



Kingdom of the Netherlands



# GLOBAL COASTAL CITIES

Summit 2023

## Building and Developing Sustainable and Resilient Coastal Metropolises: A Blueprint for Coastal Cities

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## Contents

- 1 Introduction
- 2 Challenges Faced by Coastal Cities
- 3 Global Coastal Cities Summit 2023
- 4 Engineering Leadership Group Executive (ELG) Roundtable
- 5 Outcome of the Summit discussions
- 6 Key Recommendations
  - a. Building Resilient Infrastructure
  - b. Implementing Climate Change Adaptation Measures
  - c. Promoting Sustainable Urban Development
  - d. Strengthening Governance and Collaboration
  - e. Enhancing Disaster Preparedness and Response
- 7 Implementation Strategies and Policy Implications
  - a. Integrated Coastal Zone Management
  - b. Public-Private Partnerships
  - c. Capacity Building and Knowledge Exchange
  - d. Financial Support and Investment
  - e. Monitoring, Evaluation, and Reporting
- 8 Executive Summary



## Introduction

Coastal cities have long been vibrant centers of human activity, hosting a substantial portion of the global population while serving as economic powerhouses, cultural focal points, and ecologically significant areas. Throughout history, these cities have thrived in coastal deltas, benefiting from their advantageous access to the sea and fertile farmland, which have nurtured the growth of major civilizations such as the Nile, Indus, Ganga, Brahmaputra, and Yangtze River civilizations. However, the very essence of coastal living is now posing challenges, as these cities face an array of pressing issues including rising sea levels, extreme weather events, rapid urbanization, and environmental degradation. Unfortunately, many coastal cities have not adequately prepared themselves for these pervasive and intensifying challenges. This report presents crucial recommendations aimed at bolstering the resilience and sustainability of coastal cities, prioritizing the well-being of their inhabitants, and safeguarding the invaluable coastal ecosystems.

## Challenges Faced by Coastal Cities

The challenges faced by coastal cities are multi-faceted and demand urgent attention. The following issues highlight the complex nature of these challenges:

- a **Sea-Level Rise:** Rising sea levels present a grave and immediate threat to coastal cities. The potential consequences include heightened vulnerability to storm surges, increased flooding, and accelerated coastal erosion.
- b **Extreme Weather Events:** Coastal cities are highly susceptible to the destructive impacts of cyclones, and other extreme weather events. These events can inflict severe damage on critical infrastructure and disrupt essential services. Extreme weather events overlap to form compound extreme events, with sea level rise, cyclonic storm surges, and rains overlapping into coastal floods.
- c **Urbanization Pressures:** The rapid pace of urbanization and population growth in coastal areas exerts immense strain on existing infrastructure, exacerbates conflicts over land use, and encroaches upon fragile coastal ecosystems.



**d Environmental Degradation:** The degradation of vital coastal ecosystems, including mangroves, coral reefs, wetlands, and rivers, is a pressing concern. Pollution, habitat destruction, and overexploitation are compromising these ecosystems, leading to the loss of valuable biodiversity and ecosystem services.

To tackle these challenges, a growing number of coastal cities are taking proactive measures. In addition to carbon footprint mitigation efforts, cities are adopting a range of adaptation strategies. These include the implementation of large-scale engineering projects such as sea walls, surge barriers, water pumps, and overflow chambers to mitigate the impacts of rising sea levels. Furthermore, cities are embracing environment-friendly approaches for land recovery and reclamation, as well as the restoration of mangroves, rivers, and wetlands to enhance flood water management capabilities.

Successful coastal cities recognize the importance of employing a combination of approaches. While technical solutions and large infrastructure projects can provide temporary relief, a heavy reliance on them alone is limited in its effectiveness. The most successful cities integrate a diverse range of measures, including people-oriented initiatives like urban design, building resilience, and strategic retreats when necessary. Moreover, they prioritize nature-based solutions (NbS) that preserve and strengthen the protective capacities of existing ecosystems, as these solutions have proven to be not only effective but also cost-efficient and long lasting.

The Netherlands serves as a pioneering example, demonstrating the efficacy of a multi-pronged approach in addressing the challenges faced by coastal cities. By adopting a comprehensive strategy encompassing integrated and multifunctional adaptation solutions, they have successfully navigated the complexities of coastal resilience and sustainability. For instance, the government-led National Delta Programme works to keep the country climate-resilient by coordinating efforts between national government, provincial and municipal authorities, water authorities, Rijkswaterstaat and a range of stakeholder organizations. Regional and city-level initiatives such as the Resilient Rotterdam Strategy and 'Resilience by Design' by the Amsterdam Metropolitan Area (MRA) set out guidelines to embrace and integrate climate opportunities in the future.



## Global Coastal Cities Summit 2023

The Global Coastal Cities Summit held at Taj Mahal Palace in Mumbai on May 30, 2023, brought together a diverse range of stakeholders to address the pressing issue of rising sea levels and its profound impact on coastal cities. Organized under the G20 Umbrella by Mumbai First, jointly with the Maharashtra government, the European Union, the Consulate General of the Netherlands and Resilience First (London), the summit attracted bureaucrats, diplomats, climate scientists, policymakers, urban planners, and private sector representatives. The inaugural session highlighted the immediate need for action, particularly in Mumbai, to combat the devastating consequences of sea level rise and its alarming link to viral epidemics.

Throughout the event, participants delved into the challenges faced by Asian coastal cities, sharing best practices and lessons learned. Rising sea levels and extreme weather events emerged as major threats, prompting discussions on collaboration, resilience, and inclusivity. Key highlights included India's long-term low-carbon development strategy, the diverse impact of climate change on different populations, and the crucial role of data, information, technology, and intention in shaping effective policy solutions.

The urgency of protecting city infrastructure from climate change was underscored, with success stories from global partners emphasizing the vulnerability of cities like Rotterdam and Mumbai. Strategies such as early warning systems and adaptation measures were discussed to address the changing climate conditions.

Building resilience against climate change took center stage, as global coastal cities shared experiences and strategies. Integration of natural and built environments, multi-stakeholder collaboration, and leveraging technology emerged as key factors in addressing climate challenges. The summit's final session focused on financing mechanisms and strategies to support climate resilience, highlighting the importance of green finance, capacity building, and public support.



Overall, the summit underscored the urgency of action in coastal cities, calling for collaboration and community involvement. It provided a platform to explore diverse strategies, policies, and financing mechanisms to build resilience and adapt to the threats posed by rising sea levels and extreme weather events. As climate change intensifies, the summit emphasized the pivotal role of coastal cities in leading the way toward a sustainable and resilient future.

## Engineering Leadership Group Executive Roundtable (ELG)

During the Global Coastal Cities Summit, Resilience First (London), an Associate Member of Mumbai First hosted a parallel second edition of the Engineering Leadership Group Executive Roundtable (ELG Roundtable).

This meeting brought together the world's leading engineering-inclusive organizations and focused on the role of urban infrastructure in the transition to a resilient net-zero economy. At this Executive Roundtable, the leaders called on G20 governments to urgently work with private-sector, engineering-inclusive organizations to introduce policies to support the expedited parallel development and deployment of multiple low-carbon technologies to quickly improve the availability of financially feasible decarbonization pathways, with a view to driving sustainable economic growth and meeting the moment for climate adaptation and resilience.

## Outcome of the Summit discussions

The Summit provided comprehensive planning options aimed at enhancing the resilience, competitiveness, and sustainability of coastal cities. The recommendations are put forth to advocate for paradigm shifts in innovative planning and policy approaches, fostering active engagement among communities, institutions, and stakeholders. The key objectives of this report are as follows:



- a Enhance Resilience:** The report emphasizes the urgent need for coastal cities to bolster their resilience in the face of climate change impacts and natural hazards. It proposes strategies and measures to mitigate risks, strengthen infrastructure, and promote adaptive practices that safeguard lives, livelihoods, and essential services.
- b Promote Sustainable Urban Development:** The recommendations stress the importance of sustainable urban development practices that strike a balance between economic growth, social equity, and environmental stewardship. This entails adopting holistic approaches to urban planning, encouraging green infrastructure, and promoting efficient resource management.
- c Safeguard Coastal Ecosystems:** The report underscores the significance of preserving and restoring coastal ecosystems. It advocates for the protection of biodiversity, the conservation of natural habitats, and the enhancement of ecosystem services. By prioritizing the health of these ecosystems, coastal cities can simultaneously mitigate climate impacts, preserve valuable natural resources, and enhance the well-being of both humans and the environment.
- d Strengthen Governance and Collaboration:** Recognizing the complex challenges faced by coastal cities, the report emphasizes the need to strengthen governance mechanisms and foster collaboration among stakeholders. It calls for inclusive decision-making processes, multi-level coordination, and the integration of diverse perspectives to ensure the effective implementation of policies and initiatives.
- e Improve Disaster Preparedness and Response:** Enhancing disaster preparedness, response, and recovery mechanisms is crucial for minimizing the impact of natural disasters on coastal communities. The report recommends measures to improve early warning systems, emergency planning, and community resilience, facilitating swift and effective responses to mitigate potential losses and protect vulnerable populations.

By aligning with these key objectives, coastal cities can pave the way for a more resilient, sustainable, and prosperous future, ensuring the well-being of their inhabitants and the protection of valuable coastal resources.



## Key Recommendations

This report presents a comprehensive set of recommendations aimed at improving the resilience, competitiveness, and sustainability of coastal cities. The report highlights the challenges faced by coastal cities, including rising sea levels, extreme weather events, urbanization pressures, environmental degradation, and tourism economy dependencies. It emphasizes the need for a paradigm shift in planning and policy approaches, engaging communities, institutions, and stakeholders to address these challenges effectively.

The key recommendations focus on five major areas: building resilient infrastructure, implementing climate change adaptation measures, promoting sustainable urban development, strengthening governance and collaboration, and enhancing disaster preparedness and response.

### 6.1. Building Resilient Infrastructure

- a Mainstream climate change considerations in infrastructure design and planning processes to ensure infrastructure projects are designed and built to withstand the impacts of sea-level rise, storm surges, and extreme weather events.

Any development project should consider “future” changes in sea level rise and extreme weather events, and not just the observed changes in the past. This should also consider potential overlapping hazards (compound weather extremes), not just individual hazards. Balancing investments in life-changing infrastructure versus preserving the environment will also require courageous trade-offs and strong leadership to drive change.

- b Promote the adoption of nature-based solutions such as green infrastructure solutions which includes, such as coastal defense systems, living to the green of shorelines, increasing natural buffers, permeable pavements, bio-retention ponds, etc., and promoting the ‘3S’ principle as well as Water Sensitive Urban Design (WSUD), to enhance coastal resilience and mitigate climate change impact safeguard, substitute or synergize the potential of critical infrastructure of coastal cities.





- c Encourage the use of sustainable and resilient building materials, energy-efficient designs, and smart infrastructure technologies to minimize the environmental footprint of coastal cities and enhance long-term sustainability.
- d Enhance infrastructure building codes and standards to ensure new infrastructure is designed to withstand coastal flooding and storm surges. This may include improving floodproofing measures in infrastructure design and implementation and making them compliant with national as well as internationally recognized green construction codes, standards, and rating systems. This also requires a shift from prescriptive standards to goal-based or performance-based standards for infrastructure under risks.

### 6.2. Implementing Climate Change Adaptation Measures

- a Conduct comprehensive vulnerability assessments and risk mapping to identify high-risk areas and prioritize adaptation measures that address the specific challenges faced by coastal cities.
- b Develop and implement climate change adaptation plans that incorporate measures such as coastal retreat, floodplain zoning, and ecosystem-based adaptation strategies to reduce exposure to coastal hazards.
- c Integrate climate change considerations into land-use planning, and water-use planning ensuring that new developments are located in areas less prone to coastal hazards and promoting resilient and adaptive urban design practices. This will require reconciling short-term development objectives with long-term global goals such as the SDGs.
- d Conduct cost-benefit analyses of various targeted adaptation measures to assess the economic viability, local term benefits, and social inclusivity of each adaptation measure and prioritize local adaptation efforts likewise.
- e Consider adaptive urban design strategies that allow for flexible and modular urban system developments to accommodate changing conditions.

### 6.3. Promoting Sustainable Urban Development

- a Encourage compact and mixed-use development patterns to minimize urban sprawl and reduce the pressure on coastal land, preserving valuable natural ecosystems.

Sustainable development would also entail adopting a more flexible urban planning approach that allows for planned hyper-dense development in economically important regions and balances it by preserving nature in other



regions. This would promote shorter travel times and a better lifestyle for citizens. The Netherlands, for instance, has the Netherlands Ecological Network (NNN), a coherent network of existing nature areas where development is strongly regulated or totally restricted.

- b** Promote sustainable transportation options, such as the development of efficient public transit systems, cycling infrastructure, and pedestrian-friendly urban design, to reduce carbon emissions and alleviate congestion in coastal cities.

#### **6.4. Strengthening Governance and Citizens Involvement:**

- a** Establish integrated coastal zone management frameworks that foster collaboration and engagement among government agencies, local communities, academia, and the private sector to ensure coordinated and effective decision-making.
- b** Enhance coordination and collaboration among different levels of government, promoting multi-sectoral partnerships to facilitate the implementation of coastal resilience strategies and optimize resource allocation. Enhance the interdependencies and synergies between different systems and ensure coordinated and holistic measures are adopted in the best interest of all stakeholders.
- c** Forge partnerships with international organizations, non-governmental organizations (NGOs), and academic institutions to leverage expertise, resources, and best practices in coastal city planning and management, fostering knowledge exchange and capacity building. Bringing together local communities in order for disaster preparedness and putting forth expertise from them to identify potential climate risks.
- d** Develop clear evidence-based communication strategies to inform stakeholders of the trade-offs, risks and opportunities in the project to enable them to see the larger growth picture of the Mumbai Metropolitan Region to avoid unwarranted project delays.

#### **6.5. Enhancing Disaster Preparedness, Response, and Recovery**

- a** Develop robust early warning systems and emergency response plans tailored to the specific coastal risks, integrating scientific knowledge and technological advancements to provide timely and accurate alerts for storm surges, tsunamis, and erosion threats.



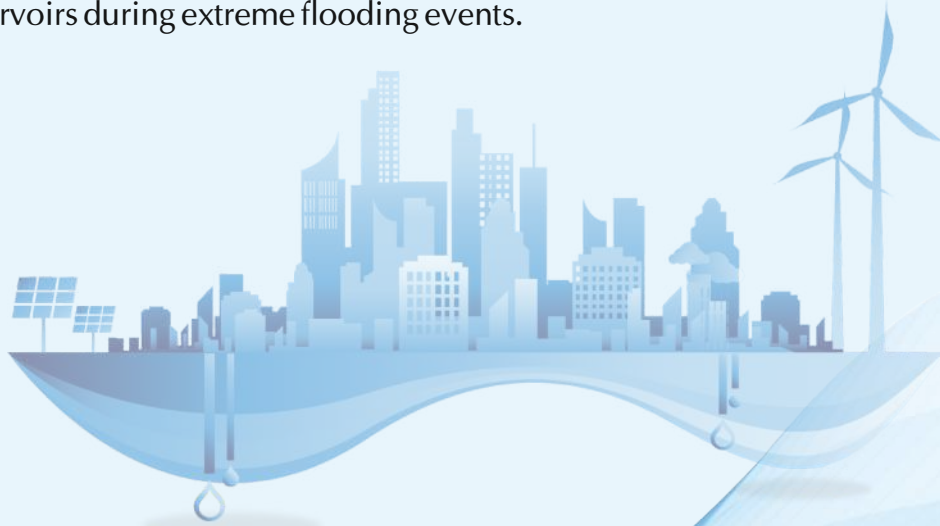
- b** Invest in comprehensive training and capacity-building programs for emergency responders, community leaders, and residents, ensuring they possess the necessary skills and knowledge to effectively prepare for and respond to coastal disasters.
- c** Establish mechanisms for post-disaster recovery and reconstruction, prioritizing the timely restoration of essential services and infrastructure while integrating long-term resilience measures into the rebuilding process, thus enhancing the overall resilience of coastal cities.
- d** Improve climate change projections, modeling, and geospatial intelligence to get access to more granular, accurate, and reliable data on future climate scenarios and the multiplicity of climatic risks that could potentially enable mainstreaming disaster risks in urban development within the city. This will enable planners to move from a constant 'reactive' planning mode to actually thinking of integrated, holistic planning strategies to mitigate disaster risks in the future.
- e** Keep climate models up to date and under constant observation because the uncertainty of projections is a natural part of scientific climate modeling and enhancing them by incorporating new and innovative scientific advancements are essential to refine projections. Prioritize the development of downscaled regional climate models that present a clear picture of climate impacts on the Mumbai Metropolitan Region.
- f** Make climate and hazard data publicly available through improved collaboration, transparency, and data-sharing policies among all stakeholders to promote a holistic understanding of the vast landscape of climate trends, flood risks, and vulnerabilities.
- g** Communicate information related to natural hazards, hazard preparedness, and response measures as well as future climatic and weather conditions through tailored IEC and dissemination activities considering the diverse needs and perspectives of different sections of the community.
- h** Standardize vulnerability assessment frameworks, indicators, and data formats and ensure that they are compliant with nationally and internationally recognized formats so that decision-makers can communicate in a common language to monitor progress, assess the efficacy of policies, and make data-driven decisions.



- I Diversify disaster risk financing and risk transfer instruments while planning for recovery efforts coastal flooding can leave behind a trail of cascading risks (such as submergence of farmlands and food insecurity, loss of livelihoods, epidemics etc.). Explore innovative financing options such as parametric insurance, catastrophic bonds, CSR pooling, etc.

By implementing these recommendations, governments across the world can proactively address the challenges faced by coastal cities, ensuring the long-term resilience of cities, sustainability, and the well-being of the inhabitants.

Key in the success model of the Netherlands is that it opts for an integrated, holistic approach of the above mentioned areas. In furthering sustainable urban development, developing and implementing climate adaptation measures in spatial planning is done in consultations with all stakeholders: local governments, water boards, the private sector and local communities, while engaging experts of various disciplines: civil engineers, urban planners, landscape architects, community workers, bankers, etc. Dutch concepts like Room for the River (a nature-based solution which is also being implemented in Kerala), moveable storm surge barriers (Maeslantkering), Multi-layer (water) safety (MLS) and Water as Leverage (implemented in Chennai) are built on this approach. It is conducive to leveraging local support and financial resources for infrastructure measures taken, and to the realization of a climate resilient infrastructure, such as multifunctional playgrounds that double up as water squares or underground parking garages that double up as water storage reservoirs during extreme flooding events.





## Implementation Strategies

To ensure the effective implementation of the recommended policies for coastal city resilience, a set of actionable strategies is proposed. These strategies focus on integrated coastal zone management, public-private partnerships, capacity building, and knowledge exchange, financial support and investment, and monitoring, evaluation, and reporting.

### 7.1. Integrated Coastal Zone Management

Integrated coastal zone management is emphasized as a crucial approach that considers the ecological, social, and economic factors involved in coastal management. By facilitating coordination among various sectors and stakeholders, this strategy ensures a holistic and integrated approach to coastal planning and development. In a recent study on resilience in urban planning in Mumbai, a practitioner from Mumbai quotes that “We should freeze ecological areas which will remain permanently as no development zones. The other areas should be very flexible to expand and absorb intense construction.”

### 7.2. Public-Private Partnerships

Public-private partnerships are seen as instrumental in mobilizing financial resources, technological expertise, and innovation for sustainable infrastructure development, climate change adaptation, and ecosystem conservation. Encouraging such partnerships can foster collaboration and leverage the strengths of both the public and private sectors.

### 7.3. Capacity Building and Knowledge Exchange

Investing in capacity-building programs is essential to empower government officials, urban planners, and community leaders with the knowledge and skills needed to implement resilient and sustainable practices. These programs enhance understanding of climate change impacts and equip stakeholders with the tools necessary to make informed decisions.

### 7.4. Financial Support and Investment

Adequate financial support and investment are crucial to support the implementation of resilience measures and promote sustainable development in coastal cities. Allocating sufficient resources at local, national, and international levels ensures the availability of funding for critical projects and initiatives.



### 7.5. Monitoring, Evaluation, and Reporting

Establishing strong monitoring, regulatory and evaluation frameworks is vital to assess the effectiveness of implemented policies, track progress, and report on key indicators related to coastal resilience, sustainability, and disaster management. Regular evaluation allows for adaptive management and ensures continuous improvement in coastal city planning and resilience efforts. In a dense region like Mumbai, “A lot of land designated for public purposes like parks and flood buffers eventually became a slum.”

By embracing these strategies, governments can effectively implement the recommended policies, enhancing the resilience, competitiveness, and sustainability of coastal cities. Through integrated coastal zone management, public-private partnerships, capacity building, financial support, and monitoring, coastal cities can thrive in the face of challenges and secure a resilient and prosperous future for their inhabitants and ecosystems.

## Executive Summary

This report provides a comprehensive set of recommendations aimed at addressing the challenges faced by coastal cities and promoting their resilience, competitiveness, and sustainability. Coastal cities are confronted with rising sea levels, extreme weather events, rapid urbanization, environmental degradation, and increasing population. To effectively tackle these issues, a multi-faceted approach is needed, combining technical solutions, people-oriented initiatives, and environment-based strategies.

The report highlights key objectives, including enhancing resilience, promoting sustainable urban development, safeguarding coastal ecosystems, strengthening governance and collaboration, and improving disaster preparedness and response. To achieve these objectives, the report proposes specific recommendations in five major areas: building resilient infrastructure, implementing climate change adaptation measures, promoting sustainable urban development, strengthening governance and collaboration along with community participation, and enhancing disaster preparedness and response.

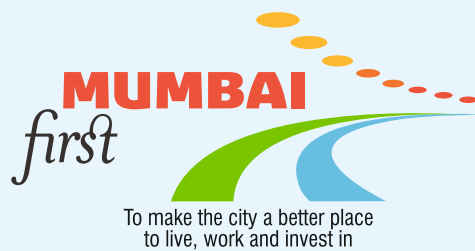


Implementation strategies are outlined to ensure the effective execution of the recommended policies. These strategies include integrated coastal zone management, public-private partnerships, capacity building, and knowledge exchange, financial support and investment, and monitoring, evaluation, and reporting. By adopting these strategies, governments can foster collaboration, mobilize resources, empower stakeholders, secure funding, and track progress.

Collaboration among government agencies, science and technology institutions, and communities is emphasized as essential for successfully implementing the recommendations and achieving resilient, sustainable, and prosperous coastal cities. By prioritizing these measures, coastal cities can navigate challenges, build resilience, and create sustainable environments for current and future generations.

## Conclusion

Enhancing the resilience and sustainability of global coastal cities is crucial to protect communities, ecosystems, and mitigating climate change impacts. This report provides key recommendations and strategies for creating resilient and sustainable coastal cities. By adopting these recommendations, cities can address challenges, incorporate climate considerations into urban planning, implement green infrastructure, and promote sustainable development. Integrated coastal zone management, public-private partnerships, capacity building, financial support, and monitoring are essential for effective implementation. Emphasizing disaster preparedness and response mechanisms will minimize the impact of natural hazards. Governments, stakeholders, and communities must collaborate to prioritize these measures. By doing so, coastal cities can navigate challenges, build resilience, and create sustainable environments for present and future generations.



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