

COASTAL RESILIENCY APPROACHES

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INTRODUCTION

Our environment has been experiencing changes in climate patterns in ways that were not anticipated by past designs. Coastal engineers are increasing at the center of complex multidisciplinary projects. With changing climate, rising sea levels, and growing coastal population centers, coastal engineers are key players in developing solutions for both built infrastructure and natural systems. The presentation will discuss the challenges to coastal engineering and examine some coastal resiliency approaches on recent projects and experiences in the United States.

COASTAL RESILIENCY

Designing to a single design event is becoming increasingly difficult as sea levels rise, and coastal drivers change. The notion of resiliency and adaptation are increasing becoming a key element of coastal planning and design. Resiliency is broadly defined as the ability of a natural or built system to recover from an extreme load or event. Such solutions require multidisciplinary collaboration (Figure 1) and multilayered approaches to coastal protection.



Figure 1 - Multidisciplinary Nature of Coastal Resiliency

PROJECTS IN PRACTICE

Examining some recent projects in the United States reveals a wide range and scale of potential approaches. Projects born from recent disasters are not just rebuilding but rethinking design. Post Hurricane Sandy, which inflicted significant coastal flooding and damage to major population centers along the northeast Atlantic coast of the United States including New York City, have resulted in creative thinking about resilient planning and design. Design contests such as Rebuild by Design sponsored by the United States government and the Rockefeller Foundation resulted in numerous innovative

projects that integrate coastal protection solutions within the urban environment. Examples include New York currently building large coastal resiliency projects around the tip of Manhattan Island, off the shore of Staten Island, and working with individual businesses to improve resiliency on a building scale. The Living Breakwater Project (Tschirky, 2018) is an example of combining risk reduction through wave attenuation and erosion prevention with ecological enhancement. The project uses breakwaters to create habitat and increase diversity while at the same time promoting community resilience through improved shoreline access and education. Communities from California to Florida are addressing the interaction of groundwater, stormwater, and storms on coastal flooding risk. National Estuary programs are including living shorelines, and coastal models as part of watershed management plans along coastal areas. Industrial facilities are addressing risks of release during hurricanes and loss of function of closure caps on waste management areas under rising sea levels. This presentation will discuss these projects and the variety coastal engineering measures used to improve resiliency.

ADAPTATION FOR THE FUTURE

Coastal engineers must improve quantification and understanding of hazards by climate change, sea level rise, assess risks, and better design for resiliency (Figure 2). Static design is no longer enough in the face of uncertainties and coastal engineers and the public will have to accept the necessity of adaptation. While we do not have to build for all future possible events today, we should plan for and leave room for adaptive strategies.



Figure 2 - Addressing Coastal Risks

REFERENCES

Tschirky, Brashear, Sella, and Manson (2018): Living Breakwaters - Designing for Resiliency, 36th International Conference on Coastal Engineering, Baltimore, Maryland - Presentation.