BIISS JOURNAL, VOL. 47, NO. 3, JULY 2026:307–338
DOI: https://www.doi.org/10.56888/BIISSj2026V47n3a2
ISSN: 1010-9536 (Print)

Shanjida Shahab Uddin

ASSESSING BANGLADESH'S PROSPECTS WITH SOUTHEAST ASIA IN THE AREAS OF RARE EARTH ELEMENTS AND PORT CONNECTIVITY

Abstract

This paper analyses Bangladesh's prospects for strengthening and diversifying its engagement with Southeast Asian countries in two emerging sectors, namely Rare Earth Elements (REEs) and port connectivity. The paper envisions the need to explore new areas of cooperation beyond traditional domains of engagement such as trade, labour migration, and tourism. Given the evolving geopolitical and economic realities, the paper argues the need to explore new domains where enhanced economic resilience, supply-chain security, and sustainable development are possible. Collecting data from both primary and secondary sources, the study examines the comparative strengths of the Southeast Asian countries in the REE and port connectivity. The findings of the study specify that Southeast Asia has great potential for Bangladesh in terms of access to key mineral supply chains, technology transfer, human resource development, improved port management practices and regional-level maritime transportation networks. Furthermore, the paper outlines several challenges such as institutional and technological restrictions, fragmented regional REE chains, infrastructure gaps, digitalisation gaps and environmental governance issues. In response, the paper suggests several policy pathways, including strengthening institutional capacity, technological modernisation, and improving regulatory aspects to achieve sustainable cooperation in the fields of REE and port connectivity with the countries of Southeast Asia.

Keywords: Southeast Asia, Rare Earth, Port Connectivity, supply chain, resilient energy transition, Bay of Bengal

1. Introduction

Bangladesh's relations with the countries of Southeast Asia have been evolving, driven by mutual political, economic and cultural linkages. Yet, Bangladesh's engagement with Southeast Asian countries mostly revolves around traditional areas such as trade, labour migration, and tourism. As the world is increasingly experiencing geoeconomic and geopolitical developments notably the latest middle east crisis due to US-Israel war on Iran followed by the closure

Shanjida Shahab Uddin is Research Fellow, Bangladesh Institute of International and Strategic Studies (BIISS), Bangladesh. Her e-mail address is: shanjida.s.uddin@biiss.org

© Bangladesh Institute of International and Strategic Studies (BIISS), 2026

of the Strait of Hormuz, it is therefore become crucial for the developing country like Bangladesh to accelerate its economic growth and strengthen its sustainable development by exploring prospects in engaging more with developed regions like Southeast Asia. The country's ongoing transition from a Least Developed Country (LDC) status to a thriving developing economy also amplifies its quest to harness robust regional and extra-regional cooperation.1 By deepening ties with regional countries and beyond, Bangladesh can access broader markets, attract foreign investments and improve trade relations, which will catalyse industrialisation and technological advancements.[2] Moreover, such collaborations can provide capital, knowledge transfer and cutting-edge technologies which are crucial to infrastructure, energy, and human resource development. Collaborative efforts can speed up the country''s industrial development by enabling inclusivity in development. Furthermore, greater partnership at the bilateral and multilateral levels enables Bangladesh to have collective bargaining power so that its voice can be heard on global issues which directly impact its socio-economic course. Therefore, enhanced connectivity with regional and global partners can be a key tool for Bangladesh to achieve its vision of becoming a prosperous middle-income country.[3]

In the process of developing itself into a prosperous middle-income country, Bangladesh could benefit enormously from boosting its ties with the Southeast Asian nations. The Southeast Asian region has the potential to offer Bangladesh a wide array of growth opportunities with its vibrant economies and diverse cultures. In this regard, Southeast Asia, which is home to the dynamic bloc of ASEAN, already holds potential for Bangladesh. Bangladesh has also been active in various regional trade and development agreements, including the Association of Southeast Asian Nations (ASEAN) and the ASEAN Economic Cooperation Program (AECP). The region is an important market for Bangladesh's exports,[4] particularly in the textile and garment sector, which is the country's primary economic activity.[5] Another key element of Bangladesh's ties with Southeast Asia is labour migration. The substantial flow of remittances from Bangladeshi migrant workers highlights the growing

[1] Mustafizur Rahman and Estiaque Bari, "Pathways to Bangladesh's Sustainable LDC graduation: prospects, challenges and strategies," in *Bangladesh's Graduation from the Least Developed Countries' Group*, ed. Debapriya Bhattacharya (London: Routledge, 2018), 44.

[2] Atiur Rahman, "LDC Graduation: Implications for Bangladesh beyond 2026," *The Daily Star*, February 28, 2024, https://www.thedailystar.net/anniversary-supplement-2024/readying-the-next-big-leap/news/ldc-graduation-implications-bangladesh-beyond-2026-3554306

[3] KII Interview with a Professor at the Department of International Relations, University of Dhaka in January 2026.

[4] Mohammad Abdur Razzaque, Rabiul Islam Rabi and Barun Kumar Dey, "Fostering export diversification on Bangladesh," *ADB South Asia Working Paper Series*, No.100, 2024, https://www.adb.org/sites/default/files/publication/978066/sawp-100-fostering-export-diversification-bangladesh.pdf

[5] Selim Raihan, "Informal institutions, the RMG sector, and the present challenge of export diversification in Bangladesh," in *Is the Bangladesh Paradox Sustainable*, ed. Selim Raihan, Francois Bourguignon and Umar Salam (Cambridge: Cambridge University Press, 2024), 101-136.

significance of labour migration in bilateral relations between Bangladesh and the Southeast Asian countries, especially Malaysia, Singapore and Thailand. Tourism is also contributing to this relationship. Particularly, Medical tourism from Bangladesh to Southeast Asian countries has seen significant growth.[6] Due to affordable, high-quality healthcare services in countries like Thailand and Singapore, Bangladeshi tourists are increasingly visiting these destinations.[7]

Nonetheless, with the changing patterns in global political and economic developments, Bangladesh and the Southeast Asian countries need to go beyond the traditional fields of cooperation such as trade, investment, labour migration and tourism to achieve sustainable development. New spheres of cooperation may include REE and port-led connectivity. The critical mineral demand is projected to rise significantly in the coming decades, with demand increasing from 7.1 million tonnes in 2020 to 42.3 million tonnes in 2050.[8] In the REE sector, Southeast Asia is home to rich reserves of REE, as it hosts major deposits of these precious elements crucial to modern technologies such as electronics, renewable energy systems, and electric vehicles.[9] In the REE sector, Bangladesh, with its developing industrial base, has the opportunity to form some meaningful partnerships with Southeast Asian nations such as Vietnam and Thailand, which possess considerable reserves of such valuable elements. By acting collectively, Bangladesh will be able to have a steady supply of these essential minerals that will fuel its already growing manufacturing industry, particularly the high-tech industries.

In the domain of Port connectivity, it is well-known that Southeast Asia has some of the busiest and most efficient ports in the world, including Singapore, Malaysia, and Thailand.[10] If any meaningful cooperation can be operationalised in this domain, then Bangladesh, being at the crossroads of South and Southeast Asia, can reap the gains of port connectivity. Enhancing port infrastructure and improving logistical cooperation can help to decrease transportation costs and improve trade flows. The unique geographical position of Bangladesh also makes it an ideal partner for Southeast Asian countries to widen their sea routes in the Bay of Bengal. Hence,

[6] Ashraful Azad and Jennifer Vallentine, "Beyond Dichotomies: Bangladesh's complex migration landscape," *Mixed Migration Centre*, May 28, 2024, https://mixedmigration.org/bangladesh-complex-migration-landscape/
[7] Jagaran Chakma, "Thailand Sees Growing Influx of Patients from Bangladesh," The Daily Star, January 3, 2025, https://www.thedailystar.net/business/news/thailand-sees-growing-influx-patients-bangladesh-3790686
[8] Han Phoumin, "Southeast Asia's Potential in Critical Minerals," The Strategist, April 15, 2024. https://www.aspistrategist.org.au/southeast-asias-potential-in-critical-minerals/
[9] "Southeast Asia Strengthens Its Role in Rare Earth Supply Chain Diversification," *International Centre for Trade Transparency and Monitoring*, April 20, 2025, https://icttm.org/southeast-asia-strengthens-its-role-in-rare-earth-supply-chain/
[10] "Singapore and Shanghai Dominance: Inside the battle for maritime supremacy," *Ship Universe*, February 28, 2025, https://www.shipuniverse.com/singapore-and-shanghai-dominance-inside-the-battle-for-maritime-supremacy-%F0%9F%87%B8%F0%9F%87%AC-%F0%9F%87%A8%F0%9F%87%B3/

exploring joint investments in port infrastructure, such as the development of deep-water ports and the modernisation of ports and terminals, can improve access to regional and global markets.[11]

Despite the growing relevance of these issues, existing studies have largely examined Bangladesh's relations with Southeast Asia through the lenses of trade, investment and labour migration. While these areas are undoubtedly significant in accelerating bilateral relations, the existing literature largely overlooks other emerging new avenues of cooperation that can help strengthen ties between Bangladesh and Southeast Asia. Although available literature has discussed traditional sectors, especially in trade, labour migration and tourism, new emerging sectors like REE and port connectivity have not received enough attention. No scholarly literature can be found that specifically focuses on the opportunities Bangladesh can explore with the Southeast Asian region in the spheres of REEs and port connectivity. Further, both areas are growing more intertwined with the modern discourse on economic security, industrialisation and regional connectivity, but are still not well investigated within the realm of Bangladesh-Southeast Asia relations. Therefore, this research gap highlights the need for a dedicated evaluation of new opportunities and possible obstacles related to collaboration in the newer domains of REE and Port connectivity.

It is in this context that the core objective of this research paper is to evaluate the prospects for Bangladesh to enhance and diversify its engagement with Southeast Asian nations by enhancing its cooperation in two new and strategically important areas: REE and port connectivity. To accomplish this objective, the current paper attempts to answer two key research questions: first, what prospects do Southeast Asian countries present to Bangladesh in the domains of REE and port connectivity? And lastly, what challenges may affect Bangladesh's engagement with Southeast Asian countries in these areas, and how can Bangladesh develop effective policy approaches to make the most of the benefits of cooperation in REEs and port connectivity? To determine the comparative advantages of the relevant Southeast Asian countries and to reveal its position in these two areas, the paper looks at the possibilities of cooperation in these two future-oriented domains. By examining these issues, the present study seeks to contribute to the emerging body of literature on connectivity, critical minerals, maritime transport connectivity and regional cooperation as well as provide insights on how Bangladesh can strategically participate in an increasingly interconnected and competitive regional setting.

[11] Sohini Bose, "Bangladesh's Seaports: Securing Domestic and Regional Economic Interests," Observer Research Foundation, Occasional Papers, January 10, 2023, https://www.orfonline.org/research/bangladesh-s-seaports-securing-domestic-and-regional-economic-interests

In terms of methodology, the present paper follows a qualitative study to answer the research questions. Qualitative methods were used to collect data (both primary and secondary). The primary data were collected using key informant interviews of scholars, academics and practitioners with relevant expertise. The research also utilises an extensive body of secondary sources such as books, peer-reviewed research articles, policy and working papers, official reports of various organisations and opinion pieces in newspapers.

To convey the findings in an organised manner, the paper is organised in six sections, each reviewing a certain facet of the prospects of Bangladesh cooperation with Southeast Asia in REE and port connectivity. The second part of the paper then conceptualises the changing role of traditional spheres of cooperation to new strategic domains and explores the increasing importance of REEs and port connectivity to the economic sustainability of Bangladesh, supply chain security and the long-term development agenda. The third, fourth, and fifth sections of the study focus on the main objective of the research. In response to the first and a part of the second question, the third and fourth sections discuss opportunities and constraints to the involvement of Bangladesh in the interaction with Southeast Asia on the aspects of REE and port connectivity. Answering the other part of the second research question, the fifth section suggests several policy recommendations such as improving institutional capacity, evaluating regulatory frameworks and promoting technological modernisation. The paper ends with a conclusion summarising the main findings and outlining relevant policy pathways.

2. Importance of Exploring Prospects with Southeast Asia in the REE and Port Connectivity

With the rapidly evolving global and regional economic and geopolitical developments, the necessity to expand and diversify the engagement spheres of Bangladesh in Southeast Asia has been gaining greater importance. Traditionally, Bangladesh's interaction with the Southeast Asia region has been based on three pillars: trade, labour migration, and tourism. Although these areas of cooperation are still important and relevant, they do not have the full capacity to capture the possibilities that the 21st century global economy offers. In the present-day world, countries' future lies in how best they react to the technological changes, green transitions and digital interdependence. This necessitates Bangladesh to go beyond conventional collaboration and embrace a more strategic and multi-sectoral relationship with the Southeast Asian countries.[12] Southeast Asia is fast-growing as

[12] KII Interview with Senior Official from Southeast Asia Wing, Ministry of Foreign Affairs, Government of the Peoples' Republic of Bangladesh in April 2026.

an important hub in various sectors that will define the future, including its prowess in essential raw materials like REEs and its strength in regional port connectivity.[13] These new areas offer high-value prospects for Bangladesh, which are necessary to modernise its economy, enhance its infrastructure, as well as attain sustainable development.

Given the recent energy crisis, which was triggered by the disruptions around the Strait of Hormuz caused by the US-Israel war on Iran that began in February 2026[14], the prospects of Bangladesh in Southeast Asian countries concerning the REEs in the area have become more apparent. The high reliance on imported liquefied natural gas (LNG), specifically that of Qatar and Oman[15], has demonstrated the strategic vulnerability of relying on maritime chokepoints and an external chain of supply of fossil fuels.[16] As approximately one-third of the country's gas is imported through the Strait of Hormuz, any geopolitical disruptions in this critical chokepoint can have direct effects on domestic energy security, industrial activities and economic stability.[17] The fuel rationing and load-shedding in Bangladesh caused by the recent blockade in the Strait of Hormuz is such an example.[18] It not only influences household consumption, but it also poses a threat to export-oriented sectors, in particular the ready-made garments (RMG) sector, which has been at the centre of Bangladesh's economy. It is in this context that the need to diversify energy sources is no longer a development agenda, but a strategic imperative. In that regard, the involvement of Southeast Asian countries in the sphere of REEs has a considerable impact on Bangladesh's long-term resilience and energy transition. Moreover, as the global economy turns towards green energy technologies, high-efficiency solar panels, permanent magnets in wind turbines, electric mobility technologies, and battery storage systems have become strategic resources requiring REEs.[19] In the case of Bangladesh, the country has committed to producing 20 per

[13] "Resource-based Downstream Diversification, critical minerals, and industrial policy: The case of selected Southeast Asian countries," in *Downstream Diversification of Mineral-rich countries*, Springer Nature, https://link.springer.com/chapter/10.1007/978-3-032-06139-3_11

[14] Samantha Gross and Ryan Beane, "From Chokepoint to Crisis: The Strait of Hormuz and Global Oil Markets," *Brookings*, 8 June 2026, https://www.brookings.edu/articles/from-chokepoint-to-crisis-the-strait-of-hormuz-and-global-oil-markets/

[15] Eyamin Sajid, "War in Middle East Threatens Bangladesh's Energy Security," Energy Tracker Asia, 18 March 2026, https://energytracker.asia/war-in-middle-east-threatens-bangladeshs-energy-security/

[16] "Restive Hormuz Puts Bangladesh's LNG lifeline in Peril," *The Daily Star*, 3 March 2026, https://www.thedailystar.net/business/news/restive-hormuz-puts-bangladeshs-lng-lifeline-peril-4119546

[17] Sakina Binte Belayet and Sadia Karim, "When Hormuz Stops: What a Strait Closure Would Mean for Bangladesh's Energy Security," *LightCastle Partners*, 16 March 2026, https://lightcastlepartners.com/insights/2026/03/what-hormuz-strait-closure-mean-for-bangladesh/

[18] "Bangladesh Shuts Universities, Limits Fuel Sale as Iran War Causes Shortage, *Aljazeera*, 9 March 2026, https://www.aljazeera.com/news/2026/3/9/bangladesh-shuts-universities-limits-fuel-sale-as-iran-war-causes-shortage

[19] Andrea Willige, "Why We Need Critical Minerals for the Energy Transition," World Economic Forum, 13 May 2025, available at https://www.weforum.org/stories/2025/05/critical-minerals-energy-transition-supply-

cent of its power through renewable energy by 2030.[20] Therefore, access to such essential resources is invaluable for countries like Bangladesh. Hence, collaborations with Southeast Asian countries, including most of them, which are emerging players in critical mineral supply chains and processing capacities, can assist Bangladesh to gain better access to these strategic resources and avoid dependence on sensitive sources of traditional energy.

Another future-oriented area of collaboration could be cooperation in port connectivity with major Southeast Asian seaports. The latest disruptions in the Strait of Hormuz showed how any major disruptions in key maritime chokepoints could create significant economic and logistical challenges for Bangladesh. One of the major challenges could occur in the event of any major maritime chokepoint disruption: trade delays and rising shipping costs.[21] The country experienced significantly higher transit time, shipping and freight charges, insurance premiums and fuel prices during the closures of the Strait of Hormuz.[22] Bangladesh imports most of the raw materials, machinery, chemicals, cotton, yarn, and intermediate materials from East Asia, Southeast Asia, and the Middle East. Unstable seas, therefore, may postpone shipments of industrial components, impacting manufacturing processes and export delays.

From this perspective, given the geographical location of Bangladesh having 710km coastline with direct access to Bay of Bengal, enhanced collaboration between the three operational seaports of Bangladesh and the major ports of Southeast Asia could support Bangladesh to build maritime resilience in various ways.[23] From a transhipment point of view, if Bangladesh is able to establish strong partnerships with major ports in Southeast Asia, such as the Port of Singapore, Port of Tanjung Pelepas, Port Klang, and Laem Chabang Port. It could offer them alternative transhipment and cargo-routing options in the event of a crisis. Better cooperation among Bangladeshi seaports and seaports in Southeast Asian countries could also help strengthen the regional production

chain-challenges/

[20] Shafiqul Alam, "Getting Bangladesh's Renewable Energy Transition on Track," 3 February 2026, https://ieefa.org/resources/getting-bangladeshs-renewable-energy-transition-track

[21] Kristian Coates Ulrichsen and Jim Krane, "Maritime Chokepoints and Risks to Global Shipping and Energy Security," *Baker Institute for Public Policy*, 2026, https://www.bakerinstitute.org/sites/default/files/2026-03/20260316-Maritime%20Chokepoints.pdf

[22] Asifur Rahman, "Bangladesh Highly Exposed to Hormuz Squeeze," *The Daily Star*, 10 June 2026, https://www.thedailystar.net/news/bangladesh/news/bangladesh-highly-exposed-hormuz-squeeze-4140506

[23] Rear Admiral M Khaled Iqbal, "Prospects for Port-led Regional Maritime Connectivity in Bay of Bengal: Way Ahead," *Bangladesh Maritime Journal* 6, no. 1 (2022), https://bsmrmu.edu.bd/public/files/econtents/621c7b59d5e021-Prospects%20for%20Port%20Led%20Regional%20Maritime%20Connectivity%20in_compressed.pdf

and distribution networks within the Bay of Bengal.[24] More importantly, joint arrangements between Bangladeshi and Southeast Asian seaports may provide an opportunity for joint contingency planning in the event of a disruption of important maritime chokepoints. This may encompass shared warehousing, emergency cargo handling arrangements, priority berthing systems and regional feeder shipping services to ensure the continuation of trade in the event of any kind of crisis.[25]

Hence, due to these evolving global and regional economic and geopolitical developments, exploring prospects with Southeast Asian countries in the areas of REEs and port connectivity has become increasingly important for Bangladesh. Recent events affecting major maritime chokepoints and the gradual global shift towards clean energy technologies have highlighted the need for Bangladesh to strengthen its economic resilience, diversify partnerships, and expand connectivity beyond the region. Therefore, the potential in the areas of REEs and port connectivity with Southeast Asian countries is explored in the next sections of the paper and its potential importance for the sustainable development of Bangladesh.

3. Understanding prospects in REE and Port Connectivity

Rare Earth Elements (REEs) are increasingly important resources which support clean energy technologies, advanced electronics and defence industries. In terms of REE, Southeast Asia has enormous potential at various stages of the its supply chain. Also, Southeast Asia has been home to some of the world's largest ports that can offer great potential to further enhance connectivity, trade ties, and participation in regional and international supply chains. In this context, this section attempts to explore the potential of Bangladesh in REE and port connectivity with Southeast Asia.

3.1 *Status of Rare Earth Elements in Southeast Asian Countries*

In today's world, REEs are integral to the modern era's clean energy solutions, high-tech electronics and defense sector, making them a key component of contemporary geo-economic development.[26] Although Southeast Asia has

[24] Chathumi Ayanthi Kavirathna, "Transshipment Hubs in the Bay of Bengal Region," *Centre for Social and Economic Progress*, 14 February 2023, https://csep.org/reports/transshipment-hubs-in-the-bay-of-bengal-region/

[25] KII Interview with Senior Assistant Secretary, Port Wing, Ministry of Shipping, Government of the People's Republic of Bangladesh in February 2026.

[26] Gloria Lin, "Southeast Asia's potential role in rare earth elements diversification," Eco-Business, [20] April 2025,

notable strengths at every segment of the REE supply chain, Bangladesh, despite being resource-limited in this sector, has the potential to be a strategic partner through technology partnership, investment links and knowledge sharing. In this context, this study explores the evolving dynamics of REE supply chains in Southeast Asia and outlines some opportunities for Bangladesh to become more involved in this new strategic sector in the context of its wider connectivity and trade activities outside the South Asian region.

Table 1: Rare Earth Elements in Southeast Asian countries

Country	Known reserves	Exploration/ production status	Major Locations	Strategic Importance	Limitations
Vietnam	3.5 million tonnes (6th globally)[27]	Exploration ongoing, limited commercial production[28]	Dong Pao mine in Lai Châu, Nam Xe, Yen Phu, Muong Hum, Coastal Mineral Sands (Quảng Ninh → Bà Rịa–Vũng Tàu)[29]	Potential regional supplier[30]	High production costs, limited technology, foreign dependency[31]
Thailand	0.45 million tonnes (12th globally)[32]	Ongoing exploration, some pilot projects[33]	Southern Peninsular, Jarin Tin mine, Kanchanaburi, Ranong, Phuket[34]	Potential regional supplier[35]	Environmental concerns, unregulated mining due to informal or illicit mining agreement[36]

https://www.eco-business.com/opinion/southeast-asias-potential-role-in-rare-earth-elements-diversification/

[27] Ngoc Trang, "Vietnam Joins the World's Top Tier of Rare Earth Suppliers," VnEconomy, 27 November 2025, available at https://en.vneconomy.vn/vietnam-joins-the-worlds-top-tier-of-rare-earth-suppliers.htm

[28] Nguyen Huu Hoai, "Rare Earth Exploration – A Promising Industry for Vietnam," Russin & Vecchi, https://www.russinvecchi.com.vn/wp-content/uploads/2024/04/english-version-rare-earths-exploitation-a-promising-industry-for-vietnam-nhh-29-sep-23.pdf

[29] Rare Earth Mining. "Vietnam Rare Earth," June 26, 2026, Rare Earth Mining.

[30] Le Hong Hiep, "Vietnam's Rare Earth Ambitions: Economic and Strategic Drivers", Fulcrum, 8 November 2023, available at https://fulcrum.sg/vietnams-rare-earth-ambitions-economic-and-strategic-drivers/

[31] Iftah Al Aqliyah, "Vietnam's Challenges to be Critical Mineral Powerhouse," Centre of Geoeconomics for the Global South, https://thegeoeconomics.com/vietnams-challenges-to-be-critical-mineral-powerhouse/

[32] "Where are Thailand's rare-earth elements that US seeks found?" Thai Newsroom, 30 October 2025, https://thainewsroom.com/2025/10/30/where-are-thailands-rare-earth-elements-that-us-seeks-found/

[33] Yada Harirakphithak, "Rare Earth: The Precious Underground Resource the World Is Watching — A New Resource and a Golden Opportunity for Thailand's Economy," Department of Geology, Faculty of Science, Chulalongkorn University, 26 March 2026, available at https://www.chula.ac.th/en/highlight/294721/

[34] "Unearthing Thailand's rare earth treasure: where are they hidden?" The Nation, 27 October 2025, https://www.nationthailand.com/news/general/40057375

[35] "Thailand Plays the Rare Earth Game-Quietly but Strategically," Rare Earth Exchanges, 29 October 2025, https://rareearthexchanges.com/news/thailand-plays-the-rare-earth-game-quietly-but-strategically/

[36] Thailand faces severe transboundary pollution crisis from rare earth mining in Myanmar," 24 June 2025, The Nation, https://www.nationthailand.com/sustaination/40051672

Malaysia	No official estimates but unofficial claim is around 16.2 million tonnes[37]	Thriving production capacity[38]	Terengganu, Kelantan, Pahang, Perak, and Kedah[39]	Strategic processing role; prospects for becoming a hub for ASEAN to global REE value chains[40]	Inconsistent government policies, public protests, environmental concerns[41]
Indonesia	No official estimates	Some pilot extraction executed[42]	Bangka Belitung, Mamuju, West Sulawesi, and Parmonangan in North Sumatra and West Kalimantan[43]	Could be Potential regional supplier if reserves confirmed and exploration executed[44]	Lack of processing tech, focus on nickel over REE[45]
Philippines	No official estimates.	Early stage of exploration[46]	Surigao, Davao de Oro, and South Cotabato[47]	Could be Potential regional supplier if reserves confirmed and exploration executed[48]	Lack of advanced processing technology, Policy uncertainty, environmental vulnerabilities[49]

[37] "Malaysia set to advance rare earth industry with RM809bil resource potential," Straits Times, 3 November 2025, https://www.nst.com.my/business/economy/2025/11/1307410/malaysia-set-advance-rare-earth-industry-rm809bil-resource
[38] Adam Aziz, "Malaysia at a crossroads in bid to become key rare earth hub amid US-China rivalry," The Edge Malaysia, 5 January 2026, https://theedgemalaysia.com/node/787380
[39] "Rare Earth: An Invaluable Element for Malaysia," Malaysian Investment Development Authority, https://www.mida.gov.my/rare-earth-an-invaluable-element-for-malaysia/
[40] Christopher Lim, "Across the Malaysian Peninsula, a Rare Earth Tide Is Turning," The ASEAN Frontier, 8 January 2026, https://theaseanfrontier.com/p/across-the-malaysian-peninsula-a
[41] Amalia Azmi and Hakim Mahari, "Malaysia faces major hurdles in developing rare earth industry, says Johari," 19 November 2025, Straits Times, https://www.nst.com.my/news/nation/2025/11/1318637/malaysia-faces-major-hurdles-developing-rare-earth-industry-says-johari
[42] "Indonesia identifies eight blocks with large rare earth reserve potential," Reuters, 9 February 2026, https://www.reuters.com/world/asia-pacific/indonesia-identifies-eight-blocks-with-large-rare-earth-reserve-potential-2026-02-09/
[43] Shree Mishra, "Rare earth potential discovered in eight Indonesian blocks," Mining Technology, 10 February 2026, https://www.mining-technology.com/news/rare-earth-potential-discovered-indonesian-blocks/
[44] Donnie Trisfian, "Indonesia Holds Rare Earth Potential, UGM Expert Highlights Prospective Areas and Extraction Technology Challenges," Universitas Gadjah Mada, 27 February 2026, https://ugm.ac.id/en/news/indonesia-holds-rare-earth-potential-ugm-expert-highlights-prospective-areas-and-extraction-technology-challenges/
[45] M Gusmana, A Sepriantib, YM Anapertac, R Anartad and HA Rahmane, "A Study of Potential and Environmental Impact of Rare-Earth Elements of Tin Mining in Indonesia: A Review," *Journal of Physics:* Conference Series 29 no.07 (2024), https://iopscience.iop.org/article/10.1088/1742-6596/2907/1/012018/pdf
[46] John P. Causey IV, "The Philippines' Rich Mineral Endowment Still Largely Untapped," Vantage, 2 September 2025, https://www.vantagefdi.com/briefs/philippines-untapped-mineral-wealth
[47] Tony Peralta, "Can Mindanao's rare earth metals and critical mineral resources propel the island's growth and development?" Minda News, 17 May 2026, https://mindanews.com/mindaviews/2026/05/development-perspectives-can-mindanaos-rare-earth-metals-and-critical-mineral-resources-propel-the-islands-growth-and-development/
[48] "Philippines Rare Earth: Key Deposits & Strategic Role," Ra*re Earth Mining News*, 11 May 2026, https://rare-earth-mining.com/philippines-rare-earth/
[49] Christine R. Mapa, "Untapped potentials: rare earth elements in the Philippines," Manila Observatory, 16 July 2025, https://www.observatory.ph/2025/07/16/untapped-potentials-rare-earth-elements-in-the-philippines/

Singapore	No REE reserves	No exploration and mining activities	N/A	Could be a hub for processing and trading REEs[50]	Lack of REE reserves, small concentration of supply chain, dependency on REE import[51]
Myanmar	No official estimates, but unofficially recognised as the largest reserve of REE[52]	Informal mining activities[53]	Northern Myanmar particularly Kachin state – Chipwi and Pangwa[54]	Major supplier of China's REE industry[55]	Illegal mining, weak regulation, political instability[56]
Laos	No official estimates, but possibility of having big reserve[57]	Limited exploration[58]	Northern Xieng Khouang and Houaphanh province[59]	Confirmed reserve could strengthen the regional supply of REE[60]	Mismanagement in exporting REEs, Lack of geological data, lack of technological strength[61]

[50] Sharon Seah and Mirza Sadaqat Huda, "Enhancing ASEAN's role in critical mineral supply chains," Yousof Ish*ak Institute,* 2024, https://www.iseas.edu.sg/wp-content/uploads/2024/01/TRS3_24.pdf
[51] Lewis Ong Yong Huat, "Singapore's critical minerals challenge: Small nation, big stakes," Think China, https://www.thinkchina.sg/economy/big-read-singapores-critical-minerals-challenge-small-nation-big-stakes
[52] Dylan Butts, "How war-torn Myanmar plays a critical role in China's rare earth dominance," CNBC, 23 June 2025, https://www.cnbc.com/2025/06/24/chinas-rare-earth-dominance-myanmar-plays-a-critical-role-.html
[53] Mathis Richtmann, "The dirty secrets behind Myanmar's rare-earths boom," Deutsche Welle, 24 May 2025, https://www.dw.com/en/the-dirty-secrets-behind-myanmars-rare-earths-boom/a-72530460
[54] "" Unearthing the Coast: Rare Earth mining in Myanmar's war-torn regions", ISP-Myanmar, June 2025, available at https://ispmyanmar.com/wp-content/uploads/2025/06/Rare-Earth-Mining-in-Myanmars-War-Torn-Regions.pdf
[55] Latoya Abulu & Sonam Lama Hyolmo, Mongabay, "Myanmar: Expansion of Chinese-backed rare earth mining in Kachin state causes deforestation and community health harms, says report," Business and Human Rights Centre, 16 September 2025, https://www.business-humanrights.org/en/latest-news/myanmar-expansion-of-chinese-backed-rare-earth-mining-causes-deforestation-and-community-health-harms-says-report/
[56] Regan Kwan, Brian Eyler and Surachanee Sriyai, "Mining, Conflict, and Environmental Action in Myanmar's Borderlands," *Stim*son Centre, 27 May 2026, https://www.stimson.org/2026/mining-conflict-and-environmental-action-in-myanmars-borderlands/
[57] Phouphet Kyophilavong, "Laos and the Heavy Rare Earth Frontier: Opportunity, Risk, and the Battle for Supply Chains," Rare Earth Exchanges, 5 March 2025, https://rareearthexchanges.com/news/laos-and-the-heavy-rare-earth-frontier-opportunity-risk-and-the-battle-for-supply-chains/
[58] "Gov't tightens management of rare earth mining," KPL, 10 March 2023, https://kpl.gov.la/En/detail.aspx?id=77031
[59] Phouphet Kyophilavong, "Laos, Heavy Rare Earths, and the Mekong's Quiet Emergency", 13 March 2026, available at https://rareearthexchanges.com/news/laos-heavy-rare-earths-and-the-mekongs-quiet-emergency/
[60] Phouphet Kyophilavong, "Laos and the Heavy Rare Earth Frontier: Opportunity, Risk, and the Battle for Supply Chains," Rare Earth Exchanges, 5 March 2026, https://rareearthexchanges.com/news/laos-and-the-heavy-rare-earth-frontier-opportunity-risk-and-the-battle-for-supply-chains/
[61] Lamxay Duangchan, "Calls to tighten mining safety regulations in Laos," Mekong Eye, 7 October 2024, https://www.mekongeye.com/2024/10/07/laos-rare-earth-leak

Brunei	No significant reserve	No mining activity	N/A	N/A	No resource base
Timur-Leste	No official estimate on significant reserve.	No local mining activity but has partnership with foreign companies[62]	No significant reserves identified	N/A	No known resource base

From Table 1, it can be understood that although Southeast Asia presents prospects in terms of REE reserves, mining, refining, and trading, it also exhibits an uneven landscape regarding REE due to countries' different stages in dealing with REE. While the region may be able to join the global supply chain for REEs, the uneven distribution of REE resources in Southeast Asia indicates uneven progress, both in upstream and downstream, in mining and processing and integration.

In the above-mentioned Table 1, it is also observed that the distribution of REEs across Southeast Asia highlights uneven progress along the supply chain, from upstream extraction to downstream processing and integration. At the upstream stage, Vietnam is the country with the largest reserves, estimated at 3.5 million tonnes, ranking sixth in the world. But the small capacity for production and reliance on foreign technology restrict its capacity to scale up extraction, and this is a mismatch between industrial capacity and geological potential. Thailand has smaller but important reserves. But the country is facing environmental and governance issues because of unregulated mining, which limits its capacity to move to formalised production from pilot mining. Malaysia is a special case. While there are no official reserve estimates, it has become an important midstream player, having developed a solid processing industry and is becoming an important regional hub. However, it is unclear whether REE will continue to be a long-term option for Malaysia as it has inconsistent government policy and faces high public opposition to REE projects. In the case of Indonesia and the Philippines, the exploratory phase is reached with preliminary extraction work in the nickel-rich regions. This is because structural constraints in both countries hinder progress beyond the upstream stage of the industry, such as technology constraints, policy instability, and environmental protection. Myanmar's informal mining contributes to China's REE supply chain, highlighting its strategic significance but also the challenges arising from political turmoil and poor oversight. Other nations, such as Laos or Timor-Leste, have potential deposits which have not yet been verified, and whose contribution remains uncertain. In the downstream stage,

[62] André de Sousa Vieira, Soraia Marques, Lukeno Ribeiro Alkatiri, Mónica Pimenta, "The Kick-Start of The Mining Industry In Timor-Leste," Morais Leitão Legal Circle, 10 December 2025, https://www.mlgts.pt/xms/files/site_2018/guias/2025/The_kick-start_of_the_mining_industry_in_Timor-Leste.pdf

Singapore has become a potential logistics centre for processing and trading of REE due to its sophisticated logistics systems. Taken together, the REE supply chain in Southeast Asia shows a disjointed picture. The region represents good upstream supply potential in Vietnam and Myanmar, midstream processing capacity in Malaysia and downstream logistics capacity in Singapore.

3.1.1. *Bangladesh's Capacity in Rare Earth Elements and Prospects of Cooperation with SEA*

In the case of Bangladesh, the country's potential for REE remains largely exploratory, with early indications of the presence of minimal deposits along coastal and major river systems. Based on the information from Bangladesh Atomic Energy Commission (BAEC), a synthesised table has been given below to display the status of Bangladesh in the REE field.

Table 2: Rare Earth Elements in Bangladesh

Known Reserve	• 17,352 MT of monazite in 17 heavy-mineral deposits (BAEC surveys up to 1986).[63] Kutubdia Island shows an average abundance of 69.67%, while Moheshkhali Island averages 9.32%.[64] • No confirmed economically viable REE reserve yet; indications only.
Major Locations	• Coastal placer deposits (Cox's Bazar region: Kutubdia, Moheshkhali, Sonadia) due to monazite enrichment.[65] • Fluvial placer sands in river (Padma–Jamuna–Brahmaputra system).[66] • Offshore coastal areas are under preliminary survey.
Exploration status	• No dedicated REE exploration by any institution.

Table 2 clearly shows that the geology of REE resources in Bangladesh is potentially rich but institutionally underexplored. The available evidence indicates that

[63] "Salient Features of Bangladesh Beach Minerals," Report Published by Beach Sand Minerals Exploitation Center (BSMEC), Bangladesh Atomic Energy Cooperation, 2004.

[64] Farah Deeba, Syed Hafizur Rahman, Mohammad Zafrul Kabir and Mohammad Rajib, "Geochemical Characterization and Presence of Rare Earth Elements in the Recent Depositions at the Islands of the Eastern Bay of Bengal, Bangladesh," *International Journal of Economic and Env*ironmental Geology 111 (2020): 40-47.

[65] Farah Deeba et al., "Geochemical Characterization and Presence of Rare Earth Elements in the Recent Depositions at the Islands of the Eastern Bay of Bengal, Bangladesh"

[66] Mohammad Rajib, Chiaki T. Oguchi, "Radioactive and Rare Earth Containing Materials in Beach Minerals of Bangladesh: A SEM Study," 2020, https://www.researchgate.net/publication/342716562_Radioactive_and_Rare_Earth_Containing_Materials_in_Beach_Minerals_of_Bangladesh_A_SEM_Study

the REEs in the country are mainly related to long-term sedimentary processes to form coastal and fluvial placer deposits.[67] The highest concentrations are found in the coastal belt in the Southeast, especially in the Cox's Bazar area with islands like Kutubdia, Moheshkhali and Sonadia.[68] Besides the coastal deposits, REE minerals have been found in the river bar sediments of river Padma, Jamuna and Brahmaputra. The source rocks for these deposits are believed to be the igneous and metamorphic rocks in the Himalayas, Indo-Burman ranges and Shillong plateau. The minerals being carried down by the rivers and concentrated by coastal hydrodynamic processes.[69]

Mineralogically, REEs in Bangladesh are not found as independent ores, but are present in heavy mineral assemblages. The host mineral in Monazite is the principal mineral, and it is the source of the majority of REEs (as well as smaller amounts of elements such as Cerium, Lanthanum, Yttrium, and Neodymium), while zircon is also a minor source of REEs, along with zirconium and uranium. The associated minerals, such as Ilmenite, Magnetite, Rutile and garnet are part of the larger group of heavy mineral sand deposit associated minerals.[70] Geochemical analyses also show that the most abundant REE in these deposits is usually cerium, which can constitute up to 32 per cent of some monazite grains, followed by lanthanum at about 10 per cent.[71] The BAEC has estimated the quantity of monazite deposits to be around 17,352 tons in 17 deposits.[72] The distribution of heavy minerals is, however, not uniform, for instance, the average heavy mineral content is almost 70 per cent in Kutubdia Island while it is much lower in Moheshkhali Island. A second characteristic feature of these deposits is their natural radioactivity, essentially from the presence of thorium in monazite and uranium in zircon.[73] Radiation levels have been measured high above background in certain sites like Kalatoli beach.

[67] Mohammad Rajib, Md Moniruzzaman and Chiaki T Oguchi, "Potentiality of Geomorphological Prospecting for Economic Minerals in Fluvial Environment of Bangladesh," *Japanese Geomorphological Union* 36, no.1 (2015).

[68] Mohammad Tofayal Ahmed, Minhaj Uddin Monir, Mohammad Rajib, Shaheen M. Sarkar, Yeasir Hasan, Chowdhury Quamruzzaman, Azrina Abd Aziz, Mohammad Forrukh Hossain Khan, Nazmul Hossain, Fahad Hossain, Faysal Ahamed Akash and Shaik Muntasir Shovon, "Heavy minerals identification and extraction along coastal sediments using placer mining technique," *Journal of Sedimentary Environments* (2022), https://doi.org/10.1007/s43217-022-00120-8

[69] Farah Deeba et al, "Geochemical Characterization and Presence of Rare Earth Elements in the Recent Depositions at the Islands of the Eastern Bay of Bengal, Bangladesh."

[70] Md. Mashrur Zaman, Mohammad Rajib, Mohammad Zafrul Kabir, Farah Deeba, Syed Masud Rana, Syed Mohammod Hossain, Sk. Abdul Latif and Md. Golam Rasul, "Presence of uranium and thorium in zircon assemblages separated from beach sands of Cox's Bazar, Bangladesh," *Journal of Science, Technology & Environment Informatics* 03, no. 01 (2016): 161-169, http://www.journalbinet.com/jstei-volume-03.html

[71] Mohammad Rajib, Chiaki T. Oguchi, "Radioactive and Rare Earth Containing Materials in Beach Minerals of Bangladesh: A SEM Study," 2020

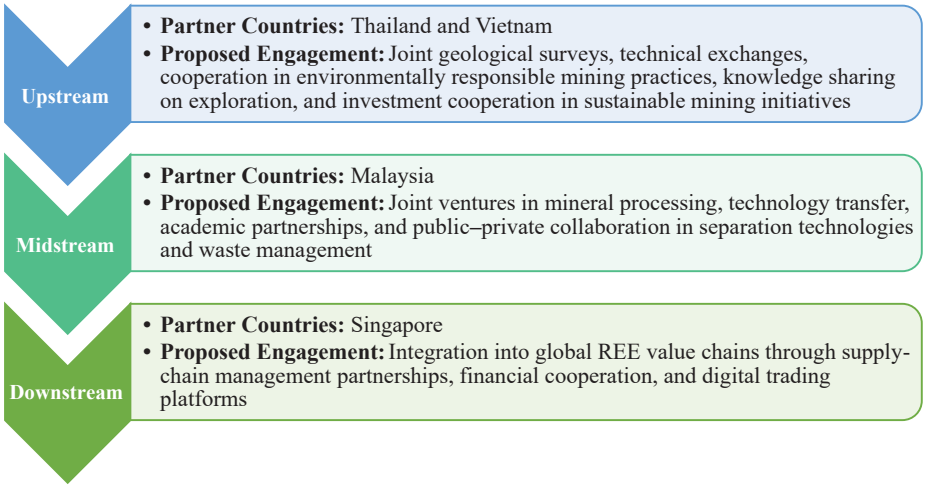
[72] "Salient Features of Bangladesh Beach Minerals," Report Published by Beach Sand Minerals Exploitation Center (BSMEC), Bangladesh Atomic Energy Cooperation, 2004.

[73] Md. Mashrur Zaman, Mohammad Rajib, Mohammad Zafrul Kabir, Farah Deeba, Syed Masud Rana, Syed Mohammod Hossain, Sk. Abdul Latif and Md. Golam Rasul, "Presence of uranium and thorium in zircon assemblages separated from beach sands of Cox's Bazar, Bangladesh," 2016.

Although Bangladesh has some promising geological resources, the exploration and utilisation of REEs in Bangladesh are still in an infant stage. At present, there is no specific exploration framework for the REEs, and the majority of available information is of a broader nature, from the general heavy mineral surveys. However, the fact that these elements are present also means that there may be potential for resource development, especially if REEs could be recovered as by-products from existing heavy mineral processing plants.

In assessing the prospects for Bangladesh's potential engagement with Southeast Asian countries in the REE sector, it is important to recognise that the increasing strategic and industrial significance of REEs offers new avenues for collaboration. Being Southeast Asian countries in various stages of REE supply chain, there are good prospects for Bangladesh to explore cooperation with Southeast Asian countries in various stages of the REE supply chain. Bangladesh's underdeveloped competency portfolio—with considerable upstream reserves available in Vietnam, midstream processing facilities in Malaysia and downstream trading and logistics facilities in Singapore—can follow a multi-tiered engagement strategy, based on its own industrial and technological aspirations. In the upstream segment, Bangladesh could engage in bilateral geological surveys and technical exchanges with Vietnam and Thailand, and invest in environmentally sustainable mining operations to access supply chains, while also promoting regional sustainability initiatives. Joint ventures with Malaysia's well-developed processing industry and technology transfer and institutional collaboration, especially in the form of public/private collaborations in the mineral processing and separation sector, waste management, and other related areas can be considered. Moreover, Singapore can be an important link for Bangladesh to enter into REE supply chain by utilising its financial expertise, supply-chain management and digital trading platforms. Such collaboration can lead to diversification in the sources of critical minerals for Bangladesh and integrate the nation as a potential player in the REE technologies, which are becoming pivotal for accomplishing sustainable development. Thus, Bangladesh's approach to Southeast Asia in REE can be understood as a multi-layered engagement plan. The process chart below integrates the information and puts it in a sequence of upstream, midstream and downstream engagement levels.

Chart 1: Bangladesh's multi-tiered engagement strategy with Southeast Asian countries in REE



3.2. *Port Connectivity*

In the realm of port connectivity, Southeast Asian seaports have emerged as highly efficient and deeply interconnected maritime hubs in the Bay of Bengal region. Considering the geographical position of Bangladesh and direct access to the Bay of Bengal, enhanced cooperation between its three operational seaports and major ports in Southeast Asia could play a key role in enhancing the country's maritime resilience. Enhanced port-to-port connectivity can help increase trade facilitation, access to regional and global supply chains and opportunities for port management and logistic related knowledge and technology transfer. In this context, this sub-section first attempts to understand the top seaports of Southeast Asia and their salient features before exploring the opportunities that these port can offer to Bangladesh.

3.2.1 *Status of the Ports in Southeast Asia*

These seaports can be characterised by large operational scale, high frequency of vessel calls, advanced cargo-handling capabilities, and extensive integration into global shipping networks. According to Lloyd's List One Hundred Container Ports 2025, Port of Singapore has secured the leading position among Southeast Asian ports while ranking second globally, underscoring its dominance in global maritime trade. Malaysia is well positioned to have two major ports, namely Port Klang (ranked 10th in the world) and Port of Tanjung

Pelepas (ranked 15th in the world) marking its high regional maritime presence. Thailand has firmly established its footing with Laem Chabang Port (20th globally), while Vietnam has made significant strides with three ports in the top 30: Port of Ho Chi Minh City (22nd), Port of Hai Phong (29th) and Cai Mep-Thi Vai Port (30th). Likewise, Indonesia's presence is supported by the Port of Tanjung Priok (26th) and the Port of Tanjung Perak (47th). The Philippines secures its position through the Port of Manila (36th worldwide).[74] Collectively, these rankings underscore a geographically distributed but coherent set of ports with high performance in Southeast Asia.

The first four container ports out of these top 10 Container ports are the high-performing ports that represent the gold standard for maritime efficiency. They have been able to operate successfully with good governance and effective coordination of maritime transport connectivity. Through their technological prowess and efficient regulatory processes, these ports are key to ensuring smooth and seamless trade, handling large volumes of containers with ease. The 'top four ports' have been identified based on the Lloyd's List One Hundred Container Ports 2025 and other port efficiency reports, and their operational characteristics are shared below:

[74] *Lloyd's List*, *One Hundred Container Ports 2025* (London: Informa PLC, 2025), https://www.lloydslist.com/one-hundred-container-ports-2025.

Table 3: Operational characteristics of the leading four ports

Ports	Throughput capacity	Infrastructural excellence	Digitalisation	Environment, Social and Governance (ESG)
Port of Singapore (Singapore)	44.66 million Twenty-foot Equivalent Units of container throughput in 2025 – a 3.5% and 8.6% increase from 2024.[75]	• Multiple terminals (including 5 container terminals, 3 ferry terminals & 2 cruise terminals)[76] • world's largest bunkering hub, handling 56.2 million metric tons of marine fuel in 2025[77] • Navigation excellence by utilising STRAITREP mandatory ship reporting system[78]	Uses its advanced DigitalPORT@SG™ system, which streamlines clearance processes by consolidating 16 forms into a single platform, as a model for international Maritime Single Windows (MSW)[79]	• Ranked first on Liner Shipping Connectivity Index[80] • Participates in Green Shipping Corridors for zero-carbon fuels; Singapore-Rotterdam green shipping corridor[81] and Los-Angeles-Long Beach-Singapore green shipping corridor[82]

[75] Singapore Posts Record Port Performance in 2025 and Develops Future Readiness through Industry Collaborations for 2026, https://www.mpa.gov.sg/media-centre/details/singapore-posts-record-port-performance-in-2025-and-develops-future-readiness-through-industry-collaborations-for-2026

[76] Maritime and Port Authority of Singapore, "Terminals," June 26, 2026. https://www.mpa.gov.sg/port-marine-ops/operations/port-infrastructure/terminals

[77] Ship & Bunker News Team. "ANALYSIS: Singapore Annual Bunker Sales Reach New Record High in 2025," *Ship & Bunker*, January 13, 2026, https://shipandbunker.com/news/apac/456201-analysis-singapore-annual-bunker-sales-reach-new-record-high-in-2025

[78] Maritime and Port Authority of Singapore, "Port Marine Circular No. 65 of 1998: Mandatory Ship Reporting System in the Straits of Malacca and Singapore (STRAITREP)," October 20, 1998, June 26, 2026, https://www.mpa.gov.sg/media-centre/details/mandatory-ship-reporting-system-in-the-straits-of-malacca-and-singapore-straitrep

[79] Maritime and Port Authority of Singapore. digitalPORT@SG™, June 26, 2026. https://www.mpa.gov.sg/finance-e-services/digitalport@sg/1000

[80] United Nations Conference on Trade and Development (UNCTAD), "Liner Shipping Connectivity Index (LSCI)," UNCTAD stat Data Centre, https://unctadstat.unctad.org/datacentre/dataviewer/US.LSCI.

[81] World Economic Forum. "Green Shipping Corridors (Rotterdam-Singapore Green Corridor)," *The Future of Clean Fuels*, June 26, 2026 https://initiatives.weforum.org/the-future-of-clean-fuels/case-study-details/green-shipping-corridors-%28rotterdam-singapore-green-corridor%29/aJYTG0000000wdV4AQ

[82] "Los Angeles–Long Beach–Singapore Green and Digital Shipping Corridor Unveils Inaugural Progress Report, Showcasing Milestones and Vision Ahead," *C40* Cities, March 12, 2026, https://www.c40.org/news/los-angeles-long-beach-singapore-green-and-digital-shipping-corridor-unveils-inaugural-progress-report-showcasing-milestones-and-vision-ahead/

Port Klang (Malaysia)	15.14 million Twenty-foot Equivalent Units in 2025 (+3.4%)[83]	• Expanded container terminals to improve anchorage and reduce waiting times[84] • Deep-water berths to accommodate next-generation ultra-large container vessels (ULCVs)[85] • Automated warehousing and advanced inventory systems to improve speed[86]	• Applies Remote Physical Check System (RPS) that uses video analytic cameras to verify every container being loaded or unloaded from vessels[87]. • Uses blockchain technology for improved tracking and tracing of shipments[88]	• Received "Best of the Best" Edge Malaysia ESG Awards 2025[89] • Uses Solar power in warehouses[90] • Awarded APSN (APEC Port Services Network) Green Port in 2017 and 2020 for adapting environmentally sustainable practices[91]

[83] Port Klang Authority, *Gateway* 3 (Port Klang: Port Klang Authority, 2025), June 26, 2026, https://www.pka.gov.my/phocadownload/Publication/gateway/GATEWAY%20ISSUE%2032025.pdf

[84] Amarasinghe, Udeshi, and Robert Platt. "Port Klang Bets for Future in Increased Container Capacity," *Central Dredging Association (CEDA)*, June 24, 2025, https://www.dredging.org/news/232/port-klang-bets-for-future-in-increased-container-capacity

[85] TNS Logistics. "Why Is Port Klang the Preferred Export Port in Malaysia?" June 26, 2026. https://tnslog.com/why-is-port-klang-the-preferred-export-port-in-malaysia/

[86] Noor Bahrain, Aris Reza. "Supply Chain: Transforming Logistics and Warehousing," *The Edge Malaysia* 25 December 2023, https://theedgemalaysia.com/node/694855

[87] Md Shahril, "Navigating the Future: Enhancing Malaysia's Port Development and Logistics Performance with Digitalisation," *Malaysian Investment Development Authority (MIDA)*, October 1, 2024, https://www.mida.gov.my/navigating-the-future-enhancing-malaysias-port-development-and-logistics-performance-with-digitalisation/

[88] Port Technology Team, "What Is the Blockchain Landscape for Malaysia?" *Port Technology International*, September 28, 2021, https://www.porttechnology.org/what-is-the-blockchain-landscape-for-malaysia/

[89] Port Klang Authority, *Gateway*, Issue 3 (Port Klang: Port Klang Authority, 2025), June 26, 2026, https://www.pka.gov.my/phocadownload/Publication/gateway/GATEWAY%20ISSUE%2032025.pdf

[90] Port Klang Authority. *eGateway,* no. 2, 2025 (Port Klang: Port Klang Authority, 2025), https://www.pka.gov.my/phocadownload/eGateway/2025/GATEWAY%2022025.pdf

[91]Westports Holdings, "Port Klang Awarded APSN Green Port 2020," February 10, 2021 https://www.westportsholdings.com/2021/02/10/port-klang-awarded-apsn-green-port-2020/

Tanjung Pelepas (Malaysia)	12.25 million TEUs in 2024[92]	• One of the most extensive container yards in Southeast Asia[93]	• Applies AI-powered management system[94] • Digitalised Vessel traffic management system by improving shoreside monitoring and communication[95]	• Received 5-star ESG recognition[96] • Transitioning to electric prime movers (e-PMs), and exploring biodiesel B20 use and green vessels aligned with the International Maritime Organization's Green Voyage 2050 initiative[97] • Implementing Sustainability Framework to embed environmental, social and governance (ESG) into its core business[98]

[92] Syed Rakin Rahman, "Port of Tanjung Pelepas Closes 2024 with More Than 12 Million TEUs," Port Technology International, January 2, 2025, https://www.porttechnology.org/news/port-of-tanjung-pelepas-closes-2024-with-more-than-12-million-teus/

[93] MMC Corporation Berhad, *Port of Tanjung Pelepas Welcomes World's Latest and Largest Container Vessel – MSC Gulsun and Breaks World Record for Vessel Utilisation*, Iskandar Puteri, (Malaysia: MMC Corporation Berhad), July 29, 2019, https://www.mmc.com.my/290719%20-%20MSC%20Gulsun%20Maiden%20Voyage%20at%20PTP.pdf

[94] Margherita Bruno, "Port Tanjung Pelepas Turns to AI-Powered Management System," *Port Technology International*, June 26, 2022, https://www.porttechnology.org/news/malaysian-ptp-turns-to-ai-powered-management-system/

[95] Cybernetica, "Cybernetica to Lead Upgrade of Vessel Traffic Management System at Port Tanjung Pelepas," September 17, 2024, https://cyber.ee/resources/news/vtms-malaysia/

[96] MMC Port, "Port of Tanjung Pelepas Becomes Malaysia's First Maritime Organisation to Achieve 5-Star ESG Recognition," January 6, 2026, https://www.mmcports.com.my/port-of-tanjung-pelepas-becomes-malaysias-first-maritime-organisation-to-achieve-5-star-esg-recognition/#:~:text=PORT%20OF%20TANJUNG%20PELEPAS%20BECOMES,STAR%20ESG%20RECOGNITION%20%2D%20MMC%20Port

[97] Jassmine Shadiqe, "PTP Strengthens Global Ties, Powers Ahead on Green Port Ambitions," *New Straits Times*, June 3, 2025, https://www.nst.com.my/business/economy/2025/06/1225109/ptp-strengthens-global-ties-powers-ahead-green-port-ambitions

[98] Pelabuhan Tanjung Pelepas Sdn. Bhd., "PTP Launches Sustainability Framework as New ESG Guideline," PTP News, February 24, 2023, https://www.ptp.com.my/media-hub/news/ptp-launches-sustainability-framework-as-new-esg-g

Laem Chabang (Thailand)	Over 8 million TEUs annually[99]	• Considered as a maritime hub for the proposed Eastern Economic Corridor of the Greater Mekong Subregion (Myanmar, Laos, Cambodia)[100] • Terminal D Handles Super Post Panamax vessels with advanced gantry cranes[101]	• Employs autonomous trucks equipped with advanced technology and a wireless charging system to transfer containers between the quay and the yard.[102] • Transformed into a digital port authority[103]	• Implementing its "Green Port Strategy," focused on reducing carbon emissions, utilizing renewable energy, and automating operations to create a sustainable, eco-friendly logistics hub, particularly through its Phase 3 expansion.[104]

From the results presented in Table 3, it can be noted that there is great convergence in the four main ports of Southeast Asia, including Port of Singapore, Port Klang, Port of Tanjung Pelepas, and Laem Chabang Port, in terms of throughput capacity, infrastructural sophistication, and digital integration, among others. Clearly, the Port of Singapore is the dominant on a scale, not only in terms of number of incoming and outgoing ships, which accounted for 44.66 million TEUs in 2025, but also with its numerous bunkering terminals and the fact that it is the world's biggest bunkering hub. However, the complementary strengths of Port Klang and Port of Tanjung Pelepas include deep water infrastructure, large container yards and advanced terminal operations, as well as Laem Chabang Port being a subregional gateway to the Greater Mekong Subregion. In all four ports, infrastructure quality is linked with the port's capacity to cater for ultra-large container vessels (ULCVs), short turnaround time and high level of operational efficiency which underpins the ports as central nodes of global and regional supply chains.

[99] UNISCO, "Laem Chabang, Thailand," June 26, 2026, https://www.unisco.com/international-ports/laem-chabang-thailand

[100] Greater Mekong Subregion, "Explainer: What Is an Economic Corridor?" June 26, 2026, https://greatermekong.org/explainer-what-economic-corridor

[101] Hutchison Ports Thailand Welcomes STS Cranes Ahead of Full Launch of Terminal D," *WorldCargo News*, January 2026, https://www.worldcargonews.com/cargo-handling-equipment/2026/01/hutchison-ports-thailand-welcomes-sts-cranes-ahead-of-full-launch-of-terminal-d/#:~:text=Terminal%20D%20now%20has%2017,and%20human%2Ddriven%20electric%20trucks.

[102] Greater Mekong Subregion, "Explainer: What Is an Economic Corridor?" June 26, 2026, https://greatermekong.org/explainer-what-economic-corridor.

[103] Port Authority of Thailand, *Smart Port Development Strategie*s (presentation, Capacity Building Workshop on Port Digitalization and Progress Towards Smart Ports, Bangkok, November 30, 2023), United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP), June 26, 2026, https://www.unescap.org/sites/default/d8files/event-documents/7_Smart-Port-Development-Strategies_Thailand.pdf

[104] Business Sweden, "Development of the First 100% Green Port in Thailand," *Business Sweden*, June 26, 2026, https://www.business-sweden.com/sv/insikter/focusasia-2024/100-affarsmojligheter-asien/2024/green-port-thailand/

Second important aspect is the crucial role of digitalisation, technological innovation and ESG-focused approaches in maintaining competitiveness over time. DigitalPORT@SG™ is a global benchmark for Singapore's Port and its leadership in green shipping corridors. Port Klang is also leading the way in digital transformation with tracking and automated verification via the blockchain. Likewise, the Port of Tanjung Pelepas uses AI for management and digital vessel traffic systems. The Port of Laem Chabang also incorporates autonomous trucks and wireless charging systems and applying automation in their operations. Remarkably, all four ports include sustainability in their business models, whether through use of renewable energy, green port programmes or commitment to international schemes like that of the International Maritime Organization (IMO) to decarbonise shipping. Hence, it underscores the centrality of technological modernisation and ESG compliance in the competitiveness of ports which are driving the transformation of maritime hubs toward more sustainable, efficient, and resilient systems.

The other six ports of Southeast Asia in the top 50, have a dynamic second tier, with their governance frameworks, digitalisation, maritime connectivity and port capacity increasingly being improved. Of these, three ports are in Vietnam, two in Indonesia and one in the Philippines. The three leading Vietnamese container ports—Port of Ho Chi Minh City, Port of Hai Phong, and Cai Mep Port—have played a central role in allowing Vietnam to rank 6th globally on the Liner Shipping Connectivity Index (LSCI) as of June 2025. [105] In terms of throughput records, Ho Chi Minh City ranks 22nd globally, maintaining its status as Vietnam's highest-ranked port, while Hai Phong and Cai Mep occupy the 29th and 30th positions respectively, reflecting a relatively balanced distribution of container handling capacity across the country's port system.[106] From a spatial and infrastructural perspective, Ho Chi Minh City functions as the principal maritime gateway for the southern industrial heartlands, effectively linking production clusters with global markets. Cai Mep in Ba Ria—Vũng Tàu province is Vietnam's most important deep-water port with the infrastructure to accommodate ultra-large container vessels and to support direct calls by major shipping alliances, eliminating the need for the usual transshipments[107]. At the same time, Hai Phong has been efficiently operating in the north in Vietnam to support the handling of large vessels traffic with a high volume. In the sphere of digitalisation and technological optimisation, the City of Ho Chi Minh has introduced standardised systems of Port EDI to manage the increasing volume of exports, while the Port of Cai Mep represents high level of operational efficiency: handling speed is 0.4 minutes per move for big vessel calls with more than 6,000 moves. Together, these three ports underpin Vietnam's high level of maritime connectivity and play an important role in its development as a key hub in the world shipping network.

[105] Liner Shipping Connectivity Index (LSCI) 2025, UNCTAD Data Hub, https://unctadstat.unctad.org/datacentre/dataviewer/US.LSCI

[106] Lloyd's List One Hundred Container Ports 2025, https://www.lloydslist.com/one-hundred-container-ports-2025

[107] Son Nghia, "Cai Mep - Thi Vai Reaffirming Vietnam's Position on the Global Maritime Map," https://vietnam.vnanet.vn/english/long-form/cai-mep-thi-vai-reaffirming-vietnam39s-position-on-the-global-maritime-map-384984.html

Indonesia is also represented in the Lloyd's list with its two strategically important ports: Port of Tanjung Priok (Global Rank: 26) and Port of Tanjung Perak (Global Rank: 47).[108] Tanjung Priok is the main port for maritime activities in the country, serving as the hub for the national container handling capacity. This port is also an integral part of the country"s participation in global shipping networks. Tanjung Priok is also reflected in the high level of technological optimisation, with the country achieving average handling times of 0.9 minutes per call for large vessels, indicating efficiency in the work carried out at the terminals and in the cargo handling process. Tanjung Perak (Surabaya), on the other hand, has been actively promoting digitalisation as a major pillar in regional connectivity, such as implementing Port EDI systems that conform with Maritime Single Window systems, to automate the process of issuing invoices and exchange of ship data.[109] The digital integration increases the transparency, diminishes administrative delays and increases the overall efficiency of the port. Moreover, the port's future growth direction and operation capacity is guaranteed by cooperation with other countries, such as a shipbuilding training center funded by the Republic of Korea, which is expected to strengthen the technical skills of the local maritime workforce. Together, both ports receive the advantage of Indonesia's 13th position in the world in terms of capacity by flag of registration, which provides them with a large base of ships. The amalgamation of technology advancement, digital integration and capacity-building efforts highlights Indonesia's increasing role in the Southeast Asian maritime landscape.

Hence, after evaluating the top 10 Southeast Asian ports it is understandable that these ports collectively represent highly efficient and interconnected maritime hubs which offers Bangladesh opportunities to enhance its maritime sector. By collaborating with these ports, Bangladesh can benefit in terms of operational excellence and reliable transshipment options that decrease the transit time for the export-oriented industries like the Ready Made Garments (RMG) and Pharmaceuticals sectors. Digitalisation models like Port EDI and Maritime Single Window (MSW) systems, which are already well developed in major ports like Singapore and Malaysia, may provide practical solutions for reducing customs delays, automating invoice processing and enhancing data exchange efficiency. Furthermore, exposures to advanced technologies, such as Automated Guided Vehicles (AGVs) and automated stacking system, can be important benchmarks for upgrading sea ports in Bangladesh. With strategic technical cooperation and ongoing policy dialogue, these partnerships offer an opportunity for Bangladesh to build institutional capacity, improve operational efficiency and ensure its ports meet internationally competitive standards.

3.2.2 *Bangladesh's Capacity and Prospects of Cooperation with SEA*

Looking at the three operational seaports in Bangladesh, the strengths and limitations of these ports have been analysed under four parameters such as throughput capacity, infrastructural strength, digitalisation and ESG capacity. These analyses have been organised in the table below;

[108] Lloyd's List One Hundred Container Ports 2025, https://www.lloydslist.com/one-hundred-container-ports-2025
[109] Port of Tanjung Priok: The Gateway to Indonesia's Trade, eezyimport, https://www.eezyimport.com/seaports/port-of-tanjung-priok/

Table 4: Bangladesh's seaports' strengths and limitations

Ports	Throughput capacity	Infrastructural strength	Digitalisation	ESG
Chattogram Port	• Handles over 3.4 million TEUs of containers annually (2025 data). • Manages 138+ million metric tons of general cargo. • Processes 92 percent of national international trade.[110]	• Operates 4 major container/cargo terminals, including the automated New Mooring Container Terminal (NCT).[111] • Average draft is 9.5 to 10 meters.[112]	• Operates a standard Port Automation Management System (PAMS). • Integrated online real-time digital tariff payments to clear documentation bottlenecks.[113]	• Strict compliance with global International Maritime Organisation (IMO) fuel caps.[114]
	Limitations: • Suffers from extreme container yard space gridlocks. • Seasonal backlog ripple-effects stall the export-ready RMG chain.[115]	Limitations: • Shallow Karnaphuli river channels require time-consuming lighterage ships to offload mid-sea. • Complete lack of deep-sea draft holds back modern mega mother vessels.[116]	Limitations: • Heavy friction points between customs, physical checkers, and the port data interface. • Legacy manual red-tape checks frequently cause digital outages.[117]	Limitations: • Intense ship emissions and urban noise close to dense urban areas. • High risk of localised oil discharge spills with slow cleanup support response workflows.[118]

[110] Staff Correspondent, "Ctg Port Handled Historic High Container, Cargo and Vessel in 2025," The Daily Star, January 1, 2026, https://www.thedailystar.net/business/news/ctg-port-handled-historic-high-container-cargo-and-vessel-2025-4070761

[111] "New Mooring Container Terminal records highest monthly container handling in history," 3 June 2026, available at https://www.textiletoday.com.bd/new-mooring-container-terminal-records-highest-monthly-container-handling-in-history

[112] Nazimuddin Shyamol, "Ctg port enters 10-metre draft era," *The Financial Express*, 3 February 2023, https://thefinancialexpress.com.bd/trade/ctg-port-enters-10-metre-draft-era

[113] "Chittagong Port launches "Port Single Window" for paperless and smart port management system," Container News, 11 February 2026, https://container-news.com/chittagong-port-launches-port-single-window-for-paperless-and-smart-port-management-system/

[114]"Chittagong port provides eco-friendly fuel oil to ships to curb marine pollution," *The F*inancial Express, 8 October 2020, https://thefinancialexpress.com.bd/trade/chittagong-port-provides-eco-friendly-fuel-oil-to-ships-to-curb-marine-pollution-1602128850

[115] Dwaipayan Barua, "Container Congestion Forces Ctg Port to Add Yard Space," The Daily Star, August 20, 2025. https://www.thedailystar.net/business/news/container-congestion-forces-ctg-port-add-yard-space-3967301

[116] "Issues at Chittagong Port," Apparel Resources, 15 June 2021, https://apparelresources.com/business-news/trade/issues-chittagong-port/

[117] Afshar Uddin Jubayer, Tamim Forhad Shuvo and Md. Mamun Habib, "Smart Port Transformation in Bangladesh: Strategies for Digital Resilience," Paper presented at INTERNATIONAL CONFERENCE ON ECONOMICS, BUSINESS AND TECHNOLOGY MANAGEMENT (ICEBTM 2025), https://www.researchgate.net/publication/398899292_Smart_Port_Transformation_in_Bangladesh_Strategies_for_Digital_Resilience

[118] Ahamedul Karim Chowdhury, "Chattogram port can no longer delay green transition," The Daily Star, 29 March 2026, https://www.thedailystar.net/opinion/news/chattogram-port-can-no-longer-delay-green-transition-4137871

Mongla Port	• Targets 12+ million metric tons of cargo for FY 2025-26. • Handles around 50,000–60,000 TEUs annually. • Captures ~8-10 percent of total domestic cargo traffic.[119]	• Capital dredging opened up new anchor berths holding ships up to 9.0 meters in draft and 200 meters in length. • Features extensive specialised car yards and eco-friendly berths[120]	• Employs a comprehensive "Single Window" system uniting shipping firms, customs agents, and port offices.[121] • Automates invoice tracking for vehicle yards.[122]	• Aimed to become a green port given its close proximity to the Sundarbans mangrove forests[123]. • Features a dedicated Port Reception Facility to mitigate oil spills.[124]
	Limitations: • Handles under 1 percent of the containerised volume that Chattogram commands. • Highly dependent on specific commodity imports (LPG, cars, coal) rather than diverse commercial freight.[125]	Limitations: • Siltation in the Outer and Inner Bars of the Pashur River demands continuous, hyper-expensive capital dredging to remain viable. • Limited local heavy industrial highway linkages.[126]	Limitations: • The automation footprint is restricted because local regional clearing agents lack matching digital infrastructure systems.[127]	Limitations: • Rigid environmental oversight raises corporate compliance costs for developers. • Vulnerable to acute climate-change impacts like cyclones and tidal surges.[128]

[119] "Mongla Port Targets Tk 6b Revenue in FY 2025-26," *The Financial Express*, August 18, 2025. https://thefinancialexpress.com.bd/trade/mongla-port-targets-tk-6b-revenue-in-fy-2025-26

[120] Ali Akbar Tutul, "Dredging Continues to Boost Activities at Mongla Port as Ship Arrivals Rise in FY24," *The Business Standard*, December 1, 2024, https://www.tbsnews.net/bangladesh/dredging-boosts-activities-mongla-port-ship-arrivals-rise-fy24-1006761

[121] "MPA Opens e-Payment-System Service," *The Financial Express*, January 3, 2024. https://thefinancialexpress.com.bd/national/mpa-opens-e-payment-system-service

[122] "Mongla Port digitises ship management", 18 March 2022, *The New Age*, https://www.newagebd.net/print/article/165749

[123] Business Inspection BD, "Mongla Port Aims to Become a Smart Port by 2027," *Business Inspection BD*, July 6, 2023, https://businessinspection.com.bd/mongla-port-aims-to-become-a-smart-port-by-2027/

[124] "Mongla Port in Bangladesh to Install Lamor's Waste Management Solutions for MARPOL Compliance," *Lamor*, February 6, 2023, https://www.lamor.com/articles/mongla-port-in-bangladesh-to-install-lamors-waste-management-solutions-for-marpol-compliance

[125] Rozina Akter, Md. Tanzeer Alam, and Sumaiya Tasnim, "Problems and Prospects of Mongla Seaport in Bangladesh," *Thoughts on Economics* 32, no. 3–4 (2022), https://www.ierb-bd.org/wp-content/uploads/2023/02/Problems-and-Prospects-of-Mongla-Seaport-in-Bangladesh.pdf

[126] Motiur Rahman, Md. Shahjahan Ali and Mostafizur Rahman, "Siltation rate analysis at the berth area of Mongla Port," Paper Presented at 6th International Conference on Civil Engineering for Sustainable Development, 2022, https://www.researchgate.net/publication/370376969_Siltation_rate_analysis_at_the_berth_area_of_Mongla_Port

[127] Sayeed M. Hassan, "How Modern Are Our Ports, Really?" *The Business Standard*, June 25, 2025. https://www.tbsnews.net/thoughts/how-modern-are-our-ports-really-1173731

[128] Md. Al Hasnat, "The feasibility and challenges of implementing a green port policy framework in Bangladesh", in The Maritime Commons: Digital Repository of the World Maritime University, World Maritime University, November 2024, https://commons.wmu.se/cgi/viewcontent.cgi?article=3420&context=all_dissertations

Payra Port	• Operates at a lower tier (16.02 million metric tonnes MT of goods). • Serves targeted industrial complexes and heavy power grids.[129]	• Boasts the largest designed potential channel route with a deep 10.5-meter draft. [130]	• Aims to build an ICT-based Port operating system.[131]	• Aims to follow contemporary Environmental Impact Assessments (EIA).[132]
	Limitations: • Minimal mainline container cargo footprint. • Highly localised ecosystem that fails to draw significant regular global shipping lines.	Limitations: • Stalled dredging has caused significant siltation in the access channel. • Reduced navigability has sharply decreased the number of ship calls.[133]	Limitations: • No significant data available	Limitations: • No Significant data available

After carefully analysing Bangladesh's three operational seaports and making a comparative assessment with the earlier discussed top 10 Southeast Asian ports, it can be inferred that Bangladesh has a lot of opportunity to collaborate with these ports, as these ports are some of the most technologically advanced and efficient maritime hubs in the Bay of Bengal region. First, by way of throughput capacity, Southeast Asian ports can be seen to be much larger and more efficient than Bangladeshi ports. In 2025, the Port of Singapore alone imported/exported 44.66 million TEUs per year and Chittagong port imports/exports roughly 3.4 million TEUs per year. The partnership with these high-capacity ports can help Bangladesh access reliable transhipment routes, speed up export transit times, and improve the competitiveness of sectors like ready-made garments and pharmaceuticals. Second, there are good infrastructural models in the Southeast Asian ports from which Bangladesh can learn. Port Klang and Laem Chabang Port have deep-water berths, high-tech container terminals, and can handle ultra-large. container ships. On the

[129] Ferdaus Ara Begum, "Rethinking the case of Payra: Port infrastructure diversification is a priority," The Daily Star, 10 June 2025, https://www.tbsnews.net/thoughts/rethinking-case-payra-port-infrastructure-diversification-priority-1162801

[130] Payra Port Ready for Large Ships after Dredging at Rabnabad Channel," *The Business Standard*, March 28, 2023. https://www.tbsnews.net/bangladesh/infrastructure/payra-port-ready-large-ships-after-dredging-rabnabad-channel-606630

[131] "Govt expects Payra Port to be fully operational by year-end: Minister," *BSS News*, 22 April 2026, https://www.bssnews.net/js-session/380382

[132] "Govt expects Payra Port to be fully operational by year-end: Minister," BSS News, 22 April 2026

[133] Mizanur Rahman Yousuf, "Silt chokes Payra Port, forcing vessels to Chattogram," *The Busines*s Standard, 20 January 2026, https://www.tbsnews.net/economy/silt-chokes-payra-port-forcing-vessels-chattogram-1338751

other hand, shallow draft, congestion and poor hinterland connectivity remain a problem in Bangladeshi ports. Advanced port infrastructure and automation systems, therefore, can be helpful for Bangladesh to upgrade its maritime infrastructure.

Third, there are practical benefits to be gained from collaboration in digitalisation. The maritime sector of Southeast Asia have embraced cutting-edge solutions like Maritime Single Window systems, blockchain-based tracking solutions, AI-driven management platforms and autonomous transport solutions. Bangladesh has implemented schemes like PAMS and EDI, but operational inefficiencies and low level of customs integration remain. Collaborative efforts with ports in the Southeast Asian region can facilitate customs clearance, data sharing and minimise formalities. Last but not least, ESG-inclusive operational practices are shown in Southeast Asian ports via green shipping corridors, renewable energy use and sustainable port strategies. Emissions, oil spill and climate vulnerability are still challenges at Bangladeshi ports. Hence, enhanced cooperation in this field can foster and facilitate environmental governance, boost sustainability levels and ensure the sustainability of the maritime sector in Bangladesh in response to emerging global demands for environmental, social and governance (ESG) standards.

4. Underlying Obstacles

4.1. *Challenges to Exploring Collaboration in REE*

Despite the growing prospects for cooperation in the REE sector, Bangladesh might have some inherent obstacles to exploring the possibility of cooperation with Southeast Asian countries. The country's lack of institutional and technological readiness, the absence of an integrated REE policy, and the lack of advanced processing capacity can limit the country's participation in the regional supply chain.[134] Furthermore, the prevailing fragmented state of Southeast Asia's REE sector, concerns for the environment and governance and uncertainty over economically viable reserves could also limit Bangladesh's potential for stable and sustainable cooperation in the REE sector.

Limited institutional and technological preparedness is one of the challenges faced by Bangladesh in exploring cooperation with countries in Southeast Asia in the field of REE. Bangladesh has some signs of deposits of REEs, but currently it is in an exploratory stage without a specific framework for REE exploration.[135]

[134] KII Interview with Principal Geologist, Institute of Nuclear Geological Sciences, Atomic Energy Research Establishment, Bangladesh Atomic Energy Commission (BAEC) in January 2026.
[135] KII Interview with Chief Geologist, Bangladesh Atomic Energy Commission (BAEC), in October 2025.

Countries in Southeast Asia, on the other hand, are at various points in the supply chain, from extracting raw materials in Vietnam and Myanmar to processing in Malaysia and trading in Singapore. The unevenness of the regional geography can present challenges for Bangladesh in finding a suitable entry point and establishing fair partnerships. Lack of expertise, advanced processing technology and specialised institutions in the country can also limit its capacity to absorb technology transfer related to this sector.

Another hurdle is the lack of an integrated Southeast Asian REE supply chain in the region. Vietnam has huge reserves, but its extraction capacity is still limited because it relies on foreign technology. Thailand faces governance and environmental issues, while Indonesia and the Philippines face problems with processing technology and policy instability. Political instability and inadequate regulation further complicate REE activities in Myanmar. These differences show that the regional framework for REE cooperation mechanisms is still being developed and is not integrated. This regional structure is a decentralised and fragmented one, which could make Bangladesh's cooperation with other countries more uncertain and unpredictable in terms of supply access, investments and technology sharing, etc.

Apart from this, environmental and governance issues are also big challenges for Bangladesh. Several challenges related to REE extraction and processing operations exist in several countries in Southeast Asia. In the case of Bangladesh, environmental-related challenges could have arisen as radioactive elements in the REE deposits could pose potential environmental hazards. And as Bangladesh still lacks robust regulatory frameworks on REE, the country may be susceptible to environmental risks and governance issues in the event of collaboration in the REE industry with Southeast Asian countries. Furthermore, working with countries with informal or poorly regulated mining can make it more difficult to develop clear and sustainable cooperation agreements.[136] Bangladesh could also be beset with economic and strategic uncertainties in the process of regional REE collaboration. There are no confirmed economically viable REE reserves in the country. The present available information related to the REE reserve is mainly from preliminary surveys. This uncertainty could reduce Bangladesh's leverage in any meaningful partnerships.

4.2. *Challenges to Exploring Port Connectivity Collaboration*

In terms of exploring collaboration in port connectivity, it shows that there are opportunities for Bangladesh in this regard; however, there are some structural and operational difficulties that impede effective engagement. One major challenge

[136] KII Interview with Principal Geologist, Institute of Nuclear Geological Sciences, Atomic Energy Research Establishment, Bangladesh Atomic Energy Commission (BAEC).

is the enormous disparity in the throughput capacity and infrastructural strength of Bangladeshi ports compared to the major Southeast Asian ports. Ports like the Port of Singapore, Port Klang, Port of Tanjung Pelepas and Laem Chabang Port have deep-water facilities, advanced cargo-handling systems and highly efficient terminal networks. Unlike this, the ports of Bangladesh are still struggling with one or more of the following challenges: shallow draft, congested yards, reliance on lighterage services and poor hinterland connectivity. Yet, Chattogram Port, despite handling most of Bangladesh's trade, still faces channel depth constraints. Also, Payra Port's transport linkages are not strong, and Mongla Port's cargo diversification is not very satisfactory. This asymmetry may reduce Bangladesh's strength and capacity to integrate in the maritime transportation connectivity.

Another challenge is related to technology and digital differences. Southeast Asian ports have been rolling out blockchain systems, Maritime Single Window, AI-driven management systems, automated guided vehicles and the new generation of vessel traffic monitoring technologies into their operations. In contrast, Bangladesh's three operational ports still face a myriad of bureaucratic obstacles in customs and physical inspection processes as well as in digital platforms. Automation and Electronic Data Interchange (EDI) systems have been introduced in Chattogram and Mongla ports; but these systems are not yet fully utilised and not well connected with the national customs and logistics systems. These technological gaps can also constrain harmonising operational standards with highly digitalised port systems in Southeast Asian countries.

Sustainability issues and ESG certification are also significant issues. The major ports of the Southeast Asian region have integrated green shipping concepts, renewable energy utilisation, low-carbon strategies, and environmentally friendly operation models into their maritime governance frameworks. Contrastively, Bangladesh's ports continue to be fragile due to the risk of oil spills, pollution, climate-induced cyclones, and reliance on energy-intensive industrial operations. For example, the environmental challenges for Payra Port are long-term issues arising from power generation projects in the vicinity, and Mongla Port is highly vulnerable to climate change impacts. Implementing ESG standards could pose challenges for Bangladesh in harmonising port governance and environmental management with more advanced ports in Southeast Asia that have integrated sustainability into their operational frameworks.

5. Path Forward

To address the institutional and technological limitations in the REE sector, Bangladesh needs to create its own national framework for REE exploration, research, and industrial development to overcome the institutional and technological challenges

the REE sector is facing. Coordinating institutional arrangements between geological, energy and industrial agencies will facilitate the establishment of a more unified policy framework. Further, Bangladesh might focus on technical cooperation with other countries like Vietnam and Malaysia to promote and build their capacity for mineral exploration, processing, and environmental management through joint geological surveys, academic collaboration, and training. These could help 'boost the country''s ability to be part of higher-value segments of the REE value chain in the long run.

Moreover, Bangladesh should pursue a multi-stage and multi-faceted engagement approach in the REE supply chain that leverages the differing strengths of the Southeast Asian countries. Partnering with Vietnam and Thailand could be centred on knowledge sharing about exploration, sustainable mining and access to supplies. Partnering with Malaysia could be positioned towards technology transfer and development of capacities regarding processing. Engagement with Singapore at the downstream level may enable the development of regional links for Bangladesh in terms of logistics, finance and trade in REEs.

Enhancing environmental governance and regulatory preparedness is also significant for Bangladesh. Transparency of environmental standards, mechanisms for occupational safety, and regulatory frameworks would help reduce the risk of REE activities in ecological and governance areas. In this regard, the REE-related environmental and governance experience of Southeast Asian countries can provide lessons for Bangladesh. Above all, Bangladesh needs to focus on domestic REE resource evaluation to minimise uncertainty as far as the commercial feasibility of REE deposits is concerned. Continued collaboration and better data collection from increased geographical surveys could lead to more reliable resource potential assessments. This approach can also help attract investment, strengthen bargaining power for regional partnerships, and lay the groundwork for future engagement in REE-related industries in renewable energy, electronics, and technologies.

To effectively explore collaboration with Southeast Asian countries in the field of port connectivity, Bangladesh should adopt a holistic policy approach focused on institutional strengthening, infrastructure development, digitalisation, and maritime governance, with sustainability issues to explore the opportunities of cooperation. Southeast Asian ports are among the most technologically advanced and operationally efficient ports in the Bay of Bengal region, and Bangladesh can take advantage of these partnerships to boost its own maritime competitiveness.

First, Bangladesh needs to focus on the modernisation of its institutions and infrastructure in the long run through technical cooperation with other leading maritime hubs in Southeast Asia. The deep-water infrastructure, integrated terminal

management and efficient maritime connectivity are important, as illustrated by the Port of Singapore, the Port of Klang and the Port of Laem Chabang. Bangladesh is thus able to negotiate and establish specific cooperation plans for port automation, terminal expansion, dredging capability, and logistics corridors. Further easing of congestion and efficiency in trade will be achieved by strengthening multi-modal connectivity between ports, railways and inland transport.

Second, Bangladesh needs to move faster towards digital transformation of the maritime sector through implementing integrated digital governance mechanisms which can be adopted in the maritime sector of Southeast Asian ports. The use of technologies like Port Electronic Data Interchange (EDI), Maritime Single Window systems, blockchain-based cargo tracking, and AI-powered port management has the potential to enhance customs efficiency and minimise bureaucratic delays. Bangladesh could strengthen its partnership with technologically advanced ports of Singapore, Malaysia & Indonesia through technical and knowledge-sharing programmes to modernise the existing ports like PAMS and enhance coordination between customs and shipping and port officials.

Thirdly, Bangladesh needs to enhance the capacity building and training of human resources in the maritime sector through regional training and technical exchange activities. Beyond infrastructure, Southeast Asian ports have become efficient in their operation by also developing the local maritime workforce and introducing effective maritime management systems. To build skills in port automation, logistics management, vessel traffic systems (VTS), and digital operations, Bangladesh should explore collaboration with regional maritime institutions in training, academics, and port management exchanges.

Just as crucially, Bangladesh needs to include environmental sustainability and ESG-focused governance in its long-term port development plan. Southeast Asian ports are increasingly prioritising environmentally friendly shipping routes and environmentally sustainable operations as part of the global push towards decarbonisation. If Bangladesh can establish meaningful collaboration mechanisms with Southeast Asian Ports, then this collaboration can help Bangladesh in many aspects, including green port management, oil spill management technologies and emission reduction technologies. This may help Bangladesh to be more in line with the changing global ESG standards and improve the resilience and competitiveness of maritime transport connectivity in the Bay of Bengal region.

6. Concluding Remarks

As Bangladesh advances toward a more diversified and resilient development trajectory in the post-LDC graduation era, its engagement with Southeast Asia needs to expand beyond the traditional pillars of trade, labour migration and

tourism. In this regard, REEs and port connectivity represent two emerging sectors. Southeast Asia's REE scenario is varied, with Vietnam's and Thailand's resource base, Malaysia's processing industry and Singapore's trading and logistics sector. Similarly, in the area of port connectivity, Southeast Asia has some of the well-equipped and technology-savvy port nodes, whose knowledge and experience in building infrastructure and digitalisation, logistics management and sustainability could be instrumental for Bangladesh. The study, therefore, underscores the need for greater involvement in these two areas with the countries in the Southeast region to help increase Bangladesh's access to critical resources, enhance supply-chain resilience, boost maritime competitiveness and support its development goals in a deeply integrated regional context.

Concurrently, the study identifies several structural, institutional, technological and governance challenges that need to be tackled for Bangladesh to capitalise on these opportunities. Lack of a dedicated REE framework, exploration capacity, technological readiness and commercial viability of REE reserves can limit Bangladesh's involvement in regional REE value chains. Similarly, major shortcomings in port facilities, digitalisation, efficiency and environmental, social and governance compliance could restrict the country's potential to leverage cooperation with the nation's top maritime hubs in South-East Asia. The study recommends, as a countermeasure, a number of policy options focusing on institutional strengthening, technological upgrading, environmental governance, human resource capacity building and partnership building, depending on the various stages of the REE and port connectivity value chains. Bangladesh needs to have a long-term and coordinated strategy, including domestic capacity building and continued regional cooperation. Through this, Bangladesh can use its connectivity to ensure that it not only benefits from regional connectivity and key mineral connectivity but also sets the scene for regional maritime transport connectivity in the Bay of Bengal and Southeast Asian region.