT, and energy. Malaysia’s Cyberjaya and Turkey’s Technopark Istanbul are also examples of how developing countries can build R&D infrastructure that attracts both domestic and foreign investment in research and technology.

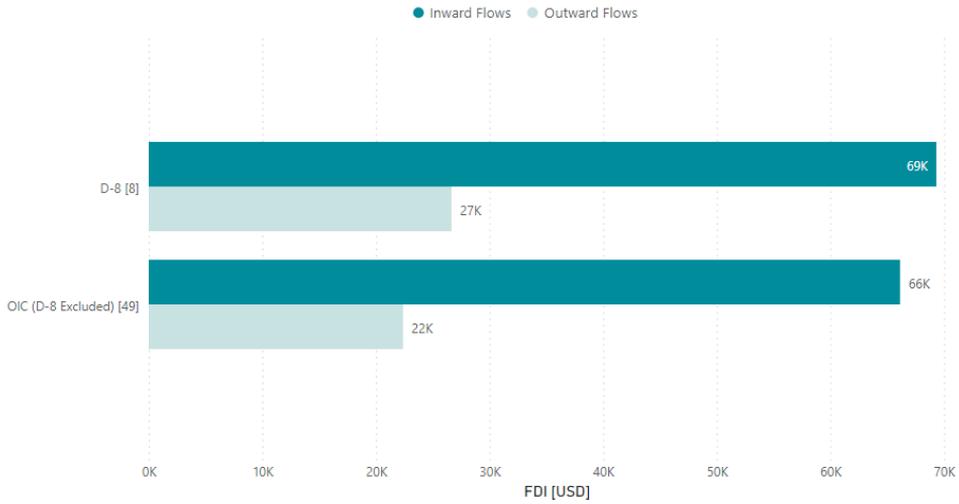
**Figure 9**  
FDI Flows for D-8 and OIC Countries (USD)



Source: UNCTAD, 2023



**Figure 10**  
FDI Flows for D-8 and OIC Countries (USD)



Source: UNCTAD, 2023

The FDI landscape among D-8 countries in Figure 9 reveals significant variations in investment flows, which are crucial for fostering collaboration in STI. Indonesia stands out with the highest inward FDI flow of 22.0 billion, highlighting its strong appeal as an investment destination. Malaysia follows closely, attracting 16.6 billion in inward FDI while also investing 13.3 billion outward, demonstrating its active engagement in both receiving and deploying foreign capital. Turkey, with inward flows of 12.9 billion and outward flows of 4.7 billion, reflects a robust investment environment conducive to innovation. Egypt’s inward FDI of 11.4 billion further emphasizes its growing attractiveness to foreign investors. In contrast, countries like Bangladesh and Iran show lower inward flows of 3.5 billion and 0.1 billion, respectively, with Iran exhibiting minimal outward investment. Pakistan’s inward FDI of 1.3 billion and Nigeria’s negative outward flows indicate challenges in attracting foreign investment. These dynamics underscore the varying levels of FDI activity among D-8 countries, which are essential for enhancing their collaborative efforts in scientific and technological advancements, ultimately driving innovation and economic growth within the region. The D-8 countries demonstrate a strong commitment to attracting FDI, with total inflows reaching 69 billion, including 42 billion in inflows and 27 billion in outflows. This reflects their appeal to foreign investors and enhances collaboration in science and technology. In contrast, larger OIC members report 66 billion in FDI flows, with 44 billion in inflows and 22 billion in outflows (Figure 11). Their lower outflow activities highlight the D-8’s dynamic role in global investments, fostering innovation and driving regional economic growth, thus establishing itself as a key center for foreign investment and collaboration. The outward flows of FDI highlight the vital role of D-8 countries, which account for 27 billion, approximately 48.7228 billion or about 51.28% of total FDI flows, the D-8 nations’ substantial contribution underscores their importance as key players in fostering foreign investment abroad. This balance emphasizes the D-8’s prominent position in the global investment landscape.

### Human Capital Development

Human capital—which includes highly skilled labor, scientists, engineers, and entrepreneurs—is another critical component of an innovation ecosystem. Developing countries must invest in education and vocational training to build a workforce capable of driving innovation. STEM (Science, Technology,



Engineering, and Mathematics) education, in particular, plays a crucial role in ensuring that countries can produce the necessary talent for research and technological development.

For D-8 countries, enhancing STEM education and creating opportunities for training and skill development is key. Turkey, for example, has made substantial investments in engineering programs and technology education to train the next generation of innovators. Similarly, countries like Nigeria and Pakistan have focused on building local talent in sectors such as agriculture technology, renewable energy, and ICT.

## Access to Finance and Investment

Access to finance is another crucial factor that determines the success of an innovation ecosystem. In many developing countries, the lack of access to venture capital, private equity, and bank financing can hinder the growth of innovative enterprises. Public funding for research and development, alongside private sector investment, is essential for fostering entrepreneurship and scaling up innovation.

To promote access to finance, D-8 countries can work together to create regional investment funds or public-private partnerships aimed at funding technology-driven businesses. Additionally, angel investors and venture capitalists in these countries could be encouraged to invest in emerging startups, particularly those in the fields of renewable energy, health technologies, and ICT. Malaysia has successfully implemented a National Venture Capital Corporation to support local startups and drive innovation in areas such as e-commerce and fintech.

## Regulatory Environment and Policy Support

An enabling regulatory environment and policy framework are essential for the growth of innovation ecosystems. Governments must establish clear IP laws, tax incentives, and research funding programs to support R&D activities and encourage private sector investment in innovation. In addition, governments need to create policies that promote technology transfer from universities and research institutions to the private sector.

For D-8 countries, regional cooperation in developing harmonized policies on IP, technology licensing, and R&D tax incentives would help streamline innovation efforts across the region. For instance, Turkey's technology-focused policies have played a key role in its rapid advancement in ICT and renewable energy. By creating similar policy environments in other D-8 countries, these nations can encourage more innovation and attract both domestic and foreign investment.

International collaboration is one of the most important drivers of innovation in developing countries. By participating in global innovation networks, D-8 countries can gain access to cutting-edge research, technologies, and expertise. Cross-border collaborations in R&D, technology transfer, and joint ventures enable developing countries to enhance their domestic innovation systems and bridge the technology gap with developed countries.

One of the key ways D-8 countries can foster international collaboration is through regional platforms such as the D-8 TTEN. By participating in such platforms, D-8 countries can engage in knowledge sharing, collaborate on joint research projects, and establish partnerships with research institutions and industries worldwide.

Building innovation ecosystems in D-8 countries presents several significant opportunities. First, the region is rich in natural resources and human capital, which can be leveraged to drive innovation in areas such as agriculture, energy, and manufacturing. For example, Nigeria's agricultural sector presents an opportunity for innovation in smart agriculture technologies and sustainable farming practices.

Similarly, Iran's expertise in renewable energy can help D-8 countries develop innovative solutions to meet the region's growing energy demands.

Second, regional integration within the D-8 framework offers a unique opportunity for collaboration in R&D, entrepreneurship, and technology transfer. By working together, D-8 countries can share resources, reduce research duplication, and tackle shared challenges such as climate change, food security, and healthcare access. Through joint ventures, regional research programs, and the development of innovation hubs, D-8 countries can strengthen their collective innovation capacity and enhance their global competitiveness.

Finally, the growing importance of digital transformation provides D-8 countries with a unique opportunity to leapfrog traditional barriers to innovation. By focusing on ICT infrastructure, digital governance, and e-commerce, D-8 countries can enhance their ability to innovate and become leaders in sectors such as fintech, e-health, and digital education.

While the opportunities are abundant, building innovation ecosystems in D-8 countries comes with several challenges, including:

- **Limited access to financing:** Despite efforts to improve access to capital, many D-8 countries still face significant gaps in financing innovation and startups. This is particularly problematic for early-stage companies and startups that may struggle to secure funding from traditional sources.
- **Weak infrastructure:** The lack of advanced infrastructure, including reliable energy supply, transportation, and internet connectivity, can hinder the development of innovation ecosystems. Investment in infrastructure is essential to create an environment conducive to technological development.
- **Policy incoherence:** Inconsistent or poorly implemented policies can undermine efforts to create a supportive environment for innovation. Without a clear regulatory framework, including strong IP protection and tax incentives, it is difficult to attract and retain innovation-driven enterprises.
- **Brain drain:** Many developing countries face the challenge of brain drain, where highly skilled individuals migrate to developed countries for better opportunities. To retain talent, D-8 countries need to focus on improving domestic education systems and creating opportunities for innovation-driven careers.

## Policy and Institutional Strategies for Strengthening STI Cooperation

Effective STI policies are critical for fostering an innovation-driven economy. STI policies provide the framework for innovation systems to function efficiently by aligning national priorities with technological advancements and research activities. These policies can stimulate technological innovation, entrepreneurship, and economic growth by creating an environment that supports R&D, investment in education, and the commercialization of technology.

In developing countries, particularly in D-8 countries, crafting effective STI policies is essential for addressing developmental challenges such as poverty reduction, healthcare access, and sustainable energy. Countries that have successfully implemented STI policies, such as South Korea and Singapore, demonstrate the importance of creating an environment conducive to innovation. By fostering a close relationship between government, academia, and the private sector, these countries have transformed their economies and become global leaders in technological innovation (OECD, 2020).

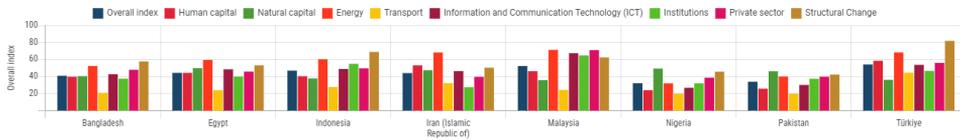
For D-8 countries, the design and implementation of STI policies should focus on specific sectors with high potential for regional collaboration, such as renewable energy, ICT, biotechnology, and

sustainable agriculture. A well-articulated STI policy can help mobilize resources, create an innovation-friendly ecosystem, and enhance global competitiveness.

Effective STI policies should include several key components to be successful:

- R&D investment is a cornerstone of any successful STI policy. Governments need to prioritize funding for basic and applied research in areas that have the potential to drive economic growth and address social challenges. R&D funding should not only come from the public sector but also attract private investment, particularly through partnerships with universities, research institutes, and private industry.
- For D-8 countries, increased R&D expenditure is necessary to build research infrastructure, attract foreign investment, and improve technological capacity. The OECD has highlighted that countries that invest in R&D see improvements in productivity and technological capacity, which in turn drives long-term economic growth (OECD, 2020). To ensure the effectiveness of R&D policies, D-8 countries could adopt tax incentives for R&D activities and create innovation funding programs to support both small startups and large-scale technological projects.

**Figure 11**  
Productive Capacities Index (PCI) of D-8 Member Countries



Source: UNCTAD, 2023

Figure 11 across eight critical categories: Human Capital (blue), Natural Capital (green), Energy (yellow), Transport (red), Information and Communication Technology (ICT) (purple), Private Sector (orange), Institutions (light blue), and Structural Change (dark blue). The overall PCI scores reveal significant variations in productive capacities among these nations. Malaysia and Turkey stand out with high scores in Human Capital, Energy, Transport, and ICT, reflecting their robust educational systems and infrastructure. Indonesia excels in Natural Capital due to its abundant resources, while the Private Sector and Institutional categories also show strong performance in Malaysia and Turkey, indicating conducive environments for business growth. The analysis highlights the diverse economic landscapes and developmental challenges faced by each member country, suggesting that collaboration and sharing of best practices could enhance their respective productive capacities. By focusing on strengthening human capital, improving energy efficiency, and developing transport infrastructure, D-8 countries can leverage their unique strengths to foster economic growth and enhance their competitiveness in the global market.

IP protection plays a central role in encouraging innovation. Effective IP laws ensure that inventors and researchers are rewarded for their work, which in turn incentivizes further investment in research and technology development. Without robust IP protection, countries may face challenges in attracting foreign investment and engaging in technology transfer.

For D-8 countries, creating a harmonized regional IP framework is essential for streamlining IP protection across borders. Many D-8 countries currently have different standards for IP protection, which can complicate international collaborations. By adopting a unified IP system, D-8 countries could increase their attractiveness as destinations for research and development investment. Strengthening IP systems would also encourage the commercialization of research outputs and foster greater cooperation with international companies and organizations.



Public-private partnerships (PPPs) are vital for facilitating the commercialization of innovative ideas and technologies. Governments can play a crucial role by creating policies that support collaborations between public research institutions and private enterprises. These collaborations are essential for scaling up innovations, transferring technology, and bringing new products to market.

In D-8 countries, promoting PPPs can help unlock the potential of small and medium-sized enterprises (SMEs) and startups in innovation-driven sectors like renewable energy, ICT, and agriculture. By fostering strong collaboration between the public sector and private enterprises, D-8 countries can create sustainable innovation ecosystems that drive economic growth and technological progress. Government programs that provide funding, tax incentives, or shared infrastructure could stimulate private sector involvement in R&D and innovation.

A highly skilled workforce is essential for the development of an innovation-driven economy. Effective STI policies must therefore focus on education and skill development. Governments should invest in STEM education (Science, Technology, Engineering, and Mathematics) to cultivate the talent needed for research and technological advancement.

For D-8 countries, investing in higher education and vocational training programs in fields such as engineering, ICT, biotechnology, and renewable energy is crucial. Collaborations with international universities and research institutions could help improve the quality of education and ensure that the workforce has the skills needed to drive innovation. D-8 countries can also establish international education exchange programs, which will help build the human capital required for a thriving innovation ecosystem.

Infrastructure plays a crucial role in supporting innovation ecosystems. Technological infrastructure, such as high-speed internet, data centers, and renewable energy infrastructure, is essential for enabling research, data sharing, and collaboration. Similarly, physical infrastructure, including transportation networks and research parks, is necessary for facilitating the movement of goods, services, and knowledge.

For D-8 countries, investing in both technological and physical infrastructure will be critical for supporting innovation. By improving digital connectivity and energy infrastructure, D-8 countries can foster cross-border collaborations and enhance their competitive advantage in global STI networks. For instance, building renewable energy grids and smart cities could help D-8 countries address common challenges related to sustainability and urbanization, while also promoting innovation in the clean energy sector.

While national STI policies are essential, regional cooperation can greatly enhance the impact of these policies by aligning efforts, pooling resources, and fostering cross-border collaborations. D-8 countries have a unique opportunity to strengthen their regional STI governance by aligning their STI strategies and creating a unified regional framework for innovation.

To strengthen STI cooperation in the region, D-8 countries could harmonize their national STI policies to create a coherent and integrated approach to innovation. This could include creating common standards for R&D, IP protection, and technology transfer, as well as aligning education and training systems to ensure that the workforce is equipped with the necessary skills to participate in regional innovation initiatives.

Another key element of regional cooperation is the creation of regional STI platforms and networks that facilitate collaboration between universities, research institutes, and industries across D-8 countries. These platforms can serve as hubs for knowledge exchange, capacity building, and joint research initiatives. For instance, the D-8 TTEN can be expanded to include more collaborative projects and

cross-border research initiatives that address common challenges such as sustainable energy, agriculture, and healthcare.

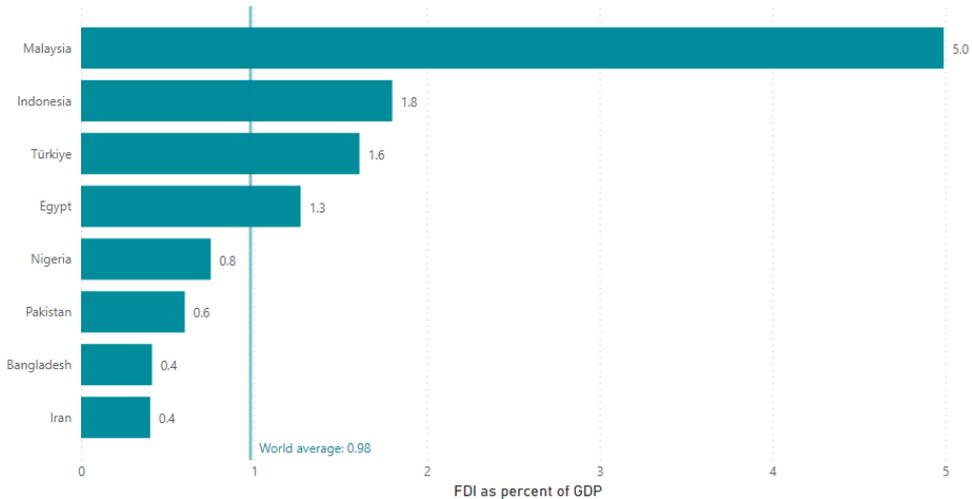
Regional collaboration can also enhance the technology transfer process between D-8 countries by creating joint research projects that leverage the strengths of each country. For example, Malaysia’s expertise in ICT can be combined with Iran’s advances in renewable energy to develop clean energy technologies that benefit the entire region. Collaborative funding mechanisms, such as regional innovation funds and joint R&D programs, could provide the necessary resources for such initiatives.

### Advancing STI Cooperation for Sustainable Development

In the face of an increasingly interconnected world, the role of STI cooperation in driving sustainable development has never been more critical. As countries around the world strive to meet the United Nations SDGs, fostering innovation through collaboration has emerged as a key strategy for addressing complex global challenges. For developing countries, especially those within regional groupings like the D-8, STI cooperation offers a pathway to accelerate technological advancements, bolster economic growth, and improve social well-being.

**Figure 12**

*SDG 17.13.01 Foreign Direct Investment, Net Inflows, as a Proportion of GDP*

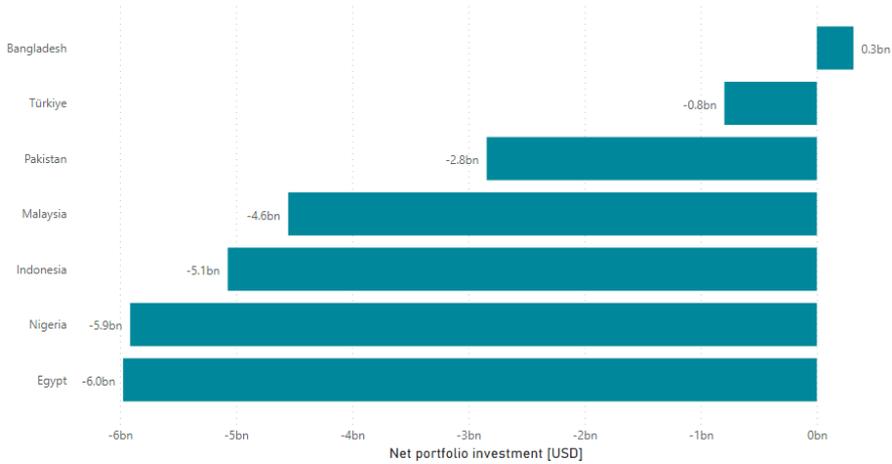


Source: World Bank, 2018



**Figure 13**

SDG 17.13.01 Portfolio Investment, Net (Balance of Payments) (Current Prices)

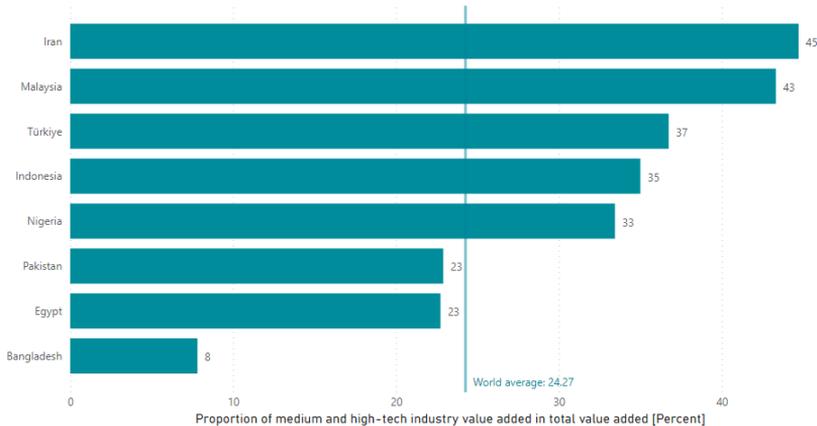


Source: World Bank, 2021

Figure 13 presents the net portfolio investment (in current US dollars) for various countries, highlighting the contributions and challenges faced by D-8 member states in attracting portfolio investments. Bangladesh leads among the D-8 countries with a net portfolio investment of \$0.3 billion, indicating a positive trend in attracting equity and debt securities. This reflects the country's growing financial market and investor confidence. Turkey follows with a net portfolio investment of -\$0.8 billion, suggesting some challenges in maintaining a favorable investment climate, despite its strategic economic position. Pakistan shows a more significant negative balance at -\$2.8 billion, indicating a need for reforms to enhance its attractiveness to foreign portfolio investors. Malaysia and Indonesia report net portfolio investments of -\$4.6 billion and -\$5.1 billion, respectively. These figures highlight the challenges both countries face in attracting foreign capital, despite their potential for growth. Nigeria and Egypt have net portfolio investments of -\$5.9 billion and -\$6.0 billion, respectively. These negative balances underscore the need for improved economic stability and investment policies to attract foreign portfolio investments.

**Figure 14**

SDG 09.0b.01 Proportion of Medium and High-tech Industry Value Added in Total Value Added



Source: UNIDO, 2020



Figure 14 illustrates the proportion of medium-high and high-tech (MHT) industry value added in total manufacturing value added (MVA) for D-8 member states, highlighting their contributions to the technological landscape. Overall Insights: The data reveals that the world average for the proportion of MHT industry value added in total MVA is 24.27%. D-8 countries show varying levels of engagement in the medium and high-tech sectors, reflecting their unique industrial capabilities and development strategies. Iran leads among D-8 nations with a significant 45% of its manufacturing value added coming from the MHT sector. This indicates a strong emphasis on technological advancement and innovation within its industrial framework. Malaysia follows closely with 43%, showcasing its robust high-tech manufacturing capabilities and commitment to enhancing its technological base. Turkey contributes 37%, reflecting its growing industrial diversification and investment in high-tech industries. Indonesia and Nigeria have proportions of 35% and 33%, respectively, indicating their emerging roles in the medium and high-tech sectors. Pakistan and Egypt show lower proportions at 23% each, suggesting opportunities for these countries to enhance their technological contributions to manufacturing.

Bangladesh has the lowest proportion at 8%, highlighting the need for increased focus on developing its medium and high-tech industries.

The varying proportions of MHT industry value added among D-8 member states underscore the importance of fostering innovation and technological development. By investing in research and development, enhancing education and skills, and promoting collaboration among industries, these countries can improve their competitiveness in the global market. Figure 15 emphasizes the critical role of D-8 nations in advancing their medium and high-tech industries, which is essential for achieving sustainable economic growth and meeting the SDGs. Strengthening the MHT sector will not only enhance their manufacturing capabilities but also contribute to broader economic resilience and technological advancement within the D-8 framework.

The data illustrates the varying degrees of success among D-8 countries in attracting portfolio investments, which are crucial for enhancing financial markets and economic growth. The overall negative net portfolio investment for several D-8 countries indicates significant room for improvement in creating conducive environments for foreign investors. By addressing these challenges, D-8 member states can better leverage portfolio investments to support sustainable development and economic resilience.

The COVID-19 pandemic has emphasized the urgent need for robust STI systems capable of responding to global crises. The pandemic highlighted both the strengths and weaknesses of national and global innovation systems. On one hand, the rapid development and deployment of vaccines, advanced health technologies, and digital solutions showcased the immense potential of international collaboration. On the other hand, the unequal access to resources, technologies, and expertise exacerbated existing disparities, underscoring the need for equitable and inclusive STI cooperation. For D-8 countries, this global health crisis presents a dual opportunity: to strengthen regional STI frameworks while ensuring that innovation benefits the entire region, particularly the most vulnerable.

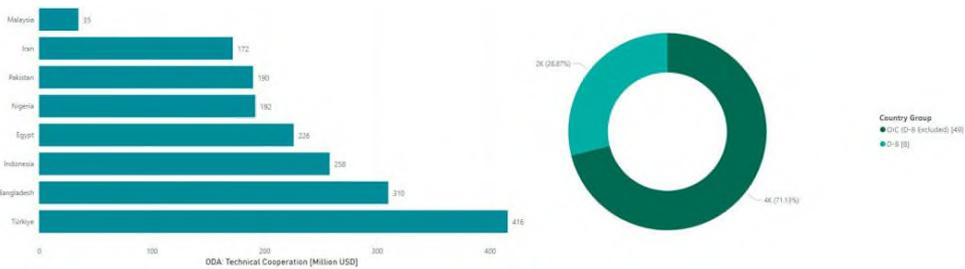
As discussed throughout this paper, the foundation of successful STI cooperation lies in the establishment of well-integrated innovation ecosystems. These ecosystems must combine strong research and development (R&D) infrastructure, a skilled workforce, accessible financing, and policy frameworks that incentivize innovation. For D-8 countries, building these ecosystems requires focusing on strategic sectors such as renewable energy, information and communication technology (ICT), healthcare, and agriculture—sectors where the region can leverage its collective strengths and make meaningful contributions to global sustainable development.

In particular, D-8 countries, with their diverse economic and technological capabilities, can form a dynamic and competitive network for innovation. By coordinating STI policies across borders,

enhancing cross-border collaborations, and establishing regional research hubs, these countries can create a more resilient and innovative region. The D-8 TTEN provides a valuable platform to facilitate knowledge transfer, share best practices, and tackle shared challenges in a coordinated manner. This collaboration is essential not only for addressing regional issues such as energy access, food security, and healthcare, but also for making meaningful contributions to global challenges like climate change, sustainable agriculture, and public health.

However, to achieve these ambitious goals, D-8 countries must overcome significant barriers. These include gaps in infrastructure, education, R&D investment, and technology adoption. Additionally, disparities in IP protection, access to finance, and regulatory frameworks need to be addressed in a collaborative, region-wide manner. Policy coherence at the national and regional levels is essential to align efforts, promote synergies, and ensure that STI initiatives are sustainable and inclusive.

**Figure 15**  
ODA; Technical Cooperation (Current Prices in Millions)

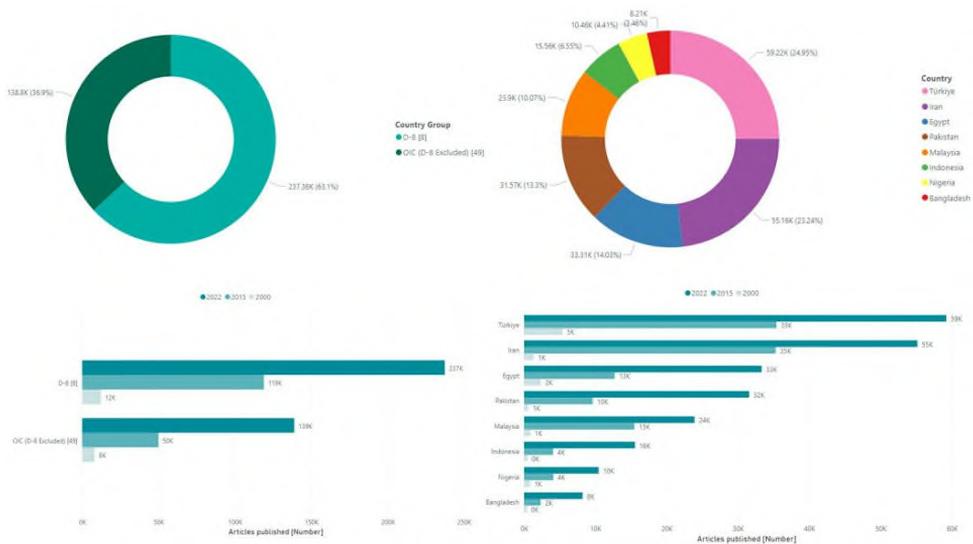


Source: OECD, 2023

In Figure 15, the Official Development Assistance (ODA) allocated for technical cooperation shows a significant disparity between D-8 countries and other OIC member states, highlighting the D-8's strong commitment to enhancing human capital and technical skills. With Turkey leading at 416 million and Bangladesh following closely at 310 million, the D-8 collectively accounts for 71.13% of total ODA directed towards technical cooperation, underscoring their pivotal role in receiving and utilizing development assistance effectively. Countries like Egypt and Indonesia also contribute significantly, with 258 million and 226 million, respectively, while Iran and Pakistan add 172 million and 190 million. In contrast, contributions from non-D-8 OIC countries are notably lower, with Malaysia at 35 million and Nigeria at 192 million. This robust investment in technical cooperation among D-8 nations not only fosters economic development but also positions them as leaders in STI, creating valuable opportunities for collaboration and sustainable growth within the broader OIC framework. In conclusion, advancing STI cooperation is not only about technological progress but also about achieving long-term, inclusive economic growth. By working together, D-8 countries can transform their innovation landscapes, ensuring that STI become catalysts for sustainable development. The ability of D-8 countries to harness the collective power of STI cooperation will define their future trajectory in the global economy and contribute to the global sustainability agenda.



**Figure 16**  
Articles Published



**Source:** Clarivate Analytics (Number of scientific articles published in journals covered by Science Citation Index Expanded (SCI-EXPANDED), Social Science Citation Index (SSCI), Arts & Humanities Citation Index (A&HCI), Book Citation Index– Science (BKCI-S), Book Citation Index– Social Sciences & Humanities (BKCI-SSH) and Emerging Sources Citation Index (ESCI))

The series in Figure 16 illustrates the number of scientific articles published by D-8 member states in journals indexed by various citation indices, including the Science Citation Index Expanded (SCI-EXPANDED), Social Science Citation Index (SSCI), Arts & Humanities Citation Index (A&HCI), Book Citation Index–Science (BKCI-S), Book Citation Index–Social Sciences & Humanities (BKCI-SSH), and Emerging Sources Citation Index (ESCI). Overall Contribution: The D-8 countries collectively published 138.8K articles, accounting for 36.9% of the total articles published by the Organization of Islamic Cooperation (OIC) countries, which stands at 237.38K. This highlights the significant role of D-8 nations in contributing to scientific research and knowledge production within the OIC framework. Turkey leads with 59.22K articles, representing 24.95% of the total D-8 publications. This positions Turkey as a key player in scientific research among its peers. Iran follows with 55.16K articles (23.34%), showcasing its strong academic output. Egypt and Pakistan contribute 31.57K (10.07%) and 23.9K (8.46%) articles, respectively, indicating their active participation in the global research community. Malaysia and Indonesia publish 33.31K (14.03%) and 10.46K (4.41%) articles, respectively, reflecting their growing research capabilities. Nigeria and Bangladesh have published 8.21K (4.41%) and 2K articles, respectively, suggesting opportunities for enhancing their research output. The data also shows a significant increase in the number of articles published by D-8 countries over the years, with a notable rise from 12K in 2000 to 138.8K in 2023. This upward trend underscores the growing emphasis on research and development within these nations. The figures illustrate the vital role of D-8 member states in advancing scientific knowledge and research output. By fostering collaboration and investment in research initiatives, these countries can enhance their global standing in academia and contribute to addressing pressing global challenges through innovative solutions. This focus on scientific publication is essential for promoting sustainable development and enhancing the overall competitiveness of D-8 nations in the international arena.



## Strategic Questions for Future STI Cooperation

As D-8 countries seek to strengthen their STI cooperation, several critical questions remain open for further discussion and policy development. These questions address both opportunities and challenges in areas such as governance, funding, public-private partnerships, regulatory frameworks, and technological advancements.

By reflecting on these strategic issues, policymakers, researchers, and industry leaders can identify actionable solutions and enhance the effectiveness of STI collaboration within the D-8 framework.

### Governance and Institutional Frameworks

- How can D-8 countries establish a centralized STI governance mechanism that ensures policy coordination, funding distribution, and implementation of joint research initiatives?
- What lessons can D-8 countries learn from EU, BRICS, and ASEAN in developing an effective institutional framework for STI cooperation?
- Should the D-8 TTEN evolve into a permanent innovation agency with dedicated funding and decision-making authority?

### Funding and Investment Strategies

- How can D-8 countries develop a sustainable regional innovation fund, similar to Horizon Europe, to support joint R&D and industrial partnerships?
- What role should public-private partnerships (PPPs) play in bridging the funding gap for STI projects, and how can governments incentivize private sector participation?
- How can D-8 members ensure equitable distribution of STI funding, considering the varying economic and technological capabilities of different countries?

### Regulatory Frameworks and IP Protection

- What steps should D-8 countries take to harmonize IP laws, technology transfer policies, and R&D incentives to facilitate seamless cross-border collaborations?
- How can standardized IP frameworks and joint patenting initiatives encourage collaborative innovation within the D-8 region?
- What are the barriers to technology commercialization, and how can regulatory reforms in D-8 countries support faster market adoption of innovations?

### Emerging Technologies and Digital Transformation

- How can D-8 nations leverage AI, blockchain, quantum computing, and biotechnology to gain a competitive advantage in global STI ecosystems?
- What strategies should D-8 countries adopt to develop regional digital infrastructure, including 5G networks, cloud computing, and smart manufacturing?
- How can D-8 countries promote open innovation ecosystems that encourage knowledge-sharing while protecting national research priorities?

## Capacity-Building, Human Capital, and Knowledge Exchange

- How can D-8 countries enhance STEM education and vocational training to create a highly skilled workforce capable of driving future innovation?
- What role should international university partnerships and student exchange programs play in fostering scientific collaboration across D-8 nations?
- How can research mobility programs be expanded to encourage knowledge transfer and talent retention within the D-8 region?

## Global STI Engagement and Strategic Alliances

- How can D-8 countries strengthen their participation in global STI networks, such as UNESCO, WTO, and OECD, to influence international innovation policies?
- What are the best models of South-South cooperation in STI, and how can D-8 countries engage with emerging economies outside the bloc to expand collaboration?
- How can D-8 countries create a joint technology roadmap for achieving long-term STI leadership on the global stage?



### Author Details

#### Rasoul Rajaei

<sup>1</sup> School of Management and Accounting, Allameh Tabataba'i University, Tehran, Iran

<sup>2</sup> Pardis Technology Park, Tehran, Iran

<sup>3</sup> D-8 Technology Transfer & Exchange Network, Tehran, Iran

0000-0002-5661-316X    ✉ r\_rajaei@atu.ac.ir

#### Salar Ghadiri Alamdari

<sup>3</sup> D-8 Technology Transfer & Exchange Network, Tehran, Iran

0009-0007-4117-7047    ✉ d8tten@gmail.com

#### Soroush Ghazinoori

<sup>1</sup> School of Management and Accounting, Allameh Tabataba'i University, Tehran, Iran

<sup>4</sup> National Research Institute for Science Policy, Tehran, Iran

0000-0001-6356-0257    ✉ ghazinoori@atu.ac.ir

## References

- Archibugi, D., & Iammarino, S. (2002). *The globalization of technology and innovation: The role of international cooperation and the new models of innovation*. Oxford University Press.
- Chesbrough, H. (2003). *Open innovation: The new imperative for creating and profiting from technology*. Harvard Business Press.
- Cornell University, INSEAD, & WIPO. (2021). *Global Innovation Index 2021: Tracking innovation through the COVID-19 crisis*. World Intellectual Property Organization. <https://www.wipo.int>
- Etzkowitz, H., & Leydesdorff, L. (2000). The dynamics of innovation: From national systems and "Mode 2" to a triple helix of university–industry–government relations. *Research Policy*, 29(2), 109-123. [https://doi.org/10.1016/S0048-7333\(99\)00055-4](https://doi.org/10.1016/S0048-7333(99)00055-4)
- European Commission. (2020). *Horizon Europe: The EU's research and innovation program (2021-2027)*. <https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/home>



- Flink, T., & Schreiterer, U. (2010). Science diplomacy: A new approach to international cooperation in science and technology. *International Journal of Global Science and Technology*, 7(2), 77-91. <https://doi.org/10.1080/2152477X.2010.10884913>
- Hagedoorn, J. (2002). Inter-firm partnerships and alliances: An overview of the literature and a research agenda. *Journal of Management Studies*, 39(5), 561-584. <https://doi.org/10.1111/1467-6486.00323>
- Lundvall, B. (1992). *National innovation systems: Towards a theory of innovation and interactive learning*. Pinter Publishers.
- Maskus, K. E. (2004). Intellectual property rights in developing countries: The role of policy and the international system. *Journal of World Trade*, 38(2), 237-266.
- OECD. (2020). *OECD Science, Technology and Innovation Outlook 2020*. Organisation for Economic Co-operation and Development. <https://www.oecd.org/sti/outlook/>
- OECD. (2021). *Science, technology and innovation outlook 2021: The impact of digital transformation on innovation*. Organisation for Economic Co-operation and Development. <https://www.oecd.org/sti/>
- Turekian, V. C., et al. (2015). *Science diplomacy: A new approach to international cooperation in science and technology*. American Association for the Advancement of Science (AAAS).
- UNCTAD. (2020). *Technology and Innovation Report 2020*. United Nations Conference on Trade and Development.
- United Nations. (2015). *Paris Agreement*. <https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement>
- United Nations. (2021). *The 2030 Agenda for Sustainable Development*. <https://www.un.org/sustainabledevelopment/>
- UNESCO. (2021). *Science diplomacy: The importance of collaboration in a globalized world*. United Nations Educational, Scientific and Cultural Organization. <https://www.unesco.org/en/science-diplomacy>
- WIPO. (2020). *World Intellectual Property Organization: International cooperation for innovation*. <https://www.wipo.int>
- World Bank. (2021). *Building a competitive innovation economy in developing countries*. <https://www.worldbank.org>