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OCEANS OF ALIGNMENT

India–South Korea Cooperation in the Indo-Pacific

Edited by

Anusha Kesarkar Gavankar and Kyunghoon Kim

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India–South Korea Cooperation in the Indo-Pacific

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Editors' Note

*Anusha Kesarkar
Gavankar and
Kyunghoon Kim*

Global uncertainty is rising as countries are putting up protectionist barriers in the name of national security and job creation. Supply-chain disruptions are becoming more frequent due to wars and extreme weather events. In this current era of a polycrisis, countries are being compelled to find credible and reliable partners whose needs are similar and strengths are complementary. The maritime sector is one domain in which India and the Republic of Korea can build a strategic relationship that strengthens their economic resilience and contributes to regional peace in the Indo-Pacific.

In April 2026, leaders of the two countries met for their first formal bilateral summit since 2019.¹ The resulting India-Republic of Korea Comprehensive Framework for Partnership in Shipbuilding, Shipping and Maritime Logistics stands out for its breadth and depth, as well as its specificity and ambition.² The Framework links bilateral cooperation directly to India's broader maritime

strategy, including the Maritime Amrit Kaal Vision 2047³ as well as specific industrial policies, while identifying key public and private stakeholders.

The present volume, *Oceans of Alignment: India-South Korea Cooperation in the Indo-Pacific*, explores five themes that examine the state of India-Korea^a maritime partnership and the opportunities for enhancing it. It brings together scholars from India and South Korea who carefully consider how the two countries can jointly respond to changes in the maritime, economic, technological, and strategic environment. Its five sections examine the geoeconomic foundations of the partnership, maritime supply-chain resilience, industrial and shipbuilding cooperation, the green maritime transition, and the human and community dimensions of maritime development.

The first section analyses the macro trends that make the maritime partnership between India and South Korea vital.

Kyunghoon Kim writes about how Korea's competitive maritime industries have been key enablers of its trade-driven, global-value-chain-linked growth experience. Korea and India's overlapping goals, as well as the growing value chain linkages between them, make maritime industries an important area for future strategic partnership.

In the second chapter, *Abhishek Sharma* situates the India-Korea relationship in the context of Indo-Pacific geoeconomics—where the two countries view one another as essential partners amidst shifts in the global order. The article highlights the potential areas for collaboration in shipbuilding, semiconductors, batteries, and digital technologies.

The second set of essays discuss the risks posed by certain geopolitical factors that influence maritime logistics.

Yeon-jung Ji highlights how the future competitiveness of India and South Korea will depend on their ability to prepare for and respond to chokepoint vulnerabilities, which increase transport time and costs and the risk of physical damage. In such an environment of various vulnerabilities, India, with its large market and growing

a This publication uses the names 'South Korea', 'Korea', and 'ROK' interchangeably.

manufacturing competitiveness, offers Korea opportunities to diversify its economic risks. India can also gain from the industrial technologies and knowhow of Korean companies.

Sayantana Halder follows with an article that links India's port-centred development programmes to the country's regional strategy to play a pivotal role in the Indo-Pacific.

The third section focuses its lens on the most important trends in the global shipbuilding sector and identifies promising areas for cooperation in the India-South Korea partnership.

Byungyul Park underlines the transformation of global shipbuilding, in which companies need to advance innovation beyond scale and cost-cutting in order to maintain industry leadership. The author argues that Korea's industrial upgrade is supported by innovation networks that act as platforms for interaction between businesses and research institutions, and underlines how India will benefit from learning from Korea's experience.

Pratnashree Basu, writing around the same overall theme, provides the rationale for strengthening the India-South Korea shipbuilding partnership in the current period of geoeconomic uncertainty. The essay outlines the key structural trends in the global economy, such as decarbonisation and digitalisation, that are also driving tectonic shifts in the shipbuilding industry, opening up strategic opportunities for technological and engineering partnerships between India and Korea.

The next two articles explore the theme of decarbonising the seas, fixing their analytical lens on the implications of the promotion and development of carbon-reducing technologies in maritime sectors.

Doyeon Kim analyses the important role that green hydrogen is expected to play in the sustainable development of the maritime sector. It suggests setting up a Korea-India Green Energy Corridor, which would include early-stage cooperation programmes such as pilot projects, testing and certification, and the sharing of standards.

Parul Bakshi follows with an essay that highlights global institutional frameworks for maritime decarbonisation, such as the International Maritime Organization's Revised Greenhouse Gas Strategy and the United Nations Framework Convention on Climate Change. The author argues that India and Korea have an opportunity to cooperate at multiple levels in the areas of production value chain, energy systems, co-financing, and standard-setting.

The publication closes with two essays that explore the human and social dimensions of maritime transformation.

Yoon Jae Ro discusses how Korea and India can work together to train a competitive workforce for maritime industries that are becoming increasingly complex and technologically sophisticated. The two countries can consider cooperation in skills mapping, curriculum development, institutional capacity building, industrial training, certification, and mobility in the maritime sector.

Anusha Kesarkar Gavankar and *Priya Miriam Noronha*, in the final article, suggest a multipronged approach to inclusive maritime cooperation between India and Korea. Large maritime industrial and infrastructure projects have spillover effects that reshape surrounding economies and societies. More specifically, changes in the landscape, natural environment, and job availability can transform an entire region. Sustainability, therefore, should be at the heart of maritime development.

Collectively, the essays in this volume make a strong case for India-Korea maritime cooperation. The two countries are reliable partners that can work together to strengthen their resilience to geoeconomic and geopolitical instability. Moreover, India and Korea have complementary capabilities that can create synergies through cooperation in maritime security, supply chains, manufacturing, decarbonisation, and human capital development.

The authors agree that the maritime sector will be a pivotal area for India-Korea partnership for decades to come. Considerable preparation is now required, as the maritime industry is a complex, multi-level sector involving diverse stakeholders. The next step requires establishing institutional mechanisms for sustained dialogue and coordination and developing an ambitious yet realistic roadmap to guide the long-term maritime partnership.

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I

India–Korea Strategic Convergence in the Indo-Pacific

Geoeconomic Drivers of South Korea–India Maritime Cooperation

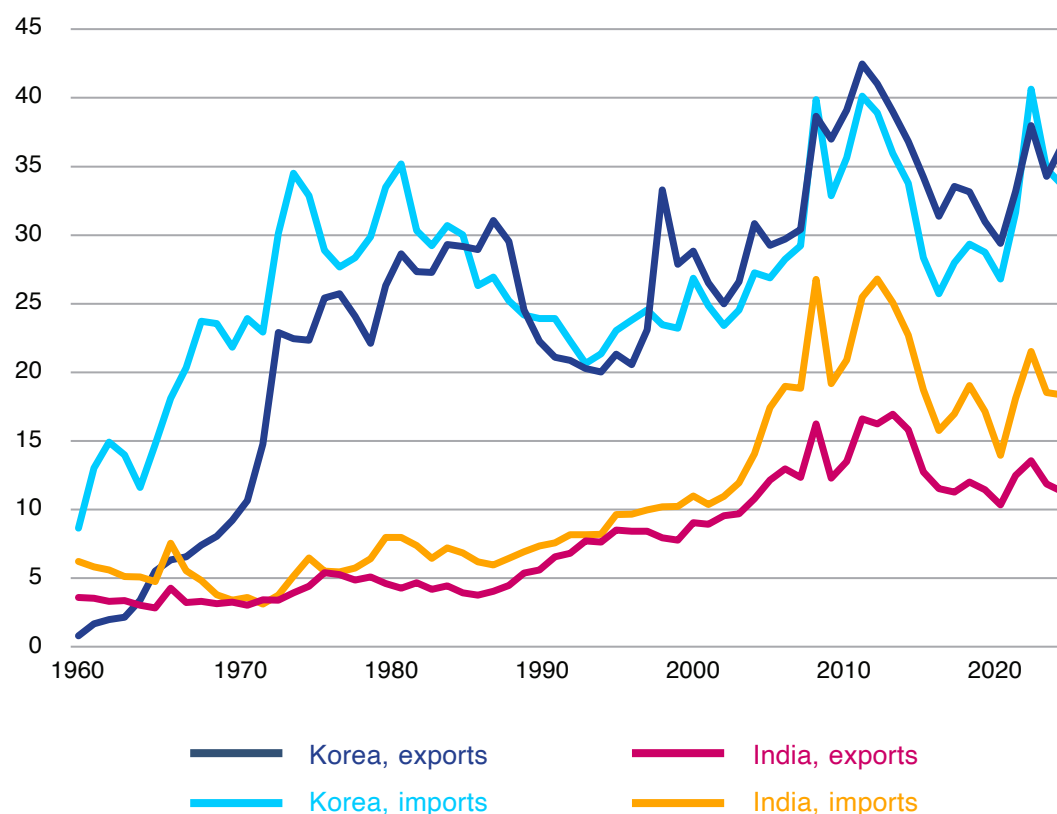
Kyunghoon Kim

Maritime strength has long been central to both South Korea's and India's economic and security resilience. As peninsular nations, both have found the ocean to be a source of opportunity as well as risk throughout their histories: while maritime trade has brought them prosperity, many of the greatest threats to their sovereignty have also come from the sea.

In the absence of overland access through North Korea, South Korea effectively functions as an island economy, making maritime trade indispensable. To become an industrialised economy, it leveraged a combination of private entrepreneurship and strong government support to foster manufacturing. In 1970, South Korea's population was just 32 million, and its per capita gross domestic product (GDP) stood at US\$282.¹ Given its limited domestic market, South Korea had to integrate into global markets to achieve economies of scale. Industrialisation through integration into global value chains led to a sharp increase in both exports and

imports, as the country relied heavily on imported raw materials, intermediate goods, and energy resources. Today, each accounts for more than 30 percent of the GDP.² Figure 1 shows that South Korea's rapid trade expansion contrasts with the much more gradual increase observed in India.

Figure 1. South Korea's and India's Merchandise Exports and Imports (as % of GDP)



Source: World Bank World Development Indicators³

South Korea's reliance on global markets means that changes in its export basket closely mirror its economic structural transformation. In 1980, the country's leading exports reflected an economy in the early stages of industrialisation, with fabrics, shirts, and footwear among the top export items. Two decades later, light manufacturing⁴ was replaced almost entirely by sophisticated products such as electronic integrated circuits, automobiles, computers, and refined petroleum products—reflecting Korea's successful transition towards high-value added industries. By 2025, while the core

composition of Korea's export basket remained broadly the same, the technological sophistication of its products had advanced dramatically. As Korea's exports grew in both scale and complexity, the security and resilience of its maritime industry became increasingly important.

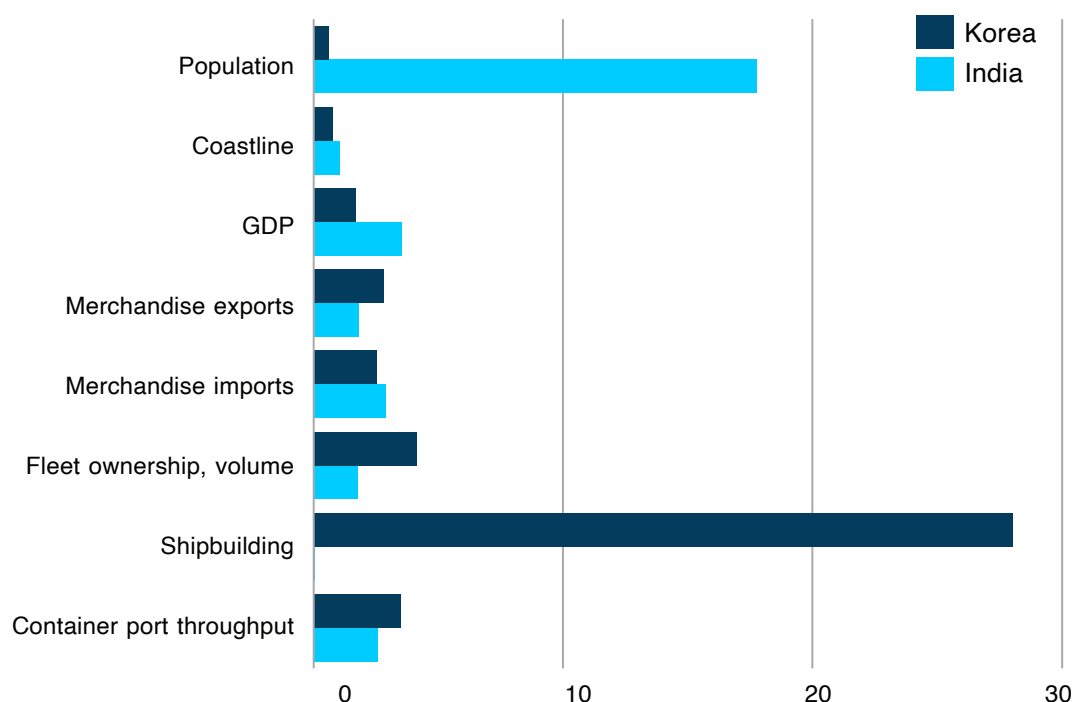
The Development of South Korea's Maritime Industry

As trade became the engine of South Korea's industrialisation, demand for maritime infrastructure and services surged. To support expanding trade volumes, the government took decisive action to strengthen port infrastructure and shipping capacity. Large-scale public investment expanded ports, while regulatory reforms attracted private investment in the shipping sector.⁵ At the same time, the government introduced policies that incentivised large conglomerates to enter the shipbuilding industry.⁶ Supported by sustained long-term investments from major national firms, ships have consistently ranked among South Korea's leading export products.

Since maritime industries are particularly sensitive to global economic cycles, South Korea has weathered severe disruptions during periods of crisis, such as the 1970s oil crisis, the 1997-98 Asian financial crisis, and the 2008 global financial crisis. These episodes highlighted the importance of maintaining competitive and strategically autonomous maritime industries for a country heavily dependent on international trade, reinforcing the government's commitment to supporting the sector through both periods of growth and downturn.⁷

This commitment underpins the global dominance of Korea's maritime sector today. Its share of global fleet ownership, shipbuilding, and container port throughput far exceeds what might be expected based on its share of the world's population and economy. Three of South Korea's ports feature among the world's top 100 container ports: Busan (7th), Incheon (61st), Yeosu Gwangyang (95th).⁸ South Korean shipping companies rank among the world's largest container carriers, including HMM (8th), KMTC (15th), Sinokor Merchant Marine (19th), and SM Line (29th).⁹ Similarly, HD Hyundai (2nd), Samsung Heavy Industries (4th), and Hanwha Ocean (5th) are among the world's leading shipbuilders.¹⁰ Figure 2 shows South Korea's maritime prominence, which exceeds India's, despite the latter's larger population, bigger economy, and longer coastline.

Figure 2. Comparative World Shares (2024, in %)



Note: Container port throughput data refers to 2023.

Source: UNCTADstat Data Centre¹¹

With the emergence of overlapping polycrises since the early 2020s, South Korea has accelerated efforts to strengthen the competitiveness of its maritime industry. Geoeconomic disruptions caused by the COVID-19 pandemic, the Russia-Ukraine war, United States-China strategic and economic competition, and the recent conflict in the Middle East have once again underscored the imperative for a resilient and flexible maritime sector.¹² At a time when economic nationalism is gaining momentum around the world,¹³ maintaining robust domestic maritime capabilities is paramount, particularly for a country as deeply embedded in global supply chains as Korea.

Against this backdrop of growing geoeconomic uncertainty, South Korean President Lee Jae Myung characterised the ocean as the “frontline that determines the nation’s survival and future,” and pledged to foster the shipping and port sectors as “national strategic industries” vital to the country’s economy and security.¹⁴ During its first year, the Lee administration established a safety net against disruptions in global logistics supply chains by expanding emergency operating fund support for Korean shipping companies. It has also supported the construction and acquisition of new vessels, helping South Korea’s fleet capacity reach an all-time high in 2025.¹⁵ In early 2026, the government announced a significant increase in funding for shipbuilding technology

development, with a focus on green shipping, artificial intelligence, and equipment localisation.¹⁶

India's Industrialisation and Its Implications for Trade

Over the past decade, India's manufacturing sector has taken off. Under its *Viksit Bharat 2047* vision, the Indian government has identified industrialisation as a key pathway towards becoming an advanced economy.¹⁷ At the same time, global supply chain disruptions driven by geoeconomic shifts have strengthened the case for expanding domestic manufacturing.

India's industrialisation gathered momentum in the early 2020s, as the government assumed a more active role in industrial policy.¹⁸ Alongside significant expansion in infrastructure investment, it rolled out substantial subsidies for manufacturing sectors with strong potential for value addition and employment generation.¹⁹ Since 2021, the government has extended incentives to 14 manufacturing sectors under the Production Linked Incentive Scheme.²⁰ The scheme's most visible success has been in mobile phone manufacturing, with India now firmly integrated into global value chains. The country's mobile phone production has seen a 28-fold increase over the past decade.²¹ Other strategic industries, such as semiconductors and shipbuilding, have also received significant financial resources and administrative attention in recent years.²²

India's deeper integration into global value chains will inevitably lead to a surge in inbound trade. While *Atmanirbhar Bharat* (self-reliant India) remains a central pillar of the country's industrial strategy,²³ building competitive domestic industrial ecosystems is a gradual process, and complete localisation across an entire value chain is neither practical nor economically efficient. Moreover, as industrialisation accelerates, India's dependence on imported natural resources will remain substantial. Despite its rapid expansion of renewable energy, India will require imported fossil fuels for the next few decades; in 2024-25, its import dependency was 89 percent for crude oil and 50 percent for natural gas.²⁴ Dependence is equally pronounced in critical minerals, with country relying entirely on imports for lithium, cobalt, and nickel.²⁵

India's industrialisation is intended not only to substitute imports but also to expand exports. One of the most notable examples is the smartphone industry, whose exports increased more than fourfold, from US\$7 billion in 2022 to US\$30 billion in 2025.²⁶ To sustain this momentum, the government has introduced additional measures that support export growth. In 2025, it launched the Export Promotion Mission, an initiative aimed at expanding access to trade finance while strengthening hard and soft export infrastructure. Furthermore, India has revived its trade talks, concluding free trade

agreement negotiations with eight economies since 2021.²⁷ The country's increasing integration with the global economy suggests that maritime competitiveness is becoming ever more important, closely mirroring Korea's experience.

India's Maritime Development Strategy

As India's industrialisation accelerates trade, competitive maritime industries will become increasingly critical, particularly in today's volatile geoeconomic environment. As Figure 2 shows, India remains underrepresented in global fleet ownership, shipbuilding, and container port throughput relative to its shares of the world's population and economy. Recognising this gap, the government unveiled the "Maritime Amrit Kaal Vision 2047" in 2023, building on the "Maritime India Vision 2030" released two years earlier.²⁸

The strategy underscores the urgency of strengthening India's maritime sector, arguing that rapidly expanding trade will place growing pressure on the country's existing maritime infrastructure and capabilities. It sets ambitious targets across key maritime sectors, including increasing annual port handling capacity from 2.6 billion tonnes to 10 billion tonnes in 2047, and raising both India's global shipbuilding ranking and the ranking of Indian-flagged tonnage from outside the top 20 into the top five worldwide.²⁹ These targets reflect the central role envisioned for the maritime sector in supporting India's economic and trade expansion, while also driving industrial development in its own right. If achieved, they would position India as one of the world's leading maritime economies.

Being at a relatively early stage of development, India's maritime sector faces multidimensional challenges across infrastructure, technology, and human capital. To address these, the government has assumed an active role, particularly in financing. Prime Minister Narendra Modi has highlighted the link between maritime development and Atmanirbhar Bharat, noting that 95 percent of India's trade is currently carried by foreign vessels, resulting in an annual outflow of US\$75 billion in freight payments.³⁰ In response, the government has outlined a long-term plan to acquire 437 ships worth INR 2.2 trillion.³¹ It has also announced an INR 697 billion maritime development package focused on shipbuilding and the development of shipbuilding clusters.³² Furthermore, it has set a target to scale India's shipbuilding capacity to 4.5 million gross tonnage – a 110-fold increase over its 2024 output. Complementing these initiatives, India's port sector is undergoing a major expansion, with the Vadhvan Port project^a commencing in 2024.

a A new major port at the West coast of India.

South Korea–India Maritime Cooperation

The resurgence of global insecurity has prompted Korea to further strengthen its maritime industry. In an increasingly fragmented global economy, building resilience requires cooperation with trusted partners.

Seoul and New Delhi view one another as key partners in strengthening security and resilience amid growing geoeconomic uncertainty. The outcomes of the April 2026 Korea-India Summit reflect this shared strategic vision – anchored in a wide range of frameworks, statements, and agreements. Maritime cooperation featured prominently through the “Comprehensive Framework for Partnership in Shipbuilding, Shipping & Maritime Logistics” and the “Memorandum of Understanding on Cooperation in the Field of Ports”.³³ Maritime issues also featured in broader agreements, such as the “Joint Statement on Energy Resource Security” and the “Joint Statement on Cooperation in the Field of Sustainability”.³⁴

The outcomes were not restricted to political rhetoric. They identified specific areas of cooperation and concrete mechanisms for collaboration. Further, they underscored both leaders’ commitment to strengthening the recent momentum in Korea-India industrial and development cooperation in the maritime sector.

As a result of its maritime-led industrialisation, Korea now possesses technologies, industrial capabilities, and policy experience that can support India’s maritime transformation. Since the Indian government began promoting maritime development in the early 2020s, Korean companies have actively explored new opportunities for cooperation. Over the past year, organisations from Korea and India have signed a series of memoranda of understanding (MoUs) covering a range of maritime sectors.^b Among the most promising developments has been the progress made towards establishing a greenfield shipbuilding cluster.³⁵

South Korea too, stands to reap substantial benefits from closer maritime cooperation with India. India’s maritime competitiveness and logistical resilience are critical for the growing number of Korean manufacturers expanding their production base in the country. Beyond supporting existing investments, India’s maritime sector also offers a

b MoUs were signed between HD Korea Shipbuilding & Offshore Engineering and Cochin Shipyard (July 2025); Samsung Heavy Industries and Swan Defence & Heavy Industries (September 2025); HD Hyundai Heavy Industries and Cochin Shipyard (November 2025); HD Korea Shipbuilding & Offshore Engineering, HD Hyundai Samho Heavy Industries, and BEML (December 2025); HD Hyundai and Guidance TN (December 2025); and HD Hyundai, NSHIP TN, and Sagarmala Finance Corporation (April 2026).

rapidly expanding market and a strategic base for diversification amid an increasingly uncertain geoeconomic landscape.

The Korean government has already recognised India's strategic importance in several policy documents. Under the "Strategy for Securing Global Logistics Supply Chain Hubs," India is identified as one of 11 priority hub countries where government will support Korean companies in securing storage and cargo-handling infrastructure.³⁶ India is also one of the 11 countries identified for potential strategic investments in container terminals. The "K-Shipbuilding Future Vision" identifies India as a key partner under the "K-Shipyard Alliance".³⁷

Given South Korea-India maritime cooperation is still at an early stage, frequent government-to-government engagement is essential to align development priorities and prevent friction. Furthermore, since most cooperation projects will ultimately be undertaken by the private sector, the two governments can play a facilitating role by providing platforms for firms from both countries to exchange information and identify opportunities. For Korean firms considering investment in India's maritime sector, policy consistency and predictability will be critical.

Conclusion

In a rapidly shifting geoeconomic environment, the maritime sector has transformed into a pillar of national economic resilience. Recognising this, both Korea and India have adopted strategies to strengthen their maritime capabilities and increasingly view each other as key partners in this endeavour.

Maritime cooperation is one of the most promising areas for industrial development and economic diversification for both countries, offering a clear pathway towards mutually beneficial alignment. Realising this potential will require accelerating the identification and implementation of cooperation projects in areas such as shipbuilding, cranes and maritime equipment manufacturing, port development, vessel registration, skills training, seafarer recruitment, and maritime research—as envisioned in the "Comprehensive Framework for Partnership in Shipbuilding, Shipping & Maritime Logistics". By deepening maritime cooperation, the two countries can unlock new economic opportunities, while contributing to the stability in the Indo-Pacific.

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Maritime Security and Supply Chain Resilience in the Indo-Pacific

Abhishek Sharma

Great-power rivalry and entrenching mercantilism in the Indo-Pacific region has led to growing fissures in the regional economic and security framework. Supply chain bottlenecks, technology restrictions, export controls, and unfair tariff enforcement are just a few manifestations of this friction. These shifts not only threaten the Indo-Pacific's economic growth, development and security, but also have profound national security implications for individual countries in the region. Economic resilience and maritime connectivity are two areas in which countries have experienced setbacks due to protracted contestation—forcing regional stakeholders, especially emerging and middle powers, to explore new mechanisms for cooperation and collaboration.

Among regional players, India and South Korea have gained greater salience amid increasing geopolitical and geoeconomic turbulence. Since 2025, India has undergone what can be called a strategic reawakening, shelving many foreign policy assumptions it had

developed over the last decade, particularly regarding its relations with China and the US.¹

As part of this shift, India is now actively seeking stronger institutional ties with like-minded partners such as South Korea, which share common values and interests. To fill the gap left by the great powers particularly in upholding rule of law and enhancing mutual economic security, New Delhi is focusing on two foreign policy priorities with South Korea:² formulating a normative and conceptual regional framework for strategic cooperation and identifying specific areas for strategic partnership. Through this alignment, India intends to uphold and safeguard the Indo-Pacific norms and values, which also underpin the Quad's foundation and its vision for the region. These values emphasise the importance of free and open sea lanes of communication, and the uninterrupted supply of goods and energy from and for the region. In this context, two specific areas are of particular interest to New Delhi: maritime security and governance, and supply chain resilience.

Establishing the Foundations for Future Strategic Partnership

India views South Korea as an indispensable partner in the region, within its Act East Policy (AEP) and Indo-Pacific vision. Once seen primarily as a vital trading partner, South Korea is now increasingly perceived as an important development, industrial and technological partner, critical to India's growth and progress.³ This shift in perception is linked to South Korea's growing strategic and economic profile in the region and its interest in deepening a comprehensive partnership with India that extends beyond economic ties. The foundations of this shift were laid during President Moon Jae-in's 2018 visit to India, which underscored India's significance as an economic player in the Indo-Pacific under the New Southern Policy (NSP).⁴

While bilateral momentum slowed under President Yoon Suk Yeol's administration, the new administration under President Lee Jae Myung has revitalised ties. The April 2026 meeting between President Lee and Prime Minister Narendra Modi was a critical turning point: it institutionalised previous agreements through concrete mechanisms and implementation measures, plugging a historical strategic gap by strengthening industrial linkages and bolstering supply chain integration. The deepening of both strategic and industrial ties enables better coordination and planning, and serves as an incentive for both nations to view this bilateral relationship as a long-term opportunity.

This strategic convergence has now expanded at all levels—from political leaders and ministries, to businesses and epistemic communities. A robust consensus has emerged

on the importance of norms and the rule of law, institutional cooperation, maritime governance architecture, and stronger bilateral ties. This marks the second time India has identified relevant strategic areas for cooperation with South Korea, beyond the standard bilateral framework. The first instance was in the immediate aftermath of the country's liberalisation in the mid-1990, when India looked at its East Asian partners for economic cooperation. Today, there is also a growing recognition of how the India–South Korea partnership can enhance both India's and the region's economic and maritime security.

While global trends have contributed to this shift to some extent, the fundamental driving factor has been recent developments in the regional political landscape: notably, the US's increasing insularity⁵ and restrictive approach to trade and technology partnerships with like-minded countries, as well as its declining adherence to universal norms and principles. Fearing the rise of a destabilising US–China G2 pact in the Indo-Pacific region, India has turned to like-minded countries that share these concerns. For trade diversification, India has reached out to the EU, the Gulf and ASEAN; for technology partnerships, it has approached South Korea, Japan, Taiwan and the UK.

India–South Korea Ties: An Emerging Node in Indo-Pacific Geopolitics

While all bilateral partnerships are vital amid increasing geopolitical uncertainty, the India–South Korea relationship stands apart from New Delhi's perspective. Most of India's bilateral ties are aimed primarily at safeguarding and maximising mutual interests, promoting trade, and contributing to regional stability. However, given South Korea's substantive industrial and technological capabilities, the India–South Korean partnership is uniquely positioned to enhance India's strategic autonomy—helping it build the capabilities and capacities required to reduce its reliance on external players.

Recent global disruptions^a in energy security, economic security, and access to technology have underscored the importance of domestic industrial and technological capacity in navigating periods of crises. Furthermore, since the Trump administration took office last year, conversations around enhancing “strategic autonomy”⁶ have

a In 2025–26, India has faced three shocks simultaneously: first, the energy shock with the protracted conflict in the Middle East; second, the economic shock from the US administration with increasing tariffs; and third, the technology shock as a result of increasing restrictions in technological cooperation imposed by the Trump administration and China, especially around artificial intelligence, rare earths exports, and processing technologies.

gained prominence in India, particularly among policymakers, strategists, and public intellectuals. Thus, India's current partnerships are judged by this touchstone, which elevates the Seoul–New Delhi relationship to the same critical tier as India's ties with Europe or Japan.

Domestically, India's growing ambitions demand partnerships built on complementary and aligned interests. In that context, too, South Korea is well positioned to support India's strategic objective. The country shares common values and interests with India on maritime security, governance, and resilient supply chains, particularly in the Indo-Pacific. This convergence was visible during the recent Lee–Modi meeting, where the two sides signed three standalone agreements—on energy resource security, sustainability, and shipbuilding and maritime logistics—in addition to a joint statement.⁷ The outcomes reflected a high degree of mutual understanding, enabling them to work together on critical issues that had previously been peripheral to the bilateral agenda.

The advocacy for a deeper India–South Korea bilateral partnership is not a recent phenomenon. During his 2024 visit to South Korea, Indian External Affairs Minister S. Jaishankar put forward the strategic rationales for greater cooperation, seeking the country's participation in international initiatives such as Indo-Pacific Oceans Initiative (IPOI) and Information Fusion Centre–Indian Ocean Region (IFC–IOR). Jaishankar noted: “India and RoK have a growing responsibility to actively contribute to the reshaping of the global order. The era when a few powers exercised disproportionate influence over that process is now behind us. Willy-nilly, it has become a more collaborative and broad-based endeavour.”⁸ This future-oriented vision recognised the potential of the India–South Korea partnership, which has since evolved on a positive trajectory and recently culminated in the diplomatic breakthroughs of April 2026.

Deeper cooperation between the two nations is now increasingly important amid the emerging and intensifying challenges in the region, particularly maritime security disruptions and supply chain bottlenecks. Reiterating this urgency at the 2026 Jeju Forum for Peace and Prosperity, Jaishankar, outlined five factors for India–South Korea partnership to limit “hostage-taking in the economic domain”.⁹

Seoul and New Delhi have grown increasingly cognisant of the shared regional challenges and the collaborative mechanisms required to resolve them. In the last few years, this greater geopolitical understanding has led to growing practical collaboration between India and South Korea in two strategic areas: maritime governance and connectivity, and economic security and supply chain resilience. In 2018, South Korea joined the Indian Ocean Rim Association (IORA) as a dialogue partner, an important

step towards participating in the Indian Ocean regional economic architecture.¹⁰ In 2023, it became an observer of the Indian Ocean Naval Symposium (IONS).¹¹ Most recently, it joined the IPOI. Furthermore, discussions are ongoing about Korea deploying a liaison officer to the IFC-IOR based in Gurugram, a critical nodal agency responsible for regional maritime domain awareness. These developments underscore Korea's growing interest in being part of the IOR governance architecture, as well as participating in discussions on multi-domain issues related to the blue economy, connectivity, security and information exchange, and have received positive affirmation from India.

Economic security and supply chain resilience form the second pillar of India's strategic outreach to South Korea. Driven by a pressing need to reduce its structural dependence on China and the US, India's is actively working to diversify economic partnerships; establish resilient supply chains; and foster trusted, less vulnerable industrial connections that can withstand external shocks and interventions. South Korea shares India's interest in building more dynamic and future-oriented ecosystems. While much was envisioned after the relationship was upgraded to a Special Strategic Partnership in 2015, tangible progress remains limited.

However, the April 2026 Joint Statement marks a decisive step forward in strengthening economic ties—by establishing an economic security dialogue; an industrial cooperation committee; a strategic framework for cooperation in shipbuilding, shipping and ports; and micro, small, and medium enterprise linkages highlight this ambition.¹² Furthermore, the signing of the India–Korea Digital Bridge framework¹³ extends this partnership into the digital corridor, facilitating collaborations across critical emerging frontiers such as cybersecurity, artificial intelligence, and quantum computing. These bilateral developments directly bolster India's economic, technological, and energy security, while also building regional strategic resilience and stability in the long run.

Conclusion

Linking maritime security to regional economic resilience is a deliberate strategy, as New Delhi recognises that securing industrial linkages and supply chains is impossible without simultaneously safeguarding maritime security and governance to maintain stable and secure sea lanes of communication. India–South Korea bilateral ties can play a significant role in areas such as shipbuilding, green energy, port modernisation, and digitisation. Recent geopolitical flashpoints, such as disruptions from the Iran–

US/Israel conflict, have reiterated the urgent need for a deeper economic partnership as well as strong defence cooperation, to ensure the uninterrupted flow of trade and commerce.

Driven by shifting global and regional dynamics, India increasingly views South Korea as a strategic counterweight in many sectors. Across electronics, semiconductors, shipbuilding, the battery supply chain, and the critical mineral supply chain, India stands to benefit from South Korea's cooperation and collaboration. Ultimately, this partnership will not only help India reduce its asymmetrical dependence on China and the US, but also strengthen the wider Indo-Pacific's governance and security architecture, fostering prosperity and stability in the region.

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II

Cooperation for Maritime Supply Chain Resilience

Disrupted but Endurable: Global Supply Chain Fragmentation and Maritime Risk

Yeon-jung Ji

For over three decades beginning in the 1990s, the global economy operated under the prevailing assumption of unhindered global integration.¹ During this process, supply chains were optimised for maximum efficiency, minimum inventory, and the lowest possible cost, heavily reliant on a stable and seamlessly connected maritime network. This paradigm has now been altered as the world has entered an era of macroeconomic and geopolitical realignment. Driven by shifting geopolitical alliances and the imperative of national security over economic efficiency, the global supply chain is actively being reshaped. This structural shift, compounded by physical disruptions and extreme chokepoint vulnerabilities, has thrust maritime risk to the forefront of global economic security.²

Yet, with around 80 percent of global trade volume moving by sea, the oceans remain essential arteries of the international economy.³ Geopolitical conflicts and post-pandemic restructuring have created a confluence of

crises. Consequently, states and multinational corporations are compelled to overhaul their operational strategies, moving from so-called just-in-time supply chains to just-in-case resilience architectures.⁴ To survive this era of compounding volatility, reliance on single maritime routes is no longer viable. Instead, states and corporations are actively decentralising their supply lines and locking in trusted geopolitical partnerships to secure them. The Red Sea impasse and the Strait of Hormuz crisis have forced them to move away from cost-first logistics. Friend-shoring and near-shoring have thus gained momentum, prompting countries such as Mexico, Morocco, Vietnam, Malaysia, and India to reinforce vulnerable logistics networks and position themselves as more reliable nodes in global supply chains.⁵

As a direct response to global supply chain fragmentation, emerging coalitions—notably that between India and South Korea—are being constructed to merge advanced technological capital with secure and expansive manufacturing geographies. By combining these complementary assets, the two countries aim to create resilient, self-sustaining economic corridors that bypass traditional vulnerabilities. Understanding this transition requires an examination of current maritime bottlenecks and the strategic collaborations, such as the emerging synergy between India and South Korea, that are being forged to navigate them.

The Global Trend of Fragmentation and Chokepoints

The fracturing of the global supply chain is no longer a theoretical risk; it is a reality. The predominant trend is characterised by friend-shoring, near-shoring, and the deliberate decoupling of strategic industries, particularly between the United States (US) and China. This geoeconomic fragmentation is actively rewriting the map of global trade routes. Manufacturing bases are gradually migrating towards Southeast Asia, Latin America, and India as multinational corporations seek to build resilience against broad tariff regimes, sweeping export controls, and multifaceted geopolitical blowback.⁶

However, this geographic migration of manufacturing is only one half of the resilience equation; securing the physical transit of goods from these new hubs requires a parallel overhaul of maritime and operational strategies.⁷ To navigate this fragmentation, states are establishing alternative multi-modal corridors and engaging in strategic stockpiling to build domestic buffers. Concurrently, commercial shipping lines and maritime insurers are enforcing route diversification and implementing fleet adjustments, such as optimising vessels for longer voyages, to mitigate the physical and financial risks associated with navigating traditional, vulnerable chokepoints.

The urgency of these logistical overhauls is underscored by growing chokepoint-induced volatility.⁸ The global maritime system is highly dependent on a few critical geographical straits,^a and amidst shifting global power dynamics, these nodes have proven vulnerable to escalating security crises. The Strait of Hormuz serves as the most profound contemporary example of this fragility. As the jugular vein for global energy and industrial markets, the Strait of Hormuz facilitates the transit of approximately 20-25 percent of the world's seaborne oil trade and roughly 20 percent of global liquefied natural gas (LNG).⁹ Furthermore, it is a critical conduit for broader industrial supply chains, carrying substantial volumes of petrochemical feedstocks, roughly around 30 percent of the world's traded fertilisers, and helium, which is an essential input for global semiconductor manufacturing.^{10,11}

The situation in the Red Sea serves as another useful example. Escalating geopolitical conflicts and targeted attacks on commercial shipping by regional actors have effectively paralysed one of the world's most critical transit corridors, which historically handled approximately 12-15 percent of global trade.¹² Bypassing the Suez Canal to travel around the Cape of Good Hope adds approximately 3,000 to 4,000 nautical miles to a journey between Asia and Northern Europe. This increases transit times by 10-14 days and requires vessels to burn hundreds of additional tons of fuel, vastly increasing greenhouse gas emissions and operational costs.¹³

The immediate consequences of chokepoint volatility generate immense rerouting pressures. When ships are forced to take longer routes, it creates a phenomenon known as increased ton-mile demand, i.e., the volume of cargo multiplied by the distance it must travel. Even if the absolute volume of global trade remains static, longer routes artificially shrink the global shipping fleet's effective capacity. Vessels spend more time at sea, delaying their return to loading ports, which cascades into severe equipment and vessel shortages worldwide.

This rerouting is not merely a logistical inconvenience; it acts as an inflationary tax on the global economy, raising the cost of energy, raw materials, and finished consumer goods. Furthermore, the downstream effects of fragmentation and chokepoint rerouting

a The Strait of Hormuz, the Strait of Malacca, the Bab el-Mandeb Strait, the Turkish Straits, and the Strait of Gibraltar are widely recognised as critical maritime chokepoints that sustain global trade and energy flows.

manifest as profound disruptions to maritime trade flows. These disruptions are systemic, affecting every node of the supply chain network from origin ports to final distribution centres.^b

Disruption of Maritime Trade Flows

The synchronisation of global vessel schedules has been disrupted. Ocean carriers operate on precise, tightly wound loops. When a vessel is delayed due to political conflict and regional instability, it misses its berthing window at destination ports.¹⁴ This leads to vessel bunching, where multiple ships arrive, simultaneously overwhelming port infrastructure, creating massive offshore anchorage queues, and slowing the landside evacuation of cargo via trucks and trains.

Disruption to trade flows results in extreme freight rate volatility. The sudden contraction in effective capacity allows ocean carriers to implement emergency risk surcharges and sharply increase spot market rates. Freight rates could triple or quadruple in a matter of weeks during severe Red Sea or Suez crises, echoing the unprecedented price spikes seen during the COVID-19 pandemic or financial crises.¹⁵ Accordingly, market fear is now quantified directly into shipping costs, with elevated risk perceptions and proactive uncertainty premiums acting as primary drivers of freight rate inflation.¹⁶ For low-margin industries, such spikes are unsustainable and often result in demand destruction or halted production lines.

Furthermore, the flow of empty shipping containers has been distinctly disrupted. The global trade imbalance implies that millions of empty containers must be continuously repositioned from consumer-heavy regions back to manufacturing hubs. This disruption loop transforms localised maritime bottlenecks into global supply chain gridlocks.

Consequently, mitigating the impacts of supply chain fragmentation and elevated maritime risk requires strategic innovation, especially through risk diversification and logistics enhancements. Risk diversification is the foremost among these strategies,

b To mitigate these vulnerabilities, policymakers are shifting from reactive crisis management to proactive resilience. Key emerging responses include building critical redundancy into logistics networks, developing alternative, resilient connectivity corridors, and strengthening Maritime Domain Awareness (MDA) to anticipate and navigate threats better before they sever global supply lines.

with global corporations abandoning reliance on individual geographic nodes. Risk diversification encompasses multi-sourcing, regionalising supply chains, and holding higher safety stocks.

In other words, multi-sourcing ensures that critical components can be procured from at least two different continents. Simultaneously, regionalisation shifts manufacturing closer to end consumption to insulate production lines from vast oceanic distances. Regionalising supply chains calls for manufacturing goods in the region where they will be consumed.¹⁷ This leads to a higher tendency to hold safety stocks. Increasing inventory holding costs creates a drag on working capital while it is viewed as an essential insurance premium against the unstable revenue losses associated with stockouts during a maritime crisis.

While these strategies apply to global markets, this strategic imperative for risk diversification, regionalisation, and multi-sourcing within the Indo-Pacific context sets the stage for a deepened India-Korea partnership. As Korean corporations seek to diversify their manufacturing networks and insulate themselves from concentrated maritime risks, India emerges as an ideal strategic hub. This linkage is driven by profound strategic complementarities. By fusing Korea's advanced maritime infrastructure and technological innovation with India's vast industrial landscape, both states achieve unparalleled manufacturing resilience. India offers a secure and expansive environment for Korea to regionalise its supply chains.

In return, hosting this hub is immensely beneficial for India, as it secures vital inflows of Korean capital and expertise critical for building future-ready industries. This collaboration directly addresses India's growing need for high-tech knowledge transfer to sustain its long-term upward economic trajectory, allowing its domestic industries to climb the global value chain and accelerating its transformation into a primary export powerhouse. Equally important, aligning with Korean logistics conglomerates empowers India to systemically diversify its own import and export routes, mitigating exposure to regional supply chain bottlenecks and securing long-term maritime resilience.

Korea—India Bilateral Synergy: A Stabilising Force

As the global order evolves, the strategic partnership between the Republic of Korea and the Republic of India emerges as a vital network for stabilising Indo-Pacific supply chains. Both countries possess highly complementary economies, are deeply reliant on maritime trade, and are equally motivated to navigate the escalating complexities of global geopolitical dynamics. Faced with the systemic vulnerabilities of chokepoints like

the Strait of Hormuz and the broader economic shocks of supply chain fragmentation, a dependable bilateral partnership offers a robust mechanism for mutual risk diversification and structural stabilisation.

First, as both countries depend on the Strait of Hormuz for crude oil and LNG imports, a localised crisis in the Gulf immediately threatens their economic stability. To diversify away from this high-risk maritime concentration, India can engage in strategic macro-level cooperation. This includes the co-development of alternative energy supply routes and joint investment in strategic oil reserves. By establishing reciprocal crude storage arrangements—where Korea can likely store strategic reserves in India’s facilities—both countries can build an immediate buffer against sudden maritime supply halts.

This risk diversification extends to the industrial sphere. As the Strait of Hormuz accounts for a massive share of the global fertiliser and chemical feedstock trade, any disruption directly threatens Korea’s and India’s agricultural sector and chemical industries.¹⁸ By cross-investing in alternative production hubs in India or in Southeast Asia, Seoul and New Delhi can effectively de-risk their primary supply lines from a single, volatile maritime corridor.

To physically support this growing economic and industrial cooperation, establishing direct, resilient maritime corridors between Korea’s mega-hub of Busan and India’s primary gateways, such as Jawaharlal Nehru Port (JNPT) and Chennai Port, physically cements this alignment.^c This direct port-to-port connectivity reduces mutual reliance on congested and vulnerable third-party transshipment nodes in East Asia. By removing these logistical middlemen, the Busan-JNPT and Busan-Chennai routes can guarantee a secure, uninterrupted transit route for bilateral trade, as well as for multilateral trade that significantly reduces dwell times and overhead costs.^d

c These specific nodes are highly strategic: JNPT provides direct access to India’s western industrial heartland, while Chennai serves as the anchor for eastern automotive and technological manufacturing clusters.

d Busan is perfectly positioned to serve as the linchpin in the proposed Chennai-Vladivostok Eastern Maritime corridor for India. By incorporating Busan into this, the corridor immediately gains the economies of scale and advanced transshipment capabilities required to succeed. This integration creates a powerful geopolitical synergy: it links India’s Act East Policy directly with Korea’s New Southern Policy, forging a trilateral maritime highway that actively diffuses supply chain risks while establishing a formidable and secure logistical network across the Asian littoral.

Second, Korea's export-driven economy relies on advanced manufacturing and semiconductors, yet it requires a massive, resilient consumer market and a diversified manufacturing base outside traditional geographies.¹⁹ India provides precisely this buffer through its comprehensive Make in India initiative and specialised production incentives. By integrating Korea's technical expertise and capital with India's expanding industrial corridors, the two countries can forge a robust friend-shored manufacturing ecosystem. Anchoring supply chains within trusted countries insulates both economies from abrupt trade barriers and economic statecraft, ensuring operational continuity and reliable market access. However, achieving this diversified ecosystem is a gradual process, contingent upon India systemically addressing ongoing domestic challenges related to logistics efficiency, regulatory frameworks, and infrastructure gaps.

Furthermore, a pillar of this industrial alignment lies in maritime infrastructure. As India aggressively modernises its maritime footprint, Korea's shipbuilding and port-operating companies can play a transformative role. Collaborative ventures can accelerate the deployment of automated, climate-resilient smart ports along India's coastline, massively reducing vessel turnaround times and cushioning global trade flows against unexpected port congestion. This includes co-developing physical AI-based manufacturing, digital tracking, and precision engineering protocols that drastically improve build quality and reduce production times. To operationalise this, India and Korea should establish a dedicated government-to-government working group that can act as a strategic policy hotline. This mechanism would streamline regulatory alignment, facilitate rapid technology transfer, and coordinate joint sovereign investments.

Ultimately, safeguarding maritime trade flows against volatile chokepoints requires hard security collaboration. Both the Indian Navy and the Republic of Korea Navy are committed to the principle of freedom of navigation and the preservation of a rules-based maritime order. By expanding the scope of their bilateral naval exercises and establishing formal mechanisms for real-time intelligence sharing—particularly regarding Maritime Domain Awareness in the Indian Ocean and critical straits—India and Korea can project a stabilising presence. This security synergy ensures that the vital sea lines of communication linking East Asia to the Middle East and Europe remain open, secure, and resilient against both state and non-state interference.

By taking proactive ownership of regional maritime security, Korea and India can move beyond merely reacting to global disruptions. Instead, they can position themselves as net security providers within the broader Indo-Pacific region. By adopting such a role,

both states are guaranteeing the safety of the sea lines of communication that their new economic synergy relies upon. In an era defined by fractured global supply chains and chokepoint vulnerabilities, this transition from mutual economic reliance to robust security collaboration is no longer just an option for India and Korea: it is a strategic necessity for sustained prosperity.

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Bolstering Maritime Supply Chain Resilience to Strengthen the India–Korea Strategic Compact

Sayantan Haldar

The positioning of the Indo-Pacific as a fulcrum of global geopolitical and geo-economic realignments has seemingly galvanised the impetus of both resident and non-resident countries with a stated commitment to a free, open, and inclusive order in the region to strengthen their strategic partnerships.¹ India and South Korea have identified a number of critical areas where they could bolster their strategic partnership.² Serving as the capstone of this quiet development was South Korean President Lee Jae Myung's 2026 visit to India,³ in which the Joint Strategic Vision for the India-ROK Special Strategic Partnership was signed. The Vision document establishes a partnership based on industrial production and technology collaboration.⁴

South Korea is a formidable player in the shipping and shipbuilding sector.⁵ India, for its part, is renewing its focus on leveraging the maritime character of its geography⁶ and is searching for policy pathways to catapult the country to a leading position in this domain.

A cornerstone for the two countries to continue strengthening their ties is maritime trade. India's impetus for port-led connectivity, facilitation of multimodal logistics integration, and diversification of maritime trade appears to be well aligned with South Korea's capabilities in advanced maritime systems and logistics technologies. The two countries need to seek strategic partnerships that are resilient to ongoing disruptions in global trade and economic integration efforts. The maritime domain is likely to shape much of the broadening and deepening of the India-South Korea dyad in maritime supply chain resilience.

India's Maritime Imperative

As a country with its geography flanked by the Indian Ocean, and as a proponent of the Indo-Pacific, India's economic growth and prosperity hinge on the maritime domain, with trade and connectivity being central to this equation.⁷ Its geography makes it naturally dependent on port-led development and connectivity. Moreover, as a littoral country, India remains an important gateway for its landlocked neighbours to facilitate trade and connectivity. This further aligns with the country's ambitions to overhaul its port infrastructure through modernisation, the integration of new technologies, and supporting green transitions.

Launched in 2015, the Sagarmala Programme remains India's flagship initiative to strengthen the country's port infrastructure.⁸ It is built on five pillars: port-led industrialisation, port modernisation, port connectivity, coastal community development, coastal shipping and inland waterways. The programme establishes various mechanisms to modernise existing ports and develop new ports, aiding port traffic management by arresting congestion and enhancing operational efficiency.

The push for more port infrastructure and a vast and diversified port network also seeks to make maritime trade cost-effective by enhancing multimodal trade. The project aims to reduce overall logistics costs and complement efforts to build port-centric industrial clusters, Special Economic Zones (SEZs), and logistics parks.

There is a strategic push for multimodal trade and connectivity routes in India. Given the country's vast geography, it is essential to ensure that architectures of connectivity and logistics integrate all corners of the country. The hinterland is envisaged as an integral component of India's maritime trade, thereby resulting in comprehensive economic growth and prosperity. Furthermore, the multimodal trade routes also stand to benefit India's landlocked neighbours who remain dependent on Indian maritime gateways to access maritime trade routes. This has also resulted in a contest of influence in South Asia and the Bay of Bengal.⁹ Both India and China are increasingly charting foreign

policy priorities such that infrastructure support is extended to landlocked and littoral countries in South Asia.¹⁰

As a result, a critical contest for influence projection appears to be emerging, where New Delhi and Beijing are competing to lead in facilitating maritime connectivity and security cooperation in the wider Indian Ocean region. This is motivating New Delhi to strengthen its maritime infrastructure and connectivity architectures to integrate various stakeholders. In 2021, India launched the PM Gati Shakti National Master Plan¹¹ to support efforts to expand multimodal connectivity across the country. Through this plan, efforts are underway to upgrade the integrated planning and coordinated implementation of India's connectivity initiatives by involving and connecting the hinterlands with the country's maritime hubs.

Additionally, India is expanding partnerships with various countries to inject momentum into its efforts to revitalise the maritime sector. Even as the state of economic integration remains fractured in the wider Indo-Pacific context, India is working to strengthen its partnerships with countries in Southeast Asia, as well as Japan, Australia, and France.

Furthermore, the Indo-Pacific is witnessing the emergence of cooperation among middle powers such as South Korea, Australia, and Indonesia, which hold vital interests in the region. Seoul's role in shaping a cohesive maritime security and connectivity paradigm in the region is crucial as a key middle power in the Indo-Pacific. Therefore, New Delhi's policy priorities in the Indo-Pacific must evolve in tandem with the imperative to bolster cooperation with middle powers like South Korea.

South Korea's Maritime Prowess

South Korea is a leading actor in the maritime domain, holding the second largest share of global ship manufacturing.¹² While Japan follows closely, China has emerged as the largest shipbuilding nation globally, with a market share of over 50 percent in the tonnage of merchant fleet building as of 2026.¹³ South Korea's market share remains at 27 percent, followed by Japan at 13 percent.¹⁴

While this establishes that South Korea plays an important role in the shipping and shipbuilding industry, the glaring gap between China and the rest makes it imperative to take on strategies to diversify and ensure that alternate players emerge to balance the shipbuilding sector. The singular dominance of China in the shipping sector poses a critical strategic vulnerability for countries, especially in today's era of seaborne trade where oceans serve as an integral medium for facilitating global trade. Given India's interest in emerging as a shipping and shipbuilding hub, as well as complementarities

in the labour force, Seoul must strengthen its partnership with New Delhi to harness strategies of shared growth.

Importantly, South Korea has made strides in infusing new technologies such as AI into shipbuilding,¹⁵ resulting in added value to Seoul's prowess as a maritime leader in shipbuilding, logistics, and smart and green port infrastructure. South Korea's focus on automated vessels also helps integrate innovation in shipping to make the future of shipping cost-effective.

Under the 2030 Greenship-K Promotion Strategy,¹⁶ South Korea seeks to facilitate the green transition and incrementally mitigate the use of fossil fuels to contribute to carbon neutrality. The shipping sector is a large consumer of fossil fuels, and the green transition has become an imperative. South Korea's position as a pioneer in sustainable shipping is an important frontier for greater cooperation between Seoul and New Delhi.

Looking Ahead: The India–Korea Compact

India and South Korea are strengthening synergies to achieve shared economic growth in the Indo-Pacific context. The shipbuilding sector, in particular, is vital for both states. Given the strategic vulnerabilities posed by China's dominance in this sector, it is key for other countries to identify avenues to diversify the shipbuilding supply chain. India and South Korea share complementarities rooted in expertise and labour force to optimise partnership and output in this sector. As such, the shipbuilding sector must remain the centrepiece of India-South Korea strategic partnership in the Indo-Pacific.

Given the green turn, which is gradually defining much of the maritime economy,¹⁷ South Korea's efforts to promote green shipping by including innovation in new systems of shipbuilding and port infrastructure, New Delhi must envisage a greater degree of cooperation with Seoul on this front.

The recent visit of South Korean President Lee Jae Myung has injected momentum into the India-South Korea partnership. Given that it is founded in an Indo-Pacific context, the two countries must ensure that maritime supply chain resilience remains at the heart of the compact.

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III

India–Korea Industrial Cooperation and Maritime Manufacturing

Beyond Scale: South Korea's Shipbuilding Strategy and Implications for Korea–India Maritime Cooperation

Byungyul Park

Global shipbuilding is undergoing a profound transformation driven by decarbonisation, digitalisation, and intensifying international competition. Traditionally, competitiveness in shipbuilding was closely associated with production scale and cost efficiency. Today, the industry's competitive landscape is increasingly shaped by technological capabilities, innovation systems, and the ability to develop high-value maritime products.

As environmental regulations become more stringent and digital technologies reshape industrial production, shipbuilding is evolving into a highly technology-intensive manufacturing sector. The transition towards green vessels, smart shipyards, and advanced maritime solutions is creating new sources of competitive advantage while challenging traditional production models.

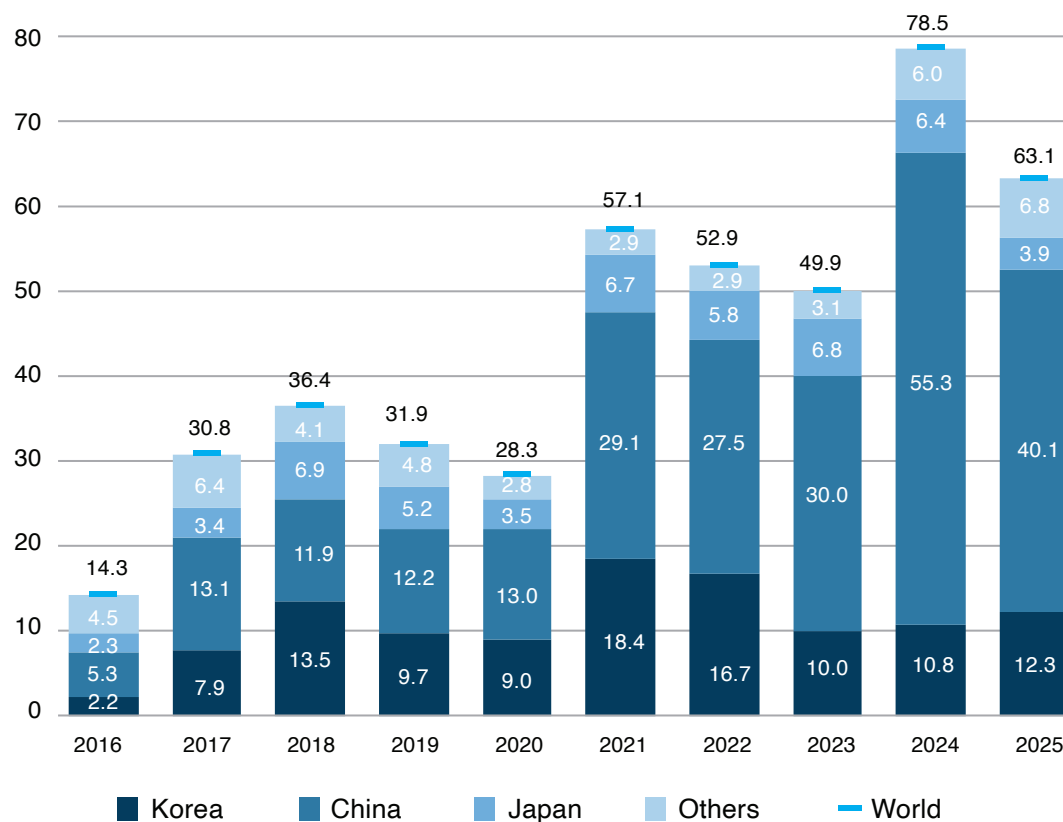
Against this backdrop, the Republic of Korea (South Korea) has maintained a leading position in high-value maritime manufacturing despite growing competition from emerging shipbuilding economies.¹ This article argues that South Korea's competitiveness stems from continuous industrial upgrading, strong innovation systems, and a deeply integrated maritime industrial ecosystem. It explores the implications of this for South Korea-India maritime cooperation.

Transformation in Global Shipping

Over the past half century, the centre of global shipbuilding has shifted decisively towards Asia. China, South Korea, and Japan collectively account for most of global shipbuilding activity, while new entrants such as India are seeking to expand their maritime manufacturing capabilities.²

China has emerged as the world's largest shipbuilding nation through substantial investments in production capacity and extensive government support.³ Meanwhile, South Korea has focused on maintaining leadership in technologically advanced and high-value segments, including liquefied natural gas (LNG) carriers, large container vessels, and specialised ships. This divergence illustrates a broader transformation in the industry's competitive dynamics.

Increasingly, competitiveness is determined not only by the number of vessels produced by a company but also by the technological sophistication, environmental performance, and industrial capabilities of its products. As decarbonisation and digitalisation accelerate, future leadership in shipbuilding is likely to depend on innovation and ecosystem-based competitiveness rather than production scale alone. As shown in Figure 1, global shipbuilding contracting increased rapidly after the COVID-19 pandemic, reaching 78.5 million Compensated Gross Tonnage (CGT) in 2024. Much of this growth was driven by China's expansion in production volume, while South Korea continued to strengthen its position in technologically sophisticated and high-value segments. This contrast between volume-driven and value-driven strategies, as illustrated in Figure 1, foreshadows the structural choice explored in this article: whether future competitiveness will be defined by scale or by technological sophistication.

Figure 1. Global Shipbuilding Contracting (Million CGT)

Source: Park et al. (2026); prepared by Eunchang Lee based on data from Clarksons Research data.⁴

South Korea's Shipbuilding Strategy

Industrial Upgrade Towards High-Value Maritime Manufacturing

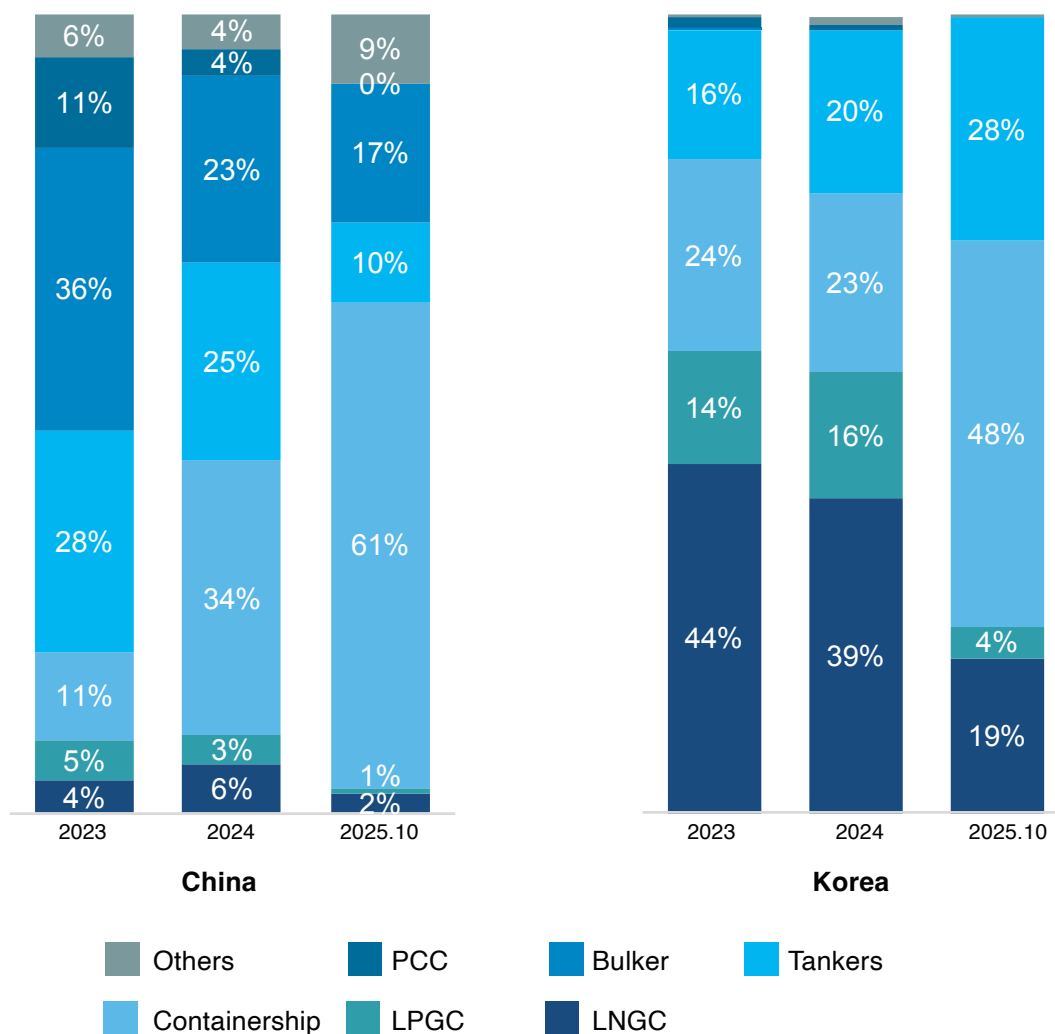
South Korea's shipbuilding competitiveness is built upon a long-term strategy of industrial upgrades rather than expansion through production volume alone. As competition in standard vessel segments intensified, its shipbuilders increasingly shifted their focus towards technologically sophisticated and high-value maritime manufacturing.⁵ This transition has enabled South Korea to avoid direct price competition with China and reinforce its position among advanced shipbuilding economies.

Over the past two decades, South Korean shipyards have developed strong capabilities in LNG carriers, large container vessels, offshore engineering facilities, and other technologically advanced ships. These segments require advanced engineering capabilities and strict quality standards, creating higher barriers to entry than conventional vessels. As environmental regulations grew more stringent, South Korean firms further expanded their presence in green shipbuilding by developing vessels powered by LNG, methanol, ammonia, and other low-carbon fuels. Major shipbuilders, including HD Hyundai, Hanwha Ocean, and Samsung Heavy Industries, have strengthened their competitiveness through investments in such alternative-fuel vessels.⁶

This illustrates an important feature of South Korea's industrial strategy. Rather than compete primarily on labour costs or production scale, South Korean shipbuilders have continuously moved towards more knowledge-intensive and technology-intensive activities. As a result, the industry has maintained global competitiveness despite the rise of emerging shipbuilding economies.

This strategic positioning is also reflected in the composition of South Korea's orderbook.⁷ As shown in Figure 2, the differing ship type mix of China and South Korea reflects contrasting competitive strategies, with the latter emphasising technological sophistication and value creation.

Figure 2. Ship Type Mix of New Contracts in China (Left) and Korea (Right) (in CGT)



Source: Park et al. (2026); prepared by Eunchang Lee based on data from Clarksons Research data.⁸

Innovation Systems and R&D Integration

A second pillar of South Korea's competitiveness is its innovation system and strong integration between research, development (R&D), and industrial production. Shipbuilding is increasingly characterised by rapid technological change, requiring continuous investment in engineering capabilities, digital technologies, and environmental solutions.⁹

In South Korea, innovation is supported by close collaboration among shipbuilders, research institutes, universities, equipment suppliers, and government agencies. The K-Shipbuilding Super Gap Vision 2040, a strategic roadmap for the country's shipbuilding future released in July 2024 by its Ministry of Trade, Industry and Energy, has emphasised such collaboration to accelerate the development of autonomous navigation, eco-friendly vessels, and smart shipyard technologies.¹⁰ This ecosystem facilitates the development and commercialisation of new technologies, ranging from advanced propulsion systems and energy-efficient vessel designs to autonomous navigation technologies and digital ship management solutions.

The integration of research and industrial production has been particularly useful while responding to the global transition towards greener shipping. South Korean firms have actively invested in alternative fuel technologies, fuel efficiency improvements, and carbon reduction solutions in anticipation of evolving international environmental regulations. For example, HD Hyundai Heavy Industries has applied its in-house R&D capabilities to move a new propulsion technology from design to commercial deployment, illustrating how close integration between research and production shortens the path from innovation to market.¹¹ Digital technologies are also being applied to monitor and optimise these systems in real time.¹² These efforts have strengthened the industry's ability to adapt to changing market requirements while maintaining technological leadership.

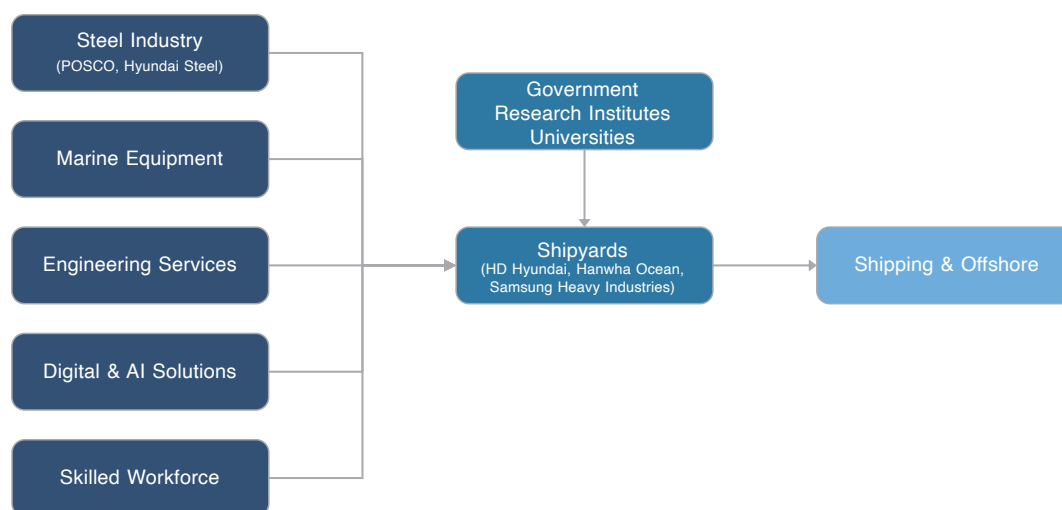
Industrial Ecosystems and Supply Chain Competitiveness

Beyond technological capabilities, Korea's shipbuilding leadership is supported by a highly integrated maritime industrial ecosystem. While shipyards occupy a central position within this ecosystem, their competitiveness is closely linked to the strength of supporting industries and supply chain networks.

One important component is the steel industry. High-quality steel products, particularly specialised steel plates used in ship construction, constitute a critical input for advanced vessel manufacturing. Korea's steel producers have developed close industrial linkages with shipbuilders, enabling stable supply, technological coordination, and continuous product improvement. For instance, leading steel manufacturer POSCO has collaborated with HD Hyundai Heavy Industries to develop and apply advanced high-manganese steel for next-generation vessels, demonstrating close technological coordination between upstream steel producers and downstream shipbuilders.^{13,14}

The broader ecosystem also includes marine equipment manufacturers, engine producers, engineering firms, digital solution providers, classification societies, and specialised service companies (see Figure 3).¹⁵ The close interaction among these actors enables the rapid development and commercialisation of new technologies, strengthens supply chain coordination, and facilitates continuous knowledge exchange throughout the shipbuilding process. Such ecosystem-based collaboration enhances innovation capacity while improving productivity, quality, and global competitiveness. As shipbuilding becomes increasingly complex and technology-intensive, the role of industrial ecosystems is becoming even more important. Competitiveness is no longer determined solely by the capabilities of individual shipyards, but by the collective strength of interconnected firms, suppliers, research institutions, and supporting industries. In this regard, South Korea's experience suggests that sustainable leadership in shipbuilding depends on building ecosystem-based competitiveness rather than focusing exclusively on production capacity expansion. This ecosystem-oriented approach offers valuable lessons for emerging maritime manufacturing economies.

Figure 3. South Korea's Maritime Industrial Ecosystem



Source: Author's illustration.

Green and Digital Transformation in Shipbuilding

The future of shipbuilding competitiveness will increasingly be shaped by the ability to respond to environmental and technological transitions. Decarbonisation, automation, and digitalisation are fundamentally transforming the maritime industry, creating both challenges and opportunities for shipbuilders worldwide. In this evolving environment,

South Korea has sought to maintain its competitive position by investing in green shipbuilding technologies and accelerating the adoption of digital manufacturing solutions.

Green Technologies and Sustainable Shipbuilding

Environmental sustainability has become one of the most important drivers of change in the global maritime industry. The International Maritime Organization (IMO) has introduced increasingly stringent regulations aimed at reducing greenhouse gas emissions from international shipping, prompting shipowners and shipbuilders to explore alternative fuels and low-carbon technologies.¹⁶

South Korean shipbuilders have responded proactively to these developments by strengthening their capabilities in environmentally friendly vessels. In particular, they have established a strong position in the construction of LNG carriers and have expanded investments in next-generation vessels powered by alternative fuels such as methanol and ammonia. For example, Hanwha Ocean has unveiled a next-generation LNG carrier integrating ammonia gas turbine technology as part of its roadmap toward zero-carbon shipping.¹⁷ These technologies are expected to play an increasingly important role as the global shipping industry seeks pathways toward carbon neutrality. Beyond vessel construction, firms such as Hanwha Ocean are also investing in energy-efficiency technologies, fuel optimisation systems, and carbon reduction solutions.¹⁸ As environmental regulations continue to tighten, the ability to develop and commercialise green maritime technologies is likely to become a key determinant of future competitiveness. South Korea's experience demonstrates how industrial upgrading and technological innovation can be leveraged to create new sources of competitive advantage.

Digitalisation and Smart Shipyards

Alongside the green transition, digital transformation is reshaping the way ships are designed, produced, and operated. Advances in artificial intelligence (AI), automation, robotics, and digital engineering are enabling shipbuilders to improve productivity, enhance quality control, and reduce production costs.

South Korean shipbuilders have been at the forefront of this transformation through the development of smart shipyards and digital production systems. Companies such as HD Hyundai and Hanwha Ocean are incorporating AI, digital twin technologies, robotics, and data analytics across ship design, production, and maintenance processes.¹⁹ Samsung Heavy Industries has introduced robotic welding systems, increasing work efficiency

by around 30 percent while reducing labour intensity and improving workplace safety.²⁰ Collectively, these technologies are improving productivity, enhancing production quality, and strengthening global competitiveness.

Digitalisation is also helping address one of the industry's most pressing challenges: the shortage of skilled labour. By automating repetitive production processes and introducing intelligent manufacturing systems, South Korean shipbuilders are improving productivity while maintaining high quality standards. Major Korean shipbuilders have expanded the use of automated transport systems and AI-based manufacturing technologies to address persistent labour shortages while improving productivity and workplace safety.²¹ Smart shipyards also enhance safety and reduce construction errors as vessels become increasingly sophisticated.

More broadly, the convergence of green and digital technologies is creating a new paradigm for maritime manufacturing. Digital twins, AI-based energy management systems, and real-time data analytics can optimise vessel design, fuel consumption, and operational performance, thereby supporting the development and operation of low-carbon ships. Future competitiveness will increasingly depend on the ability to combine environmental sustainability, technological innovation, and advanced manufacturing capabilities within an integrated industrial ecosystem. South Korea's transition towards green and smart shipbuilding demonstrates how established shipbuilding economies can adapt to changing industrial conditions while maintaining global competitiveness.

Lessons for Emerging Maritime Manufacturing Economies

South Korea's rise as a shipbuilding giant demonstrates the importance of moving towards higher-value maritime products while investing in R&D, skilled human capital, and supporting industries. Shipbuilding competitiveness is closely linked to the strength of complementary sectors such as steel, marine equipment, engineering services, and logistics.

South Korea's experience also suggests that successful industrial upgrading requires long-term investment and close coordination among firms, research institutions, and government agencies. These help emerging maritime manufacturing economies build more sustainable sources of competitiveness beyond cost-based competition. Many emerging economies still face significant constraints in technological capabilities, skilled labour, and industrial ecosystems. Overcoming these constraints is likely to require not only domestic policy commitment but also access to external capital, technology transfer, and phased capability-building, supported by more advanced shipbuilding partners.

Implications for South Korea-India Maritime Cooperation

The complementary strengths of India and South Korea create significant opportunities for expanding maritime industrial cooperation. While South Korea possesses advanced technological capabilities, extensive shipbuilding experience, and a mature maritime industrial ecosystem, India offers a large domestic market, an expanding manufacturing base, and a growing pool of skilled human resources. These complementary strengths provide a strong foundation for mutually beneficial collaboration. One example is the strategic partnership between Cochin Shipyard and HD Korea Shipbuilding & Offshore Engineering, which brings together South Korea's technological expertise and India's expanding industrial base and skilled workforce through technology transfer, joint ship design, and workforce development.²² This partnership illustrates how such complementarity can be translated into concrete industrial cooperation.

One important area of cooperation is green shipbuilding. As the global maritime industry accelerates its transition towards low-carbon shipping, both countries share an interest in developing environmentally sustainable maritime technologies. For India, expanding capabilities in green shipbuilding and alternative-fuel vessels represents an important step toward upgrading its maritime manufacturing base. Cooperation in alternative fuel technologies, energy-efficient vessel designs, and carbon reduction solutions could strengthen the competitiveness of both countries while supporting broader decarbonisation objectives. This is consistent with the priorities outlined under the Republic of Korea-India Comprehensive Framework for Partnership on Shipbuilding, Shipping and Maritime Logistics signed in April 2026, which explicitly identifies green technologies as a shared area of cooperation between the two countries.

A second area of collaboration lies in maritime manufacturing and supply chain development. South Korea's experience in building integrated industrial ecosystems—including shipyards, steel producers, marine equipment manufacturers, and engineering firms—offers valuable insights for India's efforts to expand its maritime manufacturing capabilities.²³ Strengthening industrial linkages and supplier networks could contribute to the development of more resilient and competitive maritime value chains. India's expanding shipbuilding capacity, large domestic demand, and growing manufacturing base provide a strong foundation for cooperation in ship design, production, and equipment supply.

Human capital development also represents a promising area for cooperation. As shipbuilding becomes increasingly technology-intensive, demand for engineers, technicians, and skilled production workers is expected to grow. Joint training programmes, technical exchanges, and industry-academia partnerships could help address skill gaps while supporting long-term industrial development. India's large pool of engineering talent offers significant potential, although further investment is needed in specialised maritime skills, vocational training, and shipyard management capabilities. This has already begun: as part of the Comprehensive Framework India and the South Korea signed last April, India's Ministry of Ports, Shipping and Waterways also signed a Plan of Implementation with the Korea International Cooperation Agency (KOICA) to conduct workforce analysis and develop structured training programmes for India's shipbuilding and marine engineering sectors.²⁴

Finally, innovation partnerships can play an important role in shaping the future of maritime manufacturing. Collaborative research on green technologies, digital shipbuilding solutions, smart shipyards, and next-generation maritime systems could generate mutual benefits and strengthen technological capabilities in both countries. For South Korea, such cooperation provides opportunities to expand the application and commercialisation of advanced maritime technologies, while for India it supports the development of domestic capabilities in green shipbuilding, digital production, and next-generation maritime systems. Building on the Comprehensive Framework, these areas of cooperation could be advanced through joint R&D programmes, industry partnerships, and closer collaboration among research institutions and universities. Priority areas will include green shipbuilding technologies, maritime manufacturing and supply chain development, digital shipyards, workforce development, and next-generation maritime systems. However, realising these opportunities will require overcoming practical constraints such as differing regulatory standards, financing structures, and technology-transfer arrangements between the two countries.

Conclusion

Global shipbuilding is increasingly shaped by technological innovation, environmental sustainability, and ecosystem-based competitiveness rather than production scale alone. South Korea's experience demonstrates that long-term leadership depends on continuous industrial upgrading, strong innovation systems, and close integration between shipyards and supporting industries, including steel, marine equipment, engineering, and research institutions.

As decarbonisation and digitalisation transform maritime manufacturing, the importance of industrial ecosystems is likely to grow further. Against this backdrop, the Comprehensive Framework provides a valuable platform for cooperation in green technologies, digital shipbuilding, workforce development, and innovation partnerships. Realising these opportunities will require sustained policy coordination, active industry engagement, and long-term investment from both countries. By building on their complementary strengths, South Korea and India can deepen bilateral maritime cooperation while contributing to more sustainable, resilient, and competitive maritime manufacturing across the Indo-Pacific.

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Maritime Industrialisation: The India–South Korea Opportunity

Pratnashree Basu

From a geopolitical perspective, India's maritime discourse has typically focused on ports, shipping connectivity, and naval power. However, the country's limited maritime industrial base poses an important challenge. Despite being among the world's largest trading economies by volume¹ and possessing one of the longest coastlines in the Indo-Pacific, India remains largely absent from the upper tiers of global maritime manufacturing. Shipbuilding, marine equipment production, offshore engineering, and advanced maritime technologies remain concentrated in Northeast Asia,² where decades of industrial policy, large-scale production, integrated supplier networks, and accumulated engineering expertise have created maritime manufacturing ecosystems that are difficult for newer entrants to replicate. As India seeks to expand domestic manufacturing to cement its place among the top five global shipbuilding nations under the Maritime

Amrit Kaal Vision 2047,³ South Korea is uniquely positioned⁴ as one of the few partners capable of contributing meaningfully to the development of India's maritime industrial ecosystem.

The rationale for India-South Korea cooperation extends beyond conventional narratives of technology transfer or foreign investment. The maritime sector is entering a period of structural transition driven by decarbonisation requirements, digitalisation, supply chain diversification, and changing patterns in global demand.⁵ These shifts are creating opportunities for new industrial partnerships and production geographies. India and South Korea possess complementary strengths that put them in a position to benefit from this transition, with both countries poised to reap the benefits of jointly shaping emerging maritime value chains. This article examines how the global geography of maritime industrial power is changing, and why that creates a unique strategic opportunity for India and South Korea.

Since the early 2020s, structural shifts in the maritime industry have begun to converge, including shifts in global shipping, mounting labour constraints, opportunities in maritime equipment manufacturing, the global fleet's transition towards low-carbon shipping, and the impact of digitalisation on the maritime industry. In an era where industrial capacity increasingly underpins national power, maritime manufacturing has become more than an economic sector; it is a strategic asset. Countries with robust maritime industrial ecosystems are potentially better positioned to safeguard supply chains, sustain technological innovation, and exercise greater strategic autonomy. For India, building such capabilities is central to reducing external dependencies while supporting its broader ambitions as a maritime and industrial power. Together, these developments have altered the commercial and strategic calculus, making India–South Korea maritime cooperation not merely desirable but considerably more viable than at any point in the past two decades.

Opportunities for New Delhi and Seoul

Opportunities for India and South Korea arise not from a single sector, but from broader changes in the maritime industry, with the drivers discussed in the following paragraphs being closely linked. Demand-side shifts in Indo-Pacific shipbuilding, changes in South Korea's shipbuilding industry, and India's efforts to localise production and strengthen maritime value chains together provide the foundation for co-production and technology partnerships.

The changing geography of global shipbuilding demand is the first driver. For decades, the international shipbuilding industry has been organised around exports from East Asian producers to global markets.⁶ Yet the next phase of maritime growth is likely to be increasingly demand-driven within the Indo-Pacific itself.⁷ India's maritime economy is expected to expand substantially over the coming decades, requiring new merchant vessels, coastal shipping fleets, dredgers, offshore support vessels, research ships, port infrastructure, and specialised vessels for offshore energy projects.

This creates a different industrial proposition for Seoul as Korean firms now have an opportunity to participate in building production ecosystems located closer to future demand centres. Such an approach mirrors broader trends in manufacturing, where production is increasingly following markets.⁸ As India's maritime requirements grow, localised production with Korean participation may become economically more attractive than traditional export-based models. India's value to South Korea extends beyond its manufacturing potential. Its rapidly expanding demand for commercial vessels, port infrastructure, offshore assets, and maritime services makes it one of the few large maritime markets likely to experience sustained long-term growth. This provides New Delhi with greater leverage to negotiate partnerships centred on capability creation, technology co-development, and local value addition.

A second factor concerns the future competitiveness of South Korea's shipbuilding industry itself. The country remains a global leader in high-value shipbuilding, particularly Liquefied Natural Gas (LNG) carriers, offshore platforms, and technologically sophisticated vessels. However, the industry faces mounting challenges. Labour shortages have become increasingly acute, production costs continue to rise, and demographic trends point towards a shrinking industrial workforce. According to the Korea Offshore and Shipbuilding Association, labour shortages have emerged as one of the industry's most significant constraints on future growth,⁹ with the industry's workforce falling over the past decade while an estimated 43,000 additional workers would be needed by 2027.¹⁰ These industrial pressures also reshape the political economy of bilateral cooperation. For South Korean firms, overseas production is increasingly becoming a strategy for sustaining competitiveness rather than simply reducing costs.

For India, attracting Korean investment is less about expanding foreign ownership than about embedding domestic industries within global production networks while ensuring that value creation, technological capabilities, and skilled employment progressively shift towards the local economy. Access to a larger labour pool, lower production costs, and growing domestic demand could allow Korean companies to allocate production

more efficiently across multiple locations. Although shipbuilding is embedded in global value chains for components and intermediate inputs, production continues to be organised around nationally concentrated shipbuilding ecosystems, limiting the development of geographically distributed manufacturing networks.¹¹

The third area of opportunity lies in maritime equipment manufacturing. While shipyards attract greater visibility, much of the economic value in modern vessels is generated through specialised components, digital systems, propulsion technologies, sensors, navigation equipment, and automation solutions. High-value systems, including propulsion, electronics, automation, and digital control technologies, constitute a substantial share of a vessel's lifecycle value, underscoring why equipment manufacturing is often more technologically intensive than hull construction itself.¹² Moreover, during crises, access to ship repair facilities, marine equipment, replacement parts, and specialised vessels becomes a strategic necessity rather than a commercial convenience.¹³ Recent disruptions in global supply chains^a have underscored the risks associated with excessive dependence on concentrated production hubs. At the same time, China has expanded its influence across many of these sectors, leading to concerns regarding concentration risks and supply-chain dependencies.¹⁴

India and South Korea have an opportunity to jointly develop alternative production networks for maritime equipment. Rather than attempting to replicate entire shipbuilding ecosystems, India could initially focus on selected segments where demand is growing rapidly, including port equipment, marine electronics, propulsion components, autonomous navigation systems, and green shipping technologies.¹⁵ Such an approach would allow India to integrate into maritime value chains more quickly while creating commercially viable opportunities for Korean firms. From this perspective, India-South Korea cooperation contributes to resilience by ensuring that maritime infrastructure, commercial shipping, and associated industries are supported by multiple production centres rather than a limited number of dominant suppliers.

a These include, for example, pandemic-era port congestion and container shortages; the *Ever Given* blockage of the Suez Canal in 2021, which halted canal traffic for nearly a week and left 367 vessels waiting; and the Russia–Ukraine war from 2022, which disrupted Black Sea shipping and contributed to a nearly 60 percent rise in dry-bulk transport costs between February and May 2022. These were followed by drought-induced restrictions in the Panama Canal and attacks on Red Sea shipping in 2023–24, further disrupting maritime trade routes.

Ship repair and maintenance is a particularly promising avenue of cooperation. Ship construction often dominates policy and industry discussions, yet the maintenance, repair, and overhaul (MRO) sector represents a substantial and growing market. India's location astride major sea lanes places it in a favourable position to develop large-scale repair and maintenance capabilities.¹⁶ South Korean expertise could help establish India as a regional MRO hub serving commercial vessels operating across the Indian Ocean. Compared to greenfield shipbuilding projects, ship repair facilities generally require lower capital investments while generating faster returns and creating specialised employment opportunities.¹⁷

The intersection of maritime manufacturing and energy transition policies is an additional dimension. The shipping industry faces mounting pressure to reduce emissions, with the International Maritime Organization's (IMO) revised greenhouse gas strategy accelerating the search for alternative fuels and low-carbon technologies.¹⁸ The next generation of vessels will increasingly rely on LNG, ammonia, methanol, hydrogen, battery systems, and advanced efficiency technologies.¹⁹

This transition offers India a unique opportunity to avoid the typical industrial development pathway followed by older shipbuilding powers. Instead of competing directly in mature market segments dominated by established players, India has a unique opportunity within emerging green maritime industries. South Korean companies are already investing heavily in ammonia-fuelled vessels, hydrogen technologies, fuel-cell systems, and smart ship solutions.²⁰ Joint research and production partnerships could enable both countries to shape future maritime technology standards rather than merely adapting to them.

In addition to the above-mentioned areas, the digitalisation of the maritime industry offers another new avenue for collaboration. Shipbuilding is increasingly becoming a software-intensive industry. Digital twins, predictive maintenance systems, autonomous navigation technologies, artificial intelligence (AI)-enabled logistics management, and smart shipyards are reshaping traditional production processes. South Korea has emerged as a leader in smart shipyard development through extensive investments in automation and digital manufacturing systems.²¹

For India, participation in this transformation presents an opportunity to leverage existing strengths in software development and digital technologies. Over time, such digital maritime ecosystems would not only modernise shipbuilding but also strengthen regional industrial resilience by creating trusted digital infrastructure that supports maritime production, logistics, and supply chains across the Indo-Pacific. Alongside

cooperation in physical infrastructure and manufacturing, both countries could explore integrated approaches combining Korean engineering expertise with India's digital capabilities. This, in turn, would align more closely with future industry trends than conventional industrial partnerships centred solely on production facilities.

Prospects, Challenges, and the Way Forward

To realise the opportunities outlined in this article, bilateral cooperation between India and South Korea requires a more structured institutional framework. Existing discussions largely occur through separate channels involving trade, investment, defence, or infrastructure. This could be addressed by establishing a dedicated maritime industrial working group within the existing India–South Korea Special Strategic Partnership, with a mandate to coordinate industrial cooperation, technology partnerships, financing, and implementation across relevant stakeholders. Already, the two have in place an institutional foundation through the India-ROK Comprehensive Framework for Partnership in Shipbuilding, Shipping, and Maritime Logistics.²² The framework provides a broad platform for collaboration across different sectors, including shipbuilding, maritime infrastructure, logistics, technological exchange, and industrial capacity development.

However, its long-term effectiveness will depend on translating broad areas of cooperation into identifiable projects, implementation roadmaps, and regular review mechanisms. Both sides could strengthen the framework through dedicated working groups involving government agencies, shipyards, industry representatives, and research institutions. This would enable a more systematic identification of priority sectors, facilitate coordination between public and private stakeholders, and ensure continuity in implementation while remaining anchored within the existing bilateral architecture.

It will also be critical to create the appropriate financing mechanisms. Maritime industries are highly capital-intensive and characterised by long investment cycles. India's Maritime Development Fund, announced in February 2025,²³ provides an opportunity to support joint ventures, industrial clusters, technology partnerships, and research collaborations involving Korean firms. Beyond providing capital, such financing can help firms adopt new technologies, expand production, and support joint research and innovation. In this sense, policy incentives should prioritise capability creation. Linking financial support to capability development would ensure that investments strengthen

India's long-term maritime industrial base rather than simply increasing production. The development of competitive industrial ecosystems capable of serving regional and global markets should be the objective.

Ultimately, India-South Korea maritime cooperation should not be assessed solely through individual shipbuilding projects or investment announcements. The more consequential question is whether both countries can jointly lead the reorganisation of global maritime production currently underway. The future of maritime industries will be shaped by decarbonisation, digitalisation, changing labour economics, and supply-chain diversification. These trends create opportunities for industrial partnerships that were less feasible only a decade ago, when India's shipbuilding ecosystem had more limited capacity and policy support, while Korean shipbuilders faced fewer pressures to internationalise production and diversify their manufacturing base.

For India, the challenge is not merely to build more ships but to acquire a robust position within maritime value chains. For South Korea, the challenge lies in sustaining industrial competitiveness amidst demographic and economic pressures. These objectives are increasingly complementary. If approached strategically, maritime manufacturing cooperation can evolve from a narrow bilateral initiative into a broader effort to build distributed industrial capacity across the Indo-Pacific.

The pertinent question is whether the two countries can jointly influence where maritime industrial power will reside in the Indo-Pacific over the next three decades. If East Asia defined the geography of twentieth-century shipbuilding, the next phase may depend on how successfully production, innovation, and maritime services are distributed across a wider Indo-Pacific industrial network. India and South Korea are uniquely positioned to drive that transition—not because either can replace existing maritime powers, but because together, they can redefine how maritime industries are organised.

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IV

Green Maritime Systems and Port Transition

Building a South Korea–India Green Hydrogen Partnership Through a Port-Based Green Energy Corridor

Doyeon Kim

Today's global energy order is undergoing a period of transition marked by growing and overlapping uncertainties. The disruptions in the Strait of Hormuz have reaffirmed the structural vulnerability of fossil fuel supply chains for energy import-dependent countries such as South Korea and India. These developments have not only impacted energy supplies and intensified inflationary pressures in both countries, but have also highlighted the risk of wider disruptions to supply chains, trade, and industrial competitiveness.¹ They have also raised a broader challenge: beyond diversifying sources of crude oil and natural gas imports, countries must diversify their energy sources overall and, in the long term, build new supply chains based on clean energy.²

Against this backdrop, the Korea–India summit held in April 2026 provided an important opportunity to create new momentum for bilateral cooperation in response to global challenges. In a joint statement,³ the two countries

agreed to expand cooperation on climate change, renewable energy, and low-carbon technologies. They also signed a memorandum of cooperation under Article 6.2 of the Paris Agreement.

This essay argues that South Korea and India could consider making green hydrogen a central pillar of their medium- to long-term partnership and develop a port-based green energy corridor connecting production, export, import, and industrial hubs across the two countries. This would also provide a practical platform for clean-fuel trade, maritime infrastructure cooperation, certification alignment, and carbon-market linkages. For both countries, decarbonisation is not only a climate-policy objective; it is also closely linked to energy security and future industrial competitiveness.

South Korea's Clean Hydrogen and Port Strategies

South Korea's hydrogen strategy creates a strong rationale for overseas partnerships. The country aims to meet its hydrogen demand of 27.9 million tonnes by 2050 entirely through clean hydrogen, including blue and green hydrogen.⁴ Within this framework, the country plans to produce and supply 250,000 tonnes of green hydrogen by 2030 and 3 million tonnes by 2050.⁵

To this end, the South Korean government has developed policies and institutional frameworks—including the Hydrogen Economy Promotion and Hydrogen Safety Management Act,⁶ the Clean Hydrogen Portfolio Standard (CHPS), the H2 STAR Project, and the National Port Master Plan—to support the development of the hydrogen economy. South Korea also holds competitive strengths in shipbuilding, shipping, storage, and transportation.⁷

Domestically, South Korea plans to use its strength in shipbuilding to commercialise ammonia-fuelled vessels and liquefied hydrogen carriers, while developing hydrogen ports to facilitate the import of hydrogen. By 2040, the government plans to develop 14 hydrogen ports and supply 13 million tonnes of hydrogen annually through ports such as Ulsan, Busan, Gwangyang, Pyeongtaek-Dangjin, and Gunsan.⁸

South Korea's biggest industrial ports are already being positioned for the clean-energy transition. Ulsan Port, for example, is being developed as a hydrogen hub port that can import green hydrogen and distribute it inland, while also supporting blue hydrogen production. Busan Port, as a global container hub, is expected to develop hydrogen production and supply systems for hydrogen-powered vessels and trucks. Gwangyang Port is developing infrastructure for a hydrogen complex station, including hydrogen

refuelling stations and ancillary facilities, with the aim of becoming a hub for hydrogen production and consumption in conjunction with the nearby petrochemical complex and steelworks.⁹

However, South Korea faces structural constraints in domestic renewable energy resources and land availability.¹⁰ This makes the development of overseas supply chains for clean hydrogen and green ammonia increasingly important. The South Korean government has already set out plans to expand overseas hydrogen supply chains in stages. The H2 STAR project aims to build overseas hydrogen supply chains with 40 countries by 2050.¹¹ South Korea has also sought to build a green shipping fuel supply port alliance, with Ulsan/Busan, Singapore, and Rotterdam as early nodes. This creates room to consider whether Indian ports could be connected to such emerging clean-fuel maritime networks.¹²

India's Green Hydrogen and Port Development Potential

India offers a complementary set of strengths to South Korea. It has abundant renewable energy potential, a long coastline, and growing port development capacity. According to the International Renewable Energy Agency, India currently ranks fourth globally in cumulative renewable power capacity, with the weighted average levelised cost of electricity from solar photovoltaics in India the second lowest in the world, after only China, at US\$0.038 per kWh.¹³ These conditions make India a promising location for cost-competitive green hydrogen and green ammonia production.

The policy foundation has also strengthened, with a policy direction aimed at reducing energy import dependence and strengthening self-reliance. In 2023, the Indian government launched the National Green Hydrogen Mission,¹⁴ a major policy initiative to make India a global hub for the production, use, and export of green hydrogen. The mission aims to build an ecosystem capable of producing 5 million tonnes of green hydrogen annually by 2030. The government has also introduced incentives worth around US\$2.4 billion to support domestic electrolyser manufacturing and green hydrogen production. At the same time, India has existing and prospective demand in sectors such as petroleum refining, fertilisers, and steel. India's overall hydrogen production was around 6.5 million tonnes in 2025, and total hydrogen demand is projected to increase to around 11 million tonnes by 2030 and 24 million tonnes by 2040.¹⁵ Sustained demand creation will, therefore, be essential for the development of India's green hydrogen industry.

Green hydrogen cooperation goes beyond producing molecules to encompass the integration of renewable power, industrial demand, storage infrastructure, port logistics, maritime transport, and future certification systems. India's eastern and southern coastal states are particularly relevant to this, laying the foundation for a port-based green energy corridor. Odisha, Andhra Pradesh, and Tamil Nadu have the potential to develop into production and export hubs for green hydrogen and green ammonia.

Odisha is a mineral-rich state with strong steel and mining industries. The Ministry of Ports, Shipping and Waterways has identified the Paradip Port complex as a key export hub for green hydrogen and green ammonia¹⁶ with the emergence of export-oriented green-molecule clusters on the Gopalpur–Paradip port axis. Odisha could also become relevant to future green steel development, particularly as South Korea's POSCO and India's JSW have agreed to develop an integrated steel plant through a joint venture.¹⁷ If green hydrogen becomes part of future steelmaking strategies, Odisha could serve as an important link between green molecules, heavy industry, and port-based exports.

Andhra Pradesh also has favourable conditions. It has one of India's longest coastlines, strong renewable energy resources, and well-developed port connectivity. The state government has sought to develop export-oriented green ammonia hubs by leveraging these coastal advantages. Andhra Pradesh is also important because of its fertiliser and food-processing industries. AM Green, for instance, has taken a final investment decision on a green ammonia production plant of around 1 million tonnes per year in Kakinada, making the state one of India's most prominent locations for green ammonia development.¹⁸

Tamil Nadu provides another strategic node. It is one of India's most industrialised states, with strengths in automobiles, electronics, manufacturing, and maritime logistics. The Indian government has sought to develop the state's V.O. Chidambaranar Port as a strategic site combining green hydrogen and green ammonia production, exports, global maritime logistics, and bunkering.¹⁹ This makes V.O.C Port especially relevant for South Korea, given its interest in clean shipping fuels and its industrial ports such as Ulsan and Busan.

Enabling Conditions for a South Korea–India Green Energy Corridor

South Korea and India have complementary strengths and needs. South Korea has strong shipbuilding capabilities, including in ammonia carriers and future clean-fuel vessels, long-term offtake demand, and a potential demand for green steel. India's

emerging projects, meanwhile, would benefit from early-stage demand that would improve project bankability, help develop port-based export industries, and convert renewable energy potential into higher-value industrial opportunities. A South Korea–India green energy corridor centred on green hydrogen and its derivatives could thus offer mutual benefits.

Translating these complementary strengths into an operational green energy corridor, however, would require several conditions to be addressed simultaneously. Potential demand would need to be converted into bankable long-term offtake arrangements, while commercial viability, mutual recognition of green hydrogen certification, regulatory alignment between ports, and access to policy finance would also need to be established. Equally important would be an integrated, multi-level governance framework capable of coordinating the relevant port, energy, industrial, and financial stakeholders in both countries.

Priority Areas for Operationalising a South Korea–India Green Energy Corridor

A South Korea–India green energy corridor should not be understood as a simple export–import route, but rather it should be designed as a multi-layered partnership linking physical and non-physical infrastructure. On the physical side, it would connect renewable energy generation, green hydrogen and green ammonia production, storage tanks, export terminals, ammonia carriers, bunkering facilities, and trade ports. On the non-physical side, it would require cooperation on certification, emissions accounting, standards, and market rules. Without progress on these arrangements, the corridor would remain a logistics concept rather than a trusted clean-energy supply chain.

Three areas of initial cooperation could be considered. First, South Korea and India could launch a port-to-port pilot project for green ammonia or other hydrogen-derived fuels. One possible direction is a pilot linking V.O.C Port in Tamil Nadu with Ulsan Port in South Korea for green ammonia bunkering and related supply-chain testing. This would allow the two countries to examine fuel handling, safety standards, storage requirements, transport costs, and port-readiness issues in a practical setting.

Second, the two countries should use this pilot to test certification and carbon-market cooperation. Green hydrogen and green ammonia can contribute to emissions reductions only when their production processes, renewable energy inputs, transport emissions, and end-use impacts are credibly measured, reported, and verified. Documenting this data along a single route would provide a practical testing ground

for applying MRV (monitoring, reporting and verification) methodologies, examining whether certification issued under India's framework can be recognised within South Korea's clean hydrogen accounting system, and clarifying credit ownership. It would also allow the two governments to assess whether emissions reductions from green ammonia supply chains can be linked to cooperation under Article 6.2 of the Paris Agreement, connecting the corridor not only to energy trade but also to climate finance.

Third, based on these shared standards, the two sides could explore linking Indian ports to South Korea's emerging green shipping fuel network. South Korea is already building a green shipping fuel supply port alliance involving Ulsan/Busan, Singapore and Rotterdam. Adding an Indian port such as V.O.C to future discussions could help connect the Indian Ocean with East Asian and European clean fuel routes, and would open the way for the pilot route to be extended to ammonia bunkering. This would align with India's ambitions to develop green hydrogen and green ammonia export hubs and with South Korea's need to diversify clean fuel supply chains.

Conclusion

The cooperation momentum created at the 2026 Korea–India summit must now be developed into a concrete, port-centred green hydrogen partnership. By linking production, transportation, certification, and carbon-market cooperation, South Korea and India can move beyond general statements of intent and build a practical port-based clean-energy corridor connecting India's emerging green hydrogen export hubs with South Korea's industrial ports. While such a corridor may not be able to remove all energy-security risks, it could help create a more diversified, resilient, and low-carbon energy relationship between two important Indo-Pacific partners.

Moreover, a South Korea–India port-based green energy corridor could go beyond energy trade to become a practical cooperation platform through which the two countries pursue energy security, decarbonisation, industrial competitiveness, and climate finance simultaneously. For South Korea, it would help diversify clean fuel supply chains and create new opportunities for shipbuilding, shipping, storage, and port industries. For India, it would support demand creation in green energy, project financing, green-molecule exports, and the upgrading of renewable energy into higher-value industrial sectors.

The significance of the corridor could also extend beyond the bilateral relationship. Much of the required infrastructure would have multiple uses: ammonia export terminals and bunkering facilities developed for industrial hydrogen trade could also support the

supply of low-carbon marine fuels. Moreover, Indian ports are located along major maritime routes linking the Gulf, Southeast Asia, and East Asia, while South Korea has strong capabilities in shipbuilding and engine technologies for ammonia-fuelled vessels. A certification and MRV framework developed through bilateral cooperation could also serve as a useful reference for wider regional application, as rules tested in South Korea–India trade may eventually be adapted by other producers and consumers. By supporting cleaner maritime transport, diversifying regional energy supply chains, and encouraging greater interoperability of standards, the corridor could contribute to a more resilient and lower-carbon Indo-Pacific economy. From this perspective, it could develop from a bilateral initiative into an early building block of a broader Indo-Pacific clean-fuel network.

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This article was originally written in Korean by the author and subsequently translated into English with selective assistance from AI-based language tools (ChatGPT 5.6).

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India–South Korea Cooperation on Alternative Maritime Fuels and Port Energy Systems

Parul Bakshi

Maritime transport carries more than 80 percent of global merchandise trade by volume, making it the backbone of global supply chains.¹ At the same time, international shipping accounts for around 3 percent of global greenhouse gas emissions, making it one of the most difficult sectors to decarbonise.² The International Maritime Organization's (IMO) 2023 Revised Greenhouse Gas Strategy established a pathway towards net-zero emissions from international shipping by or around 2050, while regional measures such as the European Union Emissions Trading System (EU-ETS) and FuelEU Maritime are accelerating demand for cleaner fuels and lower-emission shipping operations. These policy shifts are reshaping competition across the maritime sector by linking shipping emissions to production of clean fuels and the availability of low-carbon port infrastructure.

India and South Korea also face a growing domestic imperative to decarbonise their maritime sectors.

According to their respective submissions to the United Nations Framework Convention on Climate Change (UNFCCC), India's maritime activities, including international fleet bunkering, emitted over 6.4 million tonnes of CO₂e,³ while South Korea's domestic and international navigation emitted approximately 38.4 million tonnes of CO₂e in 2022.⁴

These developments indicate that maritime decarbonisation is no longer a question of improving vessel efficiency but increasingly depends on two interdependent energy value chains: the first centres on the production, storage and supply of low-carbon marine fuels, including green hydrogen, ammonia, and methanol; while the second focuses on transforming ports into energy hubs capable of electrifying port operations, supplying shore power, and supporting alternative fuel bunkering.

India has begun embedding this transition within its maritime strategy. With nearly 95 percent of the country's trade by volume moving through sea routes, ports are strategic gateways for economic growth and international trade.⁵ The Maritime Amrit Kaal Vision 2047 thus positions green fuels, carbon-neutral ports, and maritime decarbonisation as strategic priorities aligned with the IMO's net-zero agenda.

Similarly, South Korea has embedded maritime decarbonisation within its national policy framework. In 2026, the National Assembly passed the Green Shipping Corridor Support Act to accelerate low-emission shipping routes and support port infrastructure.⁶ Together with Korea's leadership in shipbuilding, this legislation positions the country at the forefront of next-generation maritime technologies. It is home to three of the world's largest shipbuilders—HD Hyundai, Hanwha Ocean, and Samsung Heavy Industries—and remains a global leader in the construction of Liquefied Natural Gas (LNG)-, methanol-, and ammonia-capable vessels.

Against this backdrop, India and South Korea possess complementary capabilities across the emerging maritime energy ecosystem. India's strengths lie in renewable energy deployment, emerging green fuel production capabilities, and expanding port infrastructure, whereas South Korea leads in advanced shipbuilding, alternative-fuel vessels, and smart port technologies. This article examines how India and South Korea can jointly build the infrastructure needed for maritime decarbonisation through two interconnected energy value chains: alternative maritime fuels and ports as integrated energy systems; to advance both bilateral cooperation and the broader transition towards resilient, low-carbon maritime networks across the Indo-Pacific.

Alternative Maritime Fuels

Heavy fuel oil has powered global shipping for decades because of its high energy density and suitability for long-distance ocean transport.⁷ However, the IMO's decarbonisation pathway and emerging fuel regulations are accelerating interest in green ammonia and green methanol, both of which are increasingly viewed as leading candidates for deep-sea shipping.

Green ammonia has emerged as a leading long-term option for deep-sea shipping because it contains no carbon and offers notably higher volumetric energy density than hydrogen while avoiding the need for cryogenic or high-pressure storage systems.⁸ Green methanol, by contrast, is easier to handle using existing fuel infrastructure but requires a sustainable carbon feedstock, which can be derived from captured CO₂ (e-methanol) or from biomass-derived carbon (bio-methanol), making large-scale production more complex despite its operational advantages.⁹

For ports, these fuels represent more than a decarbonisation pathway. Green hydrogen and its derivatives—like green ammonia and green methanol—can reduce emissions from port operations while creating entirely new revenue streams through fuel bunkering and exports.¹⁰ Realising this opportunity, however, will require new storage and transmission infrastructure, dedicated safety standards, large-scale investment, and coordinated regulatory frameworks to enable ports to become integral nodes within the emerging green hydrogen economy and contribute to a broader energy transition.¹¹

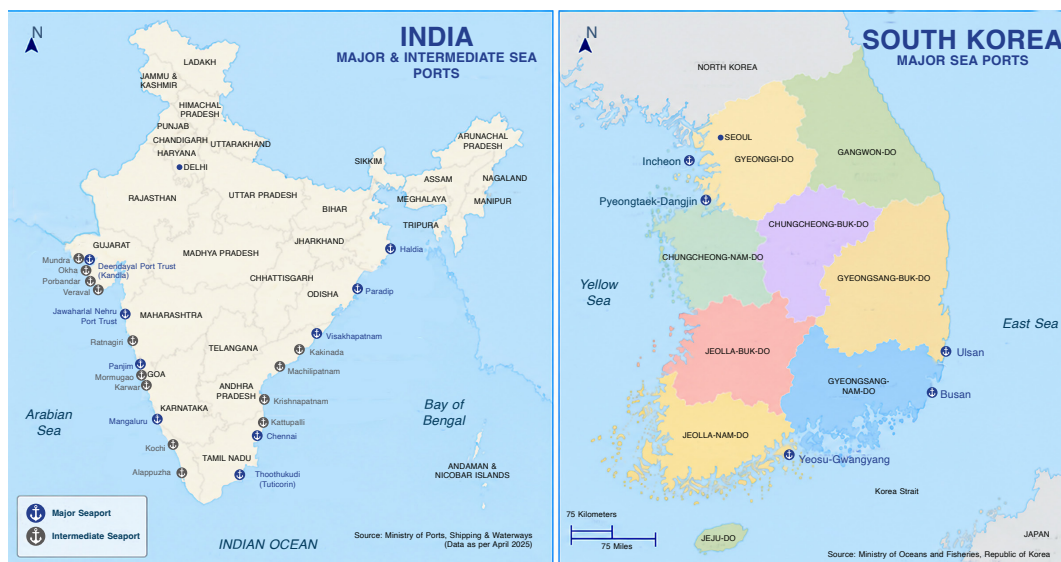
India's comparative advantage lies upstream in producing these future maritime fuels. The National Green Hydrogen Mission identified Deendayal Port (Kandla), Paradip and V.O. Chidambaranar (Tuticorin) as Green Hydrogen Hubs to integrate renewable energy, hydrogen production, and maritime applications.¹² India's competitive renewable energy costs have already translated into some of the world's lowest discovered prices for green hydrogen and green ammonia, strengthening its prospects as a future exporter of zero-carbon maritime fuels.¹³ This ambition is reinforced by the Harit Sagar-Green Port Guidelines, which require all major ports to establish green ammonia bunkering and refuelling facilities by 2035.¹⁴

There have been many noteworthy developments at the Deendayal Port Authority: in 2025, a 1-megawatt (MW) electrolyser-based green hydrogen plant was commissioned, while India's first shore-to-ship methanol bunkering demonstration was completed in April 2026, and the port aims to supply around 500 kilo tonnes per annum (KTPA) of Renewable Fuels of Non-Biological Origin (RFNBO)-compliant e-methanol by 2028–29, with plans to scale hydrogen production to 10 MW.¹⁵

The V.O. Chidambaranar (VOC) Port has emerged as India's leading green maritime fuel hub, becoming the country's first port to produce and utilise green hydrogen on-site while simultaneously developing green methanol and green ammonia bunkering infrastructure.¹⁶ In 2026, AM Green and VOC Port signed an agreement to establish up to 200 KTPA of green ammonia bunkering capacity by 2029–30, positioning it as one of India's first dedicated green ammonia bunkering hubs.¹⁷

Paradip Port, meanwhile, is developing a dedicated jetty and allied facilities capable of handling up to 4 million tonnes per annum (MTPA) of green hydrogen and green ammonia and other liquid cargo following approval by the Ministry of Ports, Shipping and Waterways (MoPSW) in February 2026, establishing India's eastern coast as an export gateway for future maritime fuels.¹⁸

Figure 1: Major Seaports of India and South Korea



Source: Maps of India and Ministry of Oceans and Fisheries, Republic of Korea¹⁹

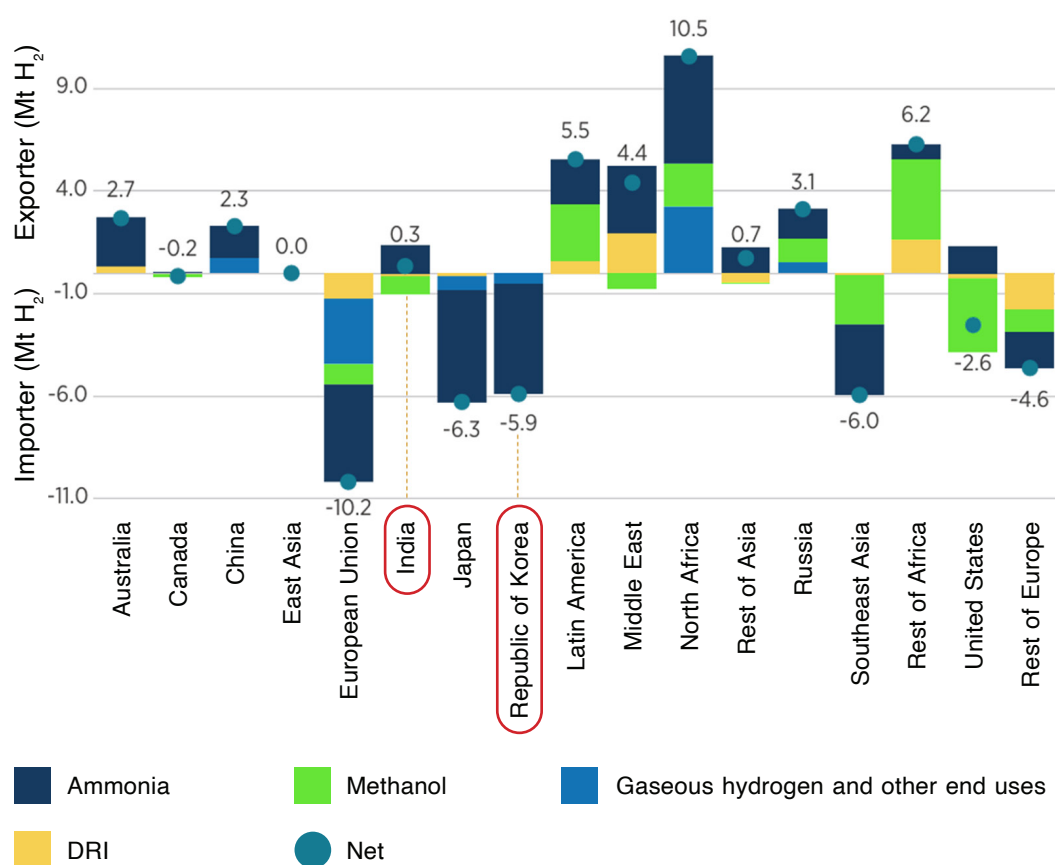
South Korea, in contrast, occupies the downstream end of the value chain. It has become a global leader in technologies compatible for utilising low-carbon maritime fuels. Korean shipbuilders are leading the development of ammonia-ready vessels, methanol-powered ships and dual-fuel propulsion systems, while ports such as Busan and Ulsan are developing commercial methanol and ammonia bunkering capabilities.

Busan has completed LNG and methanol ship-to-ship bunkering demonstrations and is preparing for commercial-scale deployment as demand for alternative marine fuels expands.²⁰

Under South Korea's Eco-friendly Fuel Supply Chain Development Strategy, Ulsan has been designated the national hub for LNG, methanol, and ammonia bunkering.²¹ In April 2026, Ulsan Port completed the commercial pipe-to-ship (PTS) green ammonia bunkering operation, supplying 600 tonnes of green ammonia to an ammonia-fuelled vessel built by HD Hyundai Heavy Industries. This marked the world's first commercial application of ammonia as a marine fuel and the first fully established integrated commercial green ammonia value chain from production to end use.²² Ulsan was also the world's first port to implement a green methanol bunkering system, and has begun supplying green methanol to ships.²³

Driven by its 2050 carbon neutrality goals, South Korea is seeking alternative fuels such as hydrogen and ammonia to cut emissions from industry and power generation. As a result, in 2025, South Korea imported US\$518 million of ammonia from Indonesia, Saudi Arabia, China, Australia, and Malaysia.²⁴

Figure 2: Net Trade Balances in Hydrogen-Based Fuels and Commodities (2025)



Source: International Renewable Energy Agency²⁵

Industrial collaboration between India and South Korea is also emerging in the green hydrogen and ammonia ecosystem. In 2025, South Korea's KP Group partnered with AHES and India's GH2 Solar to establish a 100,000 MTPA green ammonia project in India, combining Korean electrolyser technology with Indian renewable energy and manufacturing capabilities.²⁶

Further, in March 2026, Reliance Industries and Samsung Construction and Trading (C&T) signed a 15-year agreement worth more than US\$3 billion for the long-term supply of Indian green ammonia to South Korea. This creates one of the first large-scale commercial linkages between India's emerging green fuel production base and Korea's industrial demand.²⁷ It builds on earlier investments, including the 2024 US\$3 billion cooperation agreement between India's ACME Group and Korea's LTech UVC to develop green hydrogen and ammonia projects in India.²⁸

Taken together, these developments point to a complementary bilateral value chain rather than parallel national transitions. India possesses the renewable resources, production potential, and port infrastructure to become a competitive supplier of green maritime fuels, while South Korea offers globally competitive capabilities in fuel-consuming vessels, bunkering technologies, and maritime engineering. Scaling cooperation across this production-to-consumption chain could form the foundation of an integrated India-Korea alternative maritime fuel ecosystem.

Green Ports as Integrated Energy Systems

Alternative fuels alone will not decarbonise maritime transport unless ports evolve alongside them. As shipping transitions away from conventional bunker fuels, ports are no longer simply logistics gateways but increasingly function as integrated energy systems that generate renewable electricity, electrify port operations, store and bunker low-carbon fuels, and digitally manage increasingly complex energy flows. The transition, therefore, extends well beyond vessel technology to the development of ports capable of simultaneously serving as renewable energy consumers, fuel production hubs, and clean energy distribution centres.

India has begun embedding this systems approach within its broader maritime decarbonisation strategy. The Harit Sagar Green Port Guidelines require major ports to progressively increase renewable energy use to more than 60 percent by 2030 and over 90 percent by 2047. It also mandates the simultaneous expansion of shore-to-ship power, electrifying cargo-handling equipment, deploying Electric Vehicle (EV) charging infrastructure, and establishing green hydrogen, ammonia and methanol

bunkering facilities.²⁹ They also identify ports as future offshore wind support bases and require infrastructure development for green hydrogen storage and refuelling under the National Green Hydrogen Mission.

Implementation has already begun across several major ports. The VOC, Deendayal and Jawaharlal Nehru Ports are already operating predominantly on renewable electricity, while the Deendayal Port has begun generating surplus renewable power that can support future hydrogen production and port electrification.³⁰ The New Mangalore Port has achieved 100 percent solar power integration, while the Cochin Port plans to meet around 60 percent of its electricity demand through solar generation by 2030.³¹

Operational electrification is also progressing. At the VOC Port, ABB—a Swedish-Swiss technology company—has commissioned India’s first shore-to-ship power solution, enabling berthed vessels to switch off onboard diesel generators and draw electricity directly from the grid, massively reducing emissions and local air pollution during port stays.³² The Mumbai Port is also introducing shore-to-ship power infrastructure, while Deendayal Port has deployed electric cargo-handling equipment in line with the Harit Sagar Guidelines.³³

Under the Green Tug Transition Programme (GTTP), four major ports (Jawaharlal Nehru, Deendayal, Paradip, and VOC) will introduce battery-electric harbour tugs during the first implementation phase (2024–2027), before progressively adopting hydrogen, methanol, and ammonia-based propulsion technologies.³⁴

At the same time, the Maritime Development Fund, with an allocation of approximately US\$3 billion, is intended to support shipbuilding, green vessels, port infrastructure, and energy-efficiency investments, providing an important financing mechanism for India’s wider maritime energy transition with key timeline targets in 2030 and 2047.³⁵

South Korea’s policy increasingly frames ports as integrated energy hubs where renewable power generation, energy storage, alternative fuel infrastructure, and digital optimisation operate as a single system. This approach is reflected in the International Shipping Decarbonization Promotion Strategy (2023), the Hydrogen Port Master Plan, and the Carbon Neutral Port Master Plan, which together promote renewable-powered port operations, expanded onshore power supply (OPS), alternative fuel infrastructure, and intelligent energy management.³⁶

The electrification of port equipment without the decarbonisation of electricity supply merely shifts emissions from ports to the power sector, constituting what experts call “emissions externalization”.³⁷ This leads to a stronger emphasis on coupling port electrification with renewable energy deployment, distributed generation, and microgrids.

The Busan Port’s Global Hub Port strategy accordingly targets renewable electricity generation equivalent to 25 percent of port demand by 2032 and 100 percent by 2050, alongside expanded solar generation, offshore wind integration, fuel cells, and alternative marine power infrastructure.³⁸ In 2025, the Busan Port Authority launched the country’s first state-owned all-electric ferry—powered by ABB’s end-to-end electric propulsion system—as part of a national programme to replace 140 state-owned vessels with cleaner alternatives by 2030.³⁹

Meanwhile, Incheon Port has established Korea’s first charging infrastructure for electrified cargo-handling equipment and is progressively electrifying yard tractors, forklifts, and other terminal machinery, while Busan Port Authority is integrating electricity demand forecasting, renewable energy planning, and digital energy management into future port expansion.⁴⁰

Korea’s experience also reveals that the limitations of the wider energy system is a key factor that hinders port electrification. Although renewables accounted for 11.4 percent of national power generation by the end of 2025,⁴¹ ports remain heavily dependent on the Korea Electric Power Corporation (KEPCO) grid. Transmission bottlenecks and limited renewable energy access constrain deeper decarbonisation.⁴² These challenges have reinforced policy attention towards renewable energy procurement, microgrids, distributed power systems and intelligent energy management. This positions ports not only as major electricity consumers but also as strategic renewable energy off-takers within the broader energy transition.

India’s comparative advantage lies in renewable electricity generation, land availability, and the expansion of new port infrastructure, while South Korea offers world-leading capabilities in port engineering, electrification technologies, digital energy management, and smart port operations. These capabilities, when integrated, suggest that future India-Korea cooperation should extend beyond individual technologies towards the joint development of integrated green port ecosystems capable of supporting both maritime decarbonisation and wider regional energy transitions.

From Complementarity to Partnership

Rather than viewing shipping, ports, and fuels as separate domains, both countries have an opportunity to jointly develop an integrated maritime energy ecosystem spanning fuel production, vessel technologies, port infrastructure, and regulatory frameworks. Existing institutional arrangements, including the India-ROK Comprehensive Framework for Partnership in Shipbuilding, Shipping and Maritime Logistics and the recent Memorandum of Understanding (MoU) between India's MoPSW and Korea's Ministry of Oceans and Fisheries, provide an institutional foundation for such cooperation.⁴³

- **Enhanced Cooperation on Joint Value-chain Development**

Rather than pursuing isolated investments, both governments could work towards an India-Korea Green Maritime Energy Partnership centred on alternative maritime fuels and green port infrastructure. Existing commercial agreements, including the long-term Reliance Industries-Samsung C&T green ammonia supply agreement and emerging India-Korea hydrogen investments, demonstrate that industrial demand and commercial interest already exist.⁴⁴

- **Jointly Demonstrate Integrated Maritime Energy Systems**

Beyond piloting hydrogen projects or bunkering facilities, India and Korea could jointly develop a demonstration green shipping corridor linking a major Indian port such as Deendayal or VOC with Busan or Ulsan around a common alternative fuel such as green ammonia or green methanol. Demonstration projects integrating renewable fuel production, bunkering infrastructure, alternative-fuel vessels, and port electrification would provide commercially valuable operational experience while helping reduce technology and investment risks. Such projects would also build on the growing emphasis on Green Shipping Corridors within both countries' maritime strategies.⁴⁵

- **Scale Coordinated Finance, Standards, and Innovation**

Financing remains one of the principal constraints to the large-scale deployment of maritime energy infrastructure. India's Maritime Development Fund, together with financing from the Export-Import Bank of Korea (KEXIM), risk mitigation instruments from the Korea Trade Insurance Corporation (K-SURE), export-linked financing from EXIM Bank India, investments from the National Investment and Infrastructure Fund (NIIF), and multilateral institutions, such as

the Asian Development Bank, Asian Infrastructure Investment Bank and—where appropriate—the Green Climate Fund, could massively reduce investment risks for green port infrastructure, bunkering facilities, and alternative-fuel supply chains.

At the same time, cooperation should extend beyond financing to the alignment of fuel certification systems, bunkering protocols, and safety standards, while institutionalising collaboration through a bilateral Maritime Energy Innovation Platform bringing together ports, shipbuilders, fuel producers, equipment manufacturers, regulators, and research institutions. Existing industry linkages, including Korea Marine Equipment Association’s (KOMEA) Mumbai office and cooperation with Korea Marine Equipment Research Institute (KOMERI), provide an initial foundation on which such a platform could be built.⁴⁶

Maritime decarbonisation is increasingly becoming an energy transition challenge rather than simply a shipping challenge, simultaneously requiring the development of renewable electricity, alternative fuels, green ports, and digitally integrated maritime infrastructure.

India and South Korea enter this transition from complementary positions: India offers scale in renewable energy, alternative maritime fuel production, and port expansion, while South Korea contributes technological leadership in shipbuilding, port engineering, and maritime digitalisation. If these complementary strengths are combined through coordinated industrial partnerships, demonstration projects, and aligned regulatory frameworks, the partnership could extend beyond bilateral cooperation to strengthen emerging green shipping corridors and resilient clean-energy supply chains across the Indo-Pacific. In doing so, India and South Korea would not only advance their own maritime decarbonisation objectives but also help shape the region’s transition towards a low-carbon maritime economy.

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V

Enabling Inclusive Blue Growth: Human Capital and Coastal Communities

From Shipyards to Skills: India–South Korea Cooperation for Maritime Labour Transitions

Yoon Jae Ro

The maritime sector is entering a period of structural change. Shipbuilding, shipping and maritime logistics are no longer shaped only by traditional questions of scale, cost, and connectivity. They are increasingly affected by issues such as decarbonisation, digitalisation, automation, supply-chain reconfiguration, and renewed concerns over maritime economic security. These changes are creating new industrial opportunities while changing the nature of maritime work. The future competitiveness of maritime economies will depend not only on ports, vessels, shipyards, and logistics corridors, but also on countries' ability to nurture workers who can operate, maintain, and upgrade increasingly complex maritime systems.

Recent evidence suggests that existing training systems are not fully prepared for this transition. DNV's *Maritime Forecast to 2050* estimates that around 33,000 additional seafarers will need training in alternative-fuel systems within the next four years alone.¹ The United Nations

Conference on Trade and Development's (UNCTAD) Review of Maritime Transport 2025 also notes that the transition to zero-carbon and digital systems and new trade routes must be managed as a just transition, recognising that the world's 1.9 million seafarers, most of whom come from developing countries, will need updated skills and stronger protection of their rights.² The maritime transition is therefore not only technological or environmental; it is also a labour-market transition.

This issue is particularly relevant to India-South Korea cooperation. The India-Republic of Korea Comprehensive Framework for Partnership in Shipbuilding, Shipping and Maritime Logistics, adopted during the April 2026 state visit of the President of the Republic of Korea to India, reflects growing recognition that maritime cooperation can become a pillar of the bilateral relationship.³ India's maritime ambitions, articulated through Maritime India Vision 2030 and Maritime Amrit Kaal Vision 2047, aim to modernise ports, expand shipping capacity, strengthen inland waterways, and develop domestic shipbuilding and repair capabilities.⁴ South Korea, for its part, remains one of the world's leading shipbuilding economies, with strengths in high-value-added vessels, advanced production systems, and green ship technologies.^a The two countries therefore bring complementary assets to the partnership.

Yet maritime cooperation should not be understood only in terms of industrial capacity, infrastructure investment, or technology transfer. A sustainable partnership will also require a stronger human capital pillar. As the maritime sector moves towards greener and more digital forms of production and operation, the skills required across shipyards, ports, vessels, and logistics systems are changing. A future-oriented India-South Korea maritime partnership should therefore move beyond a narrow focus on shipyards towards a broader focus on skills.

Global Maritime Labour Transitions

Three structural shifts are reshaping demand for maritime labour. The first is automation in shipyard production. Modern shipyards increasingly use robotic welding systems, automated block-assembly technologies, AI-assisted quality inspection, and digital-twin platforms that allow vessels to be designed, tested, and monitored more effectively. Their adoption is changing production processes and increasing demand for workers

a 'Green ship technologies' broadly refer to technologies aimed at improving vessel energy efficiency and reducing greenhouse gas emissions, including low- and zero-emission fuels and propulsion systems.

capable of operating and maintaining digitally integrated systems. In South Korea, this transition is already visible, with shipyards investing in smart-yard technologies based on AI, IoT, and digital twins. South Korea's K-Shipbuilding Super Gap Vision 2040 seeks to accelerate this transition by targeting a 50-percent rate of unmanned production processes by 2040 and prioritising automation technologies for high-risk and technically demanding tasks such as welding and painting.⁵ These changes can improve productivity but also raise the skill requirements of shipyard workers.

The second shift is the digitalisation of vessel operations and maritime services. Integrated bridge systems, predictive-maintenance tools, and cybersecurity systems are becoming more important in modern vessels and ports. The International Maritime Organization's (IMO) ongoing review of the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW) reflects the need to update global training and certification standards for this changing environment.⁶

The third, and most important, shift is decarbonisation. The IMO's 2023 Revised GHG Strategy sets the ambition of reaching net-zero greenhouse gas emissions from international shipping by or around 2050.⁷

Together, automation, digitalisation, and decarbonisation mean that maritime workers will need new skills related to alternative fuels, vessel technologies, digital systems, and changing production and operating practices. Responding to this transition will require changes in maritime education and certification, stronger policies for workforce reskilling and upskilling, and closer international cooperation on training and skills development. The maritime transition is therefore also a skills transition.

India's Maritime Opportunity and Skills Bottleneck

India is well placed to benefit from these transitions. It has a large and young workforce, a long coastline, strategic maritime geography, growing trade volumes, and a policy commitment to maritime-sector development. Maritime India Vision 2030 and Maritime Amrit Kaal Vision 2047 indicate India's ambitions of becoming a more prominent maritime power by expanding port capacity, improving logistics efficiency, strengthening coastal shipping and inland waterways, and developing shipbuilding, repair, and recycling capabilities.⁸ These ambitions can generate employment and support broader industrial upgrading. Both visions also emphasise workforce readiness through measures such as upgrading maritime education and training institutions, expanding industry-linked courses and certifications, and developing maritime skill-development and training centres for coastal communities.

India also occupies an important position in the global maritime labour market. The Directorate General of Shipping has noted that India's seafaring workforce has grown to around 308,000 seafarers, representing roughly 12 percent of the global pool.⁹ This creates an opportunity for India not only to provide labour, but also to become a centre for maritime training, certification, and human-capital development. If properly designed, maritime workforce development can support both domestic industrial expansion and global labour-market participation.

However, India's maritime opportunity faces a skills bottleneck. The challenge is not simply the availability of workers, but of workers with the right skills, in the right places. Shipbuilding and maritime logistics require a broad occupational mix, from production workers and marine engineers to port-equipment operators, logistics technicians, safety officers, and digital-systems operators. As the industry becomes greener and more digital, this occupational mix will become more complex.

This challenge is closely connected to broader issues in India's labour market. India has made considerable investments in skills development, vocational education, and industrial training, yet many sectors continue to face gaps between formal training and industry needs. Employers often report difficulties in finding workers with job-ready skills, while workers may complete training programmes without clear pathways to stable employment.¹⁰ In the maritime sector, this mismatch can be especially costly because safety, quality, and regulatory compliance are central to competitiveness. Poorly trained workers can pose risks not only to productivity but also to safety, environmental performance, and international credibility.

Inclusiveness is another important consideration. Maritime development should not be measured only by growth in shipping, ports, and shipbuilding, but also by whether new employment opportunities are broadly accessible. In India, this concern is particularly relevant for women, workers in coastal communities, and those with limited access to technical training. Existing initiatives provide a foundation for addressing these barriers. One example is the Directorate General of Shipping's Sagar Mein Samman action plan, which promotes gender-sensitive training, safer and more inclusive workplaces, and wider access to maritime careers for women.

Addressing these challenges requires more than expanding training capacity. It requires stronger links between industry, training institutions, and government to ensure that training programmes reflect actual labour demand and lead to credible employment pathways. This is where South Korea's experience becomes relevant.

South Korea as a Skills Partner

South Korea is the world's second-largest shipbuilding nation, accounting for approximately 27 percent of global completions in 2024 on a compensated gross tonnage (CGT) basis.^{b,11} It has particular strengths in high-value vessels, complex production processes, green ship technologies, and smart-yard systems. Its relevance to India, however, lies not only in its technological capabilities but also in its experience of building a shipbuilding ecosystem in which large firms, specialised suppliers, training institutions, research bodies, and public policy are closely linked.

This experience is relevant because maritime industrial upgrading depends on more than technology adoption. South Korea's shipbuilding competitiveness has long rested on traditional production skills such as welding, fitting, painting, assembly, electrical work, and safety management. These skills remain essential even as shipyards become more digital and automated. At the same time, advanced vessels require workers who can meet high standards in design, inspection, maintenance and regulatory compliance. Smart yards require workers who can operate within digitally managed production systems, while green ships require knowledge of fuel systems and energy efficiency. Korea therefore offers useful experience in linking traditional skills training with newer forms of technical upgrading.

South Korea's industry-linked training model is particularly relevant. Maritime skills cannot be developed through classroom-based education alone; they require close interaction between training institutions, firms, worksites and certification bodies. In shipbuilding, many essential skills are acquired through hands-on practice, apprenticeship-type learning, production-site exposure, and mentorship from experienced workers. In port logistics and maritime operations, workers also need simulation-based learning, equipment-based practice, and safety-oriented training. South Korea's workforce system offers broader institutional lessons. The Human Resources Development Service of Korea (HRD Korea) administers national competency standards and qualifications, while the Korea Institute of Maritime and Fisheries Technology (KIMFT) provides public training for seafarers and maritime professionals. These experiences can inform India's approach, provided they are adapted to its labour-market and institutional context.

b Compensated gross tonnage (CGT) is a measure of shipbuilding output that adjusts vessel tonnage for differences in the complexity and workload involved in building different types and sizes of ships.

South Korea's experience also shows the labour-market pressures that accompany technological upgrading. According to the OECD, South Korea's shipbuilding workforce declined by about 44 percent between 2014 and 2024, while skilled workers accounted for only around 28 percent of the workforce in 2023. The biggest shipbuilders have partly responded by recruiting foreign workers, who now account for approximately 15 percent of total employment.¹² These figures show that even advanced maritime industries face persistent workforce constraints, making training, retention, and skills upgrade central to competitiveness.

Given differences in the scale and structure of their maritime industries, labour markets and institutional capacities, South Korean practices should serve as reference points rather than templates for direct replication in India. Cooperation should therefore be based on mutual benefit rather than one-way transfer. India offers scale, demographic potential, expanding maritime demand and a strategic location in the Indo-Pacific, while South Korea offers industrial knowledge, production experience, and training know-how. A well-designed partnership can help India build a future-ready maritime workforce while helping Korea diversify its maritime partnerships and respond to labour constraints.

Towards an India-South Korea Maritime Skills Partnership

The Comprehensive Framework for Cooperation in Shipbuilding, Shipping and Maritime Logistics, agreed in April 2026, provides a useful starting point. Yet the current agenda remains largely industrial and commercial, focusing on shipbuilding contracts, technology cooperation, yard modernisation, and logistics connectivity. The next step should be a structured Maritime Skills Partnership that adds a human-capital pillar to industrial cooperation and links governments, firms, training institutions and maritime clusters.

The first area of cooperation could be skills mapping and curriculum development. India and South Korea could jointly identify priority occupations across shipbuilding, ship repair, port logistics, coastal shipping, and green maritime technologies. This exercise should distinguish between traditional production skills, digital and green-transition skills, and use this mapping to develop modular training curricula adapted to Indian conditions. South Korea's experience could inform modules on advanced welding, ship repair and maintenance, port-equipment operation, smart-shipyard processes, maritime safety, and green shipping technologies. The aim should not be to transplant Korean curricula, but to develop content jointly with Indian institutions and firms.

The second is institutional capacity and industry-linked training. Many skills programmes are constrained by weak instructional capacity, outdated equipment, and limited exposure to industry practice. Cooperation should therefore emphasise training of trainers and the creation of industry-linked maritime skill hubs in selected Indian maritime clusters. These hubs could connect local shipyards, ports, logistics firms, training institutes and state governments, combining classroom training, simulation-based learning, worksite exposure, internships and job placement. This would link training more directly to employment.

The third area is certification, mobility and inclusion. India and South Korea could explore common training standards, joint certificates or industry-recognised modules in selected maritime occupations. Recognised certification would improve worker mobility across firms and regions while strengthening employer confidence in training outcomes. Such cooperation should also remain inclusive. Training programmes should reach not only workers connected to established institutions, but also young people from coastal communities, workers from less developed regions, women and those transitioning from informal or low-productivity employment. Stronger bilateral cooperation on maritime skills would support both industrial competitiveness and a more inclusive blue economy.

Institutionally, these efforts could build on the existing bilateral framework, with the Korea International Cooperation Agency and India's Ministry of Ports, Shipping and Waterways coordinating skills-development programmes; Korea Maritime and Ocean University and Indian Maritime University supporting education and research; and relevant firms and industry associations contributing to workplace training and certification.

Conclusion

India and South Korea's maritime cooperation is emerging as the global maritime sector undergoes decarbonisation, digitalisation, automation and strategic industrial realignment. Its success will depend on whether the two countries place human capital at the centre of their partnership. Shipyards, ports, vessels and logistics corridors are essential, but cannot realise their full potential without skilled workers, capable trainers, strong institutions, and inclusive pathways into maritime employment.

By connecting South Korea's advanced maritime capabilities with India's demographic and industrial potential, bilateral cooperation on maritime skills can support industrial competitiveness while promoting more skilled, resilient and inclusive maritime development. Over time, this approach could provide a practical model for Indo-Pacific maritime cooperation that places workforce development alongside industrial and technological upgrade.

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Strengthening Capacity Building and Inclusive Maritime Development in India–ROK Cooperation

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The meeting between Indian Prime Minister Narendra Modi and the Republic of Korea's President Lee Jae Myung on 20 April 2026 marked an important step in deepening bilateral maritime cooperation.¹ The India-ROK Comprehensive Framework for Partnership on Shipbuilding, Shipping, and Maritime Logistics outlines an ambitious agenda spanning shipbuilding clusters, financial assistance, policy and fiscal support, advanced maritime manufacturing, and other measures to strengthen India's maritime industrial capabilities.² Achieving its objectives will be critical to advancing India's Maritime Amrit Kaal Vision 2047 and its broader maritime aspirations through the Sagarmala Programme,³ while reinforcing the country's wider push to build a globally competitive maritime industrial ecosystem.

The cooperation, therefore, brings together complementary interests for both countries. For India, the partnership offers an opportunity to accelerate

shipbuilding capacity, strengthen its maritime manufacturing ecosystem, and develop the skilled workforce needed to support its maritime ambitions.⁴ For South Korea, India represents not only a growing market for shipbuilding, shipping, and maritime technologies, but also an expanding pool of maritime talent, a potential production and investment base, and a strategic partner through which Korean companies and institutions can bolster their presence in the rapidly growing Indian maritime economy.⁵

The Framework also offers an opportunity to move beyond a narrow focus on labour supply and technical skilling towards a broader conception of capacity building that recognises skills, institutions, communities, and inclusive participation as strategic assets. This means viewing people not merely as a workforce, but as stakeholders, knowledge-holders, and contributors to maritime transformation. Embedding this broader conception of capacity building in the implementation of the Framework could help create a more inclusive and enduring model of India-ROK maritime cooperation.

As the two countries deepen their maritime engagement, stronger and more inclusive coastal economies can contribute to a more resilient, sustainable, and connected maritime Indo-Pacific. This article asks how India and South Korea can ensure that maritime industrial cooperation builds not only physical infrastructure, but also the human, institutional, and community capabilities needed to sustain it.

The Human and Institutional Foundations of the Framework

Building on earlier India-South Korea cooperation in seafarer training, certification, and maritime transport, the 2026 Framework brings together several elements that recognise the human and institutional foundations of a resilient maritime economy.⁶ This draws on a longer history of bilateral engagement, including then President Moon Jae-in's 2018 state visit to India, which broadened cooperation under the Special Strategic Partnership,⁷ and more recent industry-level efforts such as HD Hyundai's 2025 Memorandum of Understanding (MoU) with Cochin Shipyard Limited for strengthened design and procurement, and workforce-training collaboration.⁸

The 2026 agreement on a Korea International Cooperation Agency (KOICA) project with India's Ministry of Ports, Shipping and Waterways (MoPSW) to strengthen shipbuilding skills places capacity development alongside industrial expansion.⁹ The recognition of India's growing seafarer pool, including the increasing participation of women, also creates opportunities for greater mobility and employment in Korean-flag operations.¹⁰ The proposed partnership between the Indian Maritime University (IMU) and Korea Maritime & Ocean University (KMOU), covering maritime education, research,

innovation, and industry-linked programmes,¹¹ points to longer-term institutional cooperation. Similarly, cooperation on maritime heritage, including through the National Maritime Heritage Complex (NMHC) at Lothal, broadens the partnership by connecting maritime activity with shared histories, knowledge, and cultural institutions.¹²

However, implementation will also need to account for the wider social dimensions of maritime transformation. Large-scale shipbuilding, port, and coastal industrial development can reshape local economies, livelihoods, and communities, creating new opportunities while also generating pressures related to displacement, occupational transitions, access to employment, and environmental change.¹³ Ensuring that maritime growth is not only economically productive, particularly in the context of India's development ambitions, but also socially sustainable will therefore be critical to the durability of bilateral cooperation.

Closing the Skills and Absorption Gap

India's maritime transformation is being driven by two key interconnected developments: the expansion of shipbuilding capacity and the development of large-scale blue-green infrastructure.¹⁴ While shipyards can generate industrial employment and strengthen manufacturing ecosystems, ports reshape surrounding hinterland economies by influencing trade flows, logistics networks, land use, and local livelihoods.¹⁵ Together, these developments can help transform the regions in which maritime industries are located.

The scale of this transformation creates opportunities for both India and South Korea. India's plan to acquire more than 400 vessels is designed to provide long-term order visibility to domestic shipyards, while its estimated US\$13.3-billion port Public-Private-Partnership (PPP) pipeline creates opportunities for South Korean port developers and terminal operators.¹⁶ India's expanding pool of seafarers also provides Korean ship owners with access to skilled maritime manpower.¹⁷ Yet this advantage does not necessarily translate into the shore-based industrial workforce needed to build a globally competitive shipbuilding industry. Both countries also face distinct structural issues. While India must overcome institutional fragmentation, financial constraints, and skills absorption challenges common to developing economies,¹⁸ South Korea faces an ageing industrial workforce, labour shortages, and the need to sustain its technological edge.¹⁹

India is the world's second largest supplier of seafarers, providing 12.2 percent of the global workforce; however, this substantial maritime workforce does not automatically

translate into the specialised shore-based workforce required for modern shipbuilding.²⁰ Advanced shipbuilding requires a different and much broader skills base. Structural welders, fitters, plate workers, marine engineers, automation technicians, production supervisors, naval architects, and port logistics specialists are all essential to a sophisticated shipbuilding ecosystem.²¹

India has a substantial technical education system, but the scale and specialisation of training will need to expand with the requirements of emerging shipbuilding clusters. Institutions such as the Centre of Excellence in Maritime and Shipbuilding (CEMS), with campuses in Vishakhapatnam and Mumbai, illustrate this base, although the approximately 15,000 candidates trained there as of 2025 will need to expand considerably to meet the scale envisaged.²² Without strong domestic skills and institutional linkages, firms may remain dependent on foreign expertise for advanced engineering, production management, automation, and specialised manufacturing, while local employment will continue to be concentrated in lower-value activities, such as fabrication, assembly, and routine production.

South Korea's experience demonstrates the value of such an ecosystem. Its emergence as a global shipbuilding leader was supported not only by investment in shipyards and technology, but also by vocational education, skilled industrial labour, supplier networks, and regional clusters. Training and industry institutions in shipbuilding centres such as Ulsan, Busan, and Geoje helped align workforce development with evolving industrial requirements and supported the sector's movement towards more complex and higher-value activities.²³

For example, Korea's Meister High Schools, specialised vocational secondary schools established from 2010 to train technical experts around local industry needs—including in shipbuilding hubs—are a concrete example of this demand-led approach to skills formation.²⁴ For India, the challenge is thus not simply to produce more trained workers, but to build the capacity to absorb, adapt, and advance technology.

Integrating Coastal Communities and Cities

Port and shipyard development will inevitably be located in or near established coastal cities and communities with long-standing livelihoods, social networks, cultural practices, and relationships with the sea.²⁵ Maritime industrialisation can bring new investment and economic activity; however, it can also reshape these communities, particularly where local economies depend on fishing, small-scale trading, processing, and other informal activities,²⁶ as illustrated by concerns over coastal erosion, the enclosure of

common spaces, and displacement linked to Kerala's Vizhinjam International Seaport.²⁷ These impacts can be overlooked when assessments focus mainly on formal land ownership and physical assets, rather than customary access to beaches, fishing grounds, landing sites, markets, and other shared spaces.²⁸

What is known as a 'blue justice' lens can provide a useful way to approach these challenges. It asks not only how the benefits and costs of maritime development are distributed, but also whose livelihoods, knowledge, and identities are recognised and who has a voice in decisions that reshape coastal spaces.²⁹ For India-South Korea cooperation, a blue-justice perspective would mean moving beyond consultation towards meaningful community participation. Transparent grievance mechanisms, livelihood-sensitive assessments, and appropriate benefit-sharing arrangements can help ensure that coastal communities become active participants in maritime transformation rather than being mere recipients of its impacts.³⁰

Community integration also has a cultural dimension. Coastal communities carry maritime knowledge, customs, and skills that are often closely tied to particular places.³¹ For instance, Mumbai's Koli fishers have longstanding and spiritual ties with the city's coastline and have preserved distinctive fishing practices and cultural traditions that remain part of Mumbai's identity, along with generations of knowledge of marine movements, tides, weather, and winds. These lived experiences can support the protection of mangroves and wetlands and, when combined with tools such as Global Positioning System (GPS), strengthen local disaster preparedness and early warning systems.³²

The Framework's emphasis on India-ROK cooperation on maritime heritage, including collaboration around the National Maritime Heritage Complex at Lothal,³³ provides an opportunity to broaden this awareness and understanding. Local histories, traditional knowledge, cultural landscapes, museums, and community heritage could be incorporated into the planning of emerging maritime clusters, helping ensure that industrial advancements remain connected to the identities and relationships with the sea that have shaped coastal societies.

Measurement Infrastructure as a Shared Project

The limited availability of consistent, policy-relevant data is a key challenge across the issues examined in this article. While India has a National Indicator Framework aligned with the Sustainable Development Goals (SDGs),³⁴ data on maritime employment and the local effects of shipyard and port development remain inadequate, particularly

when disaggregated by geography, skill level, sector, and gender.³⁵ There is also limited systematic evidence on local employment generated by shipyard investments or livelihood changes associated with port-led development.³⁶ Without such data, it would be challenging to assess who is benefiting from maritime expansion or where gaps are emerging.

India and South Korea could therefore treat measurement as part of maritime capacity building. The Ministry of Ports, Shipping and Waterways (MoPSW), the Ministry of Statistics and Programme Implementation (MoSPI), state maritime boards, skill missions, industry associations, shipyards, and Korean partners could develop shared indicators covering employment quality and local participation, skills development, technology absorption, gender inclusion, community impacts, and environmental performance. Linking these indicators to relevant SDGs would provide a common basis for assessing whether maritime investment is delivering inclusive and sustainable growth. Developing and applying such metrics would require technical expertise, institutional capacity, and coordination across government, industry, and training institutions.

South Korea offers useful experience in building these connections between industrial policy, workforce development, and regional development. The Shipbuilding Industry Win-Win Consultative Body, for example, brings together shipyard associations, subcontractors, and central and regional governments to address workforce recruitment, vocational training, and labour conditions.³⁷ Regional governments in shipbuilding centres such as Ulsan, Busan, and Geoje have similarly played an active role in workforce planning and industrial development.³⁸ India can draw on these principles, while being aware of its development needs, to bring government, industry, and training institutions together around shared information and measured outcomes.

Adapting this approach to the Indian context could create a joint maritime monitoring mechanism that tracks how investments are affecting local workforces, economies, and coastal environments. Such a system would allow India and Korea to identify gaps at an early stage, adjust skills and social programmes, and assess whether the Framework is delivering benefits beyond aggregate investment and industrial output.

A Framework for Inclusive Maritime Capacity Building

A joint India-ROK working framework towards inclusive maritime capacity building can help bring together the principal dimensions of maritime transformation with the capabilities and outcomes needed for inclusive growth. This could help identify capacity gaps, track outcomes, and highlight areas where Indian and Korean institutions can specifically contribute.

Table 1: An India-ROK Framework for Inclusive Maritime Capacity Building

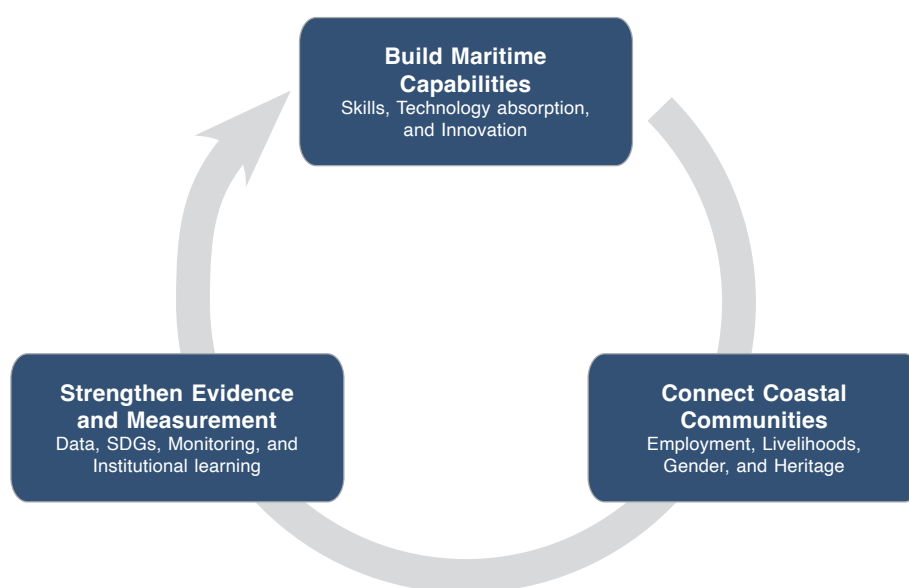
Dimension	Key Challenges	Objective	Success Indicators	Potential India-ROK Partners
Industrial Skills and Workforce Development	Reconfiguration of training systems to fully align with the scale and specialised requirements of advanced shipbuilding	To build a skilled maritime industrial workforce capable of supporting higher-value manufacturing	Workforce training completed satisfactorily; including industry-certified skills, employment placement, retention, and occupational progression	MoPSW, KOICA, State Skill Missions, Indian shipyards, technical institutions, Korean shipbuilding companies, and Korean training institutions
Financial Assistance, Technology Absorption, and Industrial Upgrading	Ensuring investment and technology transfer automatically translates into domestic capabilities	Build capacity to absorb, adapt, and develop advanced maritime technologies	Technology adoption, Research and Development (R&D) partnerships, domestic supplier participation, and technical employment opportunities	MoPSW, KOICA, Indian shipyards, research institutions, IMU, KMOU, Korean shipbuilding companies, and Korean technology firms
Employment and Local Economic Integration	Ensuring that maritime clusters can offer local employment and encourage domestic/regional linkages	Generate maritime investment through accessible and durable employment and strengthen local economic participation	Local employment share; indirect jobs, increased SME participation, improved wage levels, and domestic procurement	MoPSW, state governments, industry associations, Indian shipyards, Korean shipbuilders, Korean port developers, and terminal operators
Coastal Community Inclusion	Taking special efforts to safeguard livelihoods, customary resource access, and social networks	Enable affected communities to participate in and benefit from port and industrial expansion	Livelihood restoration, transition training, community participation, grievance resolution, and benefit-sharing	State governments, local institutions, project authorities, KOICA, and Korean maritime institutions
Gender Inclusive Maritime Growth	Gender-equal representation in both offshore and onshore maritime and technical occupations, while also recognising women's economic contributions	Expand access to maritime skills, employment, career progression, and leadership for marginalised genders	Gender-disaggregated employment and training participation, retention, women in leadership positions, and safe workplace conditions	MoPSW, employers, training institutions, KOICA, Korean maritime companies, and Korean maritime institutions
Coastal Heritage and Knowledge	Integrating local histories, traditional knowledge, and cultural identities	Acknowledge and integrate maritime heritage and local skills into contemporary maritime development	Heritage initiatives, community participation, museum partnerships, and the documentation of traditional knowledge	NMHC, Indian cultural institutions, IMU, KMOU, and Korean maritime museums/ heritage institutions
Data, Monitoring and SDG-Linked Outcomes	Identifying fragmented data that can limit the assessment of employment, skills, gender, community, and environmental outcomes	Establish a shared evidence base for policy design and accountability	Baseline datasets, employment and skills outcomes, gender indicators, community impact assessments, environmental performance; SDG-linked reporting	MoPSW, MoSPI, KOICA, state authorities, Indian research institutions, Korean research institutions, and industry stakeholders

Source: Authors' own

Policy Recommendations

The India-ROK Comprehensive Framework for Partnership provides an opportunity to translate industrial cooperation into a broader model of maritime capacity building. The recommendations outlined in this article are organised around three priority pillars: building maritime capabilities, connecting maritime growth with coastal communities, and strengthening the evidence base for inclusive and sustainable development. Together, these pillars provide a practical model for linking skills, investment, community outcomes, and institutional learning. Realising them will also require an understanding of maritime capacity building that is integrated into broader development priorities, including fiscal space, administrative and institutional capacity, and competing demands on infrastructure, education, and welfare spending.

Figure 1: An Inclusive and Sustainable India-ROK Maritime Growth Model



Source: Authors' own

Pillar I: Build Maritime Capabilities

- **Anchor KOICA-supported Skills Development in Emerging Maritime Clusters:** India-ROK maritime cooperation has already developed a foundation for capacity building in the past; the 2026 Framework provides an opportunity to broaden that foundation.³⁹ KOICA-supported training should be aligned with the geographic locations where shipbuilding, port, and maritime manufacturing capacity is expanding, including Tamil Nadu, Kerala, Gujarat, and Andhra Pradesh. For example, the 2026 tripartite agreement to develop

a mega greenfield shipyard at Thoothukudi (Tamil Nadu), through which Indian shipbuilding professionals could be trained at HD Korea Shipbuilding and Offshore Engineering's (HD KSOE) facilities, demonstrates how such geographically anchored and cluster-specific skilling could work in practice.⁴⁰

Training should be designed jointly with shipyards, technical institutions, state skill missions, and industry associations to reflect actual occupational requirements and create pathways into skilled and higher-value employment. This would help shift capacity building from generic workforce training towards cluster-specific industrial capability, while creating a more capable ecosystem for Korean shipbuilders, technology companies, and maritime investors operating in India.

- **Position the IMU-KMOU Partnership As a Platform for Technology Absorption, Innovation, and Industrial Upgrading:** The proposed IMU-KMOU partnership should extend beyond academic exchange to include joint programmes, applied research, industry placements, and collaborative work on green shipping, autonomous vessels, maritime automation, naval architecture, and port technologies.⁴¹ Structured engagement with Korean shipbuilders and technology firms could connect research and training with industrial needs and help ensure that technology transfer generates domestic engineering, managerial, and production capabilities.
- **Adapt Skilling Systems for New Technologies:** As large-scale need for reskilling in the maritime sector is driven by decarbonisation, digitalisation, and automation,⁴² training programmes could combine technical expertise with digital and AI literacy, systems thinking, and cybersecurity, potentially integrating simulations and other AI-training tools. Digital tools including AI translation and voice interfaces can also improve access to training, safety guidance, and grievance systems, especially for workers facing language or literacy barriers.⁴³ The India-Korea Digital Bridge, covering AI and data governance,⁴⁴ could support these applications, linking inclusion and workforce resilience with industrial competitiveness.

Pillar II: Connect Maritime Growth with Coastal Communities

- **Make Local Employment and Livelihood Transitions Part of Maritime Cluster Planning:** Communities located near major port and shipbuilding projects should be recognised as participants in maritime development, not simply as potential sources of labour. Skills and enterprise programmes should

be tailored to local opportunities, including maritime services, cold-chain logistics, fisheries-related value chains, aquaculture, repair and maintenance, and small-enterprise development. This would help ensure that new maritime clusters generate local economic linkages rather than operating as isolated industrial enclaves.⁴⁵

- **Institutionalise Gender-inclusive Maritime Workforce Planning:** Gender considerations should be integrated into workforce planning across shipyards, ports, maritime services, and associated supply chains.⁴⁶ India-ROK programmes should track women's participation in training and employment alongside workplace safety, retention, career progression, and leadership. It is imperative to help enable women from coastal communities affected by industrial development to access new technical and maritime employment opportunities.
- **Integrate Community Participation and Coastal Heritage into Maritime Cluster Development:** New maritime clusters should incorporate community participation from the planning stage through local consultation, participatory decision-making, transparent grievance mechanisms, and appropriate benefit-sharing arrangements.⁴⁷ Cluster planning should also recognise coastal heritage, traditional knowledge, maritime practices, museums, and cultural landscapes, building on India-ROK cooperation on maritime heritage and the NMHC at Lothal.⁴⁸ This can help connect new industrial spaces with the communities and maritime identities that already exist around them.

Pillar III: Strengthen the Evidence Base and Institutions for Inclusive Maritime Growth

- **Establish a Shared India-ROK Maritime Employment and Skills Database:** India and the ROK should develop a common evidence base for shore-based maritime employment, disaggregated by geography, sector, occupation, skill level, and gender. The KOICA-supported workforce mapping exercise⁴⁹ could provide the starting point for a continuously updated system that identifies emerging skills shortages, tracks training and employment outcomes, and informs future investment and workforce planning.

- **Develop an SDG-linked Framework for Measuring and Improving Maritime Development Outcomes:** Port and shipbuilding projects should be evaluated alongside conventional measures of investment, cargo volumes, production, and infrastructure capacity through indicators covering employment quality, local economic participation, gender inclusion, technology absorption, community impacts, and environmental performance. Linking these indicators to relevant SDGs would give India and Korea a common basis for assessing whether maritime industrialisation is generating inclusive and sustainable growth.

Conclusion

The India-ROK maritime partnership offers an important opportunity to advance the former's broader maritime ambitions under Maritime Amrit Kaal Vision 2047 and the Sagarmala Programme, while creating new avenues for Korean industrial, technological, and institutional engagement in India's expanding maritime economy. Realising this potential will require capacity building to extend beyond technical skilling and labour supply.

Looking ahead, the bilateral partnership can build on its cooperation in ships, ports, infrastructure, and skills to develop a broader model of maritime capacity building. Such a partnership would invest not only in industrial assets, but also in the people, institutions, communities, and knowledge systems that enable them to deliver lasting value. By linking competitiveness with inclusion, innovation with skills, and industrial growth with resilient coastal economies, India and Korea can build a partnership that is mutually beneficial and positioned to contribute to a more resilient, sustainable, and connected maritime Indo-Pacific.

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