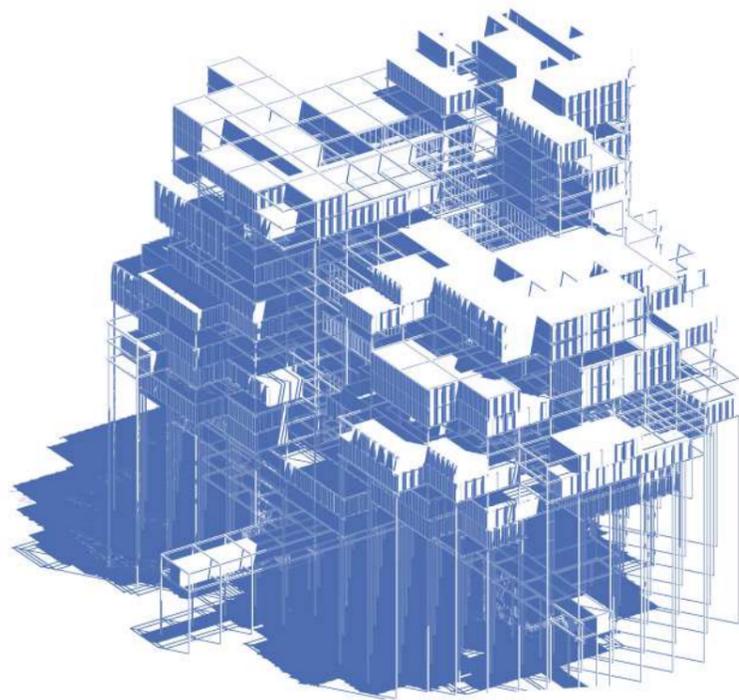


Cryoform: Experimental Arctic Constructs



The Arctic region is currently of great interest to the world and its development is an important task. The real architectural practice of this region requires new solutions and rethinking the experience of the past. To this end, a project was developed for the architectural solution of a residential building in the extreme conditions of the Arctic, which is the development of a settlement system, the principles of which will be universal for any group of Arctic islands and the creation of an apartment building for this system.

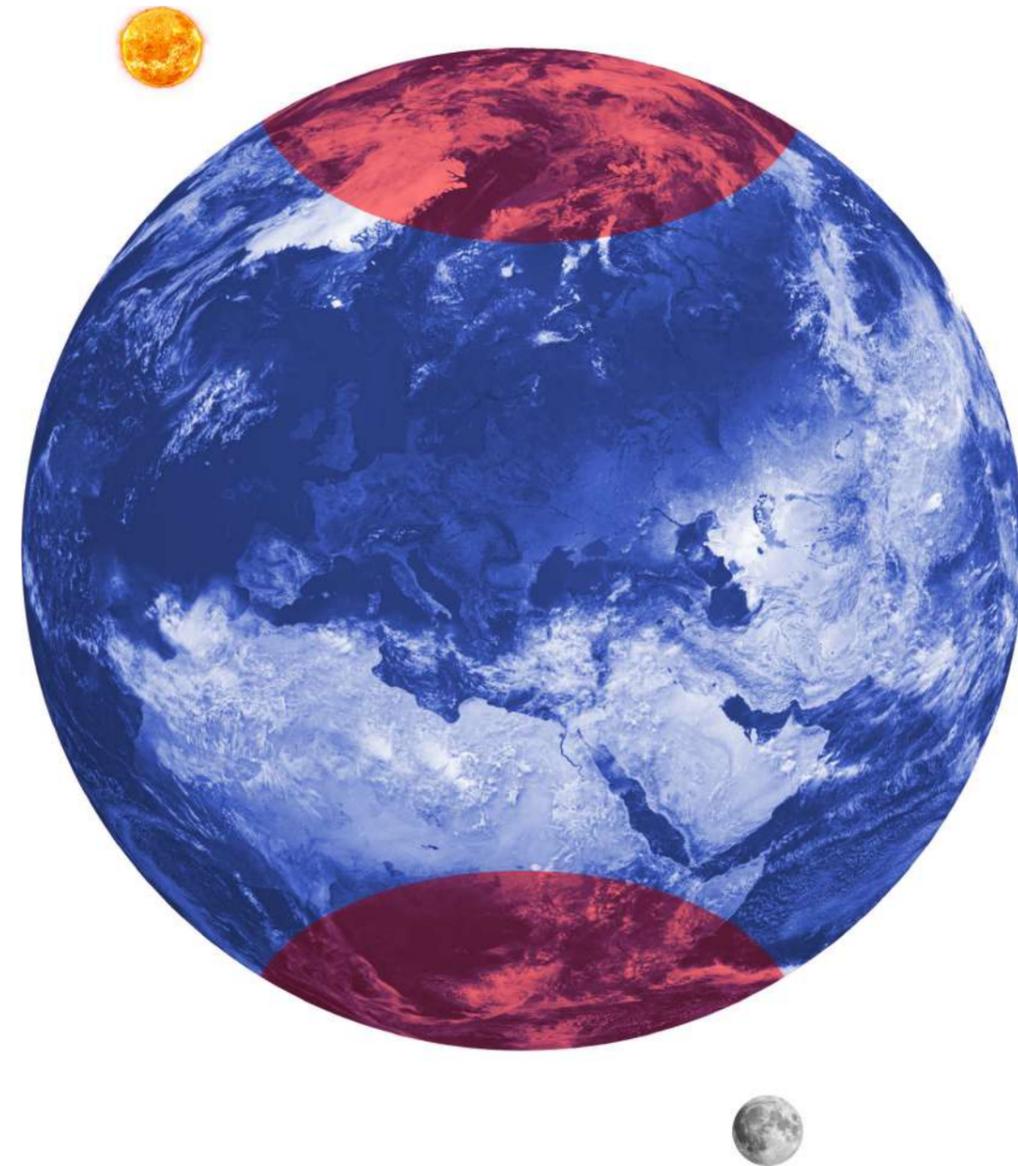
The main idea of the project is to create a sustainable and environmentally friendly settlement in the Arctic. One of the key concepts of the project is the division of the settlement into two levels: upper and low. Also, an important conceptual feature is the modularity and quick-erectability of architecture, which develops as a living organism, which allows it to flexibly and effectively change and adapt the structure and functionality of a building or settlement.



The Arctic

The Arctic is one of the most undeveloped regions of the world, but at the same time it has a lot of new opportunities for humanity. Despite the extreme weather conditions, the Arctic can become a haven for humanity and endow a person with a large amount of resources. It has significant industrial potential, expressed in the development of the oil and gas complex, pipeline networks, power plants, airports, sea and river ports. In the future, the amount of extracted resources may increase by 1.5-2 times.

Due to the upcoming global warming, as a result of which most of the mainland land will be hidden by water, the Arctic islands will become a new alternative for settlements



Upcoming challenges

Scheme of melting glaciers of the Arctic

Now

In 30 years

In 60 years

In 90 years

In 120 years

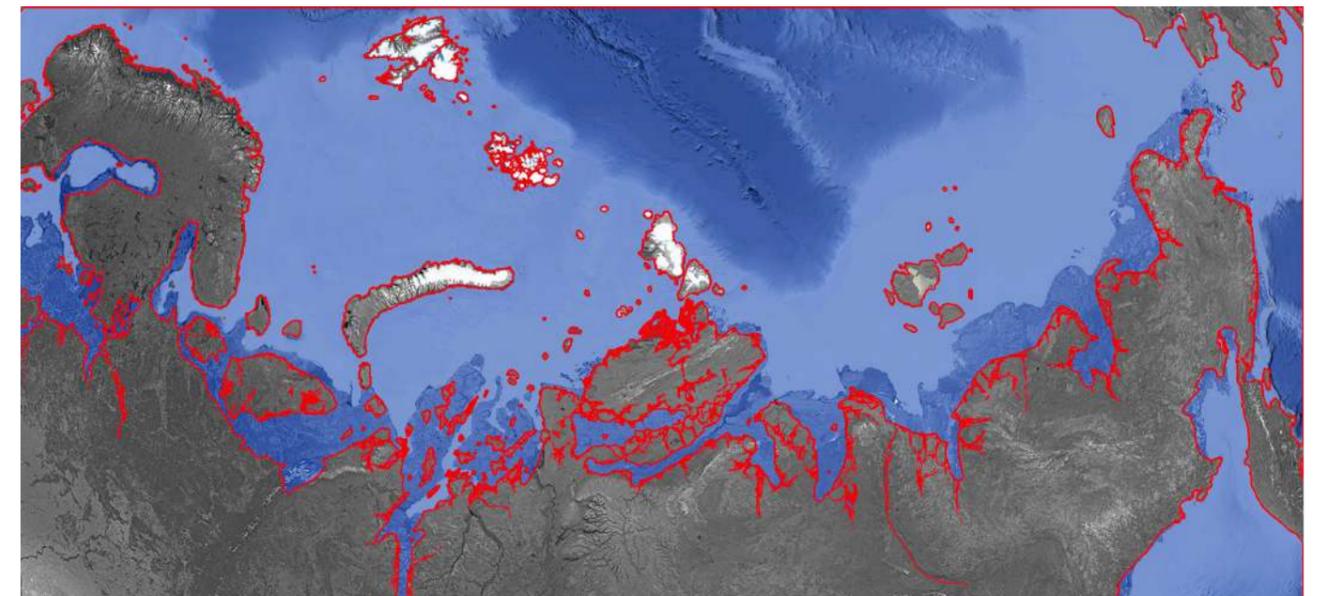
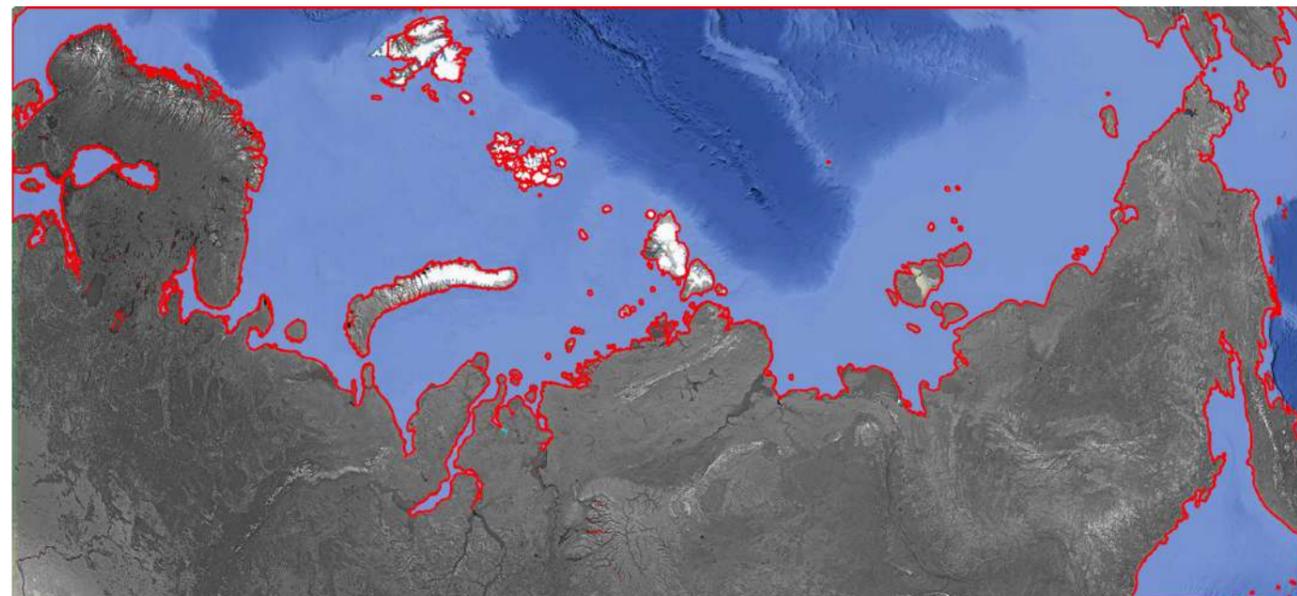


Coastline at current ocean level

Every year, the area of long-term ice decreases, and its thickness decreases. Also, the melting of ice leads to an increase in the water surface, which absorbs more solar energy and increases the warming of the region. In addition, the volume of ocean water is increasing, which can become a serious threat

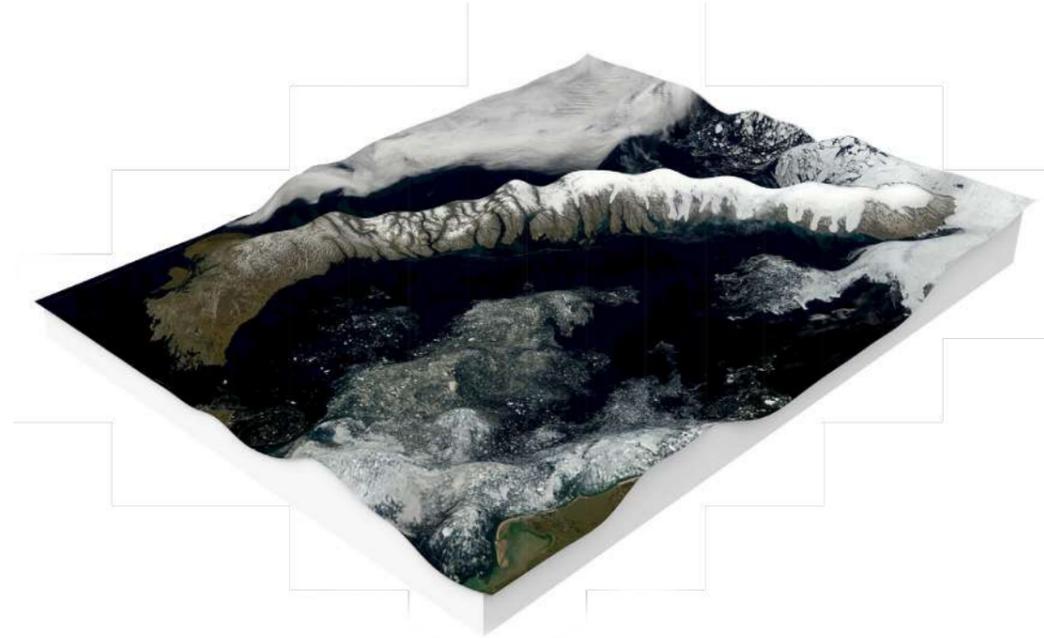
Coastline when the ocean level rises by 50 m

If the ocean level rises by 50 meters, catastrophic changes will occur in the world. Firstly, such an increase in the volume of the ocean will lead to flooding of coastal cities and regions. Millions of people living near the coast will be at risk as most of the coast will be flooded. Also, due to floods, erosion of the coastline will occur, which will lead to the loss of territories



Design location : Novaya Zemlya Archipelago

View of the archipelago



After studying the features of the Arctic region and possible territories for design, the choice was made in favor of the Novaya Zemlya Archipelago, Severny Island, in particular Pospelov Bay . The Novaya Zemlya Archipelago is located in the Arctic Ocean between the Kara and Barents Seas. Geographically, the archipelago extends from about 70° to 81° north latitude and from about 49° to 71° east. Geologically, it belongs to the East European Plateau, which is an extensive underwater platform.

The choice was justified by several criteria that made it possible to determine the territory as the most suitable place for further development. The first important selection criterion was the position of this territory relative to the Northern Sea Route (NSR), as the main artery of development. The second selection criterion was the presence of significant minerals in the region. The third selection criterion was the duration of the navigation period of the NSR. In addition, proximity to the Barents and Kara Seas has also become an important factor when choosing a territory. Further, these provisions will be considered in more detail.

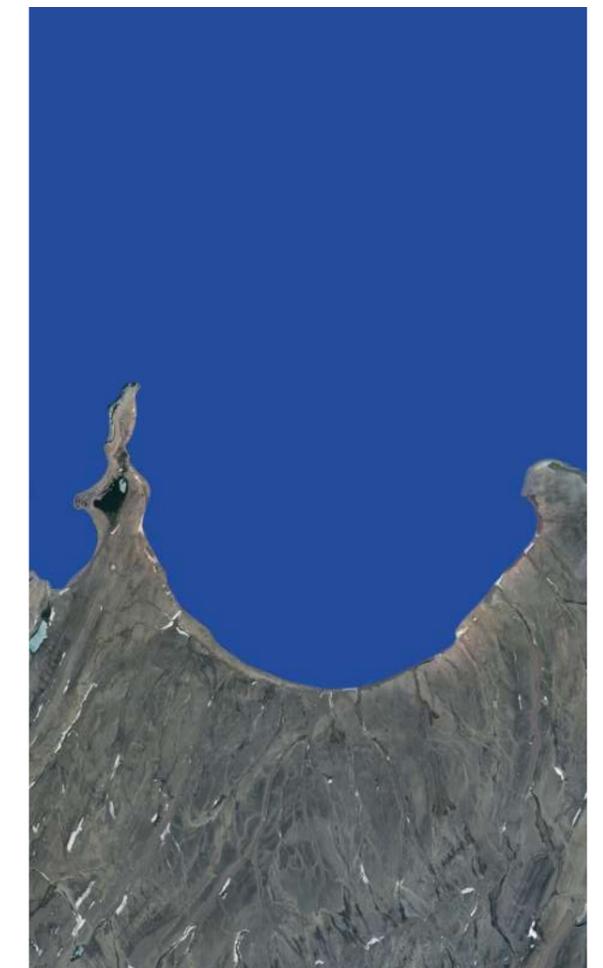
Scheme of the Novaya Zemlya archipelago



View of Pospelov Bay



Satellite image of Pospelova Bay

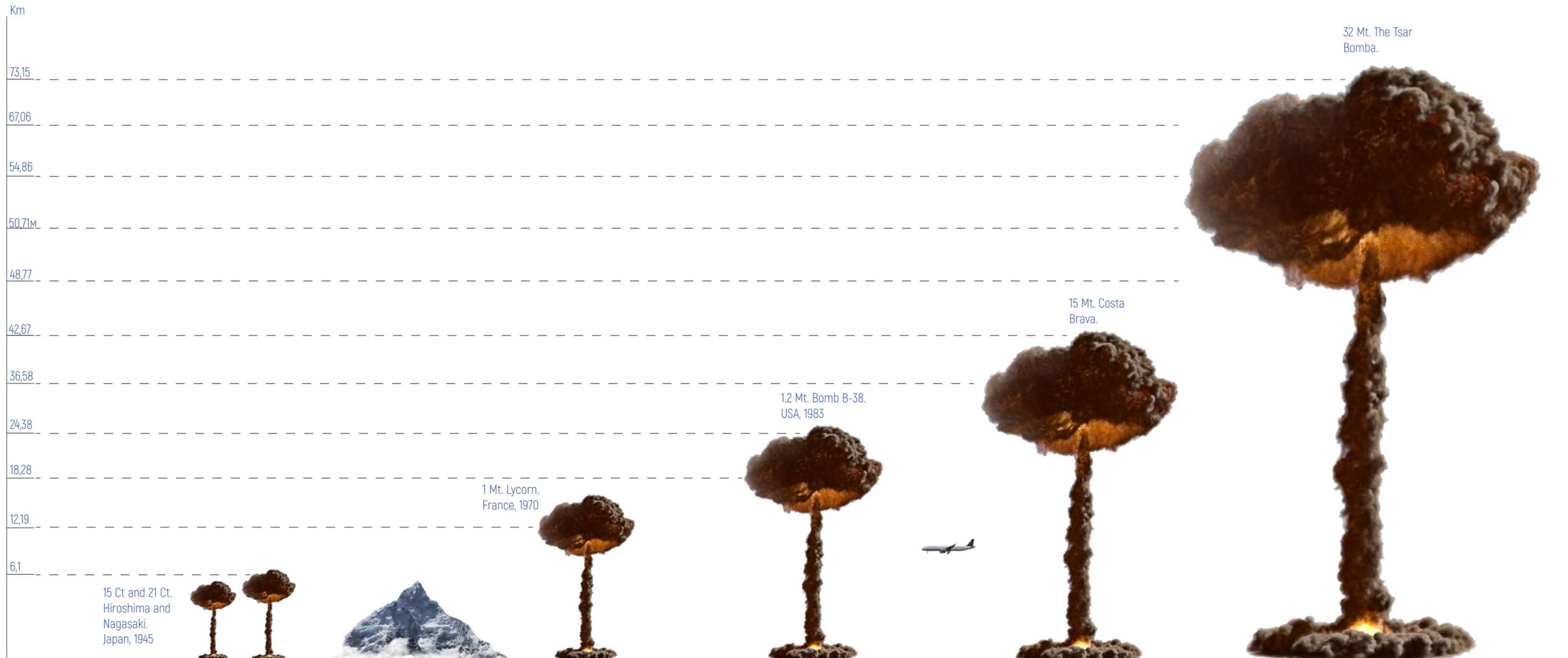


Nuclear past

Historical analysis. Nuclear past



Historical analysis. Nuclear past

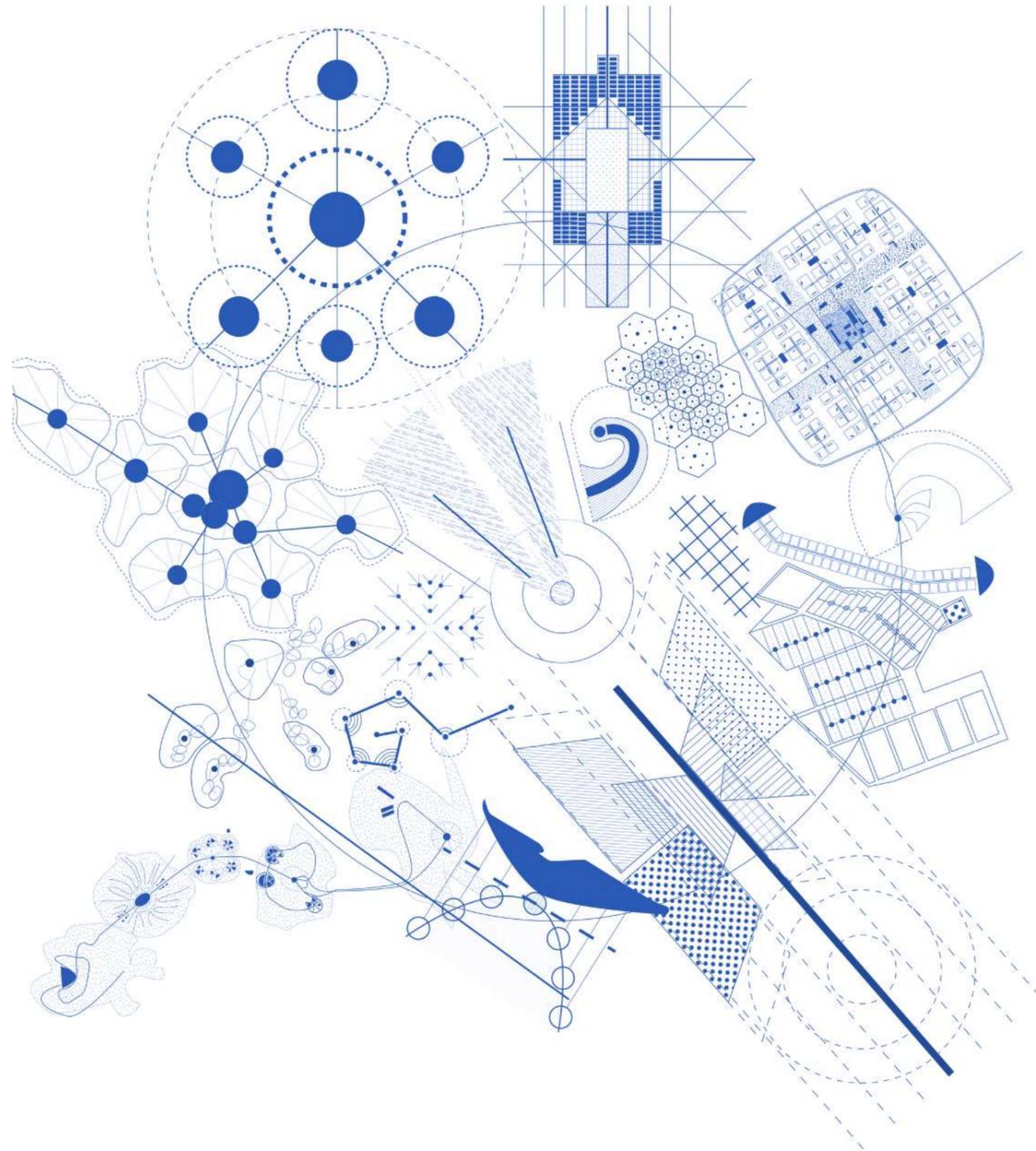


Line of development of the architecture of extreme environments

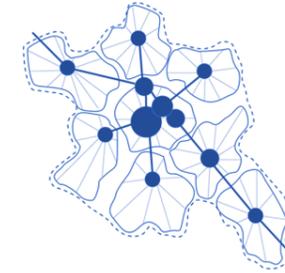


Principles of settlement systems

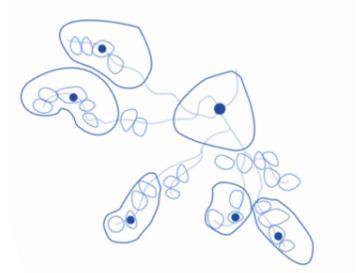
Matrix of all principles



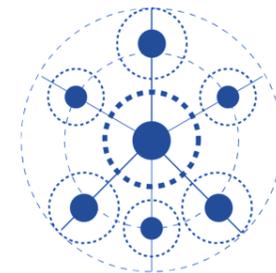
New element of Settlement (NER)



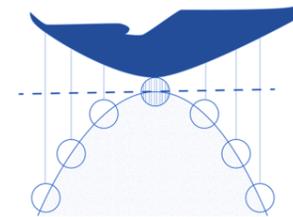
Organic settlement system



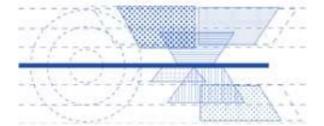
Dynamic settlement system of satellite



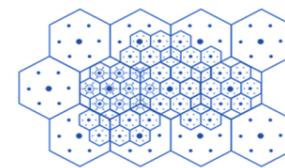
System agglomeration



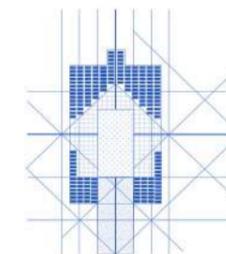
Group settlement system



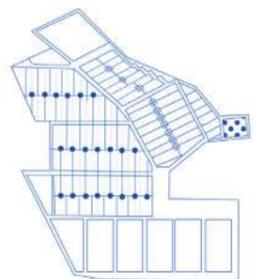
Linear settlement system



Crystal Lattice



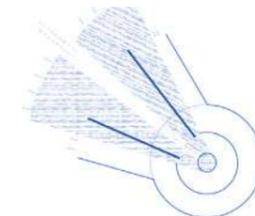
Radiant city



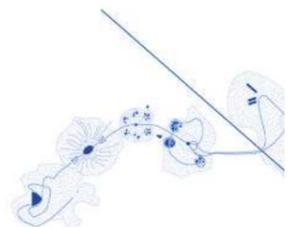
City of skyscrapers



Discrete settlement system



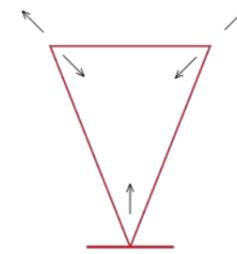
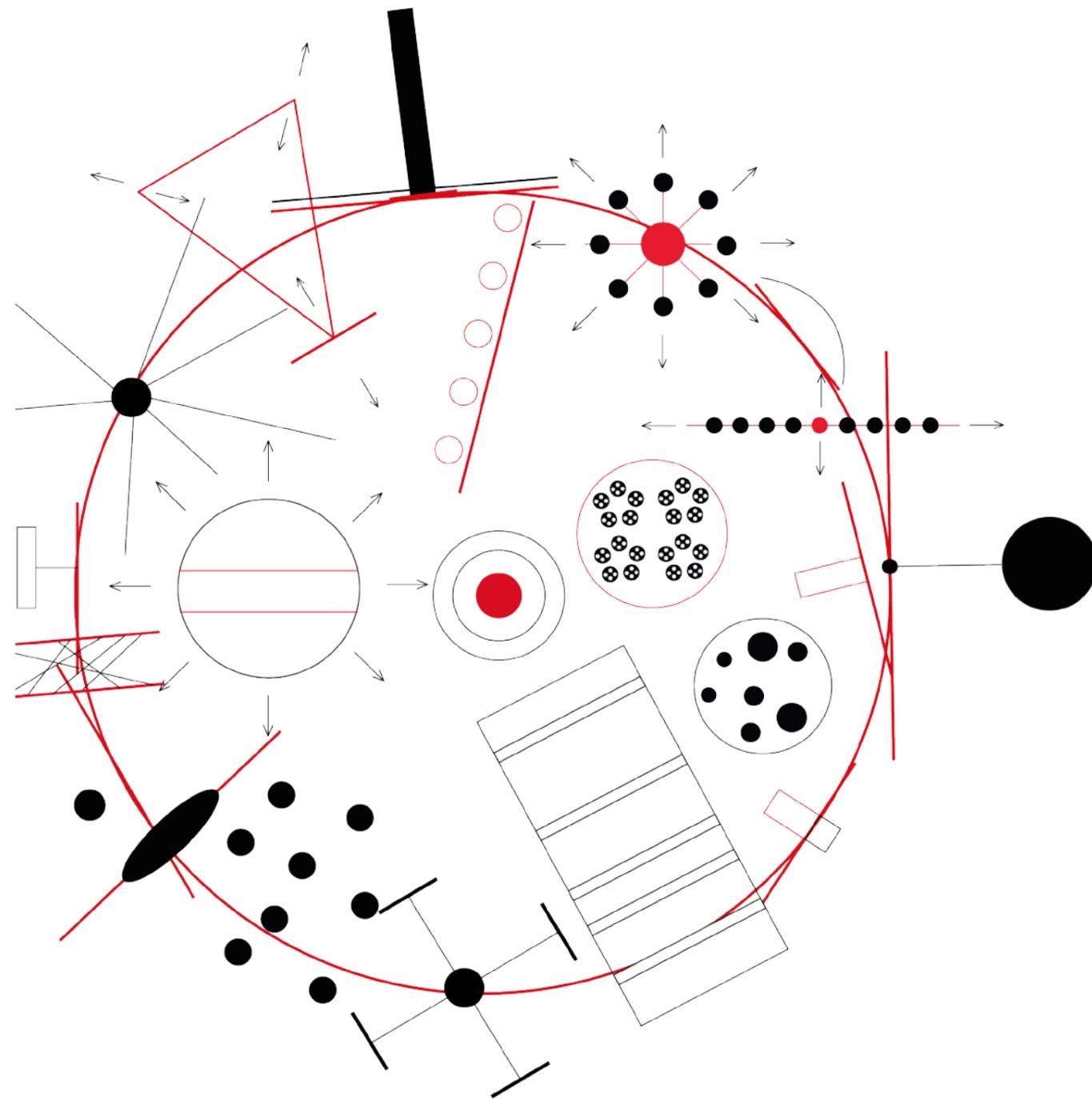
City-parabola



EPCOT. Utopia of the Future by Walt Disney

Principles of architecture of extreme environments

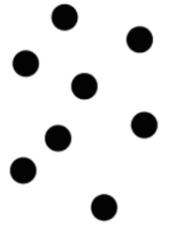
Matrix of all principles



Lack of gravity



A single system outside and inside a landscape



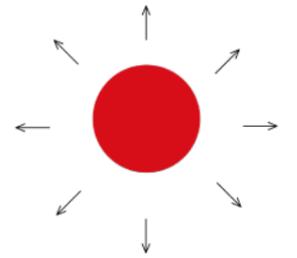
Dispersed modules



A single system outside and inside a landscape



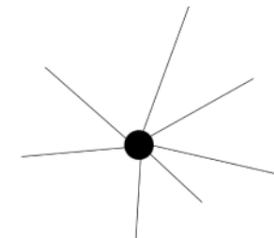
Architecture is embedded inside the body of a landscape



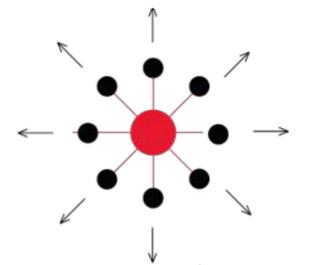
Volume concentrated in itself



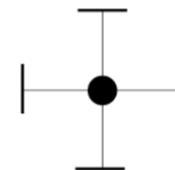
Architecture mimics an environment



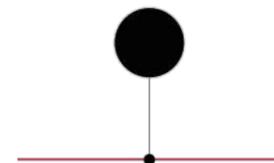
Xiphoid structure



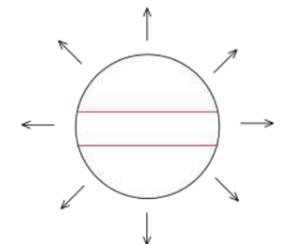
Concentration of individual units around a core



There is a main core and space isn't closed

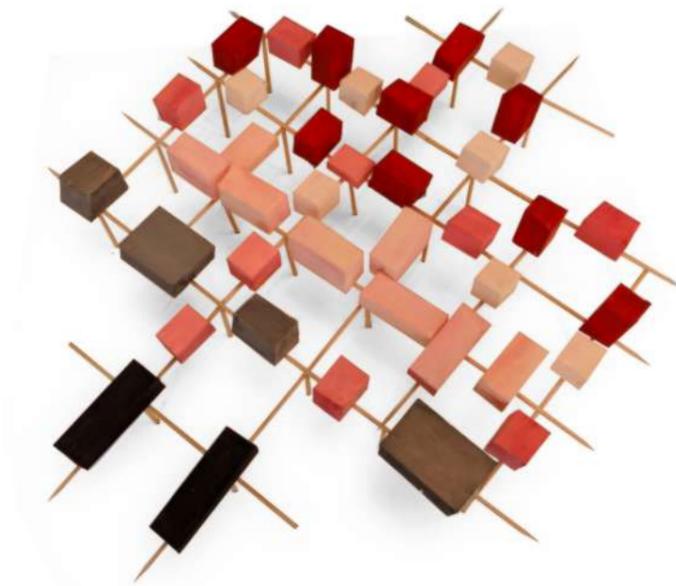


Rises above a landscape



All functions in one volume- volume is a single organism

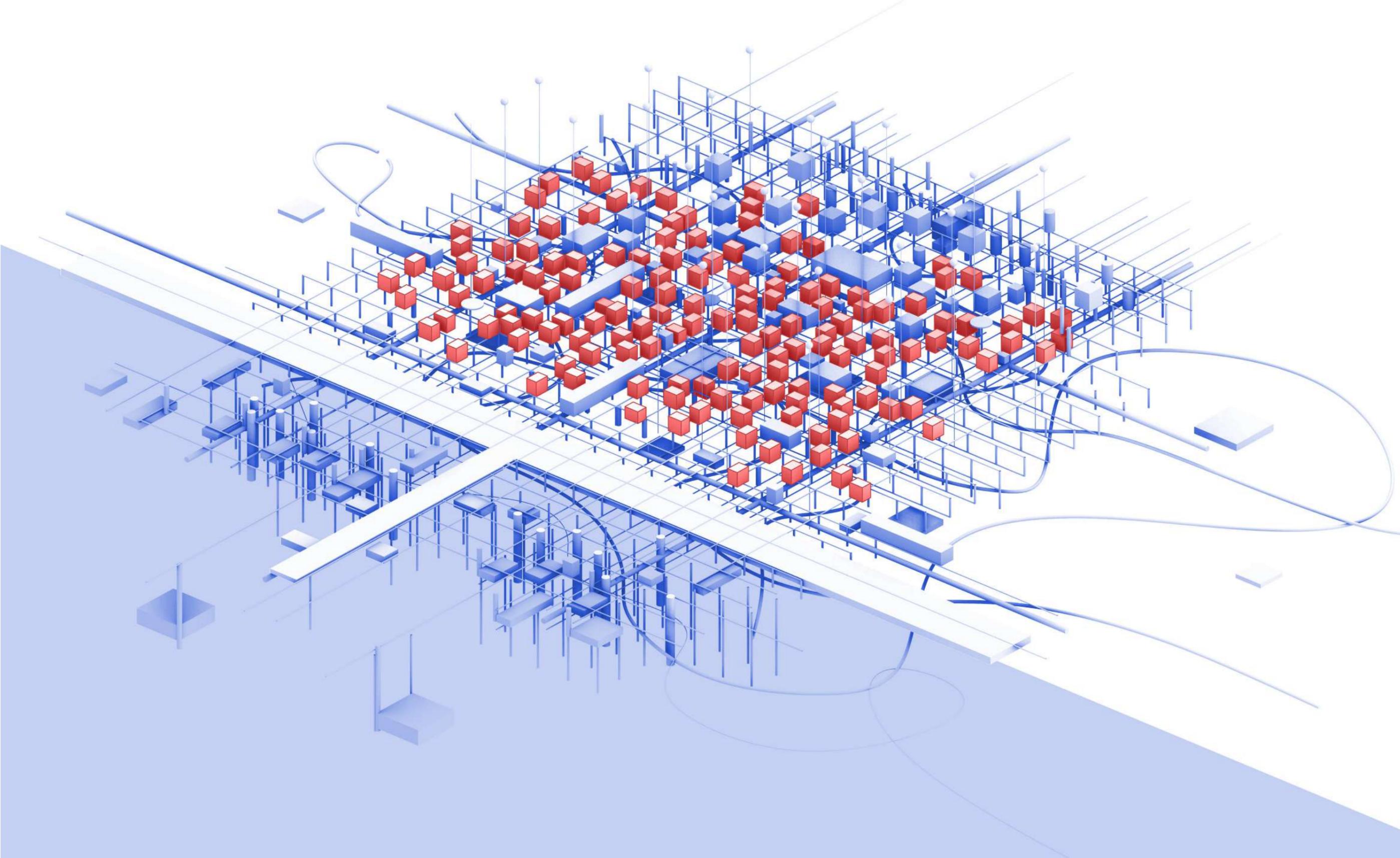
Settlement system



The settlement system is a structure based on a rigid grid, which consists of several levels and minimally affects the ground. The settlement itself is an innovative hub located on the route of the Northern Sea Route. One of the most important functional programs of the settlement is the maintenance of the NSR. In the settlement there is a port, an airfield and repair stations (The port is one of the most important points of application of labor. The creation of infrastructure around the port (in particular housing and recreational facilities) will be the first stage in the creation of the settlement. With further development, the settlement will become innovative, it will house research stations located under the water surface.

Urban planning principles of the settlement, pay special attention to environmental sustainability, walking distance and autonomy.

Settlement system



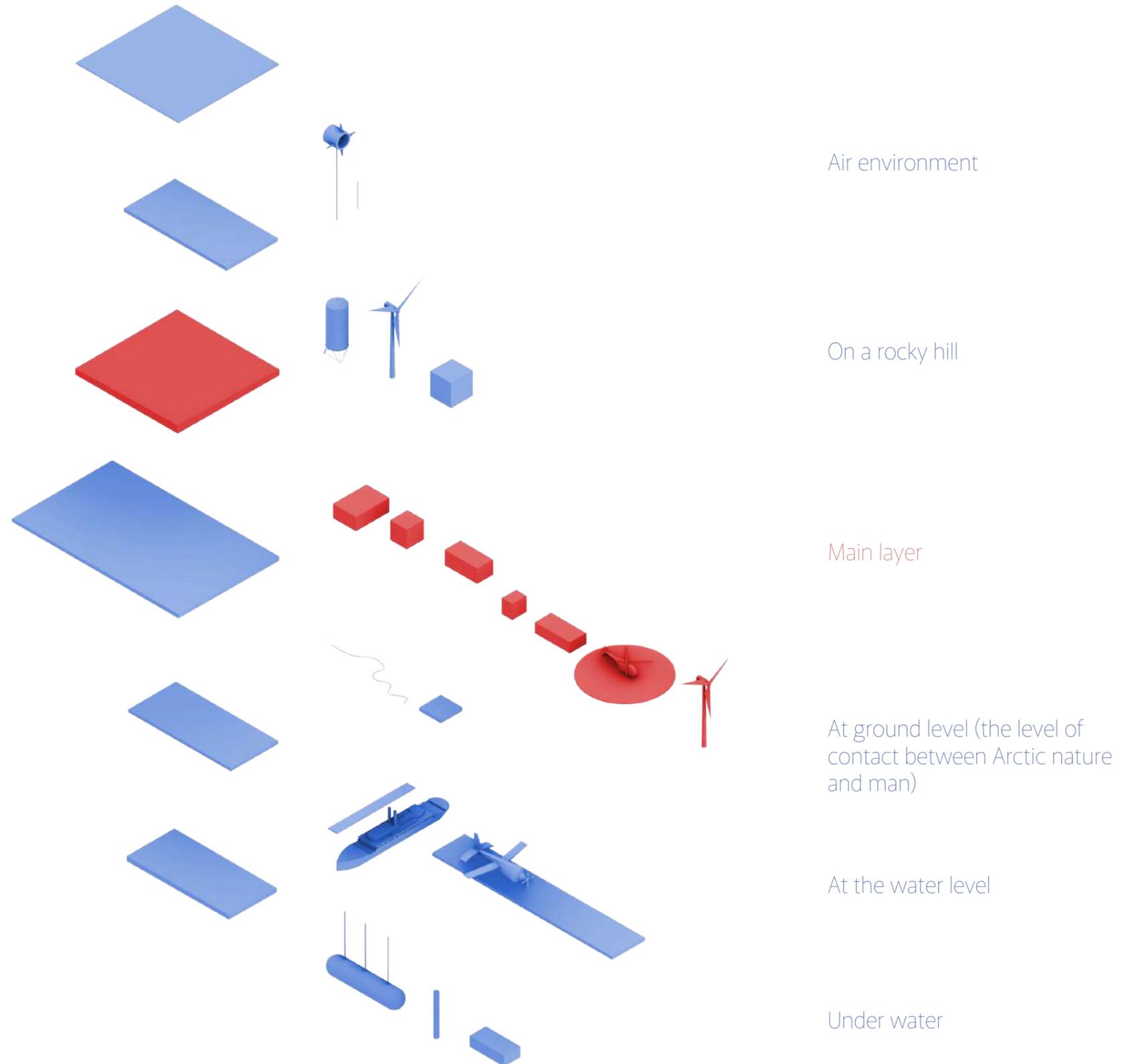
Layers of the settlement system

All the main functions are located in the aboveground part of the settlement, located at + 10,900 m from ground level. All parts of this level will be connected by transit pedestrian corridors, where thus the upper part of the settlement becomes intended only for pedestrians and at this level everything will be located in a comfortable walking distance

In the air layer and the rock layer there are energy and settlement facilities.

The layer located at ground level is designed for the interaction of man and the nature of the Arctic. Here people are engaged in sports and active forms of entertainment.

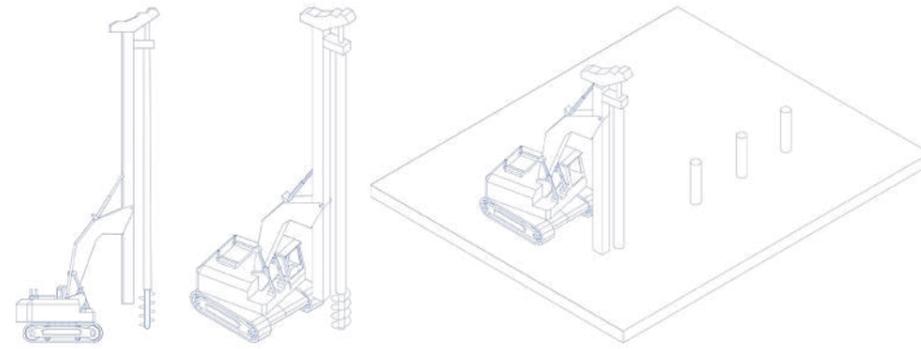
A port is located on the surface layer, and additional energy facilities, scientific stations, ocean water purification stations and algae farms are installed underwater



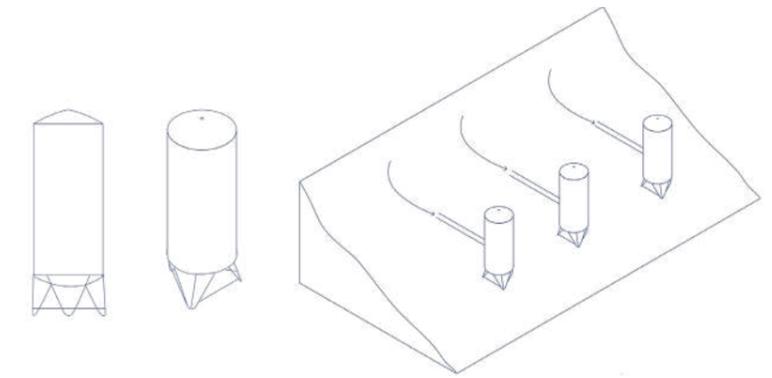
Technology

The development of the settlement includes an important aspect - the use of technology. Technology plays a key role in maintaining life in the settlement, especially in the field of energy. So, the key technologies in the settlement are technologies for installing foundations, installing architecture modules using cranes, water collection and energy.

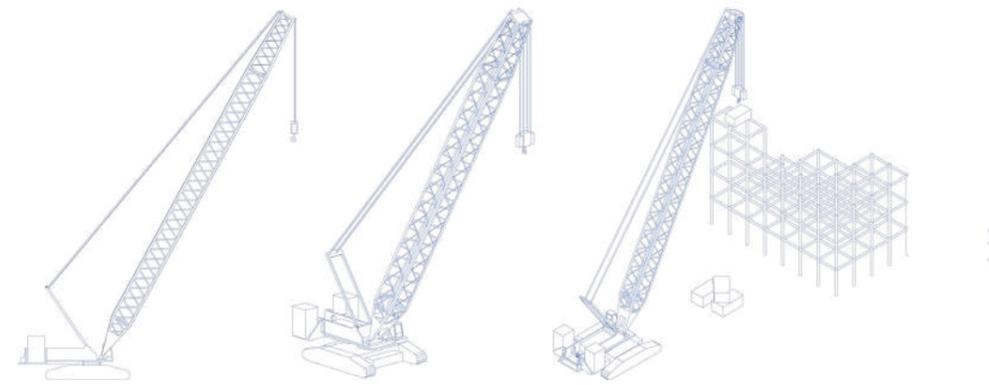
Воздушная среда



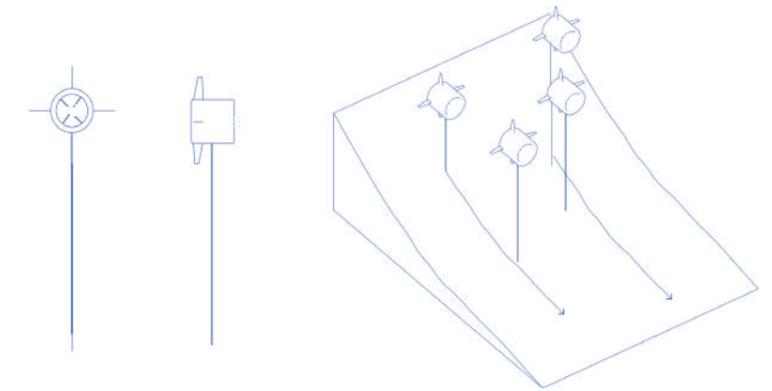
Воздушная среда



Воздушная среда

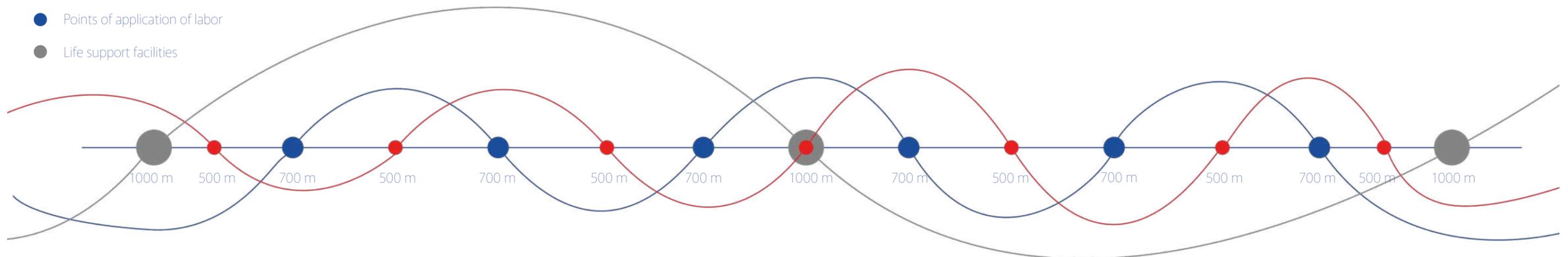


Wind turbines



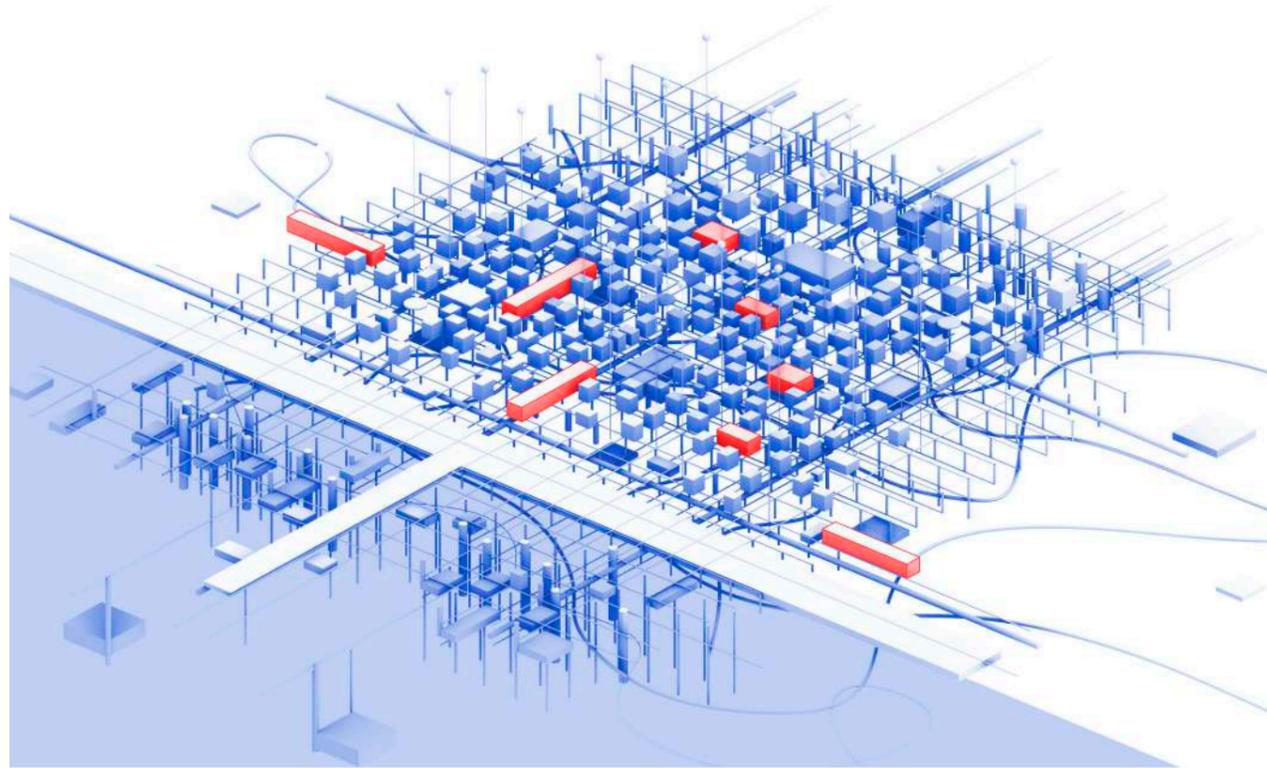
Pedestrian accessibility scheme

- Centers of Life
- Points of application of labor
- Life support facilities

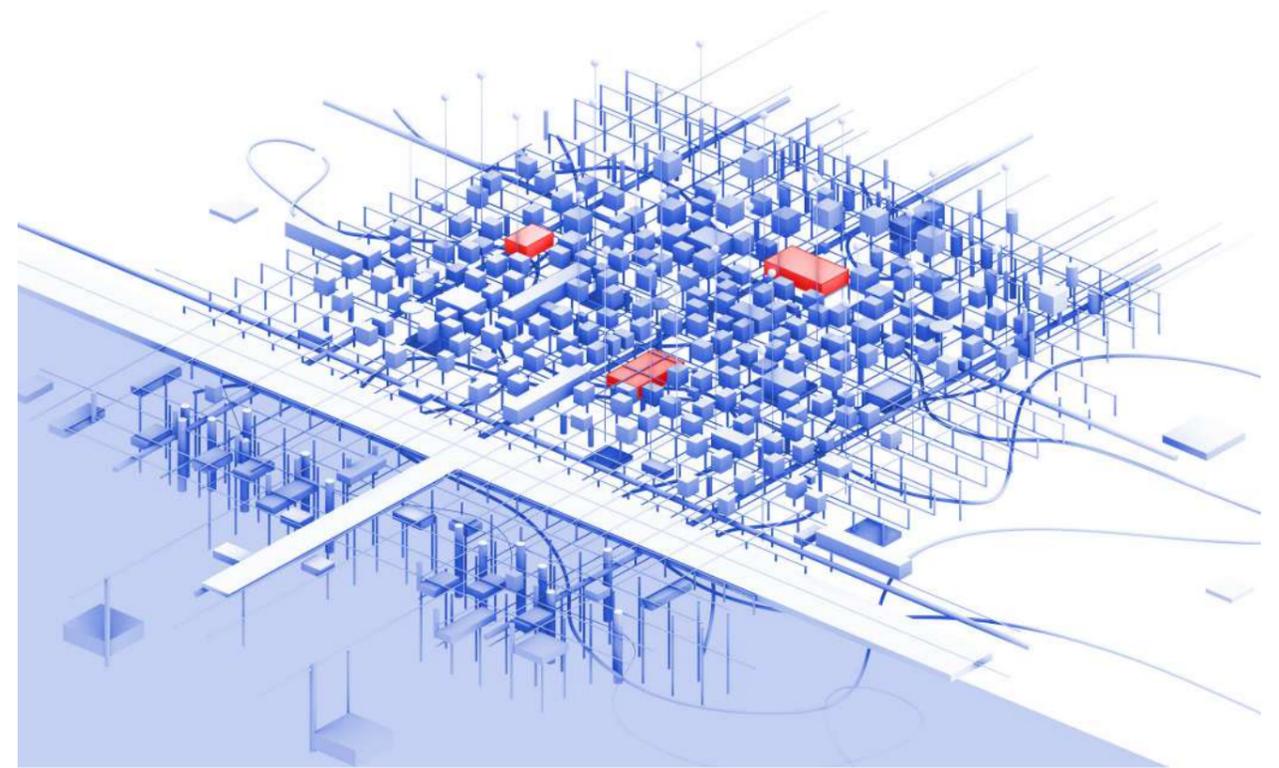


Functional content of the settlement system

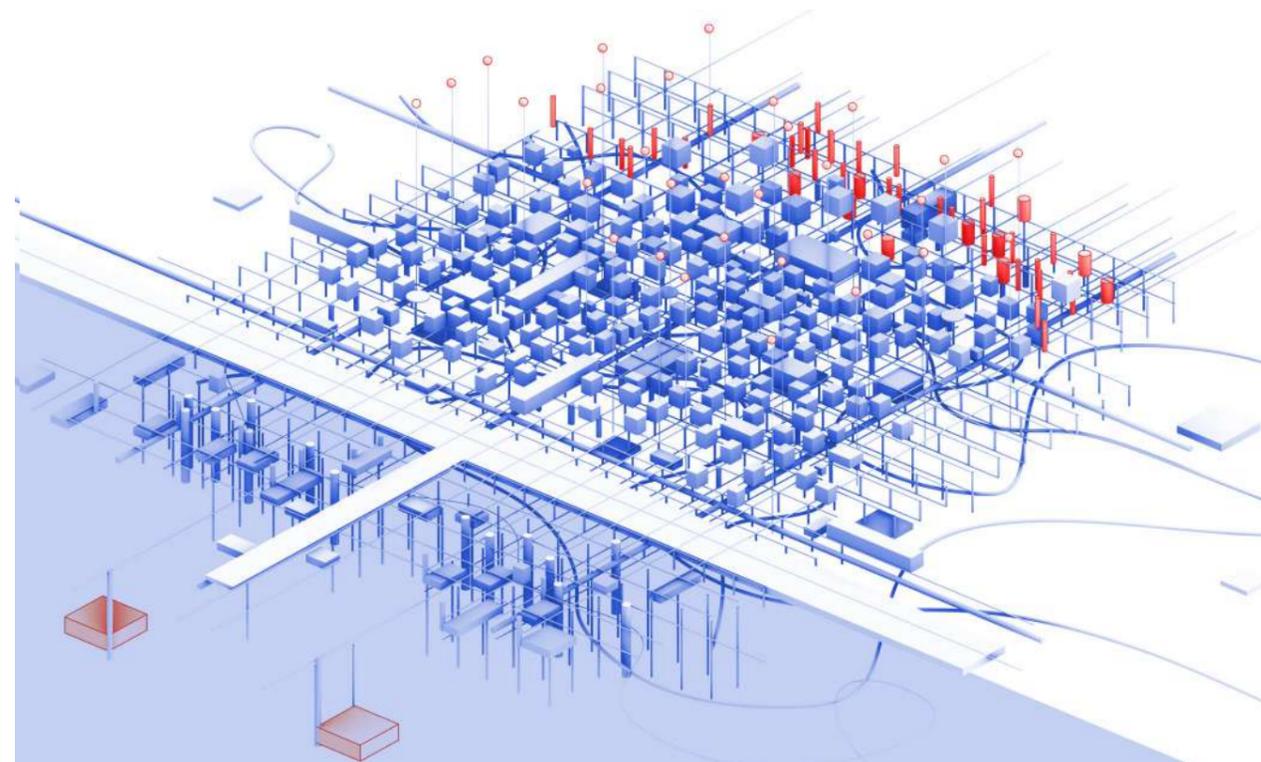
Recreational facilities



Industrial facilities



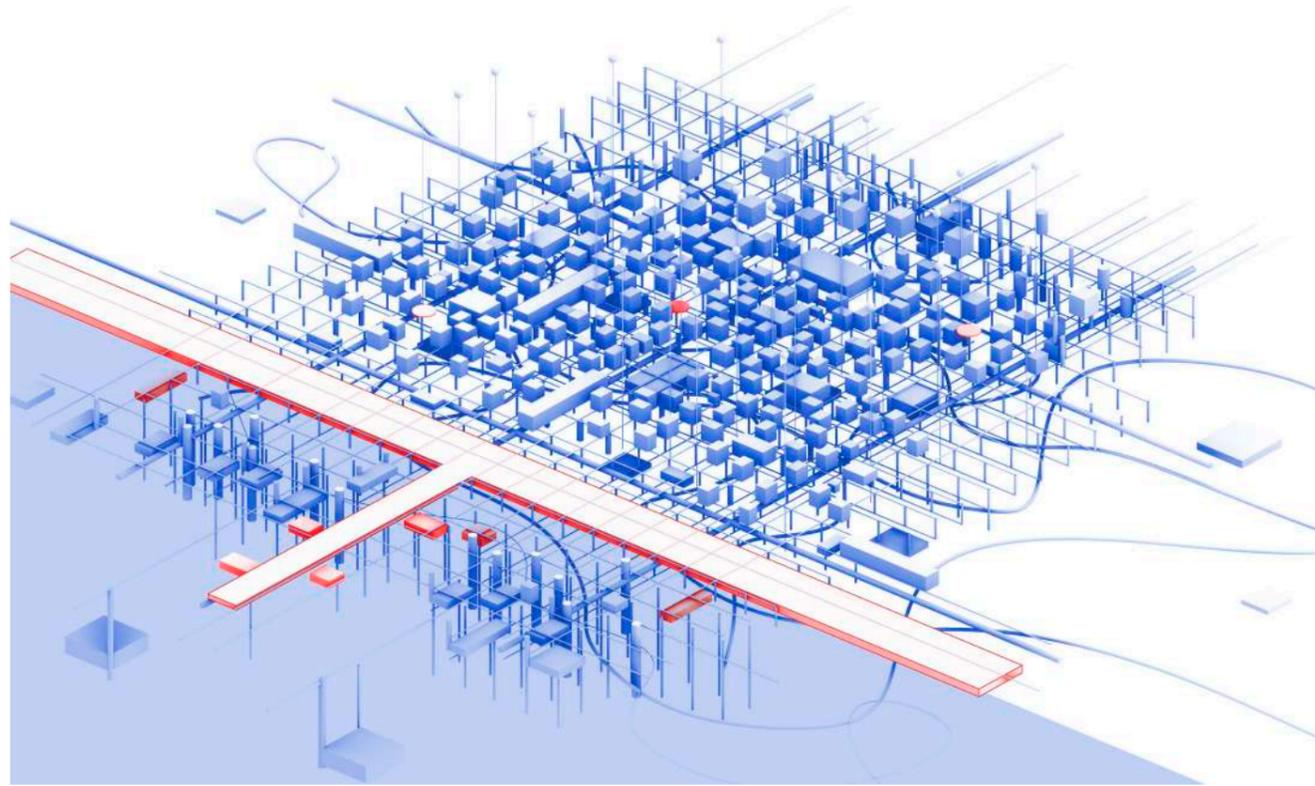
Energy facilities



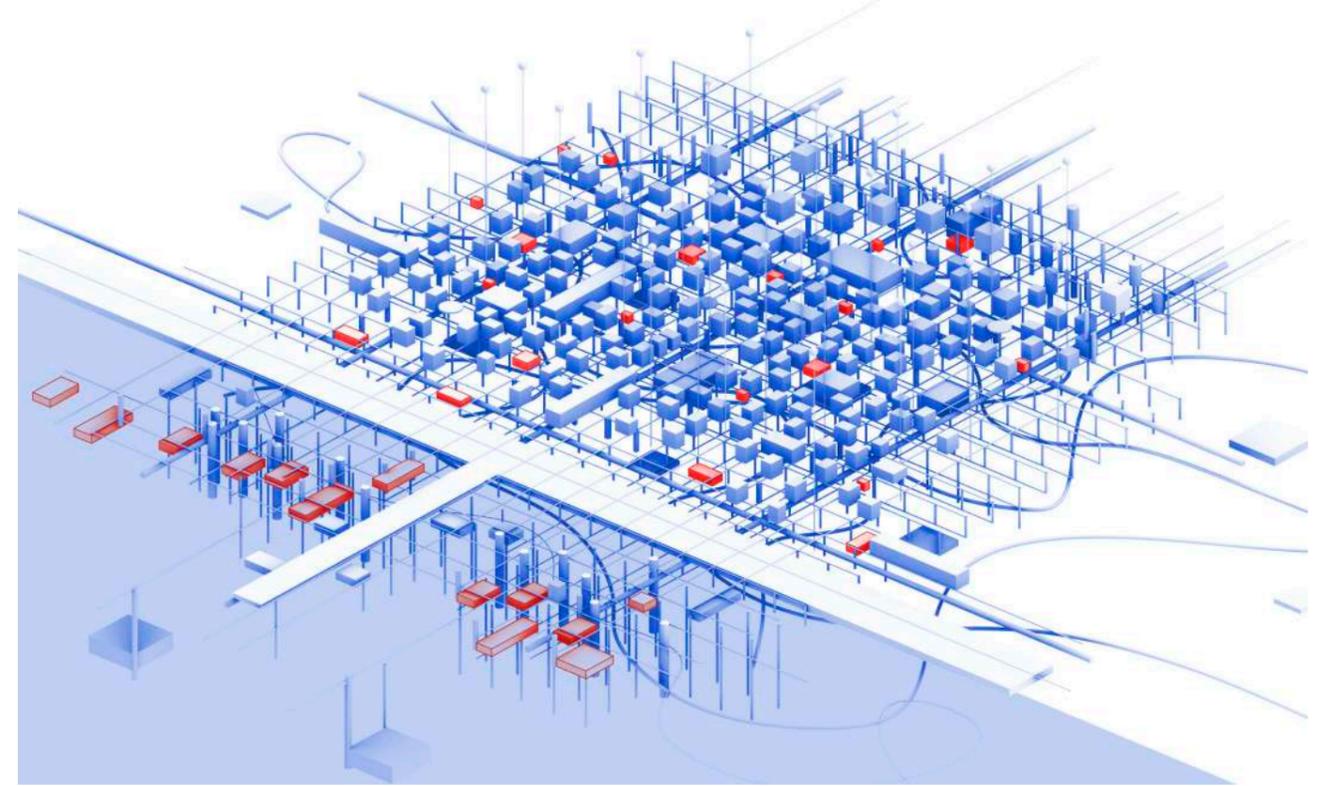
An autonomy of the settlement is one of the key factors of its existence, therefore, an important component of the functional content are energy facilities that use renewable energy sources, such as wind, solar energy and geothermal energy. The power equipment will be located in all environments of the island and will be represented by wind turbines, nuclear generators, hydro generators as the main sources of electricity

Functional content of the settlement system

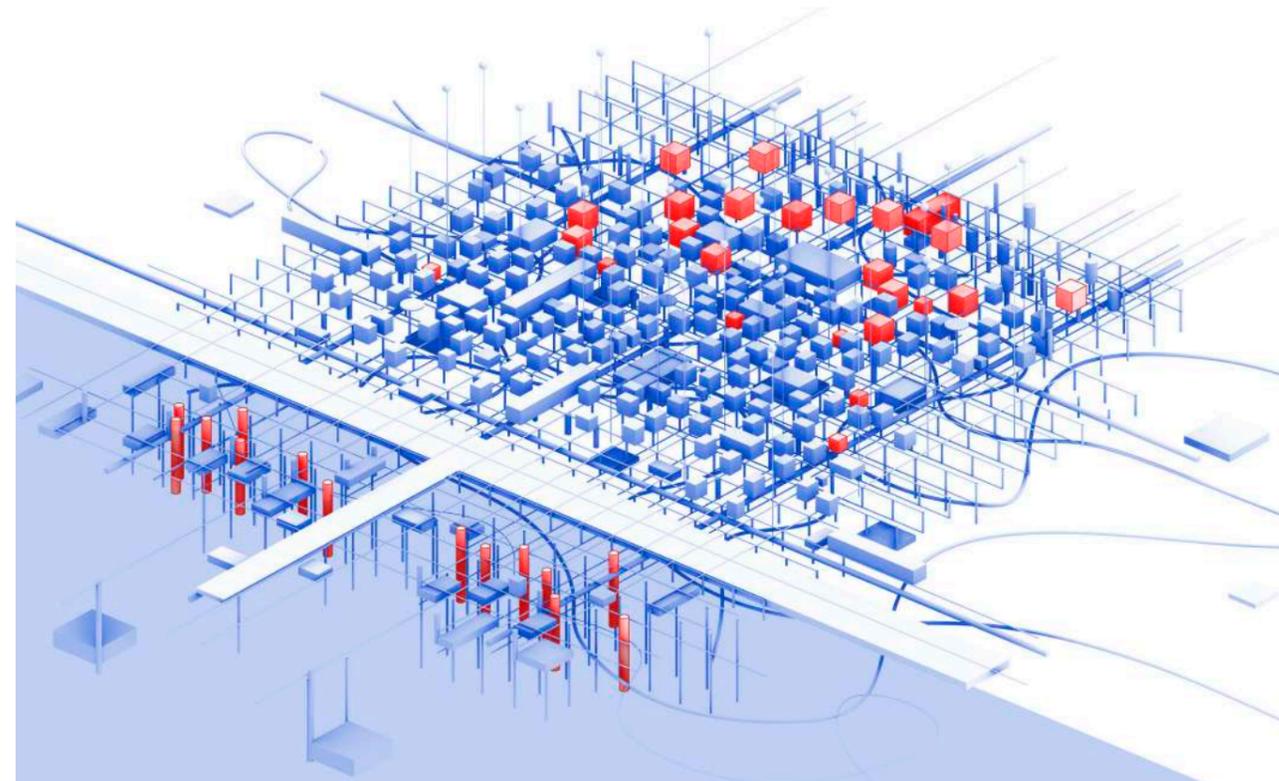
Transport facilities



Objects of science



Agricultural production facilities



Greenhouses and farms will be installed in the settlement for the permanent supply of food to residents. All the necessary plants will be grown in greenhouses. Livestock will be raised on farms. In addition, the waters of the Barents and Kara Seas have good conditions for algae life. Since the production of algae has many advantages, special plants for their cultivation will be installed in the settlement, so that the settlement will be able to supply not only itself with products from algae, but also the whole world.

A variant of the transformation of the settlement system into

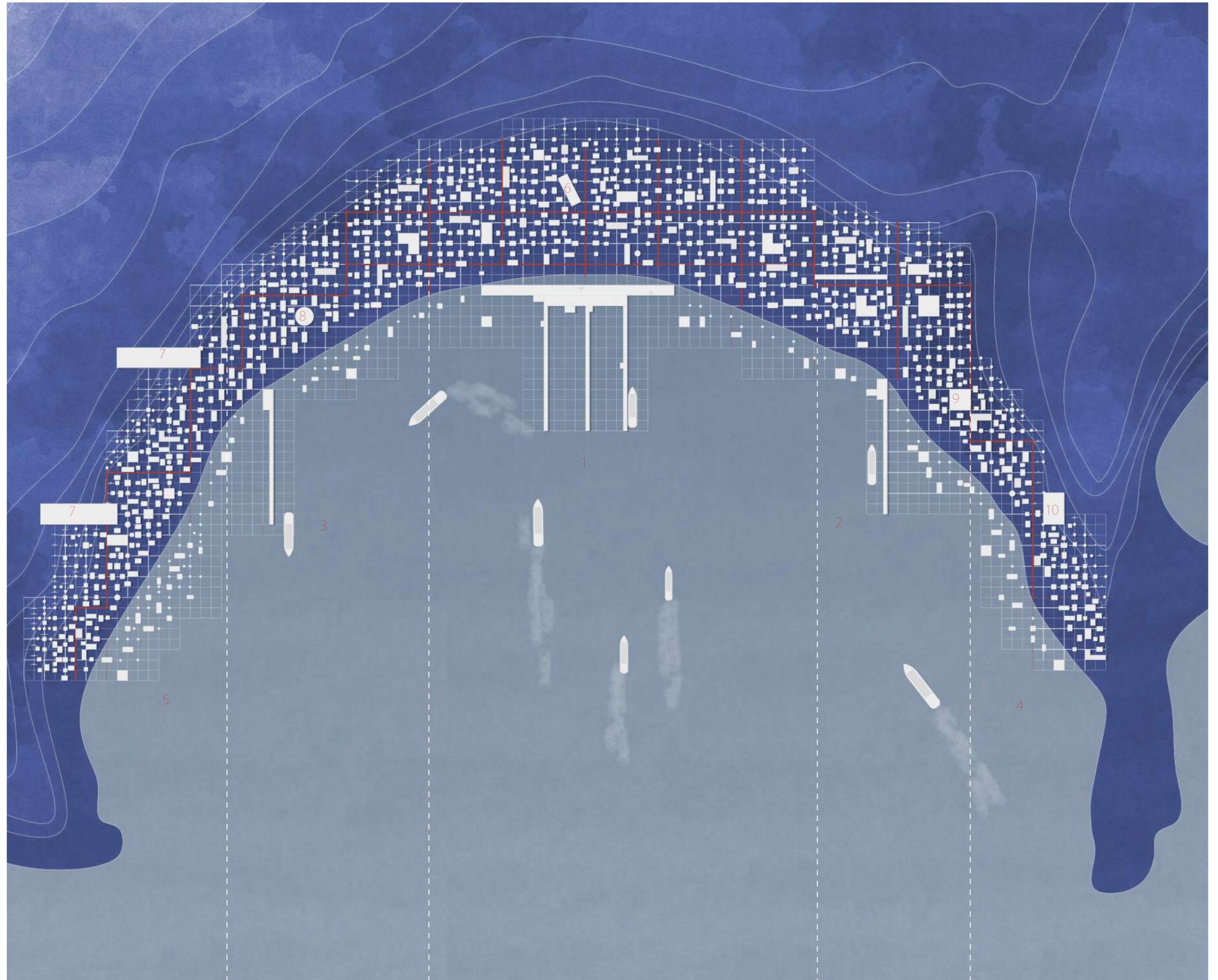
Explication

Territorial distribution:

- 1 Multifunctional part with a port.
- 2 Part of the town owned by Rostec. Functional content is mainly represented by server, mining farms, cybersecurity center.
- 3 Part of the town owned by Gazprom. Functional content is mainly represented by industrial functions and research centers.
- 4 Part of the town owned by the Biocad. Functional content is mainly represented by research centers, stations, farms for cultivation of algae and greenhouses.
- 5 Part of the city owned by Rosatom. Functional content is mainly represented by research centers and stations.

Unique objects:

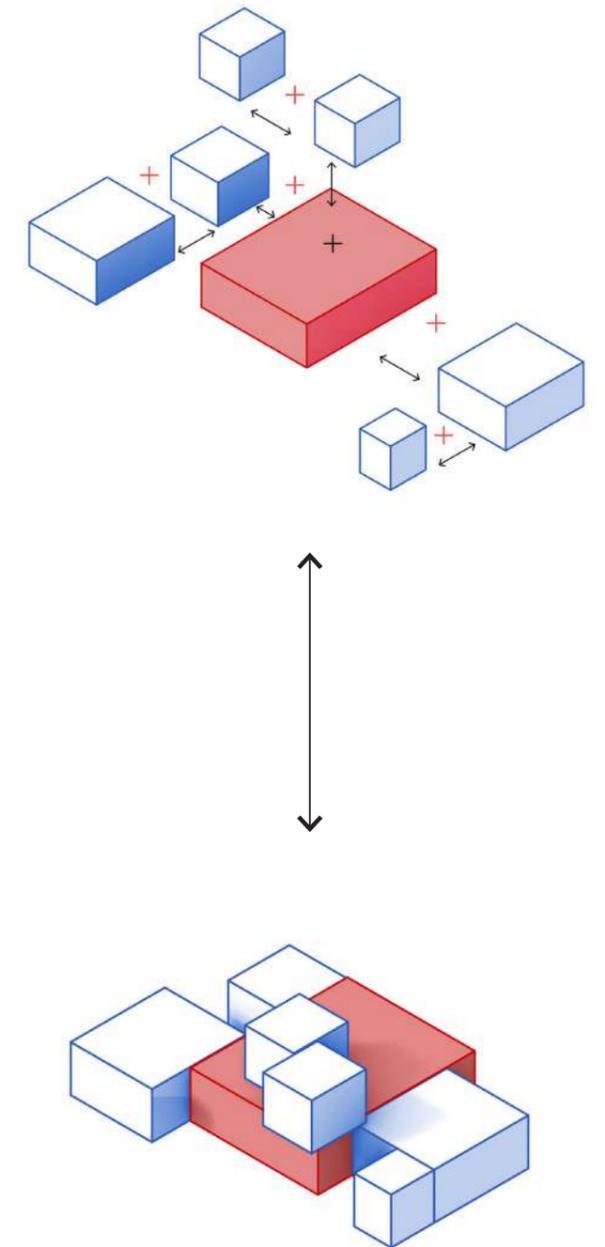
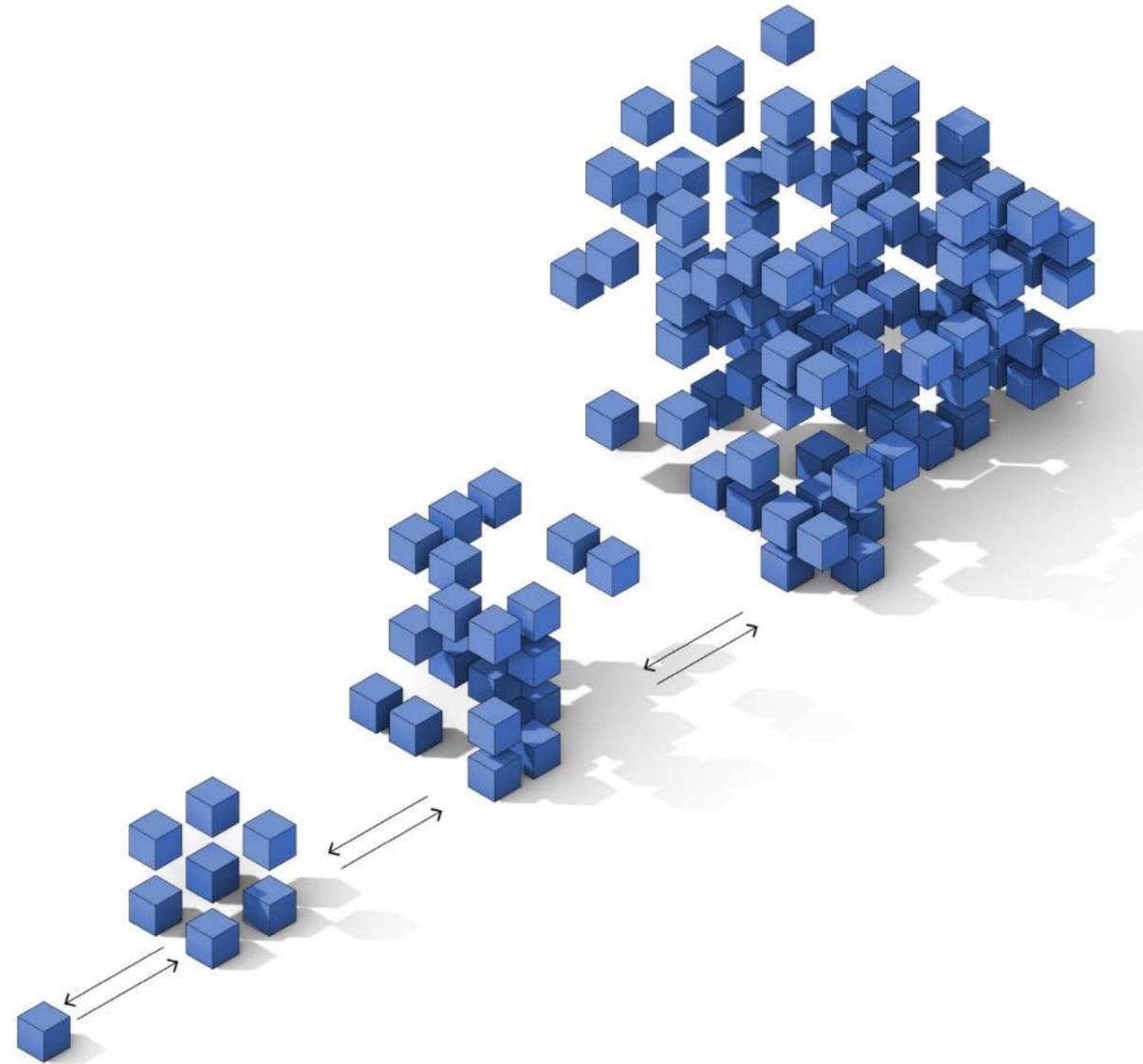
- 6 Casino
- 7 Doomsday Vault
- 8 Cybersecurity Center
- 9 Energy Center of the future
- 10 Underground storage



Formation of a residential building

Architecture is organized according to the principle of metabolism and develops as an independent living organism. Any unit can be removed, replaced and installed.

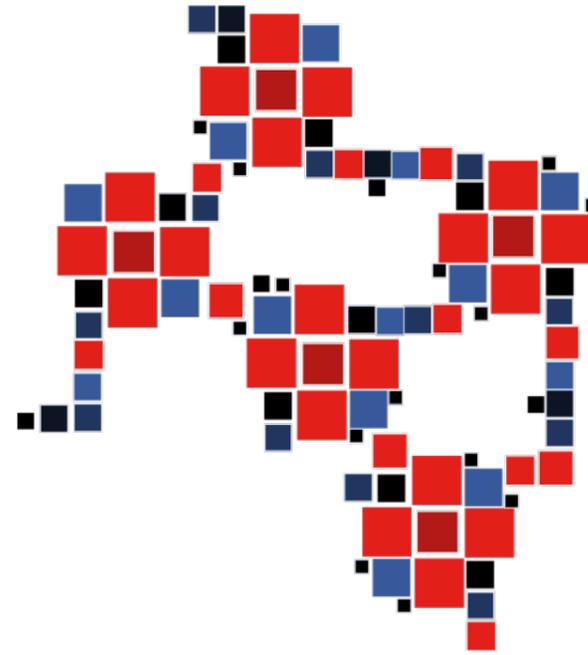
Each residential module has the possibility of expansion by attaching additional modules. This flexible solution allows residents to scale their home according to growing needs or changing circumstances, such as family growth or changing functional areas inside a house.



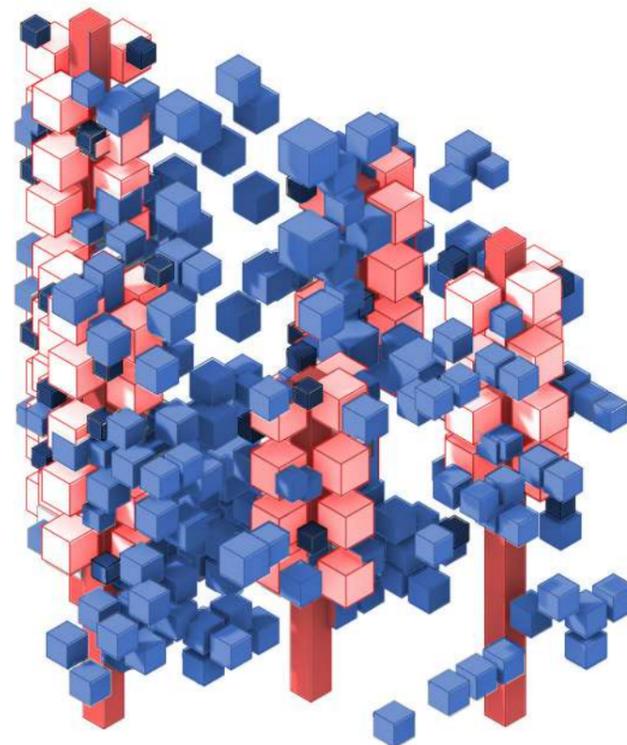
Formation of a residential building

Functional modules are installed around pre-installed cores, bases. The formation of the architecture scheme of residential buildings can occur in different ways, but there are several options for how it would be organized. It also depends on which function the house is built next to. In the case of the schemes presented here, the architecture is formed both in a tree-like form and in the form of functions impaled on corridors

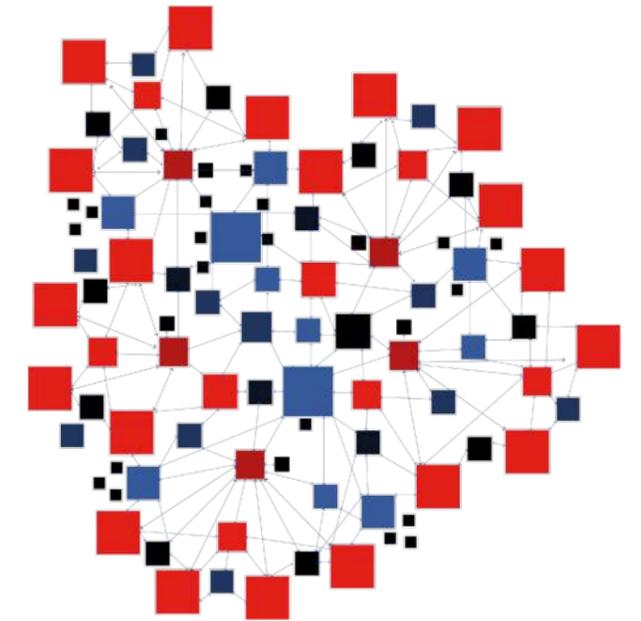
Formation of a residential building 1



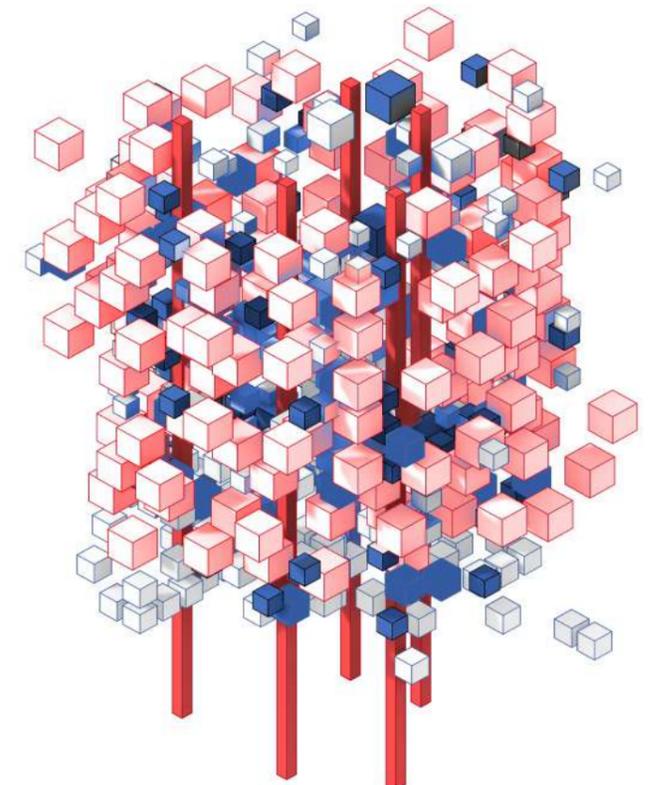
Scheme of formation of a residential building 1



Formation of a residential building 2

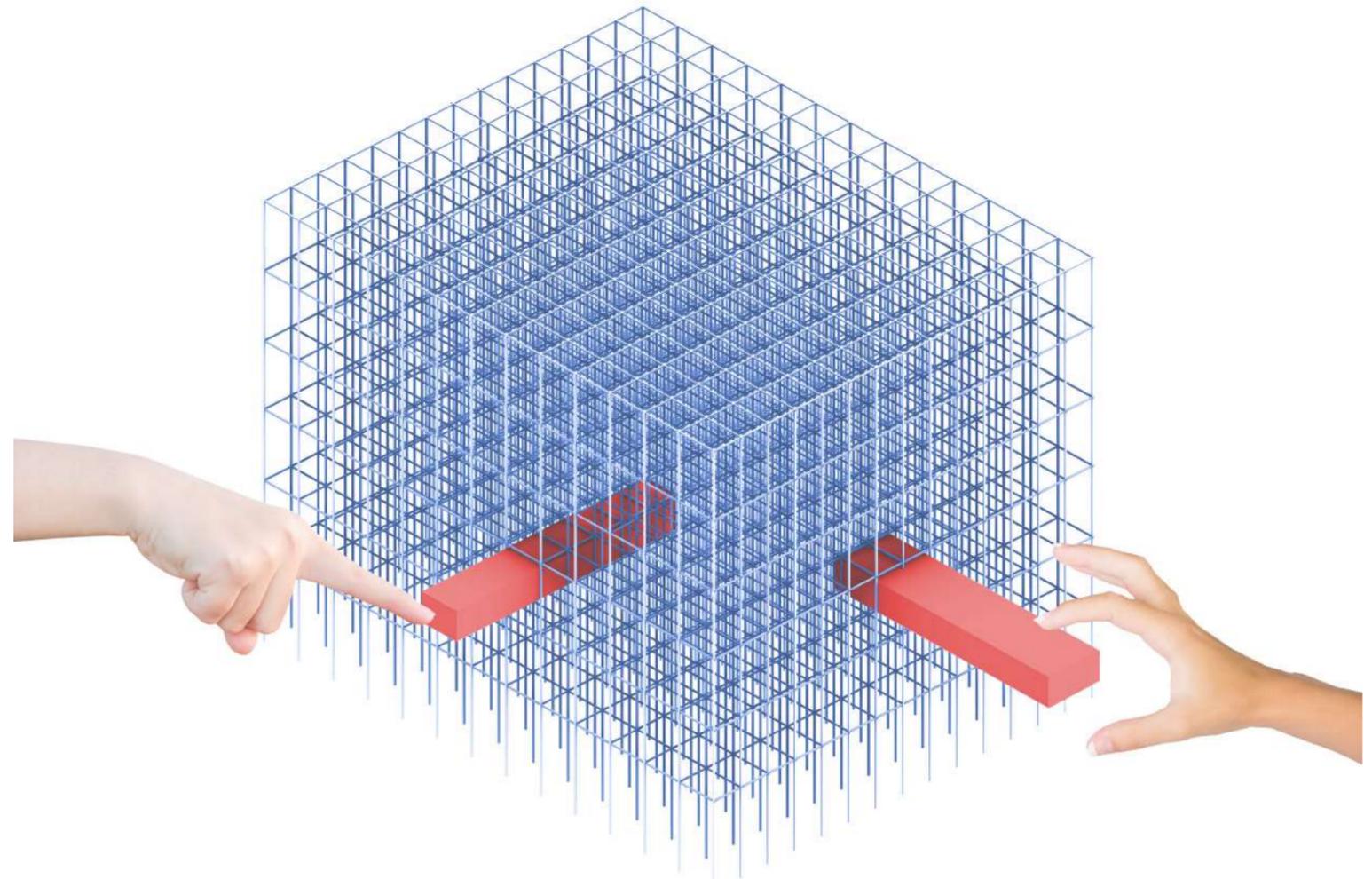


Scheme of formation of a residential building 2



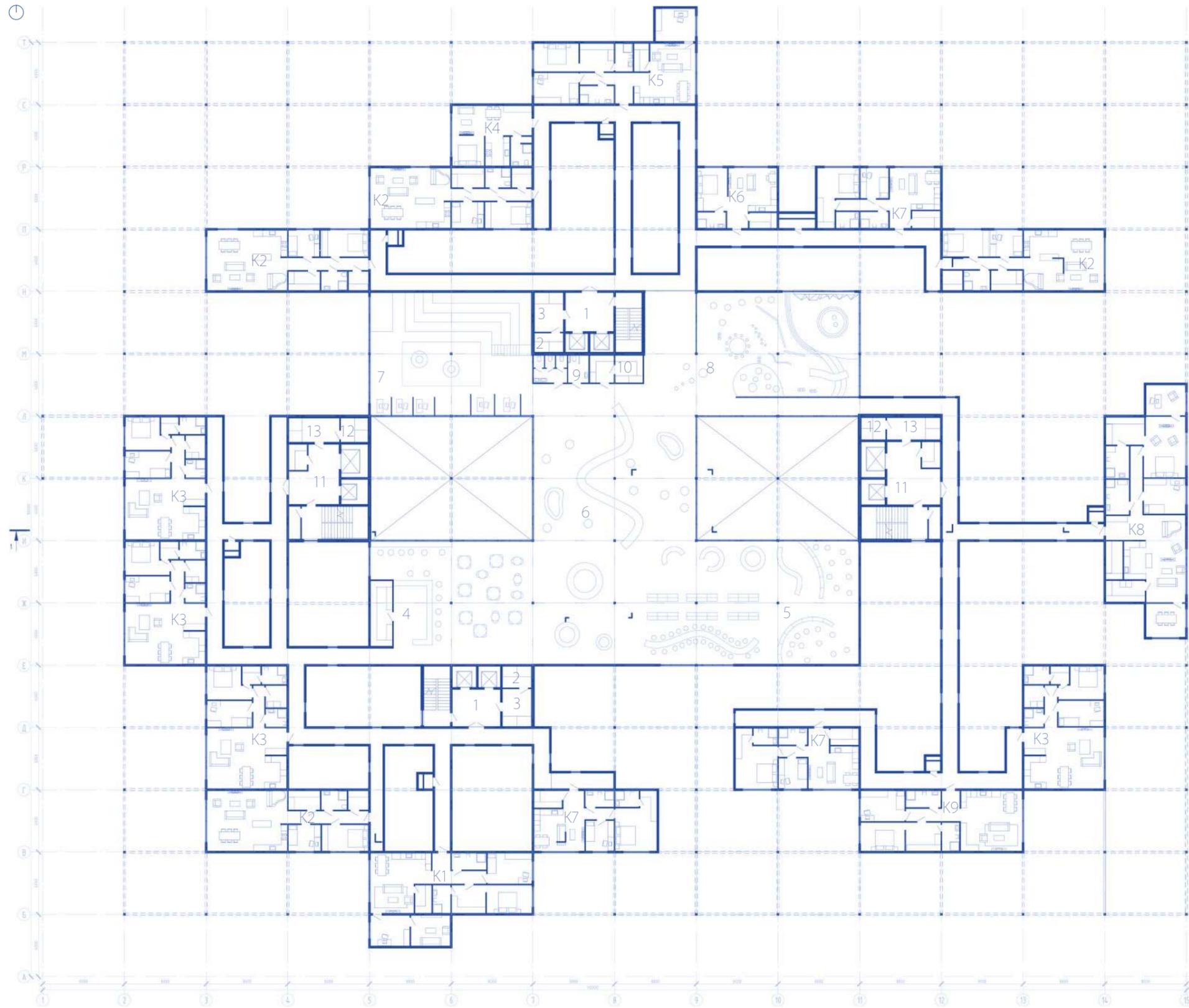
Formation of a residential building

The frame of the house is the main supporting structure, around which various residential blocks are located. These modules are also made of wood, which provides a comfortable microclimatic condition inside the house and has high thermal insulation. Inside the frame, with the help of cranes, modules made of wood are installed according to the principle of the Altai warm house.



Space-planning solution

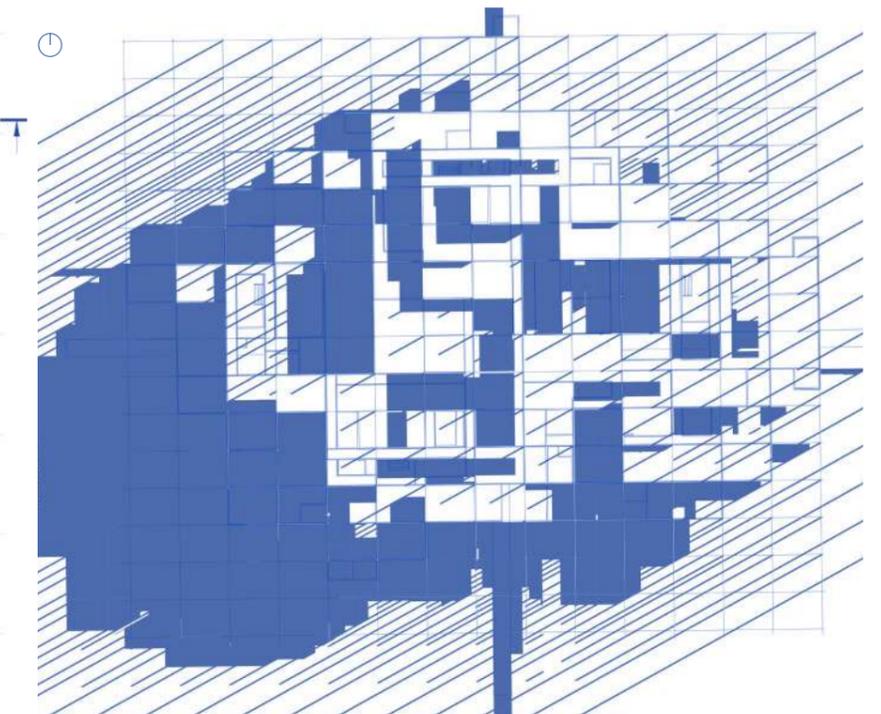
Floor plan at + 37,300



Explication of premises

1	Stair, elevator node	40 m ²	12	Technical room	6 m ²
2	Technical room	6 m ²	13	Storeroom	6 m ²
3	Buffet	10 m ²	14	Vestibule	9 m ²
4	Pub	150 m ²	K1	Apartment type 1	110 m ²
5	Library	280 m ²	K2	Apartment type 2	90 m ²
6	Zone of joint creativity	190 m ²	K3	Apartment type 3	90 m ²
7	Coworking	180 m ²	K4	Apartment type 4	45 m ²
8	Kids room	180 m ²	K5	Apartment type 5	100 m ²
9	WC	12 m ²	K6	Apartment type 6	45 m ²
10	Storeroom	14 m ²	K7	Apartment type 7	70 m ²
11	Staircase unit	6 m ²	K8	Apartment type 8	160 m ²
			K9	Apartment type 9	90 m ²

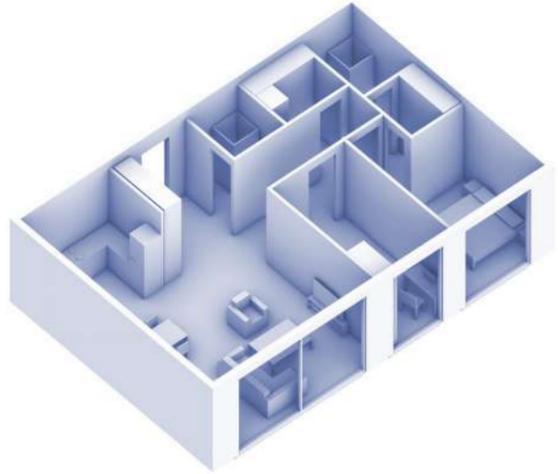
Top view



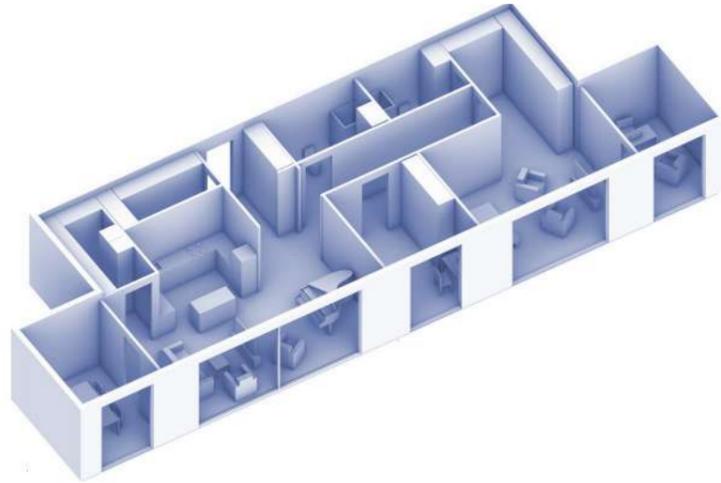
Formation of apartments



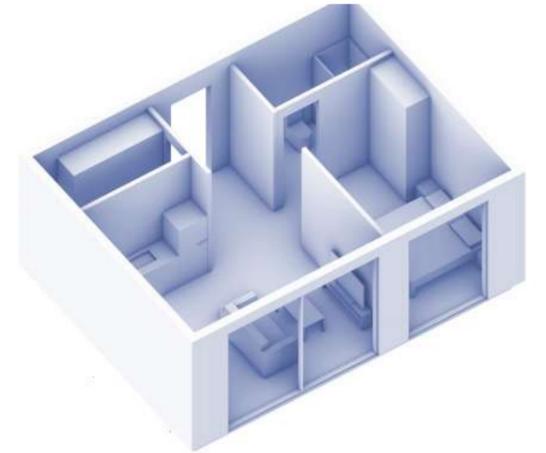
K3



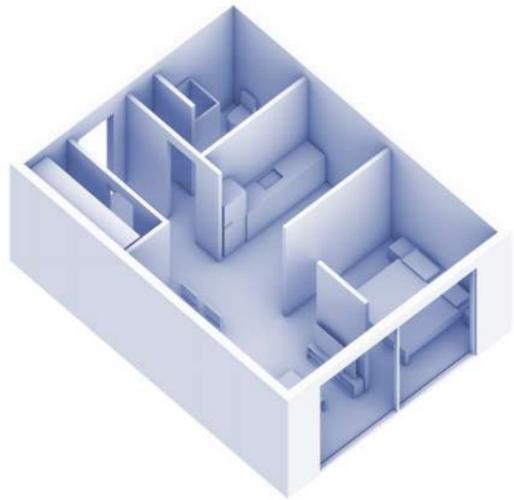
K8



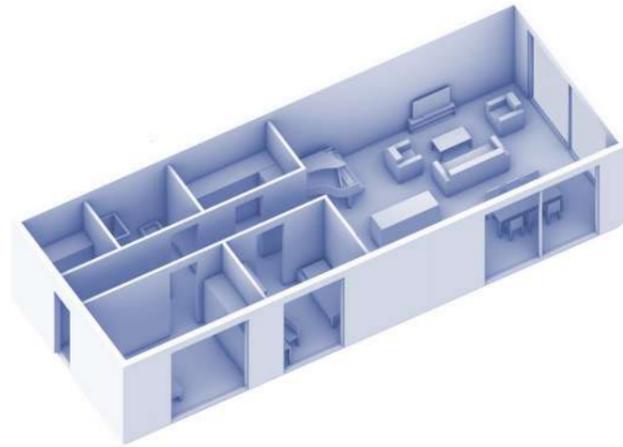
K6



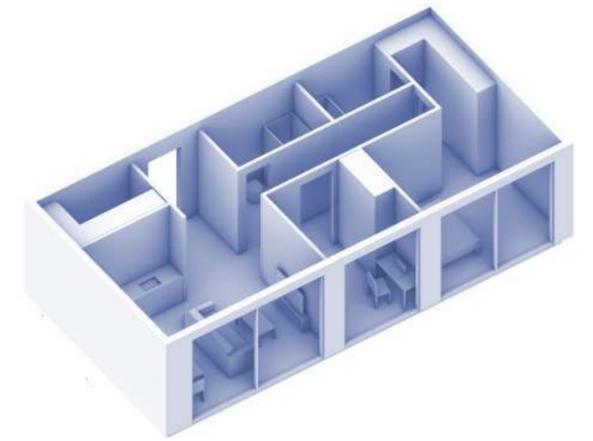
K4



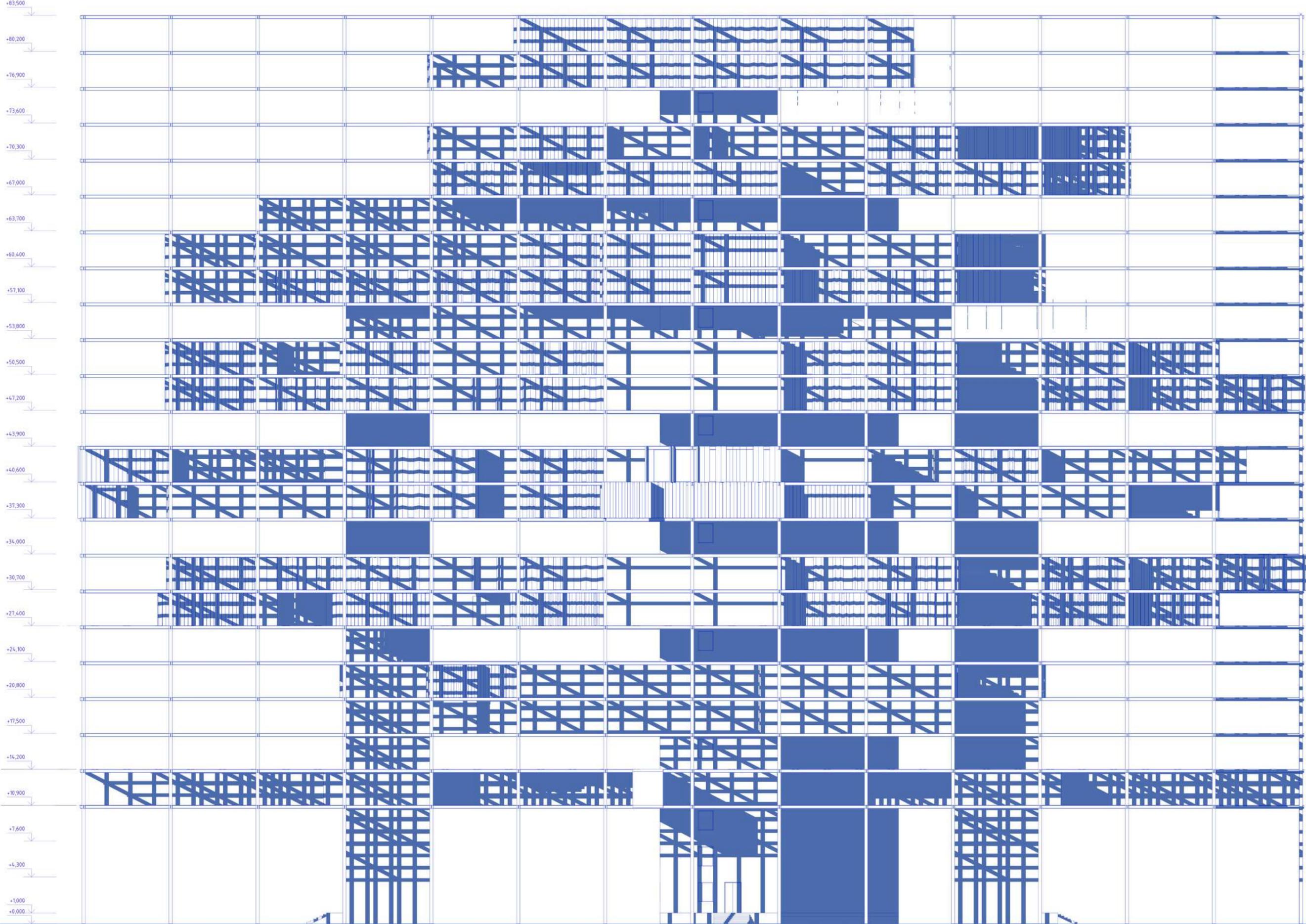
K2



K7



North facade



Section

