ARCHITECTURAL STRATEGIES FOR THE DEFENSE AGAINST TSUNAMI RISK AT YAIZU CITY IN JAPAN

EPFL ENAC ARCHITECTURE PDM17
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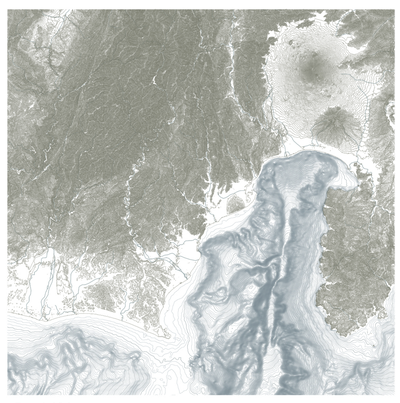
The project addresses major problematics linked to the city of Yaizu, which faces the pressing need for enhanced defense measure against tsunami, the declining local population and industry, and the redevelopment of the fish port. The following four major themes represent the overall conceptual development of the project:

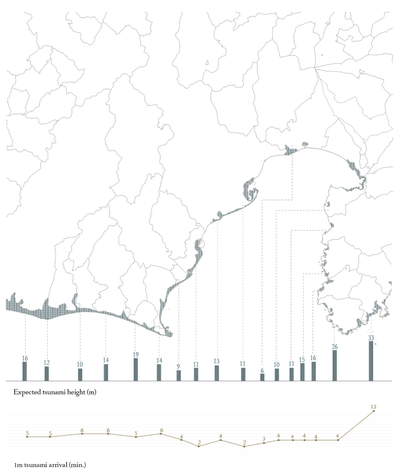
1_TERRITORY
2_DEFENSE & URBAN
3_ACTIVATION
4_ON WATER

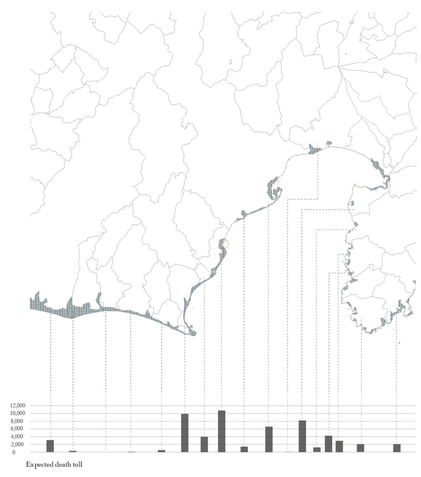
Image: Project panorama



Topography & Bathymetry

Urban system & tsunami risk area





Cartographic study of Tsunami risk area

TERRITORY
Tsunami risk & Landscape richness

The city of Yaizu is located along the coastal region within the Suruga Bay. This particular location highlights the rich landscape potential with the symbolic presence of Mt. Fuji (3776m) in the background and the serenity of its ocean. Thanks to the particular bathymetric character of the bay, which is the deepest in Japan (> 2500m depth), the city has flourished with the coastal fishery in the history. Thusly, the relationship with the ocean/mountain landscape as well as fishing industry constitute the essential backbone for the city.
However, this rich topographic character of the Bay at the same time poses the great risk for tsunami. Due to the proximity of the tectonic plates' boundary within the Bay, the tsunami is expected to arrive within few minitues and that would result in the large death toll as predicted by the government in the event of the forthcoming Tonankai Great Earthquake. Furthermore, since the city's core industry is fishing and therefore cannot "close" the port with the wall, the sensible defense system has to be thought out. The interface between ocean and the city in this context should not be like the outside and inside of a fortress, but instead like an ambiguous transition space where the elements of landscape, industry and the city life should be harmoniously merged.

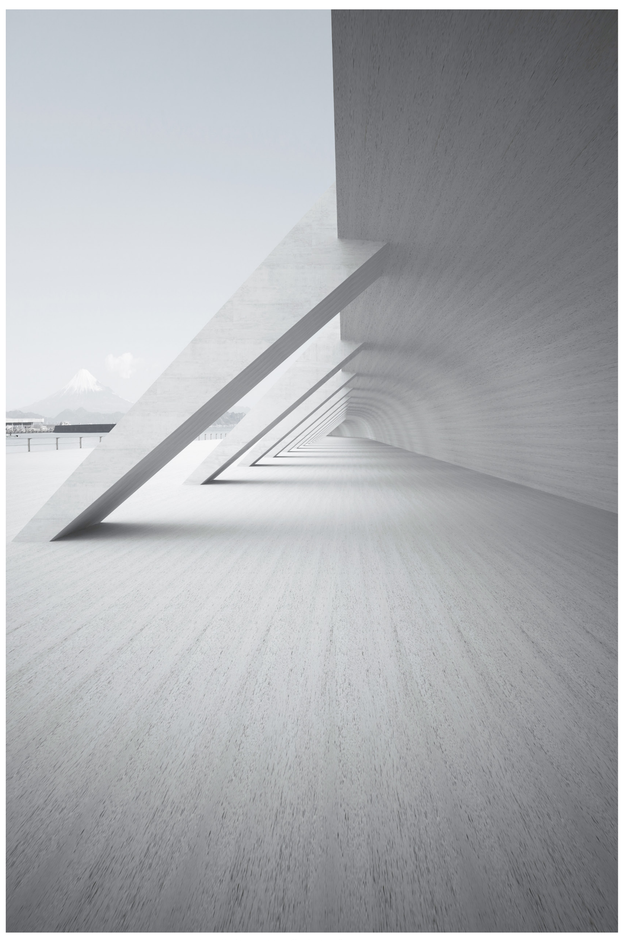


Image: Height augmentation of breakwater wall

Image: Pine forest and beach behind the wall

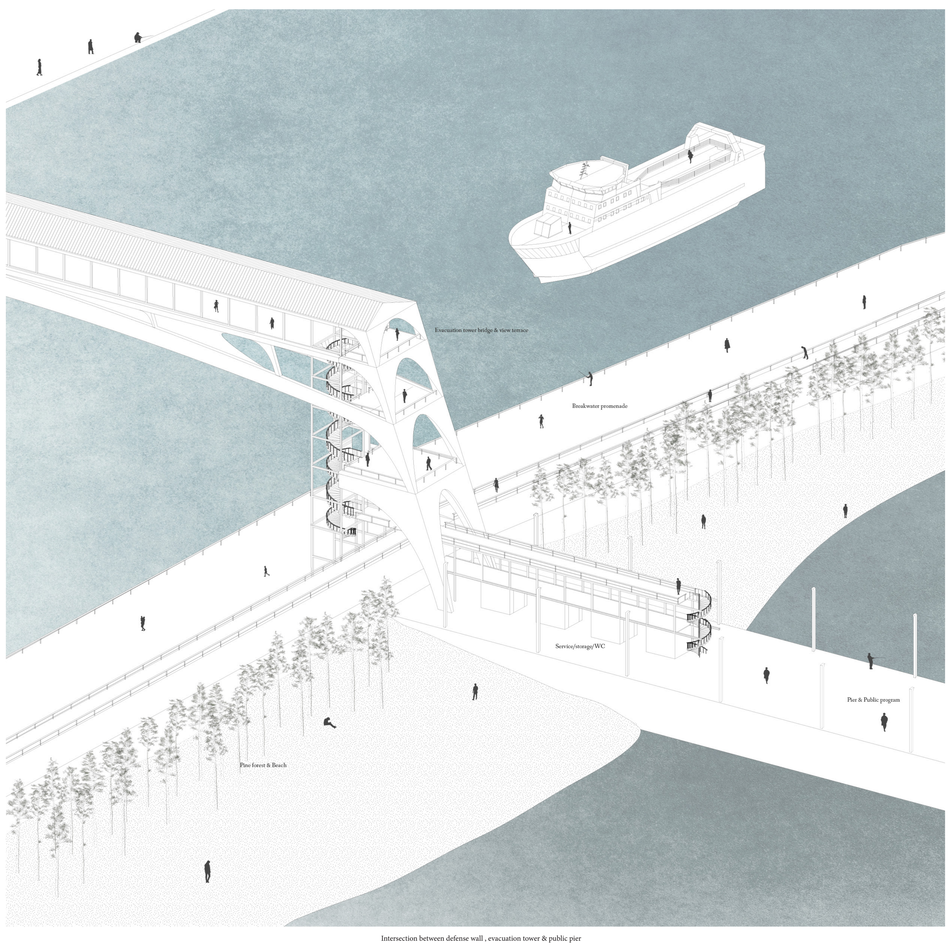
Section: Existing breakwater (top) and new proposal (bottom)

DEFENSE & URBAN
Gradational protection & Duality of space

To tackle the defense needs against expected tsunami, the project proposes both the infrastructural and urbanistic strategies. For the infrastructure, the existing breakwater (7m), which is currently 4meters lower than the expected maximum tsunami height (11m) in the region, is redesigned to provide sufficient height. The base material for this new intervention comes from the excavated soil from the site since there is the necessity to deepen the port. The upper part works as a shell which is supported by the prefabricated buttresses. Formally, this structure intends to express the resistance force against the tsunami, providing a half-covered space which could be used for any spontaneous activities such as weekly market.
As for the urbanistic concept, the Masterplan works in the principle of gradation where multiple layers of tsunami defense structures (breakwater, forest, inner city wall) are accompanied by industrial (aqcuaculture)or leisure activities. The plan is inspired by "fish spine" which draws reminiscence to the city's local identity as "fish town". Each spine, in the form of pier accompanied by evacuation towers, is placed according to the access point from the city and provides public program such as sea food restaurant and marine leisure activities.

Image: Evacuation tower bridge & breakwater

Image: Promenae on the breakwater



Intersection between defense wall , evacuation tower & public pier

ACTIVATION
Intersecting infrastructure/wall-tower-pier

To activate the new "spines", the intersections between 3 infrastructures (wall/evacuation tower/pier) are defined in order to achieve the architectural integrity of these new interventions. The defensive structure takes reference to historic fortress in Japan where horizontal solid wall makes a defined contrast with vertical light weight tower called "Yagura". The evacuation tower refers both to arch-buttress concrete wall and industrial Yagura (mine tower) in order to harmonize with the wall design and to fit in with the industrial character of the port. One of the evacuation tower in the center serves as a bridge which connect the inner port to the new waterfront public space. This placement of the bridge emphasizes the new "center" of the port which initially worked as two distinct ports on the north and south side. The breakwater wall is accessible as a long-strip promenade which gives the view to the Mt. Fuji, Suruga Bay through the pine trees and inner port. At the intersection with the wall and the evacuation tower, people have an access to the pier where the public amenity program (sport/leisure) and service program (WC/storage etc) are available.

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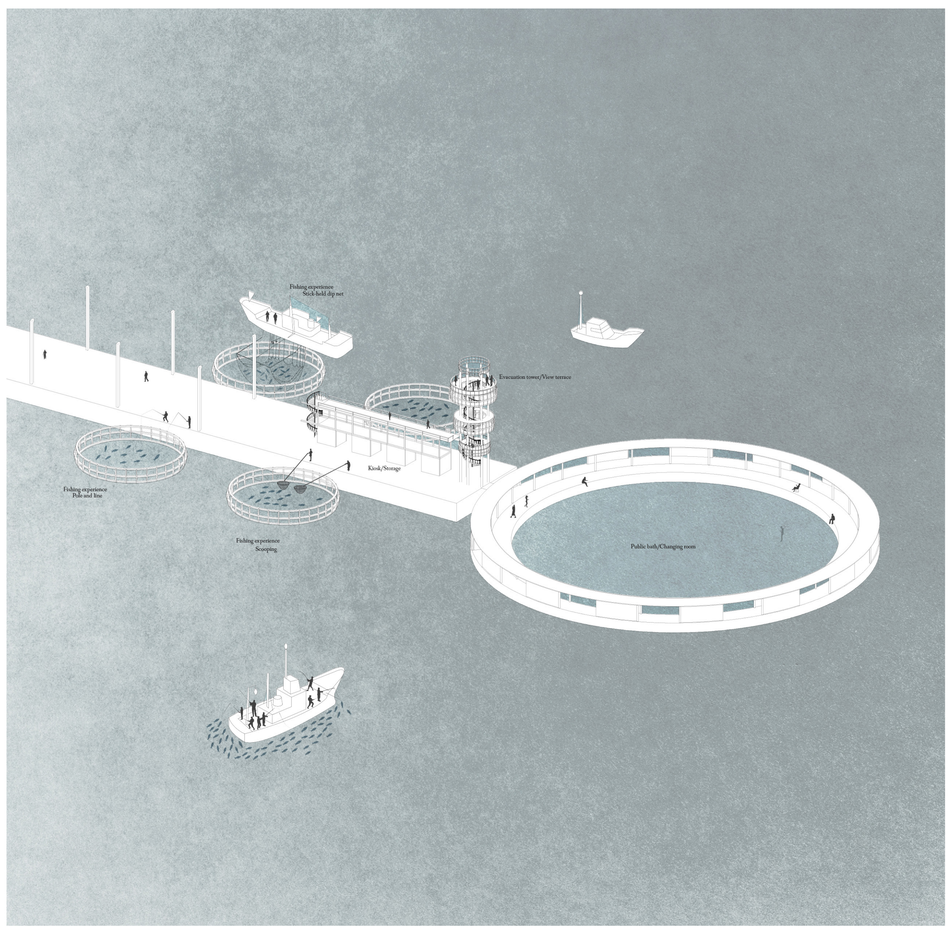
Image: Promenae on the breakwater

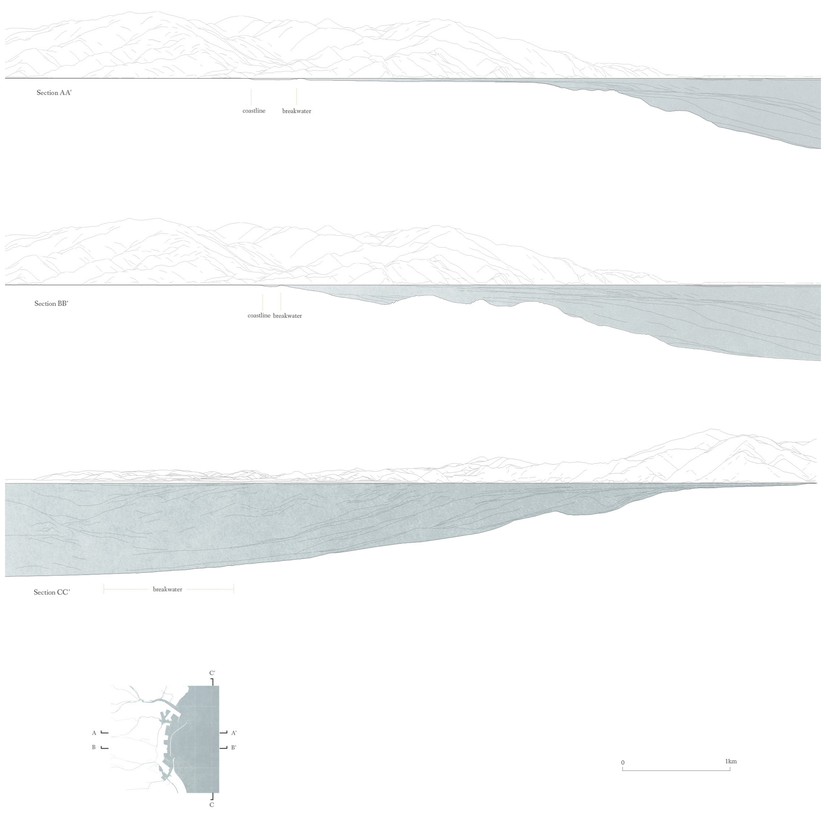


Intersection between defense wall , evacuation tower & public pier

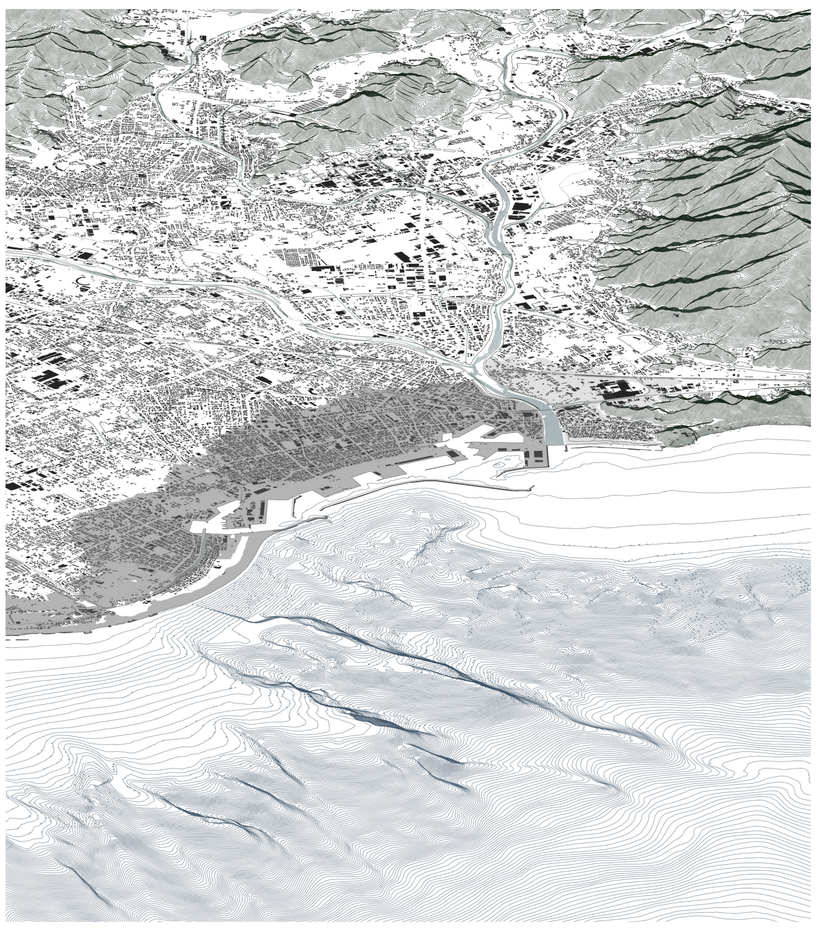
ON WATER
public/industrial programs on water

On the three piers, different activities are placed to invigorate the new waterfront public space. On the central pier connected to the bridge, there are some fishing facilities with which people can experience some of the fishign techniques. At the tip of the pier, there is a public bath where children can also swim in safety. Other two piers are oriented for the marine leisure activities such as boat, yacht, kayak, canoe or diving. Thanks to the newly added detached breakwaters offshore, people can enjoy those marine activities without wild waves. The evacuation tower on the pier refers to the circular aquaculture structure on the water, giving the industrial character to this public pier.
Through these interventions, the project aims to achieve the the site specific defense strategy where societal and territorial resilience against natural hazards constitutes a crucial pillar for the long-term urban development. Instead of hiding behind the fear of tsunami risk, the new potential of public waterfront was investigated where defesnse system, landscape elements, and people's activities could function in a reciprocal way.

Cartography: Predicted Tsunami inundation area in Suruga Bay

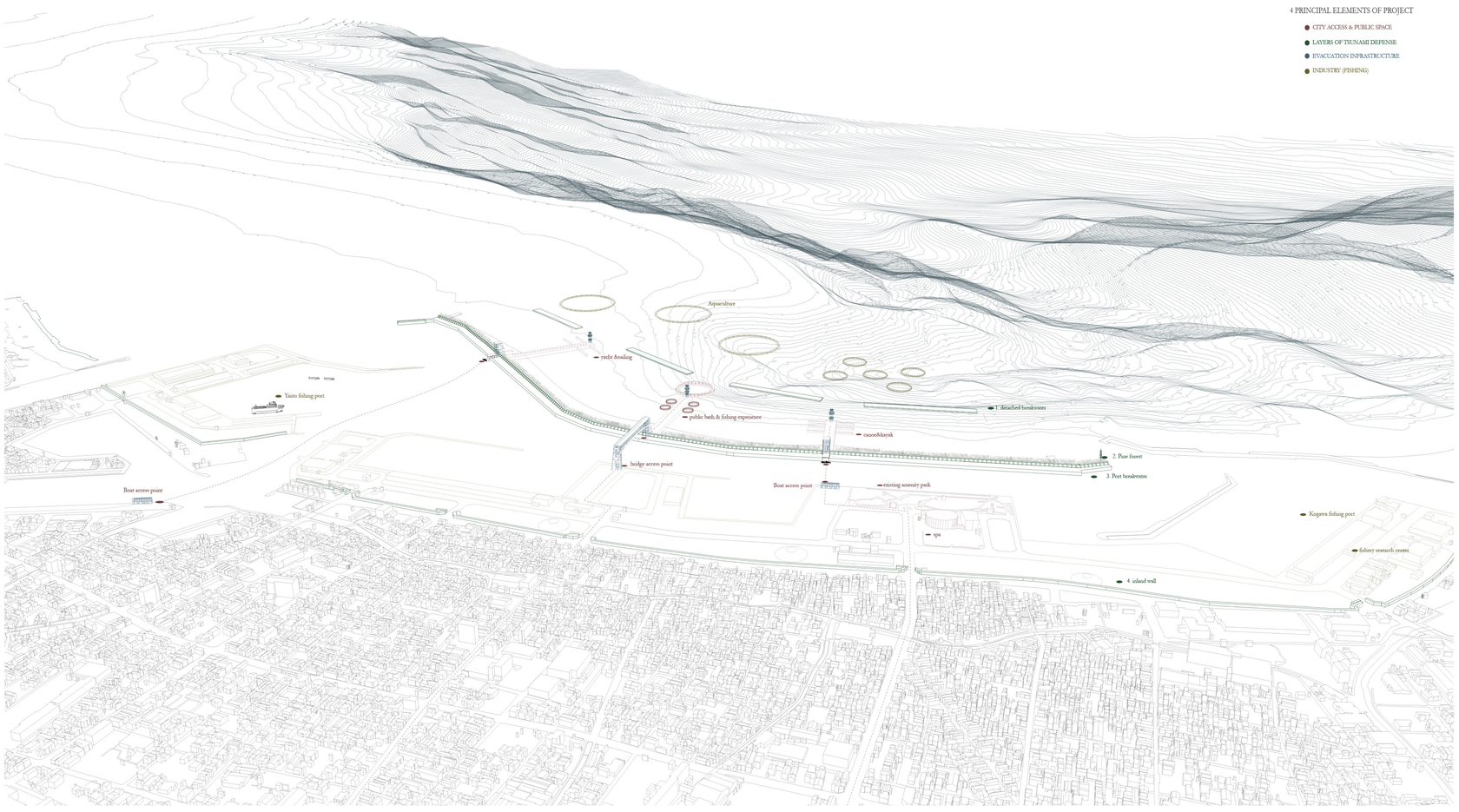


Section: topographic character of Yaizu city

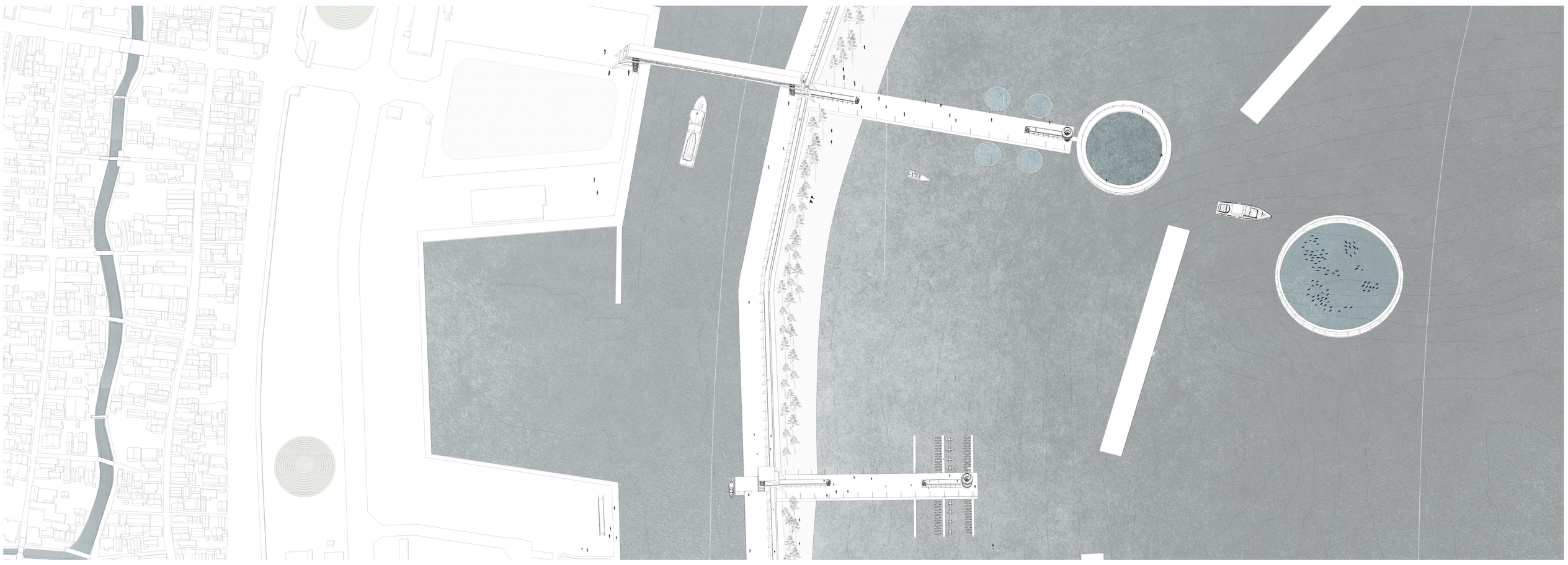
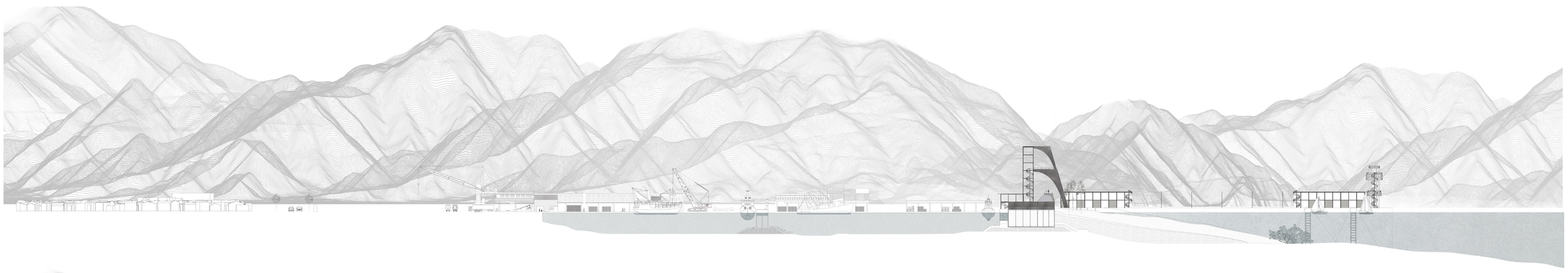
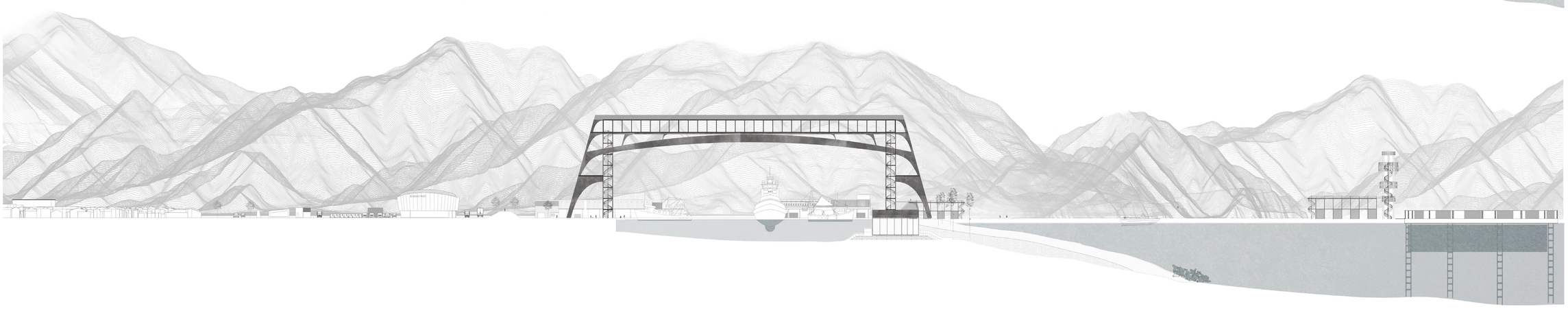


Topography, urban settlement & Tsunami risk areas

Project Master Plan/ Scale 1:10000



Master plan stragety diagram (4 elements)



Plan axonometric view of the project (from city to the ocean)