# Focus Area: SUSTAINABLE DEVELOPMENT AND INFRASTRUCTURE
# Market Segment: COASTAL RESILIENCE

**OBJECTIVE:**
Enhance resilience of coastal communities, cities, infrastructure, or ecosystems to damage from natural hazards and climate change impacts through integrated solutions including nature-based, hybrid ("grey" and "green"), soft and environmentally-sensitive solutions

Score: 23

**Sample Investments:**

- ***Private:*** Use hybrid insurance-investment vehicles for reef and mangrove restoration, in collaboration with coastal resorts and local business
- ***Private:*** Protecting ports and urban centers by installing sea barriers, piers and docks made of composite green-grey materials
- ***Public/Private:***
- ***Public/Private:*** Improving early warning systems with new technology

1. **Relevance to ADB Healthy Ocean Action Plan:** ***(Score: High=3)***
    a. Impacts from the rapidly changing ocean will have significant consequences, with widespread implications for food security, coastal infrastructure and the lives and livelihoods of many millions of people. Over 60% of the world's population lives within 60km of a coastline, making coastal resilience planning essential to protect the majority of people. Those especially vulnerable are the coastal communities in developing countries and Small Island Developing States (SIDS) and other low-lying areas. Some marine assets - mangroves, reefs, wetlands - play a vital role in protecting coastlines from climate impacts.
    b. Insurance tools merge with financial structures to fund Blue Infrastructure, making this a strong sector under the Healthy Ocean Action Plan. For example, AXA XL is developing an Ocean Risk Index to quantify the fiscal risk of storm surge linked to sea level rise and degradation of marine ecosystems. The outputs of the index will highlight the impacts of critical ocean hazards on human livelihoods and activities through the use of regional/country comparisons.

2. **Positive Social Impacts?** ***(Score: High=3)***
    a. *Poverty:* Studies show that the poor are significantly more vulnerable to the impacts and losses caused by natural disasters. In DMCs, heavier storms, floods and rising seas multiply the natural vulnerability of the poor. Disaster relief programs are in place but, by definition, they come after the storm. Our focus for investment and risk management must be primarily on preventative measures to protect communities and coastlines. Also, major storms get attention but the detrimental impacts of smaller but repeated disasters trigger migration and other tragic and disruptive responses.

b. *Gender:* Women and girls play important roles in the businesses and households of coastal communities. They have less ownership and often less voice in decision-making. But studies show they bear a disproportionate share of the negative impacts of ocean disasters. Not only engaging with women but creating opportunities for them as we develop resilient coastlines is very important, in both rural and urban communities.
c. *Health/Covid19:* We repeat the analysis made under the Ecosystem Management sector: Now is the time to strengthen not relax coastal resilience. Health impacts from natural disasters are notorious for multiplying the physical losses incurred by communities. For example, as the Philippine government warned its people: “Typhoons and heavy rains may cause flooding which, in turn, can potentially increase the transmission of communicable diseases. These include water-borne diseases (e.g., typhoid fever, cholera, leptospirosis, and hepatitis A); and vector-borne diseases (e.g., malaria, dengue).” Taking an infrastructure approach to coastal resilience acknowledges this connection to public health infrastructure.

**3. Positive Environmental Impacts? *(Score: Medium=2)***

a. When coastal protections are done with green and composite green-grey materials, environmental impacts are highly positive. Stopping erosion protects both the land and marine environments. NatureVest states “Natural solutions can reduce flooding and damages from storms, and we should be proactively restoring and protecting coastal habitats and green spaces to reduce flooding.” These solutions include restoring mangroves, wetlands and barrier reefs. For example, oyster breakwater reefs promote adjacent mudflat stability and salt marsh growth in a monsoon dominated subtropical coast (see Bangladesh case study in *Blue Natural Capital Finance, p21)*
b. Traditional grey coastal infrastructure may cause a variety of negative impacts (see Appendix, Figure 1). When grey materials are installed or degrade, externalities hit local communities, businesses, land and marine ecosystems. Much has been invested in concrete and metal structures that degrade rather than grow vegetation or use installation guidelines that are adapted to the marine environment. Green and composite materials are often a better or complementary choice. Likewise, it is paramount to reduce or eliminate negative impacts on Blue Natural Capital (BNC) from new or refurbished roads, rail- and waterways, ports and docking stations. Environmental assessments and ongoing monitoring of coastal defenses are needed to improve decisions and evaluate projects.

**4. Potential for Market Scalability? *(Score: High=3)***

a. The recent report, Blue Infrastructure Finance, notes that an estimated $94TR is needed for infrastructure between 2020-2040. Analysts suggest this amount could be reduced by an early emphasis on integrated blue infrastructure, which provides cost-efficient climate resilience. The concentration of population centers near coastlines mean that blue infrastructure has a front-line role to play in defending urban centers. Also, ports are hubs for trade and development. Elevating and protecting ports (to be discussed later in this section) is part of the scalability story.

b. Around 70% of global greenhouse gas emissions come from carbon-intensive infrastructure. Blue infrastructure integrates other needs that are not anticipated by built infrastructure, like reducing pollution and waste, generating clean power and business opportunities. Coastal tourism infrastructure is highly exposed to climate risk. Tourists expect not only to be safe but, increasingly, to see nature without pollution and development stress - making this sector a priority for blue infrastructure projects.

5. **Capacity for Innovation and Growth?** ***(Score: High=3)***
   a. Our positive review of SME opportunities and market scalability underscores the capacity of this sector for innovation and growth. A combination of science and industry initiatives drive Asian maritime hubs and accelerators that foster innovation. Coastal resilience is a high priority for these innovation centers.
   b. Natural Capital Accounting (NCA) supports the function of data collection and monitoring that is essential for innovation and growth. NCA measures and values the stock of renewable and non-renewable natural capital assets that combine to yield a flow of benefits to people. Blue Natural Capital focuses on the wealth of ecosystem services – including air, food, water, energy, shelter, medicine, as well as crucial climate change mitigation, adaptation and resilience benefits – provided by coastal and marine habitats.

6. **Benefit from Regional Governance Frameworks?** ***(Score: High=3)***
   a. Storms and sea level rise have no boundaries, especially in tropical regions where typhoons cut across nations and regions. Coordination is needed among governments on many levels for effective resilient coastal infrastructure:
      i. Long-term Finance of blue infrastructure
      ii. Insurance (like PCRAFI and PICAP)
      iii. Funding & Projects for Blue Carbon Credit Markets
      iv. Science & Engineering for storm/sea protections
      v. Regulation & monitoring of industries that degrade coastlines
      vi. Support for SMEs with resilient infrastructure contributions
   b. Early warning systems, response and reconstruction teams and technologies require regional collaboration. Islands and poor communities are often cut off and decimated by typhoons, tsunamis and other natural disasters. Developing and managing these systems in times of crisis is beyond the capacity of most single nations.

7. **Opportunities for SMEs?** ***(Score: High=3)***
   a. SME opportunities include:
      i. Adapting traditional engineering solutions, like concrete and steel barriers, with natural materials to provide more effective and affordable coastal defenses.
      ii. Local production of artificial reefs and seawalls, using composite materials that grow vegetation (see products like Econcrete)
      iii. Synergistic enterprises in tourism, marine energy, waste management, water treatment, aquaculture, data/communications, health care

iv. Servicing coastal and blue infra projects with local materials and know-how based on the local environment

b. Whilst infrastructure is often a sector dominated by large enterprises, the niche or emerging character of blue infrastructure lends itself particularly well to SMEs with local expertise. Also, island and rural communities - for whom coastal resilience is an existential priority - do not offer the scale of opportunity required by most large enterprises. So DMCs are, as a whole, fertile ground for supporting SME development on the natural coastal resilience theme.

**8. Attract Private Investment? *(Score: High=3)***

a. There is a need for risk models that quantify the probability of fiscal and economic impacts resulting from the loss of coastal natural capital. Such ecosystem risk models would have the potential to help develop new markets for insurance and micro-insurance, thus helping to close the protection gap. This is the context for AXA XL's Ocean Risk Index, mentioned under (1.b).

b. Blue Infrastructure is a highly scalable asset class, although we are at the early stages of development. For example, ORRAA is working to scale Blue Carbon Resilience Credit Projects in developing countries. This will help drive private finance into a new blue carbon and resilience credit market, creating opportunities for communities (especially women and girls) in developing countries.

## REFERENCES

*Why Resilience Matters: Poverty Impacts of Disasters*. Jun Rentschler, The World Bank.
*Blue Infrastructure Finance*. Blue Natural Capital Finance Facility, IUCN. March 2020
*Ocean Risk and Resilience Action Alliance (ORRAA)*. AXA XL and Ocean Unite.
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*Health Impacts from Typhoons and Heavy Rains*. Government of Philippines.
*Natural Solutions to Coastal Protection*. The Nature Conservancy

## APPENDIX

Figure 1: Negative Impacts from Traditional Coastal Infrastructure

## Graph 1. Coastal infrastructure without NbS