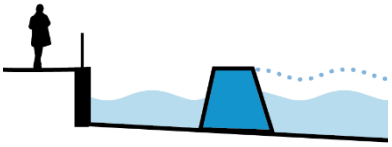
Measure Profile

Artificial Reef

Flood Adaptation Measure

PHYSICAL INFRASTRUCTURE



SHORELINE LOCATION:

In Water

An artificial reef submerged in between the Posidonia oceanica bed - Larvotto Marine Reserve, Monaco ©Avalon/Photoshot License / Alamy Stock Photo

DESIGN LIFE	ADAPTABILITY	IMPACT ON THE WATERFRONT	CONSTRUCTION COST
Unknown	Medium	Living with Water	TBD

COASTAL FLOOD HAZARDS MITIGATED:

Sea Level Rise | Storm Surge | Groundwater | Waves | Erosion

MEASURES COMPATIBILITY:

Flood	Seismic
All	All

ECOSYSTEM SERVICES: Measure may affect these shoreline values

Aquatic Habitat	Terrestrial Habitat	Water Quality	Carbon Storage
↑	—	↑	—

DESCRIPTION:

Artificial reefs and submerged breakwaters are detached structures typically with their crests at mean sea level or completely below the water surface. They serve to attenuate wave energy by partially reflecting the waves at the toe, triggering wave breaking as the wave passes over and through dissipation related to wave induced flows through the porous structure. Artificial reefs designed for coastal protection can be designed with stone, geotubes, bags of oysters or pre-constructed reef units that can be designed to provide shelter and serve as nursery areas for fish. Artificial reefs can also serve as ecological enhancements to other measures.

CONSIDERATIONS:

- Artificial reefs become less effective in attenuating waves as the water level increases and therefore will be less effective

ADVANTAGES:

- Can reduce coastal storm damage.
- Low visual impact.
- Less expensive than a taller emergent breakwater.

DISADVANTAGES:

- Limited wave attenuation, particularly for extreme water levels.
- Submerged structures can be a hazard to water users.

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during high tides and storms that are likely to cause flooding.	• Provide habitat for rock dwelling flora and fauna and fish similar to natural reefs.	

CONSTRUCTION IMPACTS TO THE PUBLIC:	SEA LEVEL RISE ADAPTATION OPPORTUNITIES:	CASE STUDIES:
• Minimal impact to waterfront uses as construction occurs in the water.	• Performance of a submerged reef or breakwater decreases with increased water levels. • Adaptation to increased water levels would require raising the crest of the reef or breakwater in order to achieve a similar performance.	• None cited

DESIGN OPPORTUNITIES:

Ecological Enhancements	Urban Design	Form
• Provides surfaces that promote growth of rock-dwelling flora and fauna. • Voids provide habitat for various aquatic species.	• TBD	• TBD

DESIGN CONSIDERATIONS:

- Structure must be sized to remain stable under extreme wave conditions.
- Design must account for geotechnical stability and foundation settlement.
- Crest elevation should be set to target desired wave conditions at the project site for various water levels.
- Should consider the effect of changes in sediment transport patterns on adjacent shorelines.

SITE-SPECIFIC CONSIDERATIONS:

- Water levels, waves, currents, propeller wash from ship activity should be well defined.
- Geotechnical investigations should be performed to determine potential for settlement and global stability failure.

INSTALLATION AND CONSTRUCTABILITY CONSIDERATIONS:

- Offshore construction of submerged breakwaters in moderately deep water would be performed from a barge by a competent marine contractor.
- Stone used for rubble mound structures would be delivered to the site either by truck or by barge. An adequate staging area would be required for the quantities of stone required by the structure. This would require a large staging area landside or use of barges.
- Artificial reefs constructed in shallow intertidal areas using oyster bags or pre-constructed reef units can be constructed from land shore for shallow low energy areas.