

Maritime Governance Analysis for Safety and Environmental Aspects of Domestic Ferries: A'WOT of a Developing Country

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Structured Abstract

Article Type: Research Paper

Purpose—This paper aims to assess the adequacy of maritime governance for the safety and environmental aspects of domestic ferries from the perspective of a developing country by undertaking the case of Pakistan.

Design, Methodology, Approach—Based on a novel approach developed for unified maritime safety onboard in response to IMO's new model safety regulation, the standard decision analysis A'WOT hybrid method was employed to carry out the study. Expert groups were consulted at various levels and fora to rationalize the internal and external factors, which were identified as strengths and weaknesses, opportunities and threats respectively.

Findings—The results are similar to the majority of developing countries in the Asia-Pacific region. The business-as-usual case reveals that Pakistan has many opportunities for domestic ferries along with a reasonable level of strength in its governance. However, there are gaps in several components of the basic governance framework that pertain to policy and regulation, operations, institutional arrangements, innovation and technology, the human element, economics, and performance systems related to safety and environmental protocols at sea, which is due to lack of focused attention.

Practical Implications—Measures are identified to overcome the challenges by

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converting them into strengths and harnessing the opportunities for best practices and sustainable governance.

Keywords: A'WOT; domestic ferry; environmental aspects; governance; IMO model regulation; maritime safety; policy

I. Introduction

Domestic navigation and water transportation are considered practical and economical for moving goods and passengers.¹ The domestic passenger ferry is a national economic and social enabler through the lens of the maritime economy, primarily for emerging economies. It contributes significantly toward national revenue generation through the promotion of maritime tourism and social-cultural activities.² The ferry has the potential to widen the supply chain and worker spending effects which promote other associated segments of the economy.³ Nevertheless, due to the complex nature of domestic ferry operations, one single incident may bring disastrous consequences. The incidents of Dona Paz (Philippines 1987), Herald of Free Enterprise (UK 1989), Estonia (Baltic Sea 1992), Al Salam Boccaccio (Red Sea 2001), Prince Ashika (Tonga 2009), and Sewol (South Korea 2014) have shaken the world with enormous social, economic, and environmental damage. Occurrences of such ferry incidents are not rare, but the consequences in terms of human lives and the degradation of the marine environment can be devastating to economic growth and society.⁴ Therefore, tackling the accident rate and improving maritime safety has captivated the interest of policymakers, the scientific community, and international organizations.⁵

At the same time, passenger ferries today are subjected to a vast array of national and international obligations, regulations, and standards, which cover every aspect of ship construction and operation, especially safety, high service quality, efficiency, and user satisfaction.⁶ However, the business-as-usual case of domestic ferry services in developing countries reflects low adherence to all such protocols compared to developed countries.⁷ Currently, Pakistan has a small domestic ferry sector including inland waterways. However, Pakistan's coastline of 1000 km, especially the Western coastline, offers a wide range of opportunities and potential for the new proposed outlook of the ferry services to domestic and international routes by a government that will open alternate routes and provide access to maritime transport for goods and passengers.

Key safety and environmental aspects and related challenges are reportedly linked with factors such as the human element, inadequate capacity of actors on planning and strategy, operational aspects vis-a-vis traditional and substandard practices, lack of technology and innovation about safety equipment, lack of stakeholder engagement and shortcomings in governance mechanisms.⁸ The capacity to cope with these challenges is further aggravated by overloading due to the profit-oriented approach of boat owners; poor adherence to operational safety culture, including negligence in respect of safety and weather conditions; reliance on traditional knowledge about weather conditions; lack of community awareness on safety; lack of proper training and education; inadequacy of crews' skills; human elements related to safety management; emission and noise control aspects; poor adherence to the annual survey and audit protocol; registration aspects; monitoring; navigational aids in channels or on coasts; lack of coordination between organizations or with

enforcement agencies; and lack of any centralized data collection, especially about accidents for any lessons learned or marine casualty investigation regime.⁹ This has also led to a weakening of inter-agency collaboration and enforcement. Additionally, the weak enforcement of maritime protection regulations and inter-agency collaboration in developing countries have frequently led to ferry disasters.¹⁰

Weak governance in developing countries significantly hampers safety in the domestic ferry sector, a challenge not negligible in Pakistan. Stakeholders emphasize the subpar safety and environmental conditions in Pakistan’s domestic ferry services compared to other developing nations. To address these issues and advance the sector, effective governance is essential. Despite existing legal frameworks, the domestic ferry domain in Pakistan is complex and often disregarded, complicating matters further. The study evaluates the status of domestic ferry governance in Pakistan concerning safety and evolving international standards, offering innovative approaches to policymakers. This study fills a knowledge gap and offers a unique approach to policymakers in Pakistan and other developing countries to enhance maritime safety and governance within the ferry sector.

II. Literature Review

Maritime stakeholders contend that domestic ferry services in Pakistan exhibit inadequate safety and environmental standards in comparison to their counterparts in other developing nations. Significantly enhancing this sector’s safety and performance remains a formidable task, one closely tied to the establishment of a robust governance framework. The increased research attention and a growing number of studies underscore the vital role of ferry safety, environmental regulations, and governance standards, as illustrated in Table 1. These studies provide invaluable insights into improving safety and governance within the ferry sector.

Table 1: Key studies on domestic ferry safety

Focus of the study	Methodology	Key Findings
Risk Assessment of Navigation Safety for Ferries	Fuzzy AHP approach, risk-matrix model	This investigation addresses a pressing concern for improved safety measures and risk assessment within the ferry sector
Safety Behavior in Ferry Transport	Exploratory and confirmatory factor analysis, structural equation modeling	Examined the effect of safety training, safety knowledge, and safety management on employees’ safety behavior at ferry services
Increased Safety for Community in Ferries Transportation	Research, Data Analysis	Highlights the importance of safety in ferry transportation and its role in connecting regions while emphasizing the necessity for safety measures to prevent and handle ship accidents

Focus of the study	Methodology	Key Findings
Trends, Causal Analysis, and Recommendations from 14 Years of Ferry Accidents	Research, Causal Analysis, Recommendations	<ul style="list-style-type: none"> • Examines common factors contributing to accidents • Highlights issues like substandard vessels, overcrowding, and inadequate training • Offers recommendations for enhancing ferry safety in developing countries
Modernizing Governance of Passenger Vessel Operations in the Canadian Arctic	Governance and Permitting Evaluation	<ul style="list-style-type: none"> • Describes the complexity of the multijurisdictional governance framework involving federal, territorial, and local governments • Discusses issues in information sharing and coordination among various governmental departments

Transitioning to a review of global literature, several studies emphasize the significance of safety and governance within the ferry sector. For instance, Hsu et al. (2022) conducted a comprehensive risk assessment of navigation safety in ferry operations, providing valuable insights that can be applied to improve safety performance within the sector.¹¹ The other study accentuates the role of safety behavior among ferry service employees, drawing from insights gained in Indonesia.¹² Sa'atun and Panggabean's (2021) research stresses the significant role of safety in ferry transportation, particularly in fostering social well-being.¹³ While Weisbrod et al study has exposed the challenges faced in implementing and improving safety, a reflection of the issues encountered in Pakistan's domestic ferry sector.¹⁴ Meagan Greentree (2023) provides valuable insights into uncoordinated governance, relevant not only in the context of Canada's Arctic but also as a reflection of the complexity of governing passenger vessel operations in Pakistan.¹⁵ Furthermore, Tehsin's work explores the potential of inland water transport in Pakistan as an alternative mode of transportation, offering insights applicable to improving ferry safety and efficiency within the country.¹⁶ These studies collectively underscore the global significance of safety and governance within the ferry sector, providing a foundation for understanding the unique challenges facing Pakistan's domestic ferry operations.

The existing literature illuminates the substantial shortcomings in safety, environmental standards, and overall governance within domestic ferry services in developing countries, Pakistan included. These inadequacies emphasize the pressing need for improvements in these areas. Nevertheless, there remains a distinct absence of comprehensive studies addressing the unique challenges and complexities of Pakistan's domestic ferry sector. This knowledge gap deters the development of tailored strategies for enhancing safety and governance. The current study is designed to fill this void by focusing on the specific challenges encountered by Pakistan's domestic ferry operations. By drawing from global insights and best practices, the research aims to provide context-specific recommendations and strategies for elevating safety and governance within the country's domestic ferry sector.

The unique contribution of this study lies in its tailored approach to the specific issues faced by Pakistan and its potential to serve as a model for other developing countries with

similar challenges in their ferry operations. In doing so, this research addresses the crucial need for enhancing safety and governance in Pakistan's domestic ferry services and offers a valuable blueprint for the maritime community at large.

III. Methodology

This study was conducted with a combination of different qualitative and quantitative methods to examine the current status of domestic ferry governance from a safety and environmental perspective at federal and provincial levels. Before determining the best suitable method for the analysis against the problem statement related to the case of maritime governance, a wide range of available literature was scrutinized through content analysis for subsequent application of an in-depth situational analysis exercise.¹⁷ The objective was to identify a unified maritime safety approach (Figure 1) for domestic ferry services in the context of the recent IMO "Model Regulations on Domestic Ferry Safety." This novel approach to unified maritime safety onboard entailed the need to employ a standard decision analysis A'WOT hybrid method, for the creation and addition of new knowledge through a case study of a developing country, i.e., Pakistan.

A'WOT is a weighted matrix of SWOT (strengths, weaknesses, opportunities, and threats).¹⁸ A'WOT is a unique application that combines a qualitative technique (i.e., SWOT) with a quantitative scoring technique (i.e., simple multi-attribute rating technique, or SMART) of the Multi-Criteria Decision Analysis (MCDA) method. SWOT presents a fundamental foundation for A'WOT-based alternative tactics for each SWOT factor and is considered strongly suited for strategic situational analysis in research studies related to decision sciences. A'WOT, a blend of SWOT and AHP (analytic hierarchy process), has also been utilized in several research studies that ultimately supported strategic planning and decisions. However, due to the complexities and drawbacks of the AHP method, recent studies now use the SWOT method in combination with SMART instead of AHP.¹⁹ SMART is a well-instituted practice used to supplement MCDA in social and management sciences²⁰ and several SMART approaches have subsequently been created.²¹

Based on the approach as outlined in Figure 1, literature review, qualitative content, and situational analysis, the identification of the SWOT factors was done through focus group consultation. Focus group consultation is a small group consultation facilitated by experts. These consultations help to determine which issues are of most concern for a community or group and assist in determining the best solutions for dealing with them.²²

Therefore, in the context of this study, twelve experts from various government and private sector organizations, international non-governmental organizations, multinational enterprises, and corporate sectors, directly or indirectly involved in the maritime sector based in Islamabad, Karachi, and Malmö, Sweden, participated in the consultation held online via Zoom session. To avoid any biases, experts were divided into four groups of three members each. Experts from each group floated their ideas, various emerging issues, and concerns. These diverse ideas helped in identifying SWOT factors for the study, which were subsequently prioritized after discussions with experts. Subsequently, considering the importance of expert knowledge, the maritime expert groups were also consulted at various levels and fora to rationalize the internal and external factors, which were identified as

strengths and weaknesses, and opportunities and threats, respectively. The SMART version draws on a fixed number of points, i.e., 100, that are allocated to all decision elements compared to the A'WOT framework. The breakdown of the SMART score is classified in terms of individual SWOT factors and their respective SWOT groups (i.e., strengths, weaknesses, opportunities, and threats).²³ The evaluation score is interpreted with the expert's knowledge of a business case.

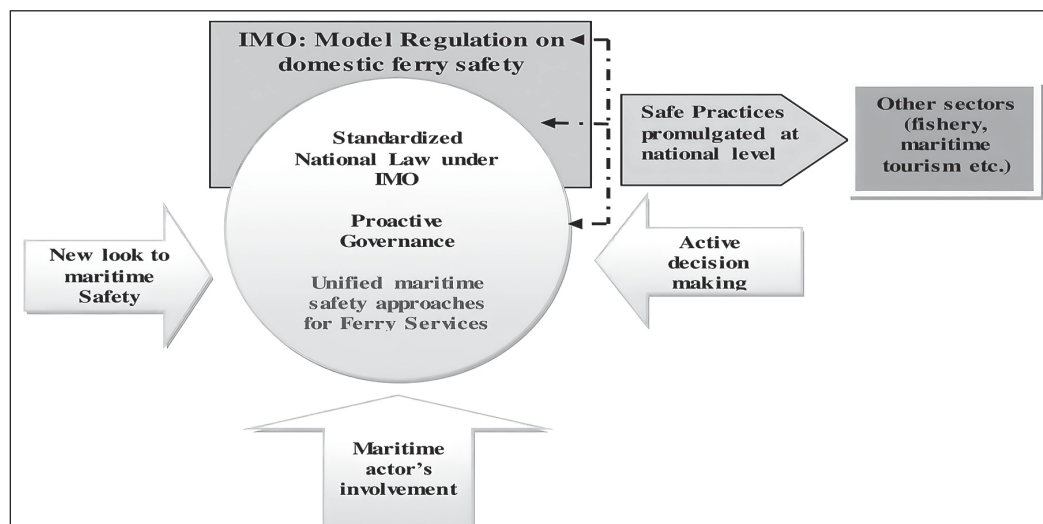


Figure 1: Unified Maritime Safety Approach for Domestic Ferry Services

IV. Results

Based on a unified maritime safety approach under the emblem of IMO's new model regulation, the A'WOT-based governance index to the mainstream business-as-usual case of safety and environmental aspects related to domestic ferry services in Pakistan is presented in Table 2. It is expected that the outcome of this study will add valuable knowledge on this significant issue that is not focused on assertively in developing countries and is apparently neglected in the case of Pakistan. Figure 2 illustrates the overall governance index in terms of percentage scores attained by different SWOT groups. Additionally, Figure 3 displays an overview of the standing of individual SWOT factors.

Table 2: A'WOT of domestic ferry governance in Pakistan for safety and environmental aspects

SWOT Group	Overall Priority	SWOT Factors	Priority's Score
Strengths	33	S1: Merchant Shipping Ordinance, 2001	10
		S2: PMSAs and PCG Act	2
		S3: Establishment of JMICC (Joint Maritime Information Coordination Center) to work more systematically, particularly for safety-related coordination	1.5

SWOT Group	Overall Priority	SWOT Factors	Priority's Score
		S4: Regulatory entities	1.5
		S5: Law enforcement agencies (LEAs)	1
		S6: Member State of IMO & UNESCAP	1
		S7: Environmental Protection Acts	2
		S8: Visible recreational activities	1.5
		S9: Government's initiative for the development of the ferry sector	10
		S10: Passengers ferry union support	2.5
Weaknesses	29.5	W1: Shortcomings in policy and regulation	10
		W2: Gaps in the implementation of existing safety & environmental regime	5
		W3: Inadequate coordination mechanism among government actors for safe operations of the ferry	2
		W4: Traditional & substandard ferries	2
		W5: Lack of community awareness	1.5
		W6: Inadequate capacity of actors	1.5
		W7: Lack of stakeholders' engagement	1
		W8: Inadequate adoption of technological innovation	2
		W9: Lack of ferry accident database; Limiting factor to strategizing policy, planning, and implementation	2
		W10: Lack of standardized terminals and relevant infrastructure	1
		W11: Lack of marine spatial planning	1.5
Opportunities	14.5	O1: Rise in maritime tourism under CPEC	2
		O2: IMO model regulations on domestic ferry safety	2
		O3: National growth prospects by uplifting maritime sectors	3
		O4: Likelihood of Joint Ventures (JVs) and Public Private Partnerships (PPPs)	1.5
		O5: Incentive for electric ferry transportation	1.5
		O6: Potential of ro-ro transportation	2
		O7: Expansion of KS&EW (Shipyard)	2
		O8: Social media platform for promotion of the ferry services	0.5
Threats	23	T1: Increase in ferry accidents at sea	4
		T2: Increase in environmental pollution	2
		T3: International pressure due to non-compliance with IMO requirements	2
		T4: Disruption to navigation at sea and harbor routes	2
		T5: Unavailability of standardized infrastructure or terminal	7
		T6: Discouraging factors for the attraction of investments (Local and foreign)	6

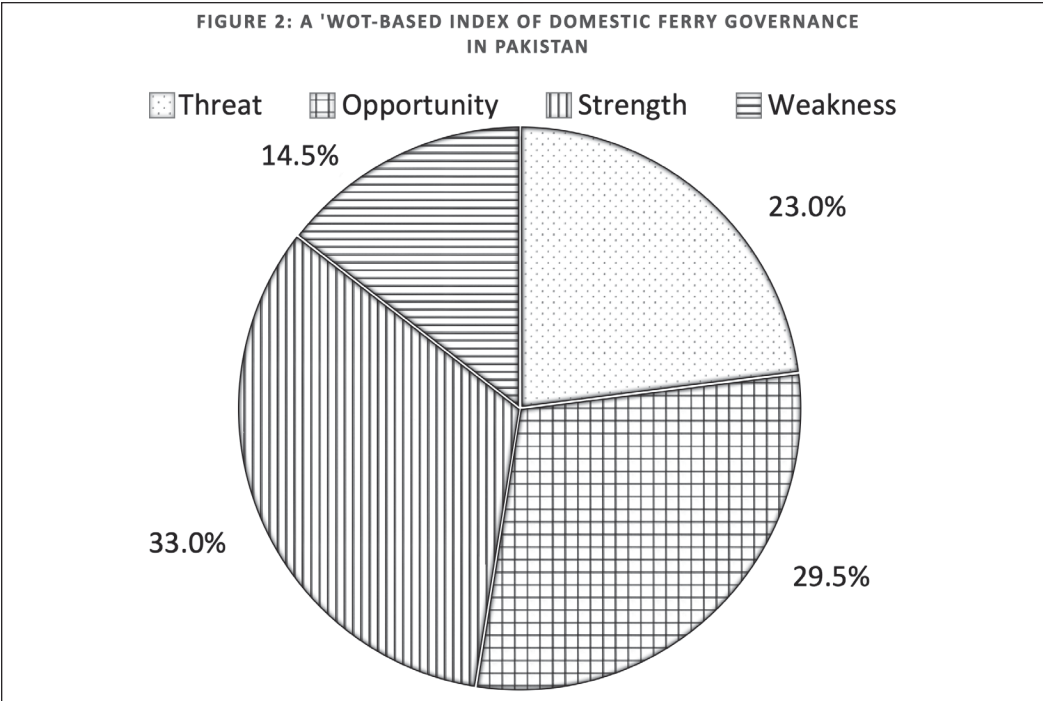


Figure 2: A'WOT-based index of domestic ferry governance in Pakistan

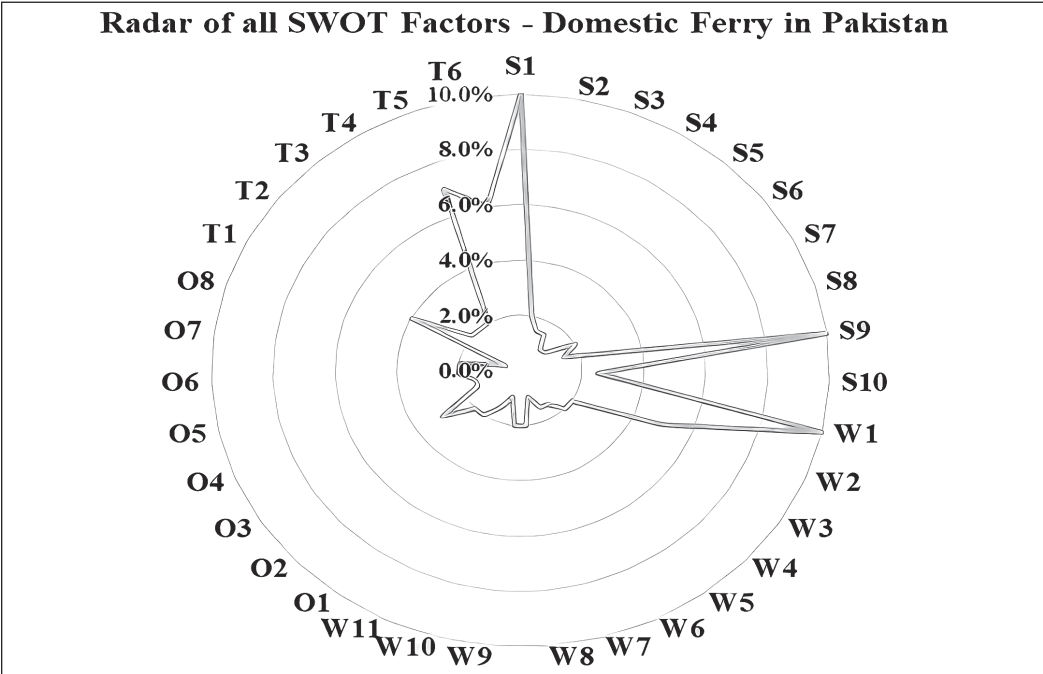


Figure 3: A'WOT based priority index of all SWOT factors

V. Discussion

5.1 Domestic Passenger Ferry—Policy and Regulation

The International Maritime Organization (IMO) envisions a series of initiatives as a crucial step in reducing maritime accidents at sea, primarily through amendments to the International Convention for the Safety of Life at Sea (SOLAS). While SOLAS applies to passenger ships engaged in international voyages, it does not extend to passenger ferries that operate exclusively within national waters, often referred to as non-SOLAS or non-convention vessels.²⁴ These non-SOLAS ferries are subject to compliance with national (domestic) regulations.²⁵

In Pakistan, passenger boats fall under the purview of national law. The development of the “Model Regulations on Domestic Ferry Safety” by the IMO is seen as a catalyst for standardizing ferry operations.²⁶ Rather than acting in isolation, international legislation, especially the IMO model safety standard, holds the potential to complement and bolster national regulations. Consequently, strong local policies can enhance the operational efficiency of the ferry sector and promote a unified approach to maritime safety and environmental measures.

It is a welcome strength that two legal frameworks exist and govern domestic ferries (inland and at sea). These are the Pakistan Merchant Shipping Ordinance (MSO), 2001,²⁷ and the Inland Mechanically Propelled Vessels Act, 1917.²⁸ The provincial transport authority and Federal Ministry of Maritime Affairs/ port & shipping wing (Karachi) act as the regulatory entities for the domestic ferry sector in Pakistan and possess various functions to ensure the implementation of the international maritime conventions, agreements, and standards; thereafter, the national law is officially announced as a regulation under the MSO, 2001 and inland Mechanically Propelled Vessel Act, 1917. The presence of these legislative frameworks provides the necessary foundation for implementing the IMO Model Regulations, aiming to harmonize standards and create a “level playing field.” This process, often termed “domestication,” can play a pivotal role in enhancing safety standards in alignment with the newly adopted international standards by the IMO (SI, 4).

5.2 Current Institutional Arrangements—Domestic Passenger Ferry

After the 18th amendment to the Pakistan Constitution, the responsibility for regulations about domestic passenger ferries was divided. The Federal Ministry of Maritime Affairs, Directorate General Ports and Shipping took charge of regulations, while the provincial transport authority (PTA) became responsible for ferry operations along the coastal belt. As a result, the domestic ferry sector falls under the jurisdiction of both federal and provincial authorities. Mukherjee (2002) pointed out that many countries, especially developing countries, contain maritime legislation in numerous pieces of outmoded and archaic legislation.²⁹ Similarly, national laws concerning passenger ferries include the absence of unified instructions, outdated regulations, and the division of responsibilities among decision-makers at federal and provincial levels. This fragmentation leads to a lack of focus and coordination, which poses significant challenges for water transportation stakeholders. This lack of coordination thus supplements the advantage of a profit-oriented mindset to

play in between, becoming a severe issue of overloading and promoting fewer safety standards and environmental control measures.³⁰ The respondents claimed that currently, the domestic ferry sector is under confusion about unified ownership for effective focus and sustainable shipping (W1). In the incident of the South Korean ferry Sewol, which capsized on April 15, 2014, claiming 300 passengers, including a large number of students,³¹ analysis exposed a lack of ownership and expertise that limited maritime safety and proactively invested in the prevention of accidents.³² In response, senior maritime experts suggested that the Government of Pakistan (GoP) could use the IMO model standard as a benchmark to unify the scattered national policies regarding safety and environmental aspects. This unification would establish a sustainable governance mechanism for domestic ferries. Furthermore, the Pakistan Navy's establishment of the Joint Maritime Information Coordination Center (JMICC) is seen as a significant step toward improving coordination of maritime safety in both domestic and international transportation. JMICC serves as a central body for disseminating information to all maritime actors operating in Pakistani waters (S3). The decision-makers can take huge advantage of circulating information regarding weather alerts, safety regulation amendments, safety awareness, and improved environmental measures.

5.3 Promising Opportunity—Domestic Passenger Ferry

Internationally, the IMO has the primary responsibility for technical safety, security, and pollution prevention related to shipping activities. The government of the Member States have to implement standards as part of their national law. Being a Member State of IMO, Pakistan has the obligation to employ the newly adopted standard for the safety of domestic ferries.³³ However, it can be foreseen that a lack of federal and provincial collaboration among maritime actors may delay the domestication of the IMO standard to transform the national framework of safety in Pakistan, including full improvement of navigation and communication equipment, LSA, crew training, safety management system, and shore side support provisions (T3). Generally, the risk of accidents involving non-convention vessels is much higher due to low safety standards, as these vessels are not governed under the IMO safety and environmental protection regime. These accidents indicate less attention from the international community, the poor focus of the governments, and the neglectful behavior of the administration (federal and provincial). Therefore, this sector calls for improvement in safety provisions.³⁴ The recent adoption of the IMO model regulation³⁵ provides an opportunity for the GoP as a Member State of IMO to revise the national law to harmonize the domestic ferry sector before the commencement of ferry services at a higher level. These amendments will also eliminate unseaworthy boats as well as streamline crew competence and step towards sustainable shipping (O2).

5.4 Maritime Policy and Governance Performances Related to Safety and Environmental Protocols at Sea

The presence of Law Enforcement Agencies (LEAs) to maintain order at sea, such as the Pakistan Maritime Security Agency (PMSA) under the PMSA Act, 1994,³⁶ and the Pakistan Coast Guard (PCG) under the PCG Act, 1973,³⁷ is an encouraging aspect for effective

enforcement. The PMSA, functioning under the Ministry of Defense with a focus on maritime disaster control and marine environment preservation, and the PCG, operating under the Ministry of Interior with an emphasis on anti-smuggling efforts, both hold the authority to inspect vessels and take action against ferries endangering maritime safety in Pakistani waters (S2). Moreover, there's a noted issue of differing priorities and coordination challenges between these agencies.³⁸ This challenge of inter-agency coordination is not unique to Pakistan. A World Bank report on the Republic of the Philippines (1983) highlighted similar problems, such as overlapping powers leading to resource wastage, inefficiency, shortages of skilled personnel, and outdated equipment, which weakened national maritime enforcement capacity.³⁹ However, the current Philippines study yielded better enforcement, regulatory, and governance mechanisms that resulted in improved domestic ferry services.⁴⁰ Additionally, Sakalayan (2006) highlighted the weakness in developing countries towards enforcement due to a lack of communication and vigorous implementation by maritime authorities, which often provide an opportunity for ferry operators to hold the whole domestic ferry operation hostage in form of strikes for approving illegal demands such as adherence of inadequate regulations, non-adherence of safety equipment and utilization of substandard boats, etc.⁴¹ This further worsens the maritime governance outlook. The lack of engagement and cooperation among all ferry sector stakeholders in Pakistan undermines innovation, safety, and community trust. Dysfunctional interaction and poor communication in safety enforcement increase the risk of maritime accidents, as evidenced in the Sewol ferry accident investigation (W7,8).⁴² Respondents indicate that, concerning inter-agency coordination, the domestic ferry sector in Pakistan faces challenges in terms of collaboration, capacity building, and synergy among federal, provincial, and LEAs, which collectively weaken the performance of maritime governance concerning safety and environmental protection at the national level (W3).⁴³

5.5 Environmental Aspects

In line with international countries, Pakistan National Shipping Corporation has taken several initiatives to reduce its carbon footprint and encourage the use of sustainable fuels including the institution of environmental laws for seagoing vessels to minimize the emission of air pollutants.⁴⁴ However, the environment is considered a multidisciplinary notion, where the laws and policies are the central means by which it has to be effectively managed for sustainable results. Against this backdrop, to strengthen the federal and provincial environmental execution, the National Climate Change Policy, 2012, Provincial Environmental Policy Act, 1997, and the National Maritime Policy, 2002 dealt with maritime transportation.⁴⁵ Moreover, the harmonization of recent IMO model regulation provisions at a national level for domestic ferries may enable cross-sectional jurisdiction to restrict unlawful activities that threaten the environmental aspects and maritime safety of the ferry, passengers, and crew (O2). Indeed, this domestication is expected to improve the current state of affairs (S7). The senior respondent briefed that the low interagency and maritime stakeholder collaboration, less political will, and overlapping of jurisdictions often obstruct effective enforcement (W3).⁴⁶ To improve the operational environmental capacity, the rapid sharing of information is determined as a relatively “low-cost” mechanism.⁴⁷

5.6 Marvels to the Blue Economy—Domestic Passenger Ferry

Maritime transport, including passenger and freight services, is being extended to both national and international destinations, with proposed routes like Karachi to Muscat, Dubai, Chahbahar, and Karachi to Gwadar, supplementing the holistic integrated planning of all modes vision of the National Transport Policy.⁴⁸ A recent study has shown new patterns of transportation routes, and vessel traffic in the Indian Ocean region, therefore the ferry services can facilitate these services to increase trade volume in the region.⁴⁹ This start will also unfold the economic opportunities and domestic passenger and freight services over a longer term (S9). Despite challenges such as the COVID-19 pandemic, domestic ferries have maintained continuous safe operations, even when international ferry passenger-carrying industries have suffered significant declines.⁵⁰ However, integration of ferry terminals with ports through CPEC development opens the door to a new era of economic growth, supporting both passengers and freight transportation and creating opportunities for the hotel industry and coastal tourism (O1).⁵¹ The senior maritime expert agreed that these activities stimulate direct (employment for the crew, shore staff, etc.), indirect (terminal or port activities, modal transport, etc.), and induced effects (coastal tourism, hotel industry, local business, rest houses, etc.) for substantial business development and, thus, uplift the local economy. Simultaneously, these developments impose significant environmental pressures. Ships and ports contribute to emissions, accident risks, pollution events, underwater noise, marine litter, and the introduction of invasive species, primarily via ballast water discharges (T2).⁵²

5.7 Domestic Passenger Ferries and the Need to Understand the Operational Challenges

The senior expert emphasized that there is a dire need to understand the quantum of challenges with the domestic ferry to unearth the associated potentials such as inadequate terminals, safe ferry activities, enforcement of marine spatial planning (MSP), etc. In addition, there will be added pressure on the coastal area due to increasing population drift and maritime transport activities. These issues are very challenging and require federal and provincial collaboration to improve the sustainability of coastal livelihood (T4). Consequently, to govern these activities, integrated MSP must be undertaken to avail environmentally friendly maritime activities (W11).⁵³ The inadequate maritime transport infrastructure and scarce hinterland connections often result in extended delays, increased costs, and low shipping connectivity.⁵⁴ Currently, the lack of state-of-the-art ferry terminals in coastal cities may limit the initiative for the commencement of ferry services (passenger and freight) in Pakistan. Although the GoP has tasked Karachi port, Port Bin Qasim, and Gwadar port authorities to establish the requisite infrastructure, to date it is only the allocation of the wharf area at the port that has been undertaken, which necessitates suitable development. Moreover, the opening of new routes for the ferry sector with an amalgamation of international routes will increase ferry traffic, air, and noise pollution, cargo operations, and increased ferry turnover with a capacity for loading and unloading cargoes, vehicles, and motorcycles at the same time, thus also requiring standardized terminals to handle ferry services efficiently (T5).⁵⁵

5.8 Capacity Building to Kick Off the Ferry Sector—Governance Aspects

Currently, domestic ferry operations are confined to Karachi Harbor, including nearby coastal areas, and inland waters, such as the Indus River and lakes. However, the initiation of CPEC activities is likely to expand ferry services to other coastal cities, potentially posing challenges for inter-provincial cooperation. Furthermore, the decentralization of domestic ferry governance from federal to provincial levels under the 18th Amendment has resulted in limitations in organizational capacity and technical resources within provinces.⁵⁶ However, management viz-a-viz growth of the ferry sector requires centralized legislation and authority to monitor (W1). With the construction of the new terminal at Port Bin Qasim as per the CPEC expansion plan, the trade volume is expected to rise shortly. This will kick off the inception of the to-and-fro, ro-ro (roll on/roll off) ferry services in Pakistan. In comparison to other cargo types—railways, aviation, and road—the ro-ro passenger ferry can be a cost-effective, convenient service and at the same time play a larger role in socioeconomic development.⁵⁷ Considering its economic growth, Pakistan critically needs an additional form of transportation to harmonize the carrying capacity of the existing system of roads and railways; in addition, the scope of activities under CPEC through Gwadar Gateway would add more traffic and an anticipated influx of tourists accessing maritime-related recreational activities.⁵⁸ This opportunity aligns with Baird's assertion that "any country with a long coastline suffering from acute road congestion and continuous road traffic growth should explore the potential for fast freight ferry services, similar to the Japanese model."⁵⁹ Consequently, the introduction of an additional mode of transportation within domestic waters may become a necessity to maximize port facilities, alleviate road congestion, and mitigate port-related externalities (O6).

5.9 Human Elements and Organizational Aspects

The inception of the ferry services (domestic and international) operations on new routes makes this sector a commercially viable option. However, the increase in transport activities in the form of ferry services may threaten the coastal flora and fauna, and any marine accident would have an impact on the coastal community's well-being and social fabric. The integrity of maritime safety is linked with regulated passenger vessel operations, and any failure of regulatory bodies or organizations can lead to a disaster.⁶⁰ In recent years, lack of enforcement in developing countries, due to a shortcoming of local authorities, has led to non-compliance by ferry operators, resulting in turn in the loss of human lives and the loss of breadwinners to their families (T1).⁶¹ This also raises questions about policy and regulatory compliance. One of the maritime experts emphasized that this is the right time for the maritime ministry to recruit and prepare manpower at the MMD (Mercantile Marine Department) office for this huge upcoming ferry sector in Pakistan. Generally, ferry crews rely on overrated knowledge of the water channels while operating to different destinations to transfer passengers and goods. Additionally, the ignorance of both ferry crews and passengers when it comes to safety adherence has proven to be equally concerning. This attitude reflects the traditional substandard practices and inadequate training and skills (W4).⁶² Moreover, one maritime expert further suggested that lack of knowledge stimulates human element-associated causes that can be overcome with the

collaboration with CPEC vocational schools in coastal cities; hence education and training for the ferry crew can be improved.

5.10 Operations of the Domestic Ferry—The Potential Economic Aspects

The development of Pakistan's maritime transport sector and its economic prospects are evident through a range of recreational activities in coastal cities, including scuba diving, pleasure trips, water sports, and sightseeing. These leisure activities aim to boost coastal engagement and stimulate socio-economic growth. Initiatives such as the establishment of a green shipyard in Gwadar, the declaration of the year of the blue economy, and hosting events like the Pakistan International Maritime Exhibition and Conference (PIMEC) demonstrate a commitment to maritime development.⁶³ Inland water transport is promoted as an affordable and eco-friendly mode, offering potential as a key element in intermodal transportation. These efforts reflect a strong commitment to a thriving maritime transportation sector in Pakistan. Timely development of passenger ferry regulations in line with IMO standards will enhance safety, standardization, and sustainability in the maritime sector (S8).⁶⁴ Government acceptance of these regulations will promote maritime awareness and reduce sea blindness. Additionally, the growth of ferry services, in tandem with coastal tourism, acts as a significant attraction for the sector (T5). Investment in coastal tourism to spur the domestic ferry sector in the coastal belts of Pakistan has the potential to develop state-of-the-art infrastructure and services that can lure Joint Ventures (JVs) and Public Private Partnerships (PPPs). This is vital for economic development and job creation (O4). However, a few elements act as discouraging factors such as a lengthy procedure to acquire NOC, overlapping federal and provincial policy and authority, etc. (T6). Increased engagement of both private and government actors is vital for sustainable maritime planning. A participatory decision-making process among these stakeholders is crucial for developing successful industry strategies.⁶⁵

5.11 Technology and Innovation Aspects

The adoption of technology and innovation greatly enhances safety training, procedures, and management, thereby contributing to improved ferry safety.⁶⁶ Prasetyawan et al (2021) advocated that in the world of a competitive environment, traditional shipping needs a pragmatic shift to promote the safety and the information technology of the modern world.⁶⁷ Conversely, the lack of technology integration negatively affects domestic ferry performance. Traditional wooden boats are notably deficient in life-saving appliances (LSA), and passengers often fail to wear life jackets. In the unfortunate event of an accident, victims lack floatation devices, and these small boats cannot send distress alerts using technologies like the emergency position indicator radio beacon (EPIRB) or portable radio beacon to maritime rescue coordination centers (W8).⁶⁸ Moreover, the absence of state-of-the-art standardized terminals becomes a hindrance to a robust integrated safety enforcement regime with the advent of new routes and advanced ferries. Presently, the designated wharf berths lack integrated technology for monitoring overloading, ensuring passenger safety, facilitating ship-shore communication for weather alerts, handling emergencies, providing technical support, and sharing passenger and freight data. As the

world shifts towards the electrification of domestic ferries, terminals should be equipped with high-tech provisions to reduce environmental externalities (W10). Digitizing the ferry terminal and connecting all stakeholders can streamline various operational aspects, including ticketing, passenger and cargo handling, schedule information, modal transport management, and safety procedures such as weather or distress alerts, technical assistance, and security measures (O3).

Pakistan's membership in IMO and UNESCAP, and its role as a dialogue partner in the ASEAN Regional Forum, contribute to strengthening national, regional, and international collaborations. This engagement fosters the standardization of capacity-building efforts aimed at environmentally friendly policies, technologies, and innovations (S6).⁶⁹ The adoption of batteries in domestic ferries aligns with global trends and could offer a green solution to reduce emissions. The government of Pakistan has already shown support for environmental solutions in the road transport sector and encouraged electric car usage through tax policies. Similar support can be extended to the ferry sector to promote eco-tourism and environmentally friendly sea transportation. Electric vessels have the potential to significantly reduce greenhouse gas emissions, noise pollution, and improve vessel maintainability.⁷⁰ Moreover, the use of alternative fuels in combination with onshore power has the potential to further reduce emissions by up to 23% (NO_x) and 17% (CO₂) in domestic ferries.⁷¹ The government can encourage the use of alternative fuels, such as LNG, electrification, or battery fuel cells, by offering tax incentives, thereby contributing to the goal of a zero-emission policy and potentially reducing the use of traditional wooden boats (O5).

5.12 Maritime Safety—Policy Aspects for Multi-Sector Engagement

Multi-sector involvement, including academia, civil society, the private sector, and the research community is key to strengthening constructive dialogue, and collaboration with public authorities to facilitate sustainable maritime transport efforts.⁷² The maritime respondent stated that maritime academia and research institutes may be harnessed to identify the forthcoming challenges in the maritime sector and support the engagement of maritime authorities in supporting flourishing maritime activities. Thus governments, research institutes and universities, and international organizations need to collaborate for the provision of customized maritime safety-oriented education and training programs.⁷³ The presence of numerous trade unions can influence the development of standardized regulations and promote the safety, wealth, and health of crew and passengers.⁷⁴ The existence of trade unions in Pakistan can play a significant role in motivating ferry operators to use standardized vessels, and in building community awareness to promote safety in the coastal community (S10). Therefore, maritime actors need to engage and collaborate with all quarters in adopting novel solutions for the improvement of the ferry sector.

5.13 Few Elements Can Promote Economic Aspects

Weisbrod et al have associated the high rate of domestic ferry fatalities and accidents with several factors, including substandard vessels, overcrowding, inadequate crew training, and more critical issues such as corruption and a lack of regulatory support.⁷⁵ This situation also reflects a lack of engagement by maritime actors, including transport unions,

owners, operators, and the community. This gap compromises boat maintenance, surveys, and safety equipment audits (W2). Furthermore, the domestic shipyard is considered essential for its role in sustaining national maritime transport. However, in the present world, a radical shift in shipbuilding has been observed.⁷⁶ In several developing countries, second-hand passenger ferries are poorly modified for profit, reducing their stability and rendering them unsuitable for local sea weather conditions, resulting in significant human and environmental losses.⁷⁷ The recent upgrade of the Karachi shipyard presents business opportunities for private actors in the state-of-the-art construction and repair of passenger ferries (O7). In this context, the Government of Pakistan may consider offering soft loans to support domestic ferry operators, promoting indigenous construction tailored to the country's sea weather conditions. This move aligns with new IMO model safety requirements, providing sustainability and a fresh perspective for the ferry sector.

The role of print and social media cannot be denied for community awareness towards the promotion of maritime safety and issues related to environmental protection in the ferry sector. The communication integration mechanisms to keep the community aware of the development initiatives may reduce the impact on the environment. The community will also highlight the shortcomings and distributed responsibilities in terms of safety.⁷⁸ The engagement of ferry unions to engage the coastal community may increase community awareness (O8). The change in awareness for local communities to give more attention to safety significantly endorses value to human lives and economic flow.⁷⁹ Furthermore, Kee et al endorsed that the public should ask for a safety certificate from the crew before boarding to improve the safety regime (W5).⁸⁰ These few initiatives can contribute to improving safety awareness.

VI. Key Findings

The Government of Pakistan's ambition to expand ferry services to other coastal cities reflects the continuous growth of the maritime sector and shipping activities. However, various challenges affecting maritime actors, including operations, policy, regulation, the human element, technology, and economics, could hinder progress if not properly addressed. In the current context, maritime safety plays a pivotal role in advancing the maritime sector.

While existing policies and acts governing the ferry sector, such as MSO, 2001, and the Inland Mechanically Propelled Vessel Act, 1917, remain in place, they are outdated and fragmented due to divided responsibilities between federal and provincial decision-makers. Therefore, the provision of IMO model regulations for domestic ferry safety standards presents an opportunity to harmonize national laws and policies, bringing maritime actors together to address longstanding safety concerns in Pakistan.

Similarly, several environmental laws apply to the ferry sector, but their overlapping jurisdiction often hinders the effective prosecution of unlawful acts in coastal waters. The study has revealed weak institutional coordination among maritime decision-makers and law enforcement agencies at the national level. Therefore, domesticating the IMO model regulation can bridge the gaps created by decentralized governance under the 18th Amendment, leading to improvements in capacity building and resource skills.

The activities related to the CPEC anticipate the expansion of ferry operations to Pakistan's coastal cities. The study emphasizes the need for state-of-the-art ferry terminals with smart connectivity to various stakeholders. These high-tech terminals can support a zero-emission policy, allowing ferries to use alternative fuels combined with onshore power to significantly reduce emissions, minimizing the need for traditional wooden boats.

Furthermore, the study highlights the potential business opportunities created by the recent upgrade of the Karachi shipyard, especially for private actors involved in state-of-the-art ship construction and repair, including ro-ro ferries. To support this, the Government of Pakistan could consider offering soft loans to encourage indigenous ferry construction tailored to local sea weather conditions, fostering economic growth and innovation within the ferry sector.

VII. Conclusion

The outcome of this study is novel as its analysis contributes to the knowledge on a pertinent topic that is not well attended to in developing countries and neglected in the case of Pakistan. The study has examined the strengths and weaknesses of the national governance system regarding safety and environmental aspects of domestic ferry services put forward opportunities to overcome/eliminate these weaknesses and highlighted the upcoming threats. The study results revealed that the situation of the domestic ferry sector in Pakistan is similar to the majority of developing countries in the Asia-Pacific region. The business-as-usual case divulges that Pakistan has many opportunities for domestic ferries along with a reasonable level of strength in its governance. It is identified that the interest of the government in the restart of the ferry services (domestic as well as international routes) in Pakistan will open a new business avenue in the maritime sector. With the integration of ferry terminals with ports through CPEC development, the new era to boost the economy will start in the shape of the ro-ro ferry service where, in addition to passengers, freight can also be transported.

In other words, by utilizing the effective water-borne transport system, CPEC activities can be beneficial both in terms of future maintenance and upfront costs. However, the study has found that, due to a lack of attention, there are gaps in all components of the basic governance framework that pertain to policy and regulation, the human element, institutional arrangements, operations, technology and innovation, the capacity of actors, and practice and performance systems related to safety and environmental protocols onboard. With the decentralization of governance from federal to provincial under the 18th Amendment, the regulation of ferries has become more problematic and complex. The recent adoption of the IMO model safety regulation for the domestic ferry is a louder call to standardize national law and is likely to provide a very good reason to harmonize the existing governance framework at the federal and provincial levels in Pakistan.

This will enable Pakistan to unify the maritime safety approaches and will provide sustenance to economic growth, and a new outlook for the ferry sector not only in Pakistan but also in other developing countries in the Asia-Pacific region. In a nutshell, the outcome of this study provides a baseline and would help in devising effective governance mechanisms in terms of policy, legal instruments, strategy, and institutional frameworks for

the operations of domestic ferries. Future studies would be able to utilize this information in decision-making, policy development, and planning specific to the sectoral economy related to the domestic ferry. It will also help in generating discussions and stimulating further studies at the national and international levels.

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