

# Intercellular

Conceptual Design of Hernesaari



Country / City Finland, Helsinki  
University / School Aalto University - School of Arts, Design and Architecture  
Academic year 2019-2020  
Title of the project Intercellular-Conceptual Design of Hernesaari  
Authors Jiaqi Wang, Xin Ding, Pirita Meskanen

## TECHNICAL DOSSIER

Title of the project	Intercellular-Conceptual Design of Hernesaari
Authors	Jiaqi Wang, Xin Ding, Pirita Meskanen
Title of the course	Computational Territories, Design of Structures
Academic year	2019-2020
Teaching Staff	Prof.Pia Fricker, Prof.Toni Kotnik, Luka Piškorec, Kane Borg
Department/Section/Program of belonging	Department of Architecture, Master's Programme in Landscape Architecture
University/School	Aalto University - School of Arts, Design and Architecture



### Written statement, short description of the project in English, no more than 250 words

Hernesaari, a former industrial area, located in the southernmost part of the downtown area of Helsinki (Finland), served as a test case for the speculative computational design studio. The project "Intercellular", proposes a future-oriented way of designing responsive urban landscapes through the understanding and integration of natural patterns as design driver. In order to create responsive urban strategies, the project avoids conventional zoning methods and applies computational design methods for mixing form and functions into a new spatial configuration.

The zoning of the site is controlled by a cellular system, using both the history, the present and a speculative future situation as visionary input parameters. Applying this method, a highly flexible land system is generated to realize multi-purpose functions, merging environmental aspects with a future-oriented urban strategy. The topography of the articulated ground condition is automatically generated and influenced by environmental factors like rain, wind and sun direction. Through this method the runoff water is purified in responsive water catchment areas, which as well interact as a mediator for different seawater levels. A systemic interplay of people, natural elements and buildings is generated as a logic consequence of the computational model and allows for change and adaption.

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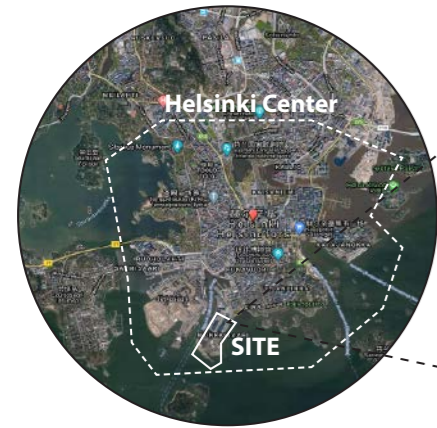
# CLIMATE CHANGE AGAIN

11th International Biennial Landscape Barcelona

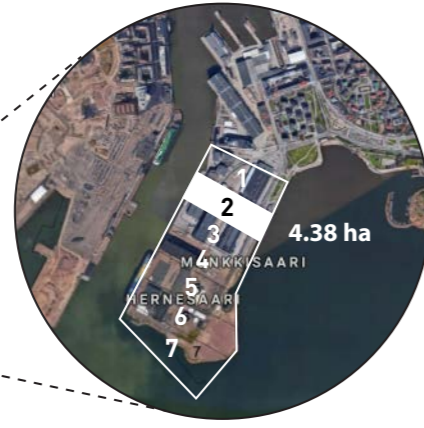
Barcelona September 2020  
SCHOOL PRIZE

# Location

Geographical location



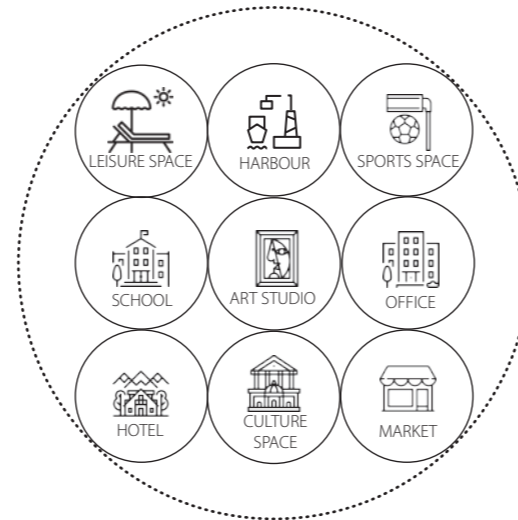
Area of design speculation



# Novel Methods for Landscape and Urban Planning



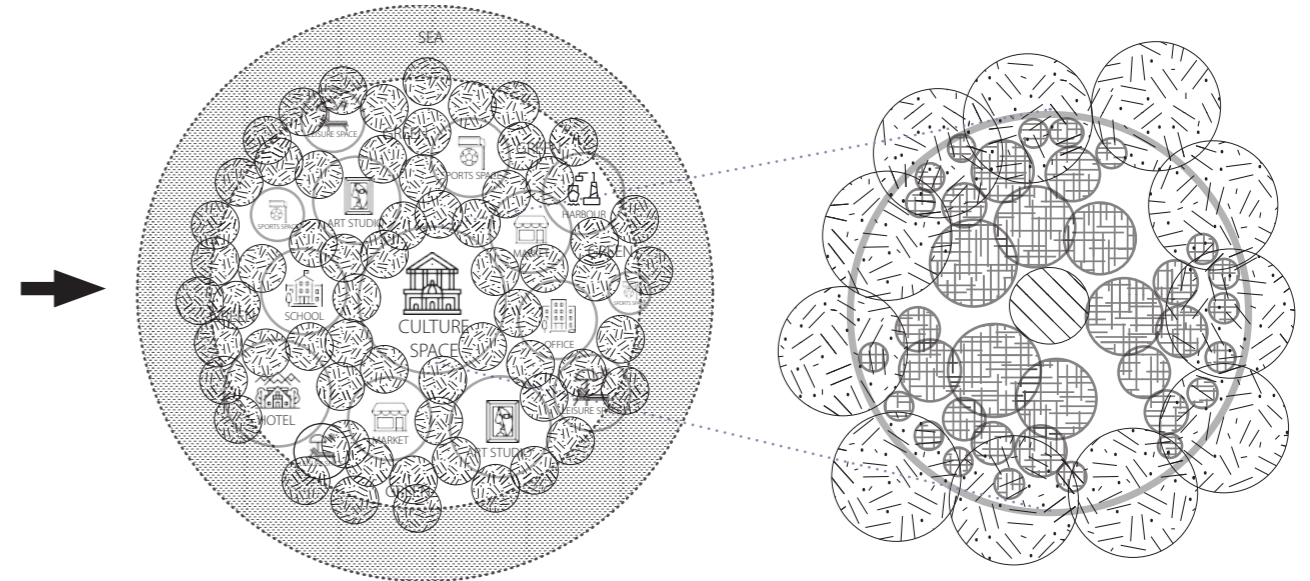
Conventional planning method - Land zoning



**Separation:**  
Each zone has clear boundary without buffer space.

**Isolation:**  
The area is divided into big zones, each with its own behavior.

New planning method - cellular land-use system



**Interaction:**  
The area is subdivided into a sequence of cells, articulated through their specific character. The border of the cells are permeable and allows interaction.

**Connection:**  
Each cell has spatial territory, separated by green area. Green area acts as buffer zone, merging into surrounding cells.

**Central space:**  
The arrangement of the built environment articulates a central open space of the new urban fabric.

**Interrelation:**  
The flow of functions and environmental conditions supports a natural exchange of the built and the green and blue elements.

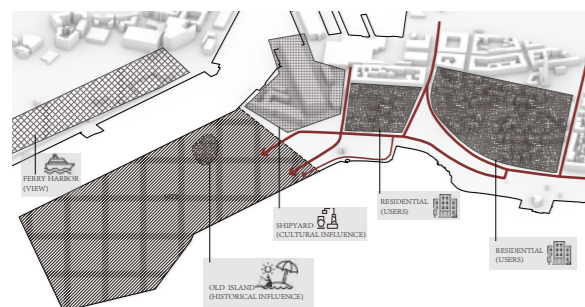
# Concept

Do everything possible to enrich the cultures and sub-cultures of the city, by breaking the city, as far as possible, into a vast mosaic of small and different subcultures, each with its own spatial territory, and each with the power to create its own distinct life style.

—A Pattern Language, Christopher Alexander

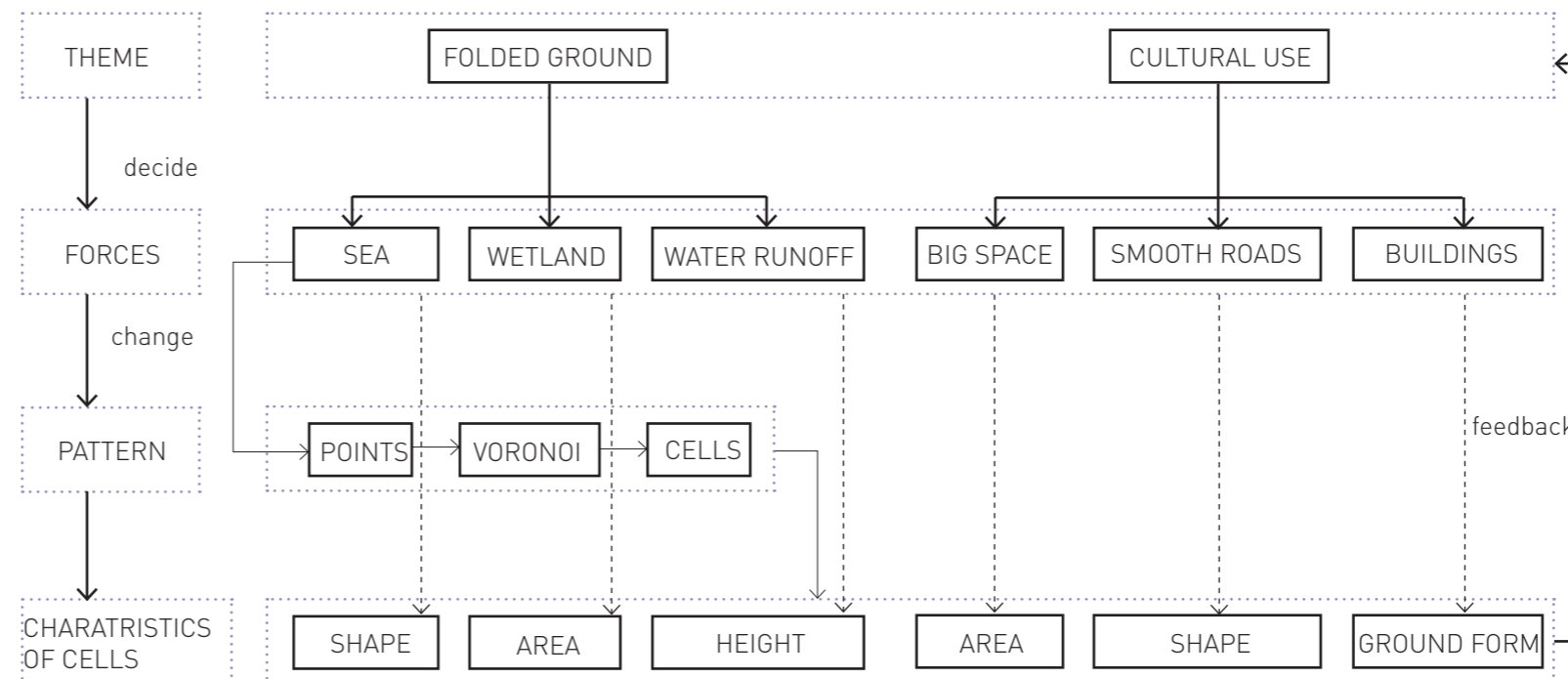


**Articulated ground:**  
The articulated ground condition is the fundamental part of the design concept. The terrain and the built elements are part of a computational design thinking stimulated by the flow of wind, water and people.



**Functions:**  
The new design emphasizes an introduction of cultural elements for the area. Culture is understood as a connection between the identities of the past and expands as well to the integrates of environmental aspects. This allows for a sustainable mixing strategy, keeping the connection to the traces of the area.

# Computational Design Mechanism



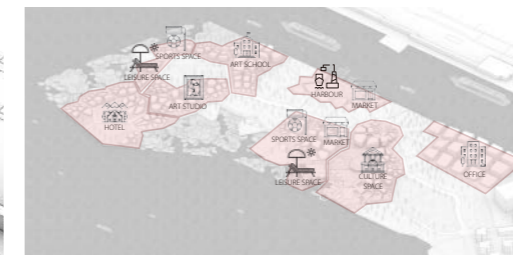


# Design Proposal



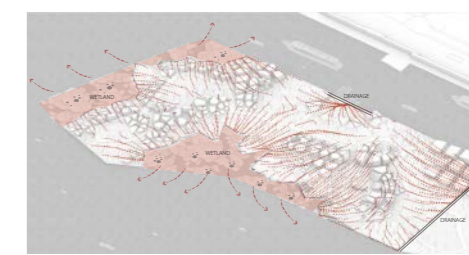
Zoom-in area

# Behaviour



Distribution of functions

Eight different functional zones that are defined according to the spatial character are distributed according to their character by the computational system.



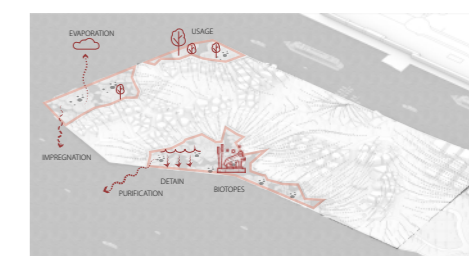
Water purification

Urban runoff flows are directed to the wetlands for purification. Wetland areas work as a buffer zone between the sea and the built environment.



Road system

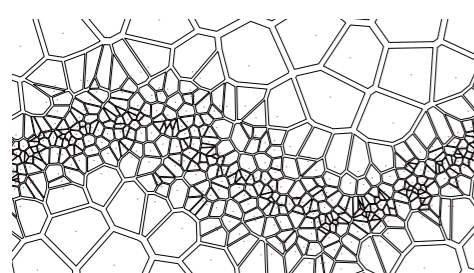
The main road connects functional cells. Cycling roads have good view. Roads between functional cells are secondary roads while others work as pedestrian roads and water streams.



Wetland functions

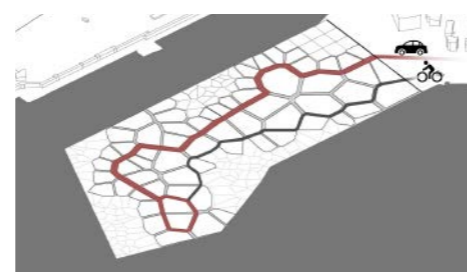
Water detention in the wetlands allows evaporation, impregnation, and creates new biotopes supporting an increased ecosystem.

# Method



Voronoi system

The zoning of the site is controlled by a cellular system. The distribution pattern is developed by applying a voronoi algorithm and by manipulating the position and density of the points according to the environmental conditions.



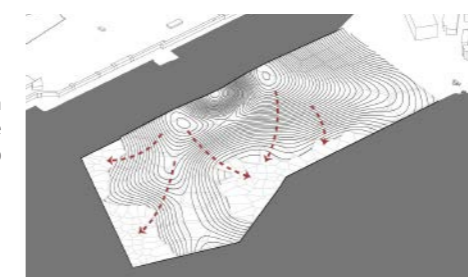
Optimization of connections

Each cell is automatically connected to a network of roads, paths and streams. Size of the network can be adjusted according to functional changes.



Urban flow

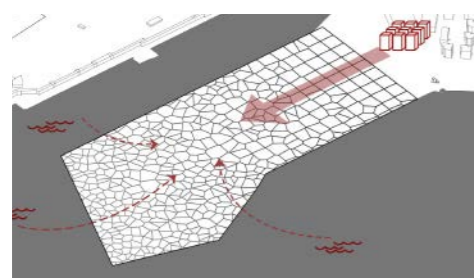
According to the spatial and functional conditions, cells are merged. This creates a sequence of public, semi-public and more private areas articulated through size and height, as well as through materialization.



Terrain modelling

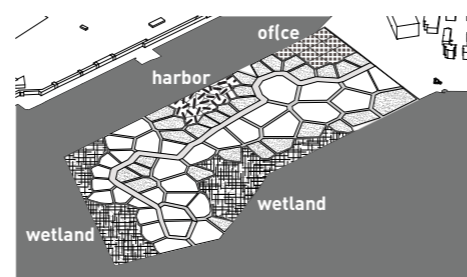
The topography is automatically generated by tilting each cell towards the wetland cells in order to let urban runoff flow to the wetlands for purification and leisure activity.

# Process



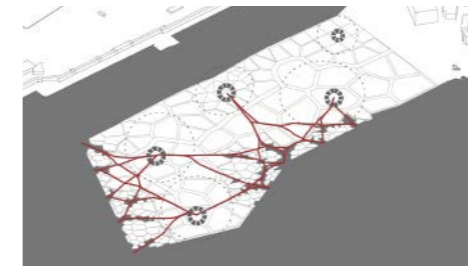
Form variation

The cell size and form is influenced by local factors. Closer to the city grid, it is more regular. Closer to the shoreline the voronoi pattern is more irregular, as it is influenced by the wind and the water.



Land zoning

To fulfill the functional purpose and to enhance the interaction with the environment, the smallest cells at the waterfront are merged into wetland zones, a harbor zone and a mediator zone with the city grid. Medium sized cells are green/blue zones which form a continuous green connection corridor.



Flow of water

Water, a central element of the design, flows into the wetlands from different directions. During winter time, these areas are used as ecological snow damp systems. The visual presence of the water, creates a new awareness of the ecological challenges.



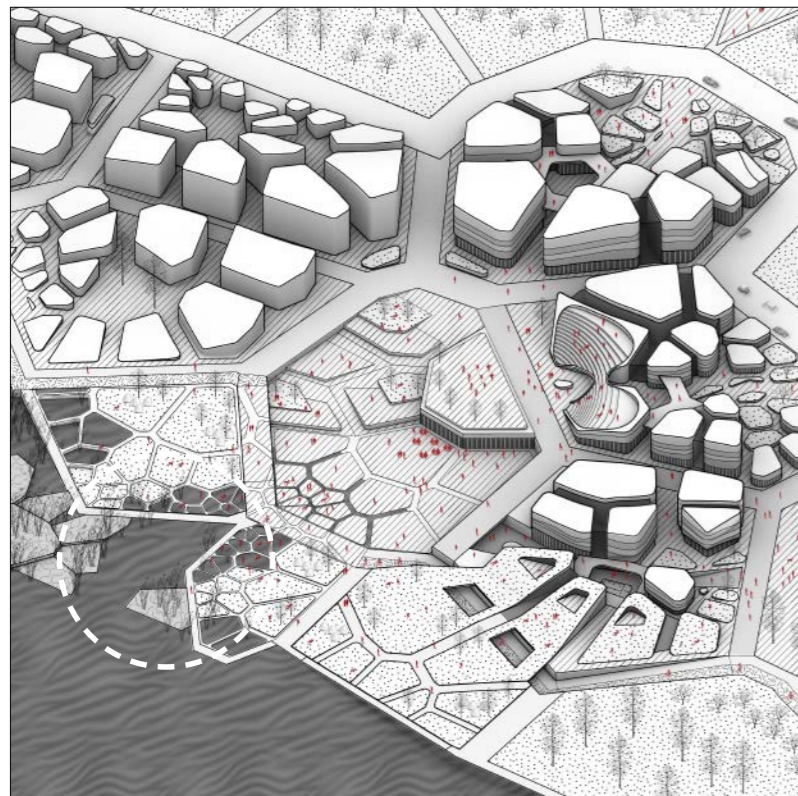
Responsive urban systems

Each area of functional zones has a central open space, emphasized through the size of the buildings and the articulation of the green and blue elements. The green accessible roofs descend to the open space, creating a continuous surface.



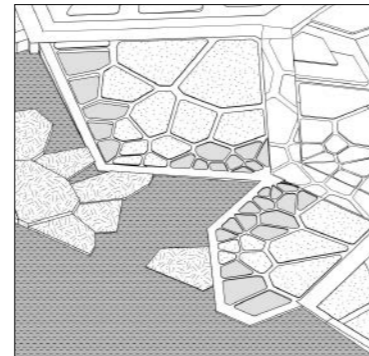


## Design zoom-in

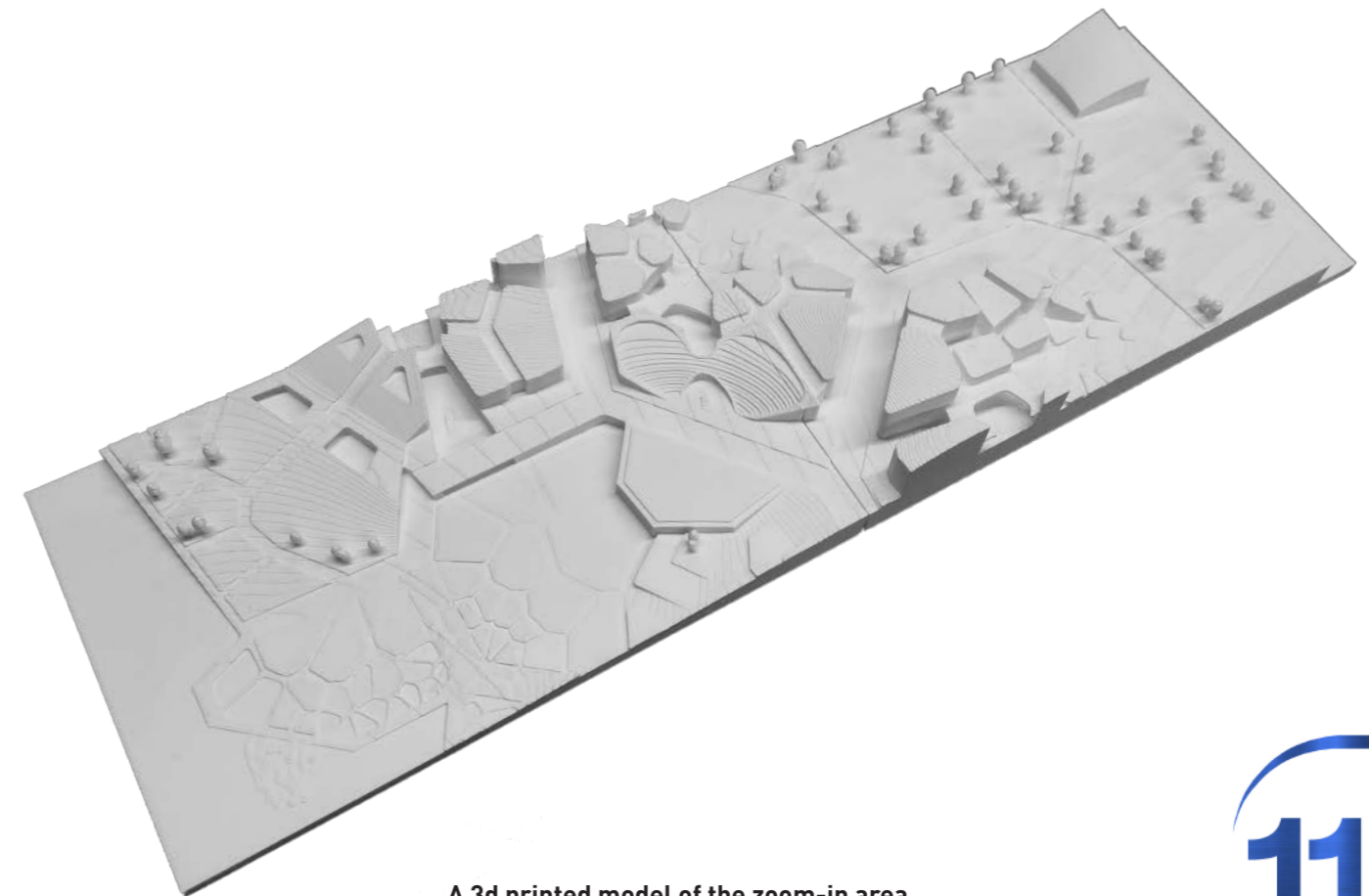
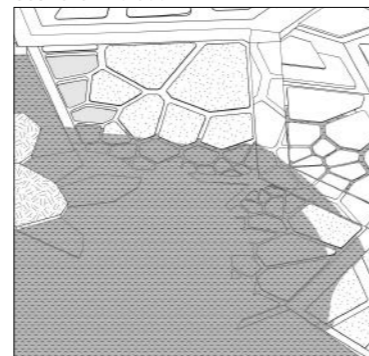


### Responsive waterfront

sea level: -0.600m



sea level: +0.600m



A 3d printed model of the zoom-in area.

