Urban Shorelines Engineering

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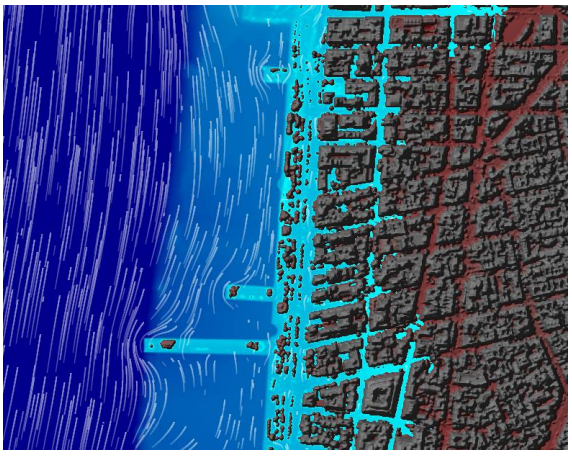
Overview

Urban Shorelines fundamentally redesign coastal infrastructure to improve city resilience, enhance biodiversity, support the blue economy, and improve social engagement with our waterfronts. We developed two- dimensional (2D) and Computational Fluid Dynamics (CFD) hydraulic models to analyze and inform the preliminary design for this new paradigm of a seawall.

2D Hydraulic Modeling

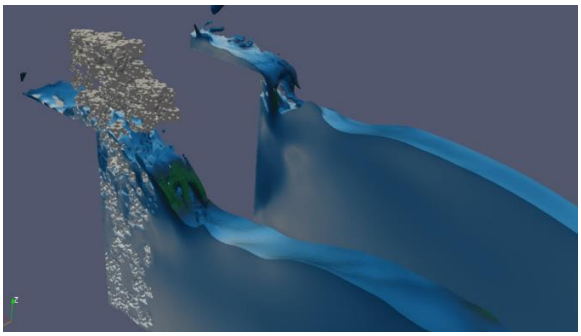
A 2D hydraulic model is being utilized to analyze the impact of river flows on the proposed seawall design on a large scale. A Series of hydraulic models representing different flow conditions will be used to identify how the proposed design can minimize the flood extent due to storm surge and sea-level rise.



A snapshot from the 2D HEC-RAS hydraulic model demonstrating a potential flood extent along the urban shorelines under a SLOSH Category 2 storm surge event

CFD Modeling

CFD modeling is utilized to represent a “smaller scale" model of the proposed sea wall geometry. This model is being used to analyze the water movement and velocities through the proposed seawall geometry as well as to understand how it can help to attenuate the wave action. The CFD modeling results will also help us to understand the structural integrity of the proposed seawall and how this will enable biological habitats.



A snapshot from CFD Modeling simulations demonstrating a comparison of the wave action at a vertical wall and one of the proposed architectural morphologies

Cost-Benefit Analysis

To determine the feasibility of this new seawall, we conducted a Cost-Benefit Analysis to capture the shift in using novel material and construction methods (3D concrete fabrication), but also the benefits gained. It is imperative to understand the anticipated benefits in comparison to the use of conventional materials and construction methods. The analyzed benefits include the overall coastal resilience, waste and carbon savings, improvement of natural habitat and biodiversity, and social engagement.