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## Resilient coastal cities for enhancing tourism economy: Integrated planning approaches

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## **ADB Working Paper Series**

### **RESILIENT COASTAL CITIES FOR ENHANCING TOURISM ECONOMY: INTEGRATED PLANNING APPROACHES**

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**Abstract**

The objective of this paper is to recommend planning options for improving the resilience, competitiveness, and sustainability of coastal cities. Insights for an improved understanding of dynamic coastal ecosystems and tourism impacts are shared. These are based on project level solutions and experiential knowledge of practices and a literature review of impacts of (a) growing pressures from coastal tourism in cities, (b) urban and environmental management practices, and (c) prevailing processes for creating and managing coastal infrastructure. Solutions to the identified problems are based on an analysis of the coastal ecosystems across three broad pillars: (i) city management, (ii) pollution and climate change risks, and (iii) coastal tourism. The problems range from a fragmented approach to coastal infrastructure planning; land and water pollution, fragmentation of natural ecosystems' loss of habitat and unique biodiversity, salinity intrusion, and climate change risks from sea level rises and natural disasters; and tourism economy dependencies on the management of natural assets and cross-sectoral planning. The paper recommends paradigm shifts for innovative planning and policy approaches that engage communities, institutions, and other stakeholders.

**Keywords:** coastal infrastructure and ecosystems, natural assets, planning, resilience policy, tourism, economy, competitiveness, communities, institutions, pollution, climate change, systems thinking, nature-based solutions, evidence-based approach

**JEL Classification:** Q54, Q56, Q57, Q58, Z32, R11, R14

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# 1. INTRODUCTION

## 1.1 Global Context

Seventeen Sustainable Development Goals (SDGs) were declared in 2015 as global goals to guide a paradigm shift toward the sustainable well-being of citizens by ending poverty, protecting the planet, and ensuring peace and prosperity (UNDP n.d.). In parallel, at the Conference of Parties (COP 21) in Paris in December 2015, parties to the United Nations Framework Convention on Climate Change (UNFCCC) agreed to accelerate and catalyze actions toward the investments needed for a sustainable low-carbon future and to limit global warming to below 2°C, along with an attempt to limit this further to 1.5°C (UNFCCC). In parallel, the Sendai Framework for Disaster Risk Reduction 2015–2030 was the first major agreement of the post-2015 development agenda, with seven targets and four priorities for action (UN Office of Disaster Risk Reduction n.d.). This facilitated a shift in prioritizing development from the rate or higher quantity to a better quality of growth (Jha, Sandhu, Wachirapunyaont 2018). In the urban context, SDG 11 on Sustainable Cities and Communities guides transformation toward economic prosperity by building inclusive, safe, and resilient cities. With more than 55% of the Asian population to be urbanized by 2030, SDG 11 is timely (ADB 2011). According to the 2010 United Nations report, Asia hosts the largest number of coastal megacities. These include Tokyo, Mumbai, Kolkata, Shanghai, Karachi, Manila, Istanbul, and Osaka. By 2025, three more coastal cities, namely Shenzhen, Guangzhou, and Jakarta, will join the list (United Nations 2010).

Urbanization, development, and pollution continue to impact and alter the natural ecosystems in the seas. The global efforts to ensure the sustainability of coastal cities are guided by: (i) SDG 6 on clean water and sanitation. More than 80% of wastewater is disposed into the seas without appropriate treatment, thereby adding to ocean pollution; (ii) SDG 9 on resilient infrastructure to promote inclusive and sustainable industrialization, fostering innovation. Since 1993, average sea levels have risen at a rate of 0.11 to 0.14 inches per year, with an estimated projection of about 30–122 cm by 2100, thereby increasing the vulnerability of coastal areas to the effects of climate change (www.undp.org); (iii) SDG 12 on sustainable consumption and production patterns. Marine pollution is largely caused by production and consumer practices compounding marine litter (UNDESA, UN-DOALOS/OLA, IAEA, IMO, IOC-UNESCO, UNDP, UNEP, UNWTO 2014); (iv) SDG 13 on climate action, which aims to mobilize about \$200 billion by 2020 to address the needs of developing countries to respond to climate change and low-carbon development; (v) SDG 14 on life below water, which is aimed at conserving and sustainably using the oceans, seas, and marine resources; and (vi) SDG 16 on improving institutions and governance.

## 1.2 Coastal Tourism Economy and Its Urbanization Challenges

### 1.2.1 Coastal Tourism

Historically, cities have developed along coastlines due to the locational economic benefits gained through trade, defense, transport, and access to food. Environments along coastlines are quite contrasting given that in the case of cities, they are usually attractive for their cultural, historical, and economic significance, while in regions such as the Pacific islands, the Caribbean and others, they are identified for their isolated yet pristine characteristics valued for their natural beauty, flora, and fauna. Therefore, the role of coastal tourism could be broadly driven by an intent to preserve the environment

and showcase it or as a tool for development in the form of economic growth (Miller et al. n.d.). Many developing Asian countries have a long coastline with unique biodiversity and ecosystems. These are home to some of the best tourist sites, such as beaches, coral reefs, and fauna. In recent decades, as shown in Table 1, countries such as Thailand, Indonesia, and the Philippines, benefiting from these rich coastal attributes, have witnessed exponential growth in their tourism sector (UN World Tourism Organization 2018).

**Table 1: Data Showing the International Tourism in the Given Indian Ocean Rim Association (IORA) Countries (IORA ranking in brackets)**

Country	Length of Coastline (km)	International Tourists Arrival (2016)	International Tourist Receipts (\$ million)	Travel and Tourism Industry % GDP	Travel and Tourism Projected GDP Annual Growth Rate (2013–2022)
Thailand	3,219 (6)	32,588 (1)	49,871 (1)	9.0 (3)	6.7 (1)
Indonesia	54,716 (1)	9,963 (7)	11,349 (7)	3.1 (12)	5.3 (9)
Malaysia	4,675 (5)	26,757 (2)	18,074 (6)	7.2 (4)	4.4 (12=)
Mauritius	177 (21)	1,275 (13)	1,572 (12)	11.3 (2)	4.4 (12=)
Sri Lanka	1,340 (15)	2,051 (10)	3,518 (10)	3.9 (10)	6.1 (4=)
India	7,000 (3)	14,569 (4)	22,427 (3)	2.0 (19)	6.4 (2)

Notes: For most countries, arrivals and receipt data are for 2016 (but when unreported for 2016, the most recent available data are included). For India, international tourism arrivals are increased by the inclusion of day visitors, which would not be classified as tourism in most countries.

Source: United Nations (2010).

“Tourism accounts for almost 10% of the world’s GDP with Asia and the Pacific alone receiving 308 million tourists per year” (UNWTO 2017). In Asia, the regions that have witnessed the fastest growth compared to global tourism estimates are East Asia and the Pacific region, where countries such as Viet Nam have evidenced a 756% rise in tourism in the past decade (Sustainable Tourism, Module 10 n.d.). These trends are indicative of the increased attraction of countries with higher biodiversity and a predominance of natural and sensitive ecosystems.

The economic importance of tourism to pristine natural ecosystems gives it a unique position in national policy practice and makes it a highly challenging component in ecosystem-based planning and adaptation strategies. “In 2016, travel and tourism contributed significantly to the gross domestic product (GDP) of the countries in the East Asia region: for example, in the Republic of Korea, 5.1% of the GDP was accounted for from tourism, while in the case of Cambodia, as much as 28% was credited to tourism. To add to this data, a considerable amount of the tourism revenue generated is attributed to the gross value addition from marine and coastal tourism.” “From 2013 to 2016, the number of cruise ships in Asia grew at a 12% compound annual rate with this trend likely to continue” (Cruise Lines International Association 2016).

While tourism contributes significantly to the economic growth of several Asian countries, one of the pressing challenges is from often unplanned developments along coastlines in terms of resorts, hotels, and other tourism-related activities, leading to a lack of proper wastewater treatment and plastic pollution contributing to the deterioration of ocean health. “Annually, sewerage treatment authorities dispose 5.9 trillion gallons of sewage into coastal waters with an estimated 160,000 factories

disposing between 41,000 and 57,000 tons of toxic organic chemicals and 68,000 tons of toxic metals into coastal waters globally” (UNEP and UN Habitat 2005). These result in enormous coastal pollution and environmental degradation, which is exacerbated by climate change-induced impacts. These threaten the sustenance of the unique and sensitive ecosystem that makes coastal areas both attractive and a large contributor to revenue generation. One critical way in which coastal areas are adversely impacted is through untreated discharge of wastewater and sewerage, and poor waste management, largely from tourism-related activities, causing severe adverse impacts on natural ecosystems, some of which may be irreversible. For example, in Pattaya, Thailand, unplanned and unregulated ribbon development along the coastline has led to wetlands being converted into open sewers due to poor wastewater management and inadequate infrastructure for treatment (Wong 1998). Similarly, Goa in India, which relies heavily on national and international tourism for its subsistence, has witnessed increased density in construction along coastlines, resulting in irreversible changes in land use, damaging coastal aquifers, the sand dune systems, and mangrove vegetation (Sawkar et al. n.d.).

Given the enormous economic significance of coastal tourism, a paradigm shift is imperative for urban policy formulation and implementation and infrastructure planning. This would enable coastal cities and their tourism sites to thrive amid growing urban pressures and increased risks from natural disasters and climate change.

## **2. THE DYNAMIC COASTAL ECOSYSTEM**

### **2.1 The Coastal Zones – Interface between Land and Sea**

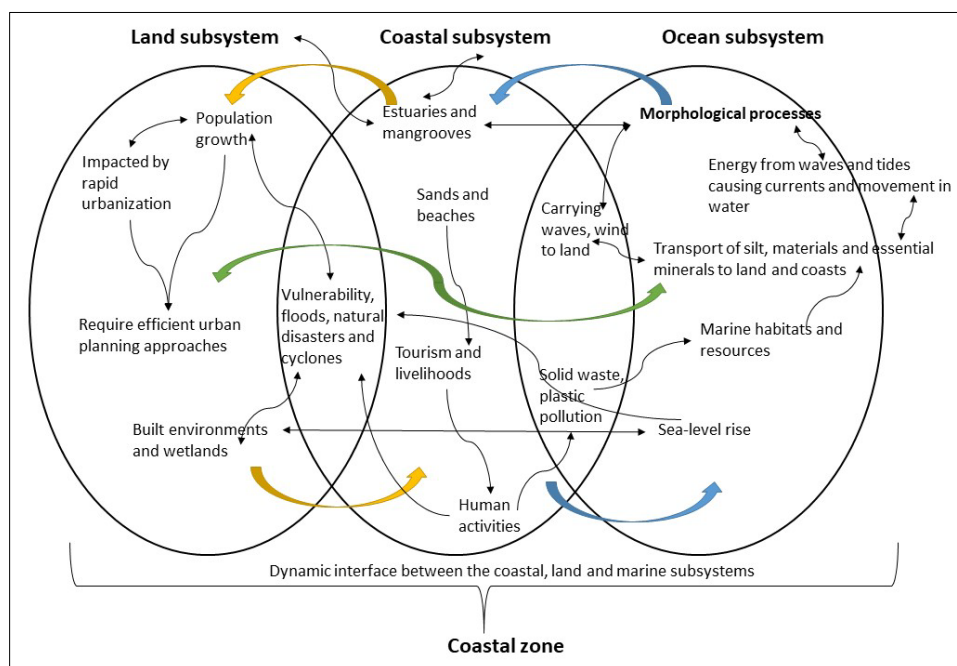
A coastal zone is a dynamic interface of the land and the sea comprising an ecosystem of the marine, coast, and land subsystems. The marine subsystem is characterized by varying water depths and sediment movement, waves, tides, and marine habitats such as coral reefs. The coastal subsystem includes the beach, foreshore, and natural coastal protection systems such as mangroves and dunes. The land subsystem is adjacent to the coast and is mainly characterized by its topography, ground, and surface water resources, habitats such as wetlands, and the built environment. The coastal zone is dynamic as it undergoes continuous interactions between the waves, the wind, and the land causing erosion of rocks and movement and deposition of sediments. Further, energy from tides and winds causes the movement of water in the form of currents and at rates that vary daily, reaching high intensity during storms. This further causes the movement and transport of materials such as silt, sand, and organic matter. The dynamic nature of the area, together with human pressures and impacts from infrastructure and services such as ports, harbors, industrial activities, fisheries, agriculture, and tourism, increases its vulnerability to natural disasters (Augustinus n.d.).

Within the land, marine, and coastal subsystems, there are three broad processes that occur: (i) natural processes that include interactions between nonhuman domains such as atmosphere, lithosphere, and hydrosphere, including abiotic, biotic, and chemical processes; (ii) user functions comprising human interests with respect to the “use” of natural resources; (iii) infrastructure functions required for human services and needs. This directly and/or indirectly impacts natural processes and user functions, resulting in stresses and conflicts that affect air, water, and land (Principles of ICZM).

Coastal zones make significant and diverse contributions to human habitats (World Ocean Review n.d.; UNEP and UN Habitat 2005). Oceans not only contribute to essential resources such as food, medicines, and biofuels, they also have natural mechanisms for reducing pollution by breaking down waste. Additionally, the coastal ecosystems act as buffers and reduce damage during storms (United Nations 2018). For example, the coastal ecosystem consists of vital features such as the coral reefs that are “marine ridges or mounds formed from the deposition of calcium carbonate by living organisms like corals, algae, shellfish, etc.” (UNEP 2006). Globally, coral reefs extensively support the ocean ecosystem by “supporting over one million plants and animal species and are of enormous economic importance as their projected value is over \$30 billion annually.” The Asia and Pacific region in particular comprises over 90% of the world’s coral reefs (UNEP 2006). The coastal habitat has not only influenced marine biodiversity but has also played a significant role in providing livelihood, and forming communities and cultures worldwide with “over one third of the world’s population living in the coastal zones, which comprise only 4% of the earth’s surface area” (UNEP 2006).

Asia’s rapid urbanization also extends to an equivalent increase in the coastal populations. “As coastal megacities have been growing on an unprecedented scale, they are distancing themselves from their environmental component while still relying on the services from its local ecosystem. With an estimated 50% of the world’s coasts being threatened by development-related activities, the demands placed on the host ecosystem are beyond its means and capacities” (UNEP and UN Habitat 2005). The complexity and intricacy of coastal zones, with their subecosystems, multiple processes, and user functions, and contribution to the economy, together with their high vulnerability, pose a challenge for coastal city managers.

**Figure 1: Conceptual Representation of the Dynamic Interface between the Coastal, Land, and Marine Subsystems and Their Interdependencies**



Source: Diagram by the author, Vedanti Kelkar.

## 2.2 Systems Analysis Approach

The land and marine subsystems of the coastal zone, together with the continuous natural processes and interactions within these (as explained in Section 2.1), pose unique operational and managerial challenges for decision-makers. Systems analysis is an approach that helps unpack such multiple systems to (i) identify the type of system and its composition of subsystems, (ii) understand the elements and traits of each subsystem, and (iii) study how these interact with each other. For example, a system could be a monolithic system or a system of systems (SoS). “A monolithic system is a set of different elements that are interconnected to perform a unique function that would not deliver the same result if performed by the individual elements.” By the same token, an SoS is “the combination of a set of different systems forming a larger SoS. This together performs a function that would not deliver the same result if performed by a single system with its individual elements.” Therefore, an SoS can be understood as “a combination of systems with operational independence from its individual components.” Application of this approach to coastal zones helps characterize it to an SoS. This provides a robust “theoretical lens” and facilitates an assessment of the human and infrastructure subsystems within the coastal zones’ natural systems, together with their interface and interconnections, which in the face of direct exposure to natural hazards adversely affect the resilience of both humans and infrastructure subsystems (Mostafavi 2017).

As explained in the previous Section 2.1, coastal and marine subsystems are highly dynamic and complex, and have always been an attractive ground for human activity since time immemorial. In the context of coastal zones, a methodology for sustainable integrated coastal zone management using a tested Systems Approach Framework (SAF) (Hopkins et al. 2012) was developed and tested at 18 coastal study sites, as shown in the figure below, in the European region as part of the European Union (EU) FP6-funded project, Science and Policy Integration for Coastal System Assessment (SPICOSA; <http://www.spicosa.eu/>). This was recognized by Land-Ocean Interactions in the Coastal Zone as a project that converged social and ecological aspects of coastal systems. It also facilitated the implementation of existing EU directives and integrated coastal zone management (ICZM) good practices. The 18 study sites represent a wide variety of European coastal systems, including transitional waters such as lagoons, deltas, and estuaries, along the coasts of the European regional seas, from the shores of the Black Sea to the fjords of Norway. This increases the applicability of the SAF beyond its tested locations. It can be locally adapted to different coastal systems, issues, stakeholders, and countries. The results demonstrated its validity for transboundary settings and systems as well (Newton 2012).

### 3. COASTAL CITY MANAGEMENT, POLLUTION, CLIMATE CHANGE, AND TOURISM

See Annex 1 for the Problem Tree and Solution Tree for a conceptual understanding of the three-pillar approach.

#### 3.1 Pillar 1: City Management

##### 3.1.1 Master Planning and Infrastructure Planning

Coastal cities face severe planning challenges with growing urban pressures, potential sea level rises, and other impacts of climate change, and there is a need to safeguard the natural ecosystems, maintain tourism revenues, and increase the resilience of communities and infrastructure. Urban development has been broadly driven by three schools of thought: one that focuses on large-scale technological and service-oriented implementation, another based on environmental safeguarding, and a third focused on urban design principles of zoning and master planning mechanisms to foster greater livability and accessibility of services. Although these approaches are directed toward the upgrading of urban areas, they have been rather fragmented and unidimensional. In the 1990s, in Southeast Asia, the development of coastal resorts was largely disorganized, unplanned, and spontaneous to meet the growing demands of coastal tourism. These developments were primarily dominated by real estate developers coupled with a slow enforcement by the government and local authorities (Wong 1998). Although some countries like Malaysia took notice of the impacts of tourism on local culture and the social fabric (Smith 1992), there was a lack of control and understanding of the impact of local populations and businesses on the physical environments of the surrounding coastal areas in most cases (Wong 1998).

This paper explains, through examples, the conflicts arising from fragmented planning and potential solutions at the project and planning level that have led to positive outcomes, reducing environmental damage, and addressing the vulnerabilities of populations due to increasing tourism pressures.

#### **Box Case 1: Pattaya, Thailand – Tourism Closure Due to Unplanned Development**

Pattaya is an example of unplanned development due to its 300-meter-long coastline consisting of bars, night clubs, resorts, and massage parlors. This has resulted in unplanned development along the coast of the natural tree cover. There is also untreated wastewater being disposed into the sea due to the lack of infrastructure for wastewater treatment. Ultimately, this situation has impacted the quality and well-being of the coral reefs (Wong 1998).

Maya Bay in the Ko Phi Phi Leh Islands of Thailand has undergone tremendous environmental damage. In recent years, the bay has had up to 5,000 tourists and 200 boats daily. In mid-2018, the beach was closed indefinitely for at least up to a year due to the destruction caused to 80% of the coral reefs by day trippers. Despite evidence of the damage to Maya Bay for years, there was a reluctance to close the tourist site due to its revenue generation of about 400 million baht (9.5 million pounds) a year. The closure of the bay was decided upon after a royal gazette was announced by Thailand's Department of National Parks, Wildlife, and Plant Conservation, directing that tourism can only continue when the ecosystem of the beach is completely restored (Ellis-Peterson 2018).

As developing countries in Asia and the Pacific undergo structural and physical transformations associated with economy, trade, urban expansion, and tourism amid climate change impacts and environmental degradation, it is highly important that an integrated approach be developed toward coastal zone management, bearing in mind associated crowding priorities. At the same time, there is an increasing interest in utilizing natural assets to support coastal communities, augment their capacity, and make them more resilient to risks of flooding and extreme events (Sutton-Grier, Wowk, Bamford 2015). A key challenge faced by various Asian coastal cities is associated with shrinking areas followed by increased fragmentation due to consistent encroachment driven by urban expansion. To address these challenges faced by coastal cities, ICZM as a planning approach has been deployed as a suitable solution. However, the implementation of ICZM approaches has not always yielded the desired or expected outcomes. Various governance and institutional frameworks that lie at the foundation of ICZM impact its successful planning and implementation. Though various Asian countries have been attempting to implement an ICZM law, it has not necessarily proved to be a tool to immediately resolve the situation. This is largely due to its “limitation in bringing about desired changes in the users of coastal and ocean resources. There is a greater need to develop a combination of approaches, going beyond conventionally practiced ICZM, directed toward behavioral changes. These could cover social, economic, and regulatory instruments in order to strengthen the overall impact, benefits, awareness, and ownership among the public. In this regard, this would encompass the local community, tourists, and business sectors benefiting from the overexploitation of the coastal habitat” (PEMSEA and World Bank 2016).

**Box Case 2: Xiamen, People’s Republic of China Demonstrates  
How Economic Growth Has Destroyed the Coastal Ecosystems**

As cited in the report, ICM Solutions: Strengthening Coastal Governance and the Application of Integrated Coastal Management through an ICZM Law, by PEMSEA and the World Bank in 2016, “the city of Xiamen in the People’s Republic of China (PRC) was designated as a Special Economic Zone among five other major zones in 1981 and is a local city in the southern part of Fujian province in the PRC. This resulted in rapid economic growth coupled with urbanization leading to growing amenities in terms of more living space. Coastal reclamation for uses such as ports and shipping conflicted with environmental pressures leading to reduced compatibility with the needs of the natural environment due to coastal engineering, untreated waste disposal, and tourism. The prevalence of 15 different ocean-related sectors managed by various departments added to the conflicted environment due to a lack of coordination and cooperation between the sectors. Though all claimed their rights to the sea, the job to take care or take responsibility was neglected leading to massive pollution from industrial and domestic waste and other activities such as aquaculture, overfishing, land reclamation, and so on. The sector-based laws led to the fragmentation of coastal governance, weak enforcement, and a lack of cooperation among agencies, thereby destroying mangrove systems and leading to the extinction of local fish stock.

Several Asia and Pacific island countries like Indonesia, the Philippines, and Thailand are surrounded by seas and oceans, which play an important global role in balancing the impacts of climate change and marine biodiversity. The complexities arising from the environmental significance of coastal cities, and the interrelationships among various stakeholders, demand a more focused understanding of ICZM approaches from the perspective of trade-offs. Additionally, a systematic framework for asset prioritization and sustainability is needed to address these issues comprehensively.

Integrated planning is not a new concept and has been in practice for more than a decade, with mixed results. Field experience and learning has revealed that integrated planning should be operationally driven; needs based as guided by the city government; directed toward medium-term targets; include commitments from businesses and civil society; and consider scale, sector, and theme. The SDGs call for the integration of city-level development plans with broader climate action plans. A paper by Tanner et al. (2009) “examined how to manage climate-related impacts in an urban context by promoting planned and autonomous adaption in order to improve resilience in a changing climate.” The paper developed an analytical framework of rapid climate resilience assessments with governance literature about ten Asian cities, namely Bangkok, Chennai, Chittagong, Cochin, Da Nang, Dalian, Hangzhou, Ho Chi Minh, Ningbo, and Surat. The paper concludes that components of good governance for urban climate resilience can be delivered through making paradigm shifts in five overarching segments: (i) decentralization and autonomy, (ii) transparency and accountability, (iii) responsiveness and flexibility, (iv) participation and inclusion, and (v) experience and support. In the conclusions, it was found that the capacity to integrate climate risk reduction and adaptation strategies in city development plans is directly proportional to awareness levels and driven by the motivation of the elected representatives and governance systems (ADB n.d.).

Further, in recent times, the overall competitiveness and attractiveness of cities have often been described as “livability.” The livability challenge in Asia has driven urban policy makers to seek solutions in integrated, holistic urban planning, given the shortfalls of sector-based approaches (ADB 2016). Usually “livability” also characterizes the ability of cities to attract globally mobile resources such as talents, high net worth individuals, investors, innovators, entrepreneurs, and capital (Giap, Thye, Grace 2014). Lately, livability has also been used to describe city planning that fosters enhanced walkability, green and open spaces, clean air, and environmental sustainability. This aspect of livability and sustainability has been further strengthened and complemented with the need to build urban resilience<sup>1</sup> by rehabilitating urban areas with green infrastructure as nature-based solutions for resilience to climate change adaptation (ADB 2016). This is corroborated by city case studies and applications in the Greater Mekong Subregion (GMS), which has an extensive coastline, riverine, and low-lying wetland areas and seasonal variability exposing populations to high vulnerability. Green infrastructure<sup>2</sup> is strategically planned and managed through a network of green spaces and other environmental features and necessary technologies fostering a unique integrated approach to planning systems within cities. The growing public demand for livable cities has resulted in ushering in new, sustainable planning approaches, policy actions, and evidence-based decisions. The GrEEEn Cities Operational Framework (GCOF) of the Asian Development Bank (ADB) was developed as a response to ensure a balance of economic competitiveness, environment sustainability, and social equity.<sup>3</sup> The GCOF guides the transformation of a city from the status quo toward livability with the development of a targeted Green City Action Plan (GCAP) supported by urban management partnerships for peer learning and decision support systems (ADB 2016). Further, various livability benchmarking indices and studies have been published that assess and rank cities in various categories (Giap, Thye, Grace 2014). While various

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<sup>1</sup> Resilience is the capacity of a socioecological system to absorb stresses and maintain function in the face of external stresses imposed on it by climate change impact and adapt, reorganize, and evolve in ways that improve the sustainability of the system.

<sup>2</sup> Green infrastructure typically refers to stormwater and drainage management systems that mimic nature by soaking and storing water and improving its quality (ADB 2016).

<sup>3</sup> The GCOF guides the transformation of a city from the status quo toward becoming a livable city by striking a balance among the 3Es—economy, environment, and equity—that define livability in the city.

livability indices focus on economic indicators and are targeted at fostering foreign investment opportunities, in the context of coastal cities, the use and development of livability indicators could help in fostering a balance between environmental and economic resilience. Currently, there is no structured livability indicator to compare and rank coastal cities in the Asia and Pacific island developing countries. This can be attributed to the lack of data, awareness, institutional capacities, and ambition among city governments. The economic and environmental significance of coastal cities in Asia can serve as a catalyst toward the creation of tailored livability parameters that support vital and much needed integrated planning.

### **Box Case 3: Dumaguete FSM Program in the Philippines Builds the Economy**

In the coastal city of Dumaguete in the Philippines (which is situated on the east coast by the Bohol Sea and Tañon Strait, serves as a natural border of the southeastern Negros Islands to the neighboring Central Visayas and has a population of approximately 130,000), the Fecal Sludge Management (FSM) program initiated by the local government has brought about tremendous socioeconomic spillover effects through ancillary benefits in the form of a city-wide sanitation improvement program for the local community, which include (i) increased property values, (ii) improved tourism and livelihood opportunities, and (iii) improved health and productivity. “Dumaguete City represents a model for how local governments can actualize cost-recoverable and sustainable city-wide FSM programs. The basic concept behind the program is that if everyone pays a small amount, it could fund the capital as well as operational expenses of the service. In this instance, the small amount is a tariff of around \$1 per family per month that is attached to the water bill and collected by the water district. This was enough to achieve full cost recovery for the capital and operational expenses in six years” (Robbins, Seetharam, Renzhi 2019). In this case, the impact of socioeconomic spillovers has been utilized to determine the true value of the project and has offered innovative policy options for local decision-makers to implement a city-wide FSM program. This emphasizes the importance of linking FSM city programs to integrated city planning.

<https://www.adb.org/news/videos/spillover-effects-fecal-sludge-management-dumaguete-city>.

### **Box Case 4: Tokyo Environmental Master Plan Demonstrates Climate Commitment**

As cities are responsible for a significant share of global greenhouse gas emissions, environmental sustainability lies at the center of climate change mitigations, and play an important role in tackling overall impacts and contributing to greater regional and global resilience. Against this backdrop, the city of Tokyo has identified its responsibility and opportunity as a megacity and thereby the Tokyo metropolitan government has effectively implemented measures to tackle climate change by realizing goals of the Conference of Parties (COP 21) Paris Agreement. As the Tokyo 2020 Olympic and Paralympic games are approaching, the city has introduced a new Environmental Master Plan to showcase policies aimed at being implemented by 2030. With goals to curb greenhouse gas emissions and accelerate renewable energy targets, the government has committed actions that will promote a scaled undertaking to promote environmental consciousness and engagement through its citizens, businesses, and stakeholders through various avenues to achieve envisioned goals. The key areas that the city-level strategies are aimed at are (i) climate change and urban energy; (ii) sustainable materials and waste management; (iii) clean and comfortable air, water, and soil; and (iv) urban biodiversity and greenery (Tokyo Metropolitan Government 2016).

### **Box Case 5: The Smart and Safe City Seoul Policy through Digital Technology Adoption**

Not long ago, in the 1960s, 1970s, and 1980s, the Republic of Korea and the capital city of Seoul were struggling with the challenge of the ever-increasing demands of urbanization, economic development, and resultant stresses on the country's and the city's natural assets. Seoul's urban development has been managed and can be attributed to the systematic governance structure and policy implementations encompassing a range of urban components such as zoning, master planning, land readjustment, landscaping, greening, and environmental improvement strategies. Over time, the possibility of climate-induced disasters has increased in Seoul, such as Typhoon Rusa (2002), Typhoon Maemi (2003), landslides, and human disasters such as fires. In recent times, the number of concepts to build smart and safe cities by way of including communication and information technology in disaster and safety management issues has increased. Similarly, the Seoul metropolitan government has also developed a public platform to build smart and safe cities by engaging in strategies to develop urban safety services using technologies such as the Internet of Things (IoT) and big data. The most important component of this initiative has been to develop an integrated platform that includes services to manage safe facilities, responses to climate and weather changes, enhanced ability of crisis management in administration, and protection of vulnerable groups (The Seoul Institute n.d.).

The above cases illustrate the various improvement programs undertaken by local governments to enhance the urban environment. Although the actions may not have been part of a comprehensive city action plan, the approach toward addressing stand-alone sector issues such as sanitation and river rejuvenation provides a direction toward approaches that integrate sectoral initiatives into broader action plans. These aim to develop comprehensive approaches to balance between nature-based solutions, economic competitiveness, and infrastructural needs.

**Integrated approaches toward master and infrastructure planning need to be contextualized and prioritized to go beyond convention to catalyze behavior change and build institutional capabilities. Sectoral priorities can be integrated within overall development plans by targeted initiatives toward climate action, livability, greater political will, and enabling governance systems, especially at the local level.**

### **3.1.2 Regional Cooperation and Integration**

#### **Collective Action: Optimizing Benefits and Addressing Transboundary Challenges**

Coastal zones and their cities, in addition to being at the front line of natural disasters, face common challenges regarding the management of their natural assets such as shorelines, beaches, and the myriad marine resources that are transboundary and cross administrative jurisdictions. In particular, in the Pacific Islands, over the last decade, unsustainable harvesting of coastal fishery resources, degradation of coastal and marine ecosystems such as mangroves, coral reefs, and seagrass beds, increasing solid waste, and groundwater pollution from human and animal waste have emerged as critical constraints to development. Further, environmental impacts include the loss of biodiversity due to invasive species, the degradation of land resources through unsustainable forestry and poor agricultural practices, excessive conversion of forest land to alternative uses, climate variability, and sea level rises (Vina Ram-Bidesi). Coastal cities are also conduits to ocean pollution, be it untreated wastewater discharge or solid waste disposed into the sea, which is dispersed across the ocean due to waves and tidal currents washing offshore where it was not generated. These issues could

undermine the economic importance of these cities as gateways to the hinterland and attractive tourist destinations. Thus, although cities contribute to the problem, they have the capacity to find the solution. For example, greater connectedness can be both a source of the problem (e.g., connectivity infrastructure, supply chains, and value chains can create and “transfer” greater amounts of air- and waterborne pollution across borders) and the solution (e.g., the harmonization of industrial and services-related pollution regulations and energy efficiency standards across countries covered by the connectivity, supply, and value chains can add to freeing trade in green technologies and services).

It has been projected that by 2025, 600 cities will generate two thirds of the world’s GDP, and cities, in particular coastal cities, generally rank higher on measures of connectedness than nonurban subnational regions. For example, in 2015, it was estimated that only six of the 34 administrative divisions (all six being coastal administrative regions) of the People’s Republic of China (PRC) accounted for three quarters of its foreign trade in goods (McKinsey Global Institute 2016). This renews the attention given to coastal cities and their leaders for addressing opportunities and challenges related to the economic and environmental sustainability of cities through the engagement of local government, business, and civil society. Further, formulating institutional mechanisms both within and across neighboring countries to address such issues can enhance shared economic benefits and optimize the conservation of natural assets. This opportunity for collective action can be sought through regional cooperation and integration (RCI), which is a process by which national economies become more connected regionally (ADB, ADB’s Focus on Regional Cooperation and Integration n.d.).

The Great Pacific Garbage Patch, which is also known as the Pacific Trash Vortex, spreads across the ocean from the west coast of North America, off Hawaii, to Japan. This comprises floating debris, 80% of which is contributed by North America and Asia from land-based activities, including large amounts of fishing nets, and the other 20% can be sourced to boaters, offshore oil rigs, and large cargo ships that most often throw their debris directly into the ocean (National Geographic n.d.).

This paper shares some successful policy examples aimed at harmonizing city planning and the protection of ecosystems across countries, including creating platforms for collective action. These include, to name but a few: (i) the EU’s 2014 Marine Spatial Planning Directive, which “created the world’s first legal requirement for countries to create transparent planning-at-sea systems and to cooperate with their neighbors to make that happen.” This is to be adopted by EU countries into national legislation for implementation of marine spatial planning by March 2021 (PEMSEA n.d.); (ii) The 17th COP for the Convention on Migratory Species, November 2017 in Manila, emphasized the importance for countries of the region to scale up integrated coastal management (ICM). This process was identified as a scientific ecosystem-based management system for implementing National Biodiversity Strategy and Action Plans (NBSAPS). This would be through strengthening public and private sector commitments and investments in biodiversity conservation, and contributing to, among others, sustaining natural marine resource-based livelihoods and eco-businesses, including tourism (PEMSEA n.d.). Partnerships in Environmental Management for the Seas of East Asia (PEMSEA) is the leading organization in East Asia that applies ICM to address “the governance of human activities affecting the sustainable use of goods and services generated by coastal and marine ecosystems.” ICM coverage surpassed 20% of the region’s coastline in 2017, with PEMSEA Partner Countries targeting 25% coverage by 2021. An innovative policy approach to promote tourism is to create marine protected areas (MPAs) or no-take zones, where fishing, aquaculture, and other exploitative activities are forbidden.

Tourism-related economic benefits associated with well-managed MPAs largely outweigh the costs associated with managing the MPA itself (PEMSEA n.d.).

The value of the MPA approach is illustrated by the following: (i) Palau, a small Western Pacific Island country, comprising about 340 islands, is a dedicated shark sanctuary. Koror City, also known as Shark City, attracts tourists from all over the world to experience these predators in their natural habitat. Diving tourism contributes about 39% of the country's gross domestic product. That means every single shark generates about \$1.9 million during its lifetime, compared to about \$100 of fishing income for the same shark caught for its meat and fins (Ricciardi 2019); (ii) the Tubbataha Reef in Palawan, the Philippines, a UNESCO World Heritage Site, is located about 100 miles off the coast and is a refuge for hundreds of marine species, including large predators like sharks and tuna, and a nesting site for birds and marine turtles. The local community did not initially welcome its declaration as a marine protected area until they realized the benefits. Their local fishing areas are now richer, as fish from the no-take area in Tubbataha spill over to their waters. They also receive shares from tourism revenues for their livelihood programs (Ricciardi 2019).

Collective action by countries through harmonized approaches for the protection of ocean resources for shared economic and optimal livelihood benefits is illustrated through the Coral Triangle Initiative in the following box.

#### **Box Case 6: The Coral Triangle Initiative**

The Coral Triangle Initiative (CTI) on Coral Reefs, Fisheries, and Food Security was launched in 2007 by six countries, namely Indonesia, Malaysia, and the Philippines in Southeast Asia, and Papua New Guinea (PNG), the Solomon Islands, and Timor-Leste in the Pacific region. The CTI had a targeted objective of protecting the resource-rich coral triangle, which extends across these six countries, endowing the countries with large economic benefits together with being the source of marine activities-based livelihoods for large populations. Some 34 million people benefit from capture fisheries in the Asia and Pacific region and their export value in Southeast Asia alone was \$19.5 billion in 2015. With 76% of all known coral species in the world, and 37% of the world's total coral reef fish, the coral triangle is considered one of the world's richest marine life areas. This important ecosystem faces fragility due to threats from mangrove deforestation, land reclamation, unregulated tourism, pollution, climate change, and damaging fishing practices. A comprehensive regional action plan following an ecosystem-based approach was adopted by the six countries in 2009 at the CTI Summit in Manado, Indonesia. This outlined (i) a framework to address the threats to the fragile region; (ii) commitments to policy reform and strengthening institutional mechanisms; (iii) goals with targeted action for designating "priority seascapes," establishing marine protected areas and the protection of threatened marine species; and (iv) implementation of climate change adaptation measures. The CTI Summit led to multiple good practices in management approaches covering different dimensions of area protection, and accomplished the: (i) preparation of an Integrated Coastal Resource Management (ICRM) and Ecosystem-based Fisheries Management (EBFM) Strategic Plan for PNG; (ii) approval of ICRM plans for Ra Province and Tikini in Fiji; (iii) formation of multi-stakeholder ICRM committees at the provincial level, such as for Ra Province in Fiji; (iv) development of marine protected areas and EBFM plans for North Isabel, Solomon Islands; (v) establishment of marine protected areas and approval of their management plans for Timor-Leste; (vi) skills training for about 1,000 trainees; (vii) completion of biodiversity conservation plans for Kimbe Bay in PNG, Isabel and Malaita provinces, and the Solomon Islands (Development Asia, Saving the Coral Triangle n.d.).

### **Box Case 7: Binding Agreements That Stimulate National, Regional, and Local Initiatives through Coordinated Action, Cooperation, and Partnership**

*The Mediterranean Protocol on Integrated Coastal Zone Management (ICZM Protocol)*  
(<http://paprac.org/iczm-protocol>)

Countries such as India that have a long coastline covering multiple states could benefit from interstate cooperation mechanisms or protocols to address the common challenges of expanding tourism, transportation infrastructure, and exposure to natural disasters. Formal agreements between states would complement and enhance the governance and implementation of the ICZM regulation. India's entire coastline spans 7,516.6 kilometers (km), comprising the mainland coastline of 6,100 km and its islands' coastline of 1,197 km. This spans nine states and four union territories<sup>1</sup> (The Free Press Journal 2018). States would benefit from collective action. The Mediterranean Protocol is one such agreement that provides learning on the implementation of collective action. This is an integrated approach agreed and signed in Madrid on 21 January 2008 at the Conference of the Plenipotentiaries on the Integrated Coastal Zone Management (ICZM) by 15 countries (contracting parties) around the Mediterranean Sea, Albania, Algeria, Bosnia and Herzegovina, Croatia, Cyprus, the European Union, Egypt, France, Greece, Israel, Italy, Lebanon, Libya, Malta, Monaco, Montenegro, Morocco, Slovenia, Spain, Syria, Tunisia, and Turkey. The countries mutually recognized that the coastal zones of the Mediterranean Sea are a common natural and cultural heritage and face common risks from anthropic pressures, significantly reducing the loss of biodiversity of coastal ecosystems, and climate change such as storm surges and sea level rises. The protocol aimed to achieve coherence between public and private initiatives and decisions by the public authorities, at the national, regional, and local levels, that impact the use of the coastal zone (Environment n.d.).

### **Box Case 8: Destinations – A Project Leading to Strategic and Multi-stakeholder Cooperation**

The "Destinations" project demonstrated that collective action toward common goals can be successfully accomplished through strategic cooperation at the country and city level using an approach that combines partnerships and analytical tools. This was accomplished by the Priority Actions Program of the Regional Activity Center (PAP/RAC), INFO/RAC, the Worldwide Fund for Nature (WWF), and the governments of Algeria, Morocco, and Tunisia, which face high risks from environmental degradation adversely affecting the tourism economy. The "Destinations" project demonstrated this action toward the common goal of sustainable tourism with social, economic, and environmental considerations by using Tourism Carrying Capacity Assessment (TCCA) as an analytical tool. Cooperation was facilitated among governments, intergovernmental organizations, the private sector, scientists, nongovernment organizations, and civil society, focusing on the coastal areas of Algeria, Morocco, and Tunisia. This was guided by the Coastal Area Management Programs carried out by the PAP/RAC. Strategic sustainable tourism plans were proposed based on the TCCA that followed a participatory process engaging all stakeholders. The WWF's expertise contributed to the development of guidelines for sustainable tourism investments. These are also evidenced based gathered from an analysis of ecologically vulnerable areas of the Mediterranean and the impacts of tourism interactions. Further, a pilot demonstration project for the local tourism industry in each country demonstrates the application of environmental management instruments (such as EMAS, ISO 14001, and EU Ecolabel) by the tourism industry. Awareness and skill building through educational programs ensures that institutional capacity and stakeholder awareness are enhanced through the transfer of knowledge and expertise on TCCA and other tools. A legal framework is ensured by the government. The business sector applies the investment guidelines and environmental management instruments to reduce adverse ecological impacts. Intergovernmental organizations (PAP/RAC, INFO/RAC) coordinate all stakeholders' inputs and establish continuity through the planning and management process for sustainable tourism development in the Maghreb coastal zone (UNEP 2009).

As illustrated in the examples, inter-country cooperation has the potential to manage natural assets in a collaborative manner. Coastal cities share the nature, scale, conflicts, and burden of managing their natural habitats, assets, and populations. The benefits of inter-city cooperation and harmonization of approaches toward collective action can be synergistic in determining the most appropriate solutions.

**Given that coastal cities have emerged as the hub of economic activity in countries, the learning from collective action at the country level through regional cooperation can be extended to cities.**

## **3.2 Pillar 2: Environment Pollution and Climate Change Risk**

### **3.2.1 Solid Waste and Sanitation Management**

The challenges faced by coastal cities are greatly exacerbated by the complexities resulting from the mismanagement of solid waste due to the inadequacies in sanitation infrastructure and its proper planning. The Asia and Pacific region boasts over 90% of the world's coral reefs, which are now highly contaminated and polluted due to high levels of untreated sewage discharge, coastal marine pollution, and solid-waste disposal due to urban development along the coastlines (UNEP 2006). For instance, the enormous adverse impact of plastic pollution originating from Asia and Africa is attributed to about 88% to 95% of the global marine plastic waste pollution from rivers in Asia and Africa, among which the Mekong river faces one of the most crucial pollution crises (*The Mainichi* 2018). As most developing Asian countries are undergoing rapid urbanization, industrialization, and economic growth, coastal cities have also become key centers of trade, tourism, fishing, and livelihood generation. These demands and necessities of the growing coastal city economies have put great pressures on the management of solid waste and sewage. At the same time, many Southeast Asian economies like the Philippines, the PRC, Viet Nam, Indonesia, and Thailand also serve as home ground for the collection of the global plastic waste sold by global corporations (Oceana.org 2017).

The waste management infrastructure in developing Asian countries is not sufficiently well equipped to handle the compounding stresses from the ever-increasing local needs and waste volumes. The majority of the waste is therefore disposed into the oceans and seas. This further threatens the health and well-being of the ocean ecosystem. Two of the primary constraints faced in the management of solid waste (including plastics) and sewage are the limited budget allocation and the weakness shown in organizing collection systems (Dhokikah and Trihadiningrum 2012). Further, with the rise in collection and disposal of waste requirements, there is a need for available land for the ultimate disposal of solid waste (Khajuria, Yamamoto, Morioka 2008). Moreover, the situation is compounded as waste management does not generate attractive revenues, thereby limiting the possibilities of acquiring development and/or investment loans. At the same time, there is a greater need to evaluate the technical, financial, economic, and social constraints associated with solid-waste management and its adverse impact on the well-being of the natural environment and coastal communities.

In recent years, various local city governments in developing Asian countries such as India, Bangladesh, and the Philippines have been making efforts to implement and practice approaches toward a circular economy and the 3Rs (reduce, reuse, and recycle). These are done in association with private operators or community enterprises. While this is positive, there are still various regional challenges toward the consistent functioning of these efforts. In contrast, in terms of a circular economy and

material cycling, countries such as the Republic of Korea and Japan are successful examples where material recycling policies have been in place beyond waste management (Terazono et al. 2005). Comprehensive waste management, including disposal, recycling, and a circular economy, would be successful if these were included as integrative programs in city planning and strategies. The process of formulating strategies would include various stakeholders, such as private operators, wholesale and retail material suppliers, local community and businesses, researchers, and practitioners, which would bring about a mindset change and increase awareness of the seriousness of the issue.

**Box Case 9: Navi Mumbai Municipal Corporation Landfill, Waste Recycling, and City-Greening Project**

The Navi Mumbai Eco-City project was launched as a vehicle to plan and transform the city on the principles of sustainable development by implementing low-carbon consumption strategies with the appropriate utilization and conservation of natural resources. One of its action plans, the Nisarg (nature) Udyan (park) in Kopar Khairane in the city of Navi Mumbai, is an example of an urban space transformation project undertaken to improve the quality of life of the people. The park was earlier a garbage dumping ground containing over 2 million metric tons of city waste. It was officially closed by the local city government in 2008 in order to transform the area into a recreational open space to address the grievances of residents. Among the initial efforts to reclaim the landfill site, “a network of wells was laid to collect trapped landfill gas (LFG) and a flaring unit was installed at the site to burn the LFG.” This was followed by the construction of a leachate collection tank to collect the leachate and treat it before disposal. The overall regeneration of the site was undertaken in two major components: (i) converting the land area of the open dump into a 22,000 km<sup>2</sup> garden by adding a grass layer; and (ii) setting up a jogging track and other amenities like dedicated sitting areas and pergolas for people to spend their leisure time. Additionally, with the implementation of a sewage treatment plan at the site, the treated wastewater was also used for watering the lawn (NIUA-CIDCO Smart City Lab 2019). The site revitalization efforts have resulted in the park being used by the public and the residents from the surrounding areas for various day-to-day activities for healthy living. This has also increased the overall value of the neighborhood. At the foundation of the effective solid-waste management program of the Navi Mumbai Municipal Corporation is the comprehensive urban planning of the city. As the city was planned and developed from scratch as a shock absorber for the growing population of Mumbai, necessary elements toward the efficient functioning of the city were integrated within the development plans from time to time.

The Navi Mumbai case illustrates that local government initiatives focused on a larger city-wide program can catalyze sustainable development. This has included sectoral strategies to tackle the challenge of waste management, landfill site regeneration, urban planning, and overall socioeconomic value addition. In the context of the coastal cities, decentralization and transferring greater autonomy to local governments can result in them playing a more pivotal role in integrating various stakeholders associated with wastewater management and solid-waste management. These may include a city-wide strategy focused on a stronger policy initiative encompassing compliance requirements to be satisfied by local businesses, housing complexes, hotels, and other developments existing and/or upcoming along the coastlines. This also includes innovative urban planning strategies to spare available land for installing solid-waste management and sanitation facilities. These may be integrated with broader urban space planning policies.

**Solid-waste and sanitation management have been identified as one of the most pressing issues faced by coastal cities in general and coastal tourism in particular. Cities and tourism contribute to the problem and are affected by the prevailing inadequate practices. With the availability of various technological solutions, city-wide strategies can be successfully introduced to tackle challenges effectively. Understanding similar implementations carried out in other cases in the Asia and Pacific region coupled with effective inclusion of the private sector, local communities, and businesses will also help.**

### **3.2.2 Habitat Loss and Fragmentation of Ecosystems**

Coastal cities have an innate tourism potential due to their natural habitats and ecosystems. This setting and its economic potential are also responsible for the coastal habitations being established and expanded. Over the last several decades, these habitations have grown from habitations to villages to towns and have now become full-fledged cities. Some of them are even megacities. As major hubs of economic activity, there are serious pressures in terms of land availability in coastal cities. This has led to the destruction of natural habitats and fragmentation of ecosystems.

Once the economic value of land rises, there is demand and pressure at the local government level to convert natural ecosystems to other land uses that have a greater economic potential in the immediate and short term. This is the main cause of habitat loss and the fragmentation of ecosystems. The economic pressures are huge. A high degree of commitment is required for the city management not to yield to these pressures. Such commitment and vision are often not common within city management. Part of the reason is also due to the influence of local politicians and developers. Habitat loss and fragmentation of ecosystems arise mainly from (i) the conversion of water bodies to alternative land use such as residential land or industrial land; (ii) ensuring that the ingress of salt water into mangrove areas is stopped so that the mangroves don't thrive and the land can be put to alternative use; (iii) reclaiming the sea by landfilling in order to use the coastal shoreline for other economic purposes; and (iv) fragmenting estuaries at the time of constructing bridges, and not paying enough attention to the impacts on species diversity, e.g., birds (resident and migrant) and fish life.

There is no single solution to address this problem as the economic interests arise from several directions, i.e., different sectors and multiple stakeholders. At the outset, developing a high degree of commitment among the political and bureaucratic leadership of coastal cities is of paramount importance. For instance, in the coastal city of Chennai, India, the government decided that an urban park would be located in the heart of the city. A considerable size of land – with enormous economic potential – has been retained as a green landscape area for tourists, and to function as the city's lungs. Further, in the same city, an estuary redevelopment plan – referred to as the Adyar Poonga (Government of Tamil Nadu 2019) – has been planned and implemented. This estuary is in an area where the economic potential is extremely high. In the first instance, leadership and commitment need to play a strong role to ensure such natural habitats are avoided for planning purposes. Second, urban planning supported by bureaucracy should identify these natural habitats as special preservation zones. Additionally, the usual economic rationale for land use planning should not be permitted in these preservation zones. Justifying the use of the land for preserving natural habitats in terms of a standard financial rate of returns will, most often, reveal a suboptimal allocation. However, its value – both for tourists and the resident population – in terms of enriching their lives and functioning as a natural defense mechanism during times of extreme events cannot be overemphasized. Third, coastal cities have been losing green cover due to the pressures of land development and conversion to service infrastructure. This

has resulted in the cities becoming increasingly warmer in pockets and exposed to the vagaries of the urban heat island effect. Restoring the green cover has multiple advantages: (i) it serves as a natural air conditioner, reducing the city's temperature; (ii) it improves the city's soil conditions due to the organic growth that it promotes; (iii) it contributes toward increasing the groundwater table; (iv) it brings about coastal ecosystem connectivity if the green cover is carefully planned; and (v) it offers a first line of defense against climate-induced events such as floods, storm surges, and sea level rises (ADB 2016). Moving forward, developing urban forests – using indigenous (not exotic) species diversity instead of mere linear tree plantations – brings additional advantages as these man-made forests could also serve to generate revenue from the visiting tourists. And lastly, the awareness of the unique ecosystems and the importance of their preservation should be common knowledge among the entire city population. The responsibility for its protection should not be limited to the law-enforcing authorities. The coastal communities should themselves take ownership and responsibility. This is difficult to accomplish, but it is a need that should be fulfilled.

#### **Box Case 10: Adyar Poonga, Chennai, India**

In the coastal city of Chennai in South India (population of about 10 million), the subnational government ordered the ecosystem to be restored and the development of 58 acres of Adyar Creek, which is unique in terms of the wide variety of flora and fauna that it supports. Referred to as Adyar Poonga, the aim was to protect the creek and create an eco-park to restore the ecological balance and raise public awareness of environmental issues. The creek is located at the mouth of the 42 km long Adyar river that outfalls into the Bay of Bengal in Chennai.

The restoration activities included (1) excavation to increase the water spread area; (2) arresting of sewage discharge from outfalls; (3) developing land by creating mounds to support coastal vegetation such as intertidal plants like mangroves, their associates, reeds, and terrestrial plants; (4) recreating vegetative elements such as trees, herbs, grasses, and aquatic plants; and (5) monitoring and measuring the species diversity, density, and the abundance of faunal elements. To raise public awareness, the following facilities have been set up: (1) an orientation zone, (2) an interactive learning space, (3) a nursery center, (4) an environmental education center, (5) a pedestrian bridge, and (6) an appropriate technology center.

Recognizing that the creek will not sustain if the remaining area – about 300 acres – is also not restored, the government is pursuing additional interventions: (1) improving water carrying and holding capacity through excavation; (2) measures for enhanced tidal exchange; (3) habitat restoration through site clearing, bund development, and mangrove plantations; (4) shoreline protection and stabilization through infrastructure development works; and (5) continuous monitoring of the project area. These are proposed to be implemented by different subnational departments under the broad aegis of the Chennai River Restoration Trust (refer to Box Case 12) over the next 5–10 years.

### **3.2.3 Sea Level Rises and Climate-Induced Natural Disasters**

Being a coastal city brings with it some advantages as well as some drawbacks. On the one hand, the city benefits from the unique confluence of ecosystems such as estuaries and pleasing, scenic sea views. It is these that form the foundation of the coastal city tourism. On the other hand, the city has to necessarily reckon with climate-induced events such as cyclones and typhoons. Some of these weather extremes are so severe that they are classified as natural disasters. The impact of these disasters on the tourism economy is pronounced and it often takes a number of months or even years for the city to return to its pre-disaster situation. Adding to the vulnerability, there are some coastal

stretches within cities that are adversely impacted due to sea level rises that are attributed to global climate change (IPCC Fifth Assessment Report 2014) (Byravan et al. 2010).

Internationally, it is recognized that the coasts in the developing countries are likely to be more affected through increased frequency and intensity of climate-induced events. And, along the coasts, it is the cities that have been the focus of the economy and hence are likely to bear the brunt of the negative consequences of these climate-induced events. As this is a global issue, a coastal city really has no way to prevent the occurrence of these events. However, the city's management can avoid or reduce or manage the impacts arising from these events. Currently, the city's planning, design, execution, and operation of coastal infrastructure assets give little or no consideration to possible climate-induced events. In the past, the occurrence was rare, and the intensity was less (IPCC Fifth Assessment Report 2014). However, in the present, and with what's predicted for the future, coastal infrastructure assets will have to deal with the consequences.

Similarly to these climate-induced events, the growing problem of sea level rises is also evidenced in coastal cities. This is resulting in the submergence of the shoreline, greater salination of the coastal groundwater, and an increase in the seawater reaching the land at high tide in certain coastal stretches, some of which are in cities, e.g., Kochi in Kerala, India. All of these are gradually resulting in negative consequences, which are affecting the coastal infrastructure assets in general and tourism assets in particular.

The coastal cities require a solution framework that focuses on the natural coastline and its immediate surroundings. Any coastal infrastructure – whether it is tourism related or not – needs to be climate-proofed. In other words, the infrastructure plans and designs should incorporate considerations of possible climate impact scenarios. For instance, if a building is designed for wind speeds of 180 kilometers per hour (km/hour), then it should be designed for higher wind speeds, say 200 km/hour if the scenarios suggest preparedness for cyclone events that are more frequent and more intense. Also, the protection of the coastline should be a wise mix of nature-based solutions and engineering solutions (Pontee et al. 2016). It is increasingly recognized that sand beaches are the most effective protection for coastal communities. Often, coastal cities cause sea erosion through the construction of sea walls, e.g., by using rubble masonry. While this may protect one coastal stretch, the intensity of the sea erosion tends to aggravate another. Instead, the coastal cities should manage through periodic beach nourishment, which will protect the particular coastal stretch/community without negatively impacting elsewhere.

The usual constraint raised against climate-proofing and a judicious mix of nature-based solutions is higher investment costs. While these may appear to be higher in the immediate timeframe in terms of other alternatives available, it needs to be seen from a medium-term perspective as the damage and loss arising out of climate-induced events would be a lot lower if climate-proofing and nature-based solutions were used to protect the coastal cities. Another constraint is that nature-based solutions require the involvement of the coastal communities for these to be sustained. As that is indeed the case, it is required to build community ownership and acceptance through bottom-up, community-driven disaster risk management approaches. This is a challenge that needs to be taken up in order to ensure adequate preparedness not only for local communities but also for coastal assets. Further, it is important to note that there is no one-size-fits-all solution for coastal cities. Nature-based solutions need to be planned and designed taking into consideration the natural attributes, e.g., mangroves, beaches, sand bars, shelterbelt plantations, and water bodies, that are part of the particular coastal

ecosystem. The following box describes the impact of the India Fani cyclone (May 2019) that ripped through the coastal state of Odisha.<sup>4</sup>

### **Box Case 11: India, Odisha, Cyclone Fani's impacts<sup>a</sup>**

*Impact of the Chilika-Puri-Konark on coastal tourism cities and sites (Cyclone Fani Damage Loss and Needs Assessment, 2019)*

Located along the east coast of India in the state of Odisha, the Chilika-Puri-Konark is a unique combination of nature, temples, and historic and cultural tourism. First, the Chilika Lake is a Ramsar site and the largest brackish water lake in India. It is a unique assemblage of marine, brackish, and freshwater ecosystems with estuarine properties. The highly productive lake ecosystem sustains the livelihood of 0.2 million fishermen and a 0.8 million lake basin community. Located about 35–40 kilometers (km) toward the north and along the coast is the important temple and pilgrimage town of Puri. A further 35–40 km toward the north and along the coast is Konark, which is the home of the famous Sun Temple – the flagship tourism site in the state – which was built in the 13th century and designed as a gigantic chariot of the Sun God, Surya. Listed as one of the World Heritage Sites by UNESCO, the temples of Konark are the main attractions, providing a glimpse into the finest achievement of a lost masonry style. The marine drive between Puri and Konark has the man-made Balukhand-Konark Wildlife Sanctuary, which is a unique coastal forest ecosystem. The vegetation includes casuarina, eucalyptus, acacia, and cashew. Natural mangroves and their associates are also seen in stretches. The sanctuary is predominated by the spotted deer but also supports a variety of wildlife. The nesting beaches of the endangered olive ridley turtle are a seasonal tourism attraction.

This entire coastal stretch was recently affected by the Fani cyclone and was a topic of international attention. In early May 2019, categorized as a “very severe” cyclone, Fani had its landfall at around 8.00 am, on 3 May 2019, near Puri. The wind speed reached 175–185 kph, gusting to 205 kph, and the eye kept moving northeastward. It devastated the capital city of Bhubaneswar, created four new mouths in the Chilika lake, destroyed Puri and the entire vegetation of the Balukhand-Konark Wildlife Sanctuary, reduced the green cover (even large trees) significantly along its route, and created substantial debris and waste along the coast. Several issues have come to the forefront in dealing with the aftermath of Fani. The role of a natural ecosystem such as the Chilika lake in protecting villages that would have otherwise had to face the direct fury of the cyclone was clearly recognized. The innate ability of the Chilika lake to repair itself within weeks of the cyclone impacts was also noted. There was a concern that the four new bar mouths may have a major impact on the lake ecosystems and that the salinity levels would increase. This was not the case, however, as the bar mouths were seen closing up through natural processes of sandbar formation. The role of the coastal sanctuary – though totally devastated – in protecting the villagers living both within the sanctuary and in the immediate vicinity was also noted.

The difficulties in coastal city management, particularly in Puri, i.e., sewage management, solid-waste management, stormwater drainage management, the disposal of excessive amounts of trees and building debris, and the management of hazardous waste such as asbestos roofing and transformer oil leakages were also recognized. If the city's management had been more resilient, it would have been possible to receive the cyclone impacts more effectively and get back to normalcy sooner. Witnessing the effects of cyclone Fani, there is a clear need to mix nature-based solutions with structural man-made solutions in order to develop a holistic approach toward natural disasters and build resilience. Integrated coastal zone management is therefore vital for restoring both coastal infrastructure and livelihoods, of which tourism is an integral part.

<sup>a</sup> In 2011, the government of India approved the name change of the State of Orissa to Odisha. This document reflects this change. However, when reference is made to policies that predate the name change, the formal name Orissa is retained.

<sup>4</sup> In 2011, the government of India approved the name change of the State of Orissa to Odisha. This document reflects this change. However, when reference is made to policies that predate the name change, the formal name Orissa is retained.

**Climate-proofing, hybrid approaches that include nature-based solutions and community ownership are increasingly becoming critical for coastal cities to deal with climate-induced events.**

### **3.3 Pillar 3: Coastal Tourism**

#### **3.3.1 Management of Natural Assets**

Coastal tourism is dependent on the city's natural assets. Therefore, it is only to be expected that its proper management is a necessary condition for the tourism economy to thrive and expand. Unfortunately, in many coastal cities, the management of natural assets is suboptimal. There are several reasons for this: (i) natural assets require an evidence- and science-based management approach. The latest research-based understanding of the type of natural assets in general and research on the specific natural assets in the city are required. However, these generic research studies are not used to define the management approach, nor are city-specific research studies done. The science-based approach is therefore not deployed; (ii) in many cities, the responsibility for managing the natural assets is combined with the city's built assets and lies with the urban department and the municipality processes. That management approach is not sufficient; (iii) multiple government agencies and departments are held responsible. For instance, in the case of a water body, the Environment Department is responsible for the water quality, the Fisheries Department is responsible for the fish; the Agriculture Department is responsible for the farmland surrounding the water body, and the Water Resources Department is responsible for the embankments that protect the water body. There is no unifying department or official responsible for the water body in a holistic sense; (iv) involvement of the community, businesses, and civil society in the conservation of these natural assets is either minimal or nonexistent; the absence of local ownership and commitment makes management more difficult; and (v) budgetary allocations for the management and maintenance of natural assets are limited.

Improving the management of natural assets in coastal cities requires a special purpose vehicle (SPV) or an integrating organization, which has the highest level of city government at an advisory level. This SPV should be empowered to coordinate and direct the various line departments to contribute appropriately to the management of these natural assets. For instance, the conservation or restoration of a river requires the support of multiple departments within the city government. It is this SPV that should direct the Works Department to deal with the wastewater treatment, the Landscape Department to restore the riverside greenery, and the Social Development Department to engage with civil society to build the commitment and ownership required to ensure the proper management of these natural assets. The SPV should synthesize plans and draw on the resources from the various departments. Further, the SPV should constantly engage with reputed universities and encourage them to conduct research that will lead to a better scientific understanding of the natural assets and provide insights into managing them better. With respect to financial resources, the SPV should have its own annual budget and should also coordinate the inclusion of the required financial resources in the respective line department budget. The SPV should make budgetary provisions during planning/designing and ensure that these budgets are used systematically during the implementation and operation phase. It should be the role of the SPV to ensure that these are done in an interlinked manner. It is inevitable that there will be weak links that need to be focused upon. Once again, it should be the role of the SPV to keep track and ensure that these are suitably addressed. The following box case (Chennai Rivers Restoration Trust 2019) provides an example of how the subnational

government in India promoted an SPV to address the problem of the rivers in the coastal city of Chennai.

**Box Case 12: Chennai, India – A Special Purpose Vehicle to Clean the City**

The subnational government has created a special purpose vehicle, the Chennai Rivers Restoration Trust (CRRT), whose role is planning, coordination, funding, and monitoring along with various agencies with the objective of rehabilitating Chennai's waterways and water bodies. The implementation and operation and maintenance will remain with the respective government departments, but these will be carried out under the overall coordination of the CRRT. The key departments will have their secretaries as the directors of the Trust. Headed by the Chief Secretary, senior bureaucrats from the following make up the directors: the Municipal Administration and Water Supply Department, the Finance Department, the Environment & Forest Department, the Public Works Department, the Highways & Minor Ports Department, and the Corporation of Chennai. Further, a subcommittee and a technical committee are formed to coordinate the various activities of the Trust.

It is important to note that the CRRT does not implement independently of the various key departments. As the CRRT includes the leadership of several senior bureaucrats from the key departments, it has the leverage to facilitate implementation through proper planning and coordination. This SPV approach enables the CRRT to integrate the various interventions in order to effectively achieve the overall goals of managing natural assets.

**An institutional arrangement that ensures that the key government agencies can execute their respective roles and responsibilities in a timely, coordinated, and integrated manner is a necessity for managing natural assets effectively.**

### **3.3.2 Synergies in Tourism Planning Policies, Environmental Protection, and Community Inclusion**

The challenge for city managers is to balance the trade-offs while bringing convergence and improving governance in planning for city infrastructure, tourism, and the management of environmental and climate risks together with benefits to local populations. Sustainability would be at the confluence of these elements. This is easier said than done, given specific mandates that different departments are governed by. Municipal governments, which once focused almost exclusively on the delivery of urban services, have become increasingly involved in seeking external investment and developing city economies. This means that integrating the environment into city government activities must engage both with the service delivery and the economic development components of their work (Dodman, McGranahan, Dalal-Clayton 2013). Alongside local and national frameworks, coastal city management is marred by conflicts of interest associated with regulatory frameworks and policies directed toward property development and GDP creation.

The potential of the contribution of the tourism sector to the overall development of coastal areas, which largely benefit local populations, is an incentive for city managers to synergize planning and environment protection. These complement tourism with the monitoring and assessment of coastal tourism's effects on the environment and quality of life. There is no one size fits all. Moving toward coherent and comprehensive approaches to tourism policy making will help countries to reframe tourism growth to better spread the benefits, address inequalities, and improve the resilience of economies. Long-term strategies and policies focused on promoting improved employment and job creation, skills development, entrepreneurship, innovation, effective

investment, and integrated regional development are integral to achieving sustainable and inclusive tourism growth – growth that takes into account current and future economic, social, and environmental impacts, and addresses the needs of visitors, the industry, the environment, and host communities, such as by: (i) providing consumers with access to high-quality, reliable, and safe tourism experiences; (ii) increasing productivity in the tourism sector, and particularly among SMEs; (iii) protecting, managing, and enhancing natural and cultural resources (OECD 2017); (iv) improving competitiveness; and (v) promoting inclusive growth and development within and across countries.

### **3.3.3 The Role and Responsibility of the Private Sector in Enhancing Sustainable Tourism**

Tourism economy in general and coastal tourism in particular are domains of the private sector. The private sector, with its built infrastructure, occupies a significant geographic footprint in coastal areas. It is the private sector that largely establishes coastal tourism facilities, whether it is to create the opportunity to enjoy the scenic beaches or to admire the unique ecosystems. These activities can often negatively impact coastal systems. However, these are also negatively impacted by natural hazards like coastal erosion, coastal flooding, and climate change. Coastal tourism is driven by the private sector under the broad framework established by the government and is a large generator of employment.

Private sector businesses can be classified as either large or medium and small, and both should engage in activities that are in line with sustainable tourism practices. Generally, where regulation enforcement is reasonable and awareness is high, the large businesses recognize the importance and adhere to the coastal norms established by the government. However, they need guidance and support. The balancing of economic interests with environmental concerns must be met and progressively developed. It should shift from managing the coastal environment to enhancing it, which should become a necessary condition for tourists to accept these private sector businesses. This mindset shift should be ushered by the government through the support of the civil society, the local community, and environmental nongovernment organizations. An example of such a collaborative initiative is captured in the following Box Case 13.

#### **Box Case 13: Conserving Coastal and Marine Biodiversity in Palawan, Philippines**

The Asian Conservation Company Project is working toward conserving coastal and marine biodiversity in the El Nido-Taytay Managed Resource Protected Area. This is a collaboration with a private equity company. This protected area is spread over a 92,303-hectare terrestrial and marine park in Palawan, the Philippines. The project includes cofinancing from multiple stakeholders – local government, an ecotourism resort operator, a charter airline, the El Nido Foundation, and donor agencies including IFC. The interventions include partnership, management, enforcement, information, education and communication, livelihoods, institutional development, financing, biodiversity research, and monitoring and supervision. The conservation efforts have focused on a small area within the park. The income/revenue streams are the issue that constrains investments.

Source: Private sector contributions to improved marine and coastal resources management, IFC, 2008.

Addressing large businesses will not be resolved as the coastline has dramatically increased the number of medium and small businesses that cater to the tourists. Their activities impact the coastal environment significantly and reduce the economic potential of coastal tourism. For instance, commercial establishments/shops – both formal and informal – contribute sizably to the generation of solid and liquid wastes that are detrimental to the coastline and water bodies and other natural assets if there are any in the vicinity. A comprehensive approach is required to deal with the private sector. One way is to adopt an environmental supply/value chain approach to protect the coastal environment. The large businesses adopt selected medium and small business in order to bring about the mindset change in terms of not polluting the coastline.

It is important to recognize that coastal tourism works through a supply chain. The large businesses are dependent on medium and small businesses such as tour operators and commercial establishments. They are closely linked with economic interests. These need to be expanded to ensure that the supply chain of tourism services is sustainable. For instance, the tour operators should be sensitive both to the tourists and the other service providers, the commercial establishments. The tour operators should highlight the achievements of these sustainable initiatives on the part of their supply chain. This should be driven by the large businesses as they have the capacity to bring about the mindset change. Over time, this would become a norm of coastal tourism.

While all of these are to mitigate or reduce the impacts of the coastal activities, there is also the role of the private sector in protecting the coastal infrastructure from extreme climate-induced events. This is relevant not only for coastal assets owned by the private sector but also for those in the public/government sector. With the increased availability of climate data in the public domain, there have been several private entrepreneurs in the field of data sciences who have been able to use the data gainfully to predict the likelihood of climate-induced events affecting particular coastal stretches. There are private sector start-ups that offer their services to the city government, the private sector, and insurance companies. Although this is a relatively new area of work and largely in developed countries, it is the private entrepreneurs who are driving this agenda forward in order to make more informed capital (advanced) and operational (real-time) decisions. Upstream Tech, Jupiter Intel, Coastal Risk Consulting, and Green Stream are some of the private sector entrepreneurs working on building climate resilience. Their contributions protect not only the coastal assets but also the coastal communities.

#### **4. A TIME-TESTED FORMULA: USING THE ICZM APPROACH**

Originating at the Rio Summit (1992), integrated coastal zone management (ICZM) is the concept of a dynamic, multidisciplinary, and proactive approach to resource management for sustainable development in coastal areas. It covers the different elements of typical management processes that include data/information collection, analytical science-based studies, decision-making on interventions, planning-designing-implementing interventions, and monitoring interventions, and the natural coastal dynamics in general. The approach is integrated in that different interventions (policies, programs, and investments), different sectors, and different administration departments need to collaborate to achieve the coastal development goals. It is also integrated in that it uses the informed participation and cooperation of all relevant stakeholders – government, civil society, and businesses – to assess the development goals and to take appropriate actions. All interventions should aim to balance environmental, economic,

social, cultural, and tourism objectives within the limits of natural coastal dynamics. As coastal areas are directly exposed and vulnerable to climate-induced extreme events, all interventions should consider business-as-usual as well as extreme scenarios. In broader terms, ICZM is a natural resource management (NRM) governance approach on the part of coastal areas that integrates terrestrial and marine components in time and space. In essence, ICZM aims to coordinate the implementation of the triple bottom-line objectives – environmental, social, and economic – of sustainable development. This ensures the different interests in the coastal areas are met in a structured, coordinated, and integrated manner. It also ensures that the coastal resources are optimally used for both the present and future generations without compromising the ecological processes.

The principles of ICZM that broadly lead toward sustainable development include a holistic approach, an ecosystem approach, good governance, inter- and intra-generational fairness of resource distribution, a focus on traditional coastal activities albeit taking into consideration the coastal economy's needs, and the precautionary and preventive principle to ensure that the coastal carrying capacity is not exceeded.

The ICZM approach includes distinct phases. The first phase is the identification wherein the initial conditions are appreciated, and the feasibility of implementation is ascertained. The second phase is the preparation, wherein the socioenvironmental assessment is carried out, possible scenarios are developed, and the proposed intervention is detailed. The third phase is the implementation, wherein the execution of the intervention is undertaken in the context of defined institutional arrangements, operation and maintenance arrangements are firmed up, and an evaluation of its effectiveness is undertaken. The benefits arising from the ICZM approach are captured in the following table.

**Table 2: Benefits of the ICZM Approach**

<b>Social Benefits</b>	<b>Economic Benefits</b>	<b>Environmental Benefits</b>
Provides diverse opportunities for recreation, leisure and cultural activities and thus improves the quality of life	Supports sustainable economic activities and thereby ensures income in the long run	Ensures integrity of the coastal environment and biodiversity as a natural system
Helps resolve conflicts	Allows better zoning and use allocation	Ensures the sustainable use of natural resources
Strengthens institutional frameworks and enforces cooperation among stakeholders on the basis of shared objectives	Improves management (legal framework, risks, help to the decision-making process) and thus permits gains in efficiency and time	Preserves and improves natural areas (habitats, species and biodiversity)
Provides security from natural hazards and risks	Develops new economic instruments to finance environmental protection	Improves pollution control
Raises public awareness and favors information exchange on sustainable development and environmental issues	Promotes environment-friendly technologies and cleaner production for the markets of tomorrow	Improves beachfronts and soil alteration management
Encourages broader public participation	Adds value to products through eco-labelling schemes	Integrates river basin management

Source: Sustainable Coastal Tourism – An integrated planning and management approach, UNEP, 2009.

There have been about three decades of ICZM experiences around the world. While the benefits are recognized, ICZM is faced with several challenges that must be addressed to deliver effective outcomes:

- (i) Increasing consumption per person, multiplied by a growing population, is the root cause of the increasing demand for ecosystem services.
- (ii) Water is becoming an important issue on the coast. The scarcity of fresh water is a real challenge, especially at a time when the conversion of the coast into built-up and artificial land cover is growing, and intensive agriculture is expanding.
- (iii) Changes in natural resources (e.g., fish stocks) due to overfishing will place more intense pressure on several coastal communities.
- (iv) Science-based analytical studies are often inadequate as they have not been the focus of academia or practitioners, as natural processes along the coast are dynamic, and thus a constantly updated science-based understanding is required to drive decision-making along the coast.
- (v) A legal framework is required to protect the natural processes as well as the livelihoods along the coast; such a framework is often not comprehensive and therefore not effective.
- (vi) There are many sectors that are dependent on the coast, e.g., fisheries, ports and harbors, tourism, and urban development. Coastal areas and their natural processes need to cater to different requirements, which often compete with each other. Striking the right balance is often difficult. Improved “horizontal” coordination is required.
- (vii) Institutionally, governments are structured into various departments that tend to work in isolation; in coastal areas, a mindset for integrated functioning is called for, and this is often not forthcoming.
- (viii) There are various levels within the government, i.e., local, sectoral, regional, and national. All of these have interests in the coastal areas, and these compete with each other. Vertical coordination is often suboptimal. Delegation of power to the more local, i.e., the city, governments and ensuring that they have the capacity to deal with coastal issues is required and is what the development community is striving for.

Coastal tourism is a key component of coastal and marine economies and ecosystems. On the one hand, coastal tourism depends on the quality and diversity of the coastal assets. On the other hand, an understanding of tourism policy lies at the heart of the broader goals of ICZM. Coastal tourism is inextricably linked with ICZM.

*Some key recommendations on integrated planning aligned to Sections 3.1.1., 3.3.1, 3.3.2, and Way forward:*

1. **Integrated planning should be operationally driven and not technically driven.** Integrated coastal zone management (ICZM) has been in practice in many developing Asian countries. However, the effects of this integrated approach have not yet been realized to the extent that was originally intended. This is because they are largely technically driven. Ministries or departments of the environment are responsible for ICZM. These are technical ministries that provide technical advice to the government as a whole, and other ministries/departments. However, modifying such technical advice to the operational reality requires further work. For instance, there is a big difference between drawing a multi-hazard vulnerability line through a coastal city on a map and in practice. In fact, drawing such a hazard line on a map is really the first step. Identifying areas/localities along the hazard line and defining what actions need to be taken is what is required; this refers to the points made regarding an

evidence-based approach in the Way forward section. As that has not been done, there is a lack of an operational mindset and capacity in the integrated planning initiatives. All integrated planning should be operationally driven, followed by, or in conjunction with, the technical advice, rather than the other way around.

2. **Integrated development must be needs based and synthesized/directed by the city government.** If integrated planning outputs are to be used effectively, the city government should not only have the capacity but also the authority. In most developing country cities, the city governments execute directions from higher levels of government (state or central) rather than deciding what is appropriate for the city's development. If the prevailing practice continues, then the city's infrastructure development will move in different directions and be based on where the higher levels of government are investing. This is suboptimal as the investments are not driven by the city's needs but by funding/budget availability.
3. **The medium-term nature of implementing integrated plans must be recognized.** The design and execution of integrated plans, and the realization of their benefits, require a medium-term timeframe. The effectiveness cannot be demonstrated in the immediate or short term. For instance, in the city of Chennai, the Cooum Restoration activity is recognized as requiring two decades or more. The activities are undertaken in an integrated and coordinated approach with various departments in a painstaking way. The benefits of these restoration activities are not seen today but will be seen in the future. The city government and the stakeholders must accept this. To convey these more practical examples, public awareness and capacity-building activities must be undertaken to convey these messages from time to time along with the progress of the initiatives undertaken. This will build an environment of trust among local governments and their stakeholders.
4. **Stakeholders, including businesses and civil society, should be committed to the integrated planning.** Having government commitment alone will not suffice. The government is run by the political parties, which change periodically. Commitment to integrated planning should be beyond such changes. If businesses and civil society commit to integrated plans, then it will be possible to persist with the prevailing government with the integrated plans and realize the benefits that they bring. The role of businesses and civil society should not be underemphasized. An institutional framework must be developed to enforce consensus among the changing governments and parties in power to carry on the initiatives of national, state, and city interests in terms of the integrated planning so as to maintain continuity and complete beneficial, necessary, and impactful projects.
5. **Integrated plans should be focused and prioritized.** In the past, integrated plans have been misinterpreted as being comprehensive plans, which covers everything that every sector/department needs to do to realize the benefits. Having too many initiatives implies that city governments will be spread too thin in order to conduct them. Often, not many initiatives are carried out. Integrated plans should pick the focus initiatives and examine how those will leverage the other changes that are required. Having a "Christmas tree" of initiatives is not integration.
6. **Integrated plans need to consider scale, sector, and themes.** An integrated plan for infrastructure that is consistent to promote coastal tourism should have multiple considerations. In terms of scale it should consider regional-, state-,

district-, and city-level plans in order to determine what would be the initiatives that would be consistent with all of them. If the regional plan requires the initiative at a city level and it is not included, its absence will result in other unintended negative outcomes. For instance, if the regional plan suggests beach nourishment and the city plan does not include the same, the absence of such nourishment will cause coastal beach erosion, rendering them unusable in time. It should also consider sectors other than tourism that are closely interrelated. For instance, if the city has an estuary, the Water Resources sector becomes critical. If there are urban forests, then the Forestry sector becomes critical. A sustainable tourism initiative should necessarily include the respective sector expertise in order to make it most effective. And lastly, all the relevant themes – economics, environment, and equity – should be considered in a balanced manner. Initiatives that emphasize one of the themes at the expense of the others will result in suboptimal, nonsustainable outcomes. For instance, a high-end tourism entertainment park in a locality occupied by low-income earners is bound to have frequent hindrances due to community pressures.

7. **Quality infrastructure (QI) implementation as a way to implement ICZM solutions.** Integrating urban and environmental planning with infrastructure and economic planning for cities is imperative for improving livability and sustainability. This has been strongly endorsed globally in the last few years. In 2016, the G7 summit held in Ise-Shima, Japan confirmed the need to achieve inclusive, sustainable, and resilient “quality growth” by way of “quality infrastructure (QI) investments” for bridging the infrastructural gap, which is a key constraint for shared economic growth in Asia. QI investments and their importance have also been stated in recent years by the G20, APEC, and the 2030 agenda for sustainable development. The Japanese government, through its QI investments for projects like the Delhi Mass Rapid Transport and the THSR in Taipei, China, has been a pioneer in taking the first step in this direction.<sup>5</sup> In the context of coastal cities, using QI approaches during the designing and implementation of projects will help optimize various parameters associated with the systematic delivery of ICZM. For example, the key features of QI include: (i) optimal utilization of public financial resources as catalysts for private financial investments; (ii) support for building PPP-related systems and capacities through technical cooperation; (iii) cofinancing with other donors; (iv) consistency with long-term plans and master plans (as well as support in preparing these plans); (v) sharing and overcoming development issues through dialogue; (vi) dialogue and cooperation with stakeholders and development partners; (vii) compliance with international standards established to mitigate environmental and social impact; (viii) construction management (utilization of ICT, strict observation of delivery deadlines, adjustment to plan changes, etc.); (ix) resilience against natural disasters (systems taking into account durability, backups, and prompt recovery); and (x) ensuring safety in use and operation as well as security in and around construction sites. As QI is more of a practical implementation tool for planners and engineers, in the case of coastal environments it ought to be included with the overall integrated

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<sup>5</sup> “Quality Infrastructure Investment” Casebook, Govt of Japan, <http://www.mofa.go.jp/files/000095681.pdf>. The importance of quality infrastructure investment has been confirmed in recent years by the G20, APEC, the FfD, the 2030 agenda for sustainable development, etc. (i) Annex to the Beijing APEC Declaration in November 2014 “APEC Connectivity Blueprint” and (ii) G20 Leaders’ communiqué Brisbane Summit.”

management plans at the time of decision-making to help monitor and manage coastal city assets in a more efficient and practical way.

## **5. WAY FORWARD**

Synergizing evidence-based and experiential learning across the three pillars, the paper recommends a way forward along the following lines. These can be adapted by multiple stakeholders directly and/or indirectly contributing to either the problem or the solutions of the various facets of coastal cities. These cities are clearly assets to countries and need to be intelligently and sensitively managed to sustain their tourism potential and contribute to the country's GDP.

### **5.1 System of Systems Approach**

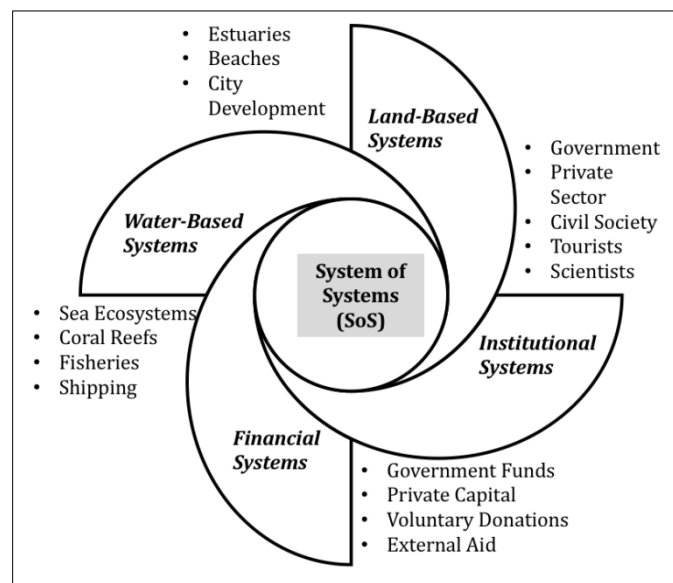
Improving the functioning of coastal cities, subsequently its competitiveness and livability can be achieved through a systems approach. This takes the concept of integration to a deeper level by first unpacking each system and process and finding contextual solutions. Given that coastal cities are rooted in complexities of multiple systems with processes and interventions embedded in each system, the system of systems (SoS) approach offers itself as a systematic city-wide management strategy for enhancing tourism, minimizing environmental damage, improving efficiencies in service provisions and infrastructure, and enhancing livability. Consider a coastal tourism intervention, natural or proposed, such as a beach or a marine park or estuary that draws tourism revenue as well as contributing to the protection of the natural assets. The accepted three-dimensional considerations for sustainable development – economic, social, and environmental – can be used as parameters to unpack and recognize the depth of each system in the context of an intervention. The economic systems will include elements such as selling, marketing, provision of services, cost control, and labor conduct. All these elements need to be in tune with each other in order to deliver effective economic performance. Invariably, there will be one or two weak elements in the economic systems that will pull down the performance. It is these weak elements that need to be focused upon. Similarly, the social systems will include elements such as community acceptance of the intervention, community involvement/employment, and the extent of community benefits. Here too there could be a couple of weak elements in the social system that will pull down the social acceptance. These should be the focus of attention. The environment systems are the natural ecosystems. Based on the type of natural assets, the elements that are critical to the thriving of the ecosystem should be considered. For instance, in an estuary, the saltwater-freshwater balance could be a critical element that would have to be focused upon. For a coastal tourism intervention to be sustainable, the economic systems, the social systems, and the environmental systems should have all their elements functioning effectively. If there are weak elements, then these will get picked through this systems approach and appropriate action will need to be taken to address them. Any system is only as strong as its weakest element.

Apart from coastal tourism interventions, there are also other coastal infrastructure interventions that are critical to tourism. Each of these interventions will also have individual systems embedded within such as the land-based systems, water-based systems, and institutional systems. For instance, the city's bus stand or rail station is an intervention that is critical to tourism which is linked to land-based systems. The water-based systems associated with the intervention will include elements such as waste management and the provision of drinking water. It is easier to see that this intervention will have financial systems and social systems each with their respective elements. And, using the systems approach, the weak links in each of these systems is identified and suitable actions will need to be taken to address them. That will ensure the effective performance of that intervention within its system.

Moving from single interventions which are directly related to tourism or tourism critical infrastructure is referred to as the system of systems approach. This helps to identify the weak links in the system covering economic, social, and environmental dimensions. Subsequently interventions can be prioritized by the city's management. Consider the city as a network of interventions critical for tourism that can be effectively managed through a system of systems approach. In the context of coastal cities these include land systems, coastal systems and the dynamic ocean system which intersects with other systemic categories such as science, governance and the civil society that are crucial to the management of the physical and natural well-being of cities. Identifying the weak links in the systems – economic, social and environment in the context of institutional, financial, land and water systems will together help in prioritizing and focusing the city's management attention in an integrated manner. Thus, the system of systems approach offers itself as a city-wide management approach for enhancing tourism in the highly dynamic system of coastal cities.

**The system of systems approach offers itself as a city-wide management approach for enhancing tourism.**

**Figure 2: Showing the SoS Schematic Encompassing the Various Systems and Stakeholders**



Source: The author, S. Vaideeswaran.

## 5.2 Hybrid Approach to Coastal Assets

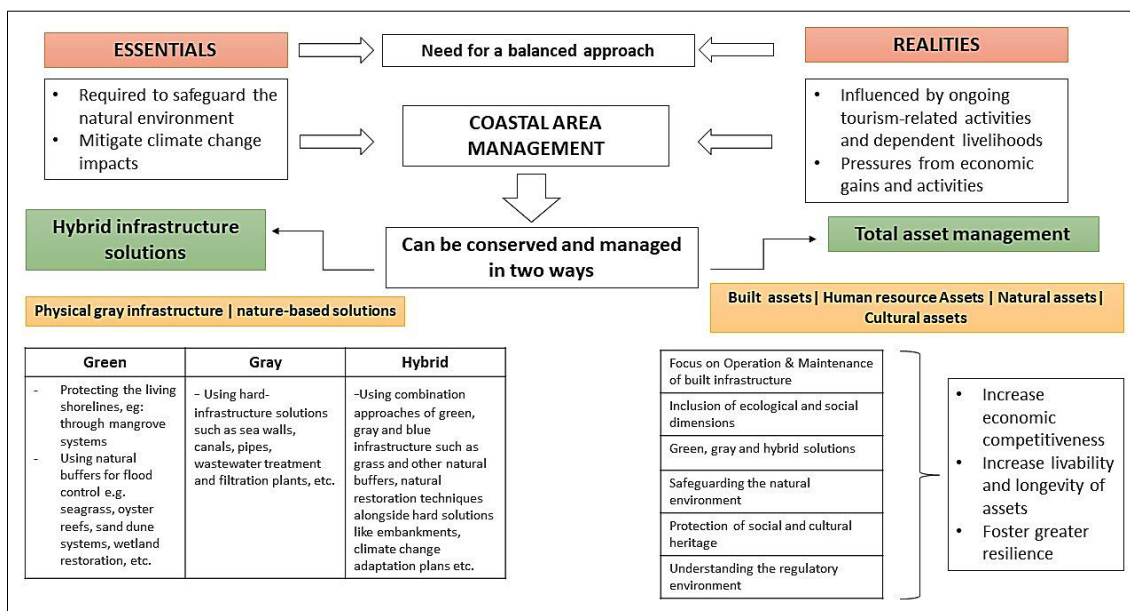
Generally, coastal assets are created as physical infrastructure: for example, a sea wall that uses rubble masonry protects coastal communities from natural processes such as beach erosion. These definitely serve a purpose in the immediate and short term. But there are two issues: (1) beaches are natural assets that attract tourists. However, by constructing a sea wall, the natural asset has been compromised for the sake of community protection; (2) the community may be protected in that location, but wave action ensures that the erosion happens in another location. And often this erosion is deeper and more damaging. In the context of these issues, the question to ask is whether other solutions exist. It is clear from a variety of research carried out that beaches are the most effective solution (Black et al. 2019) for coastal community protection. Retaining the beaches will serve the twin purpose of both meeting tourism needs and also protecting the community. Determining how to nourish the beach while pumping fine sand/silt from the nearby riverbed is a hybrid approach that has nature-based solutions at its core. Another coastal asset is the estuary, where the freshwater and seawater ecosystems merge. This is a unique and fragile ecosystem. The common approach of river training is to build embankments that lead to the sea. Although this may protect the coastal communities during high tides or during flood-like situations due to excessive precipitation, this can destroy the natural processes and the ecosystems that they generate. These have a community protection function as well. And their unique ecosystems offer themselves as a city tourism site. Certain physical infrastructure is necessary, but what's more important is that natural processes are recognized and interwoven with the overall hybrid solution. It provides a win-win solution.

Using these two generic examples and other examples illustrated earlier, the paper argues that physical infrastructure without considering nature-based solutions should not be pursued (European Union 2015). Today's norm is to proceed with physical infrastructure solutions alone. This approach should structurally change. These have a major impact in destroying the city's tourism potential permanently. Also, nature-based solutions by themselves may not always be appropriate in today's modern cities. What's required is a hybrid approach that gainfully combines the two. Adopting a total asset management (TAM) approach can provide a pathway for integrating these aspects within city development strategies and asset management plans, adding to the resilience of the city's infrastructure and its population. TAM builds on and enhances the conventional asset management procedures adopted in cities that most often focus on the operation and maintenance of built infrastructure. The TAM approach covers the ecological and social dimensions and includes the city's: (i) physical or gray infrastructure; (ii) natural environment; (iii) social and cultural environment or the city's heritage; and (iv) regulatory environment. This comprehensive approach enables a city to develop a detailed inventory of assets in each asset category, identify the need, and assess its performance together with the human impact and compliance with appropriate standards and laws. It analyzes the life cycle of an asset, beginning with its initial demand, through to its continued performance, and its rehabilitation or ultimate disposal, including post-disposal liabilities. This helps decision-makers develop asset management plans integral to the city planning and development plans. Such an approach, which is based on risk and condition assessments of assets, integrated in the city's urban profile and baseline, can ensure timely and continued operation and maintenance of assets, further leading to resilience and sustenance during unexpected events (Asian Development Blog 2019). This correlates to the earlier argument that due expertise on natural processes and appropriate nature-based solutions will be required. This should be sourced nationally and internationally and should be contextualized to local situations and considerations that may be available

from universities and institutions doing coastal research. Arriving at an appropriate evidence- and science-based hybrid solution with an appropriate asset management plan for long-term operation and maintenance is not easy but there is enough experience around the world to learn from.

**Science-based hybrid solutions that judiciously combine physical infrastructure with nature-based solutions should be adopted together with a total asset management approach to ensure the sustainability of these solutions.**

**Figure 3: Explaining the Hybrid Approach toward Coastal Assets and Area Management**

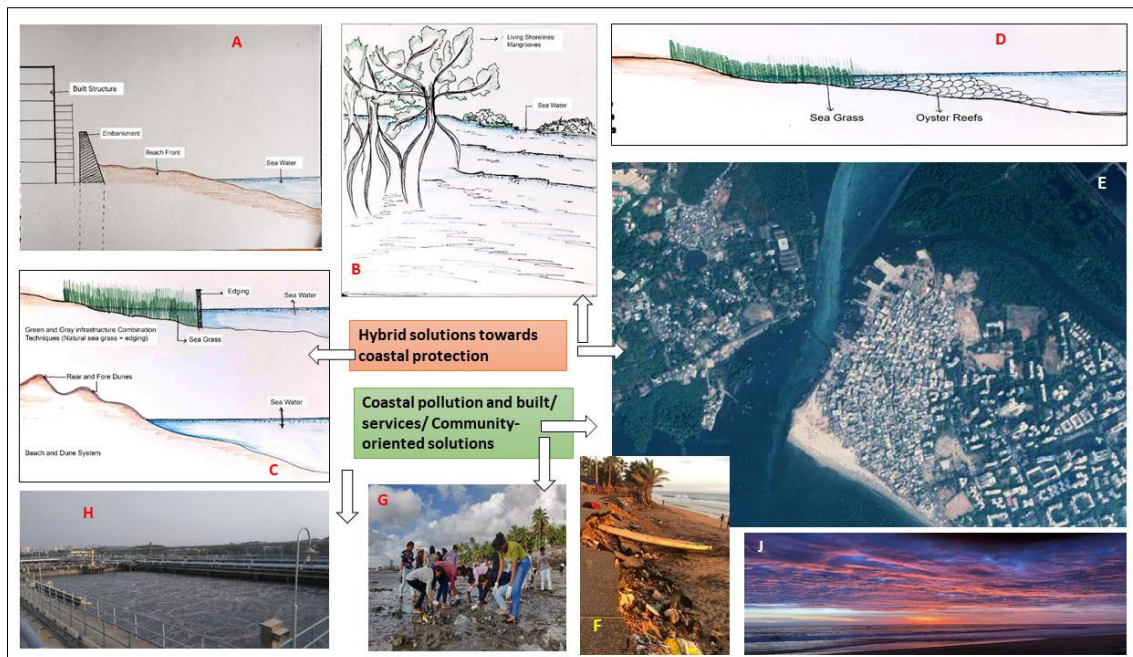


Source: The author, Vedanti Kelkar.

### 5.3 Evidence-Based Coastal Tourism Interventions

The planning, design, implementation, and operation of coastal tourism interventions should adopt an evidence-based approach contrary to the present fragmented practices. In other words, information on the successes and failures of these interventions elsewhere should be analyzed. This should be done both in terms of economic gains and achieving ecological goals. In terms of the economic aspects, it needs to be ascertained whether the attraction of tourists justifies the intervention for meeting the direct operation and maintenance costs at least. This is important as building an asset without economic support for its operation and maintenance is not sustainable. As regards the ecological aspects, the type of natural regeneration and its implications should be fully appreciated. The intrinsic ecological value should be recognized, documented, and publicized to draw both the layperson and the nature expert. The possible benefits in terms of building climate resilience should also be considered.

**Figure 4: Collage of Sketches, Photographs, and Map of Urban Coastal Areas in Developing Asia Demonstrating Hybrid Approaches toward Managing Them Better**



- A. Sketch showing idea for beach and embankment protection.
- B. Sketch showing idea for a natural buffer through safeguarding the mangrove system.
- C. Sketch on green and gray infrastructure approaches using elements such as seagrass, edging, and beach and dune system.
- D. Sketch on nature-based flood control approaches using elements such as seagrass and oyster reefs as buffers. *Source: All sketches from A to D are prepared by the author. Credit: Vedanti Kelkar.*
- E. Confluence of the estuary and the sea at the Versova beach and mangroves, Mumbai city. *Source: Google Images.*
- F. Coastal pollution and litter on Shanghumukham beach in Trivandrum, Kerala, India. *Source: Clicked by the author. Credit: S. Vaideeswaran.*
- G. Community group initiative by "Beach Please" to clean up Dadar beach in Mumbai city. *Source: "Beach Please" Facebook page.*
- H. Tackling wastewater pollution in oceans and seas through appropriate sewage treatment measures. *Source: NaviMumbai Sewage Treatment Plant clicked by author in January 2018. Credit: Vedanti Kelkar.*
- J. Picture showing the beautiful sunset at Shanghumukham beach in Trivandrum, Kerala, India to emphasize the idea that there is a need to safeguard the pristine coastal environment and reduce coastal pollution through technological and community initiatives. *Source: Clicked by the author. Credit: S. Vaideeswaran.*

Further, the expertise of those involved in similar initiatives elsewhere should be employed. As is well known, the expertise in this area is rather limited. Therefore, it is important to involve those who have successfully executed similar initiatives so that their expertise is effectively used. Consultants/advisers should have field-level implementation experience in order to ensure the most effective delivery. It is important not to start from scratch but rather to leverage on the already existing expertise to build bigger and better.

Once these interventions are completed, it is required to keep track on how these are attracting tourists. Is it in line with what was expected? The tourism revenue data should be the basis for deciding whether further capital investments should be made in order to attract more tourists. Here again, it should be evidenced-based. Constant exchange of information with other cities with similar interventions should be carried out in order to keep learning from each other so that decisions are evidence-based. Creating indicators for such monitoring would be integral to being evidence-based.

Further, new tools are emerging from the broad discipline of data sciences. These include data analytics, GIS, artificial intelligence, and machine learning, which are increasingly and gainfully being integrated into various disciplines. For example, ADB's recently developed Spatial Data Analysis Explorer (SPADE) is a geospatial web platform, open source, and cloud hosted, and contains layers of geospatial data for project identification and preparation, the production of maps, engineering design, and analysis of impacts and risks. SPADE supports the preparation of assessments of land use, socioeconomic impacts, safeguards, climate risk, and vulnerability to inform country, regional, and city plans and strategies. This has the capability of informing the location, design, construction, and performance of infrastructure investments through project visualization and assessment of institutional overlaps and risks. This can increase the efficiencies of due diligence, engineering design, and monitoring, in consultation with stakeholders. In addition to existing satellite maps and climate change data sets of 21 ADB project cities, SPADE can be a repository of project GIS data sets, so that these are accessible anywhere and anytime. With all its complexities, the discipline of urban planning will greatly benefit from the use of these tools. More data-driven solutions will emerge once the required data and their correlations are identified, collected, and analyzed. This will be both at a city level, bearing in mind that it is really a functioning SoS, and also at an intervention level. The use of these tools will be the future of evidence-based urban planning, and cities should prepare themselves to adopt them.

**Evidence-based decision-making on both economic and ecological considerations should be the overall approach.**

Among the three recommendations of this paper, the SoS approach is cross-cutting and foundational. The systems thinking makes it holistic and integrated. It goes beyond independent initiatives, highlights the importance of interactions between different systems, and emphasizes the synergies that need to be embedded in the planning. The two other recommendations that were a focus of this paper, namely the hybrid approach that incorporates nature-based solutions and the evidence-based planning, will also have to intrinsically consider the SoS approach. Such systemic considerations are required to generate maximum value from the various interventions and for them to be most effective (Keesstra et al. 2018).

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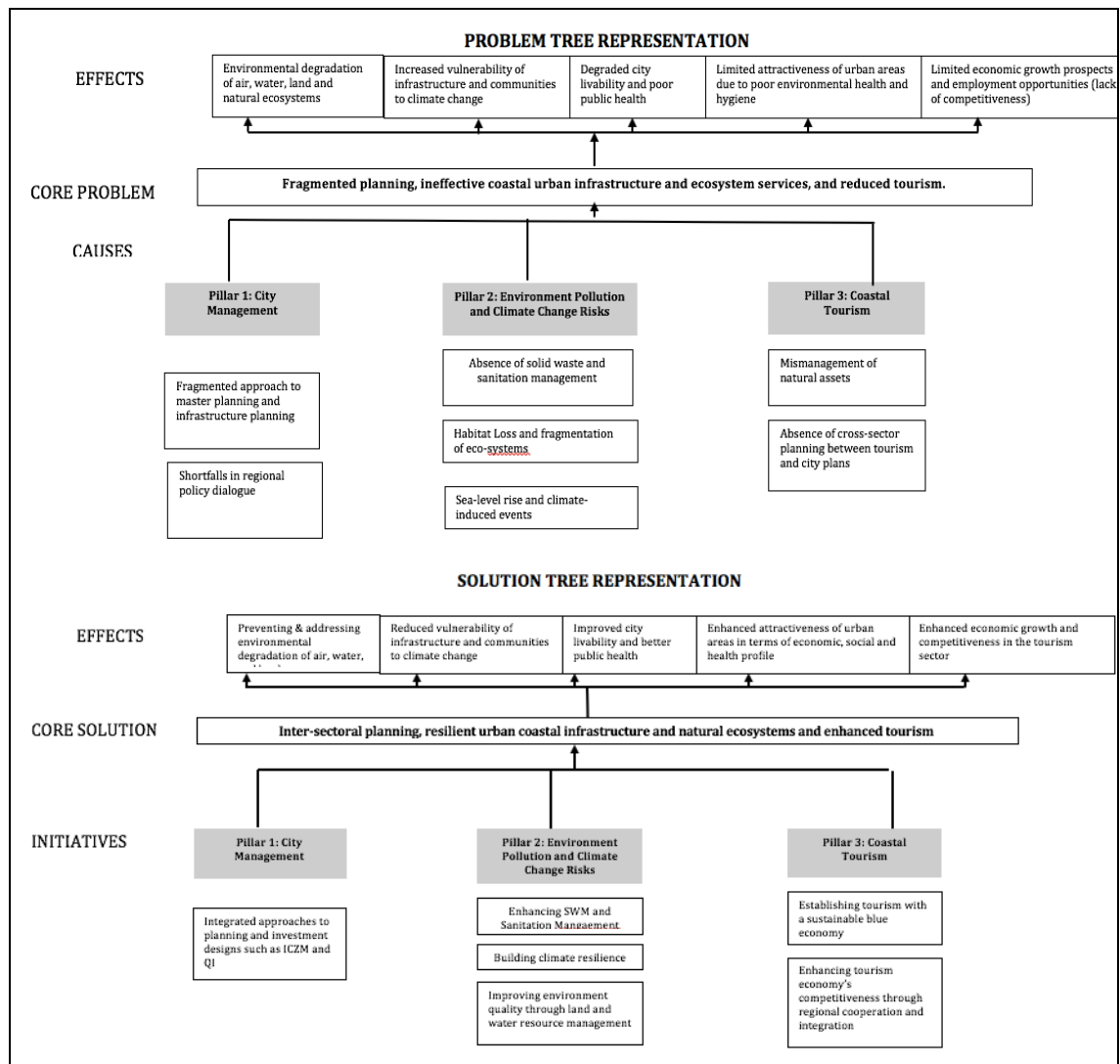
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## ANNEX 1: PROBLEM TREE AND SOLUTION TREE REPRESENTATIONS



## ANNEX 2: GRAPHIC ILLUSTRATING DYNAMIC AND CONTINUOUS INTERACTIONS BETWEEN THE LAND, COASTAL AND OCEAN SYSTEMS

