

LJUBLJANA represents a healthy proportion between nature and the built urban environment. Nature is in fact woven into the fabric of the city, resulting in a very stimulating and appealing setting that includes parks and river areas.

# LJUBLJANA SCIENCE CENTRE DESIGN COMPETITION

48010

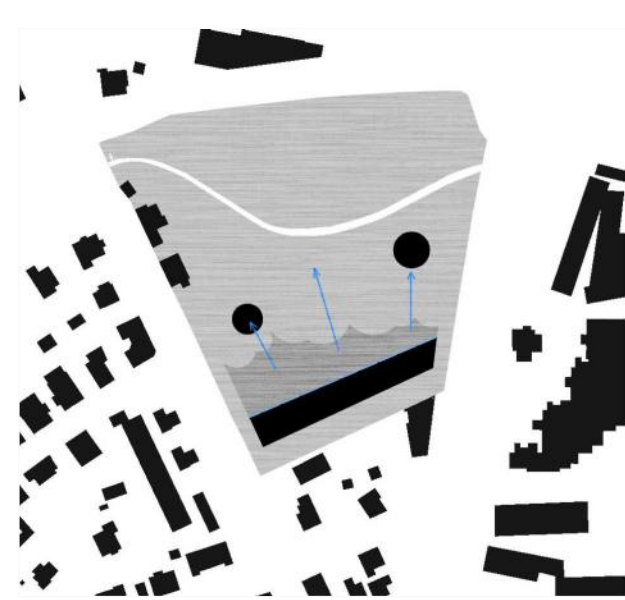
The entire OPPN81 land offers a wide range of opportunities for creating a universal Venue for the City of Ljubljana, but there's only one way of being respectful with existing nature, accommodating the New Science Centre leaving the maximum space for the park, and keeping the original walking paths from east to west. To the south a private road will be designed for private Museum use. In a second Stage, the idea continues with the same principles, a big park to the south is envisioned, leaving the remaining space for another building to be decided that will share the existing private road of the first stage for services as well.

On the science museum centre an emerging green terrace overlooking the city's skyline is designed as a fifth facade of the complex that will have a commanding presence when seen from the hills that gather the heart of the city.



The project presents an urban scale south facade and a large green-roof which is connected to the forest.

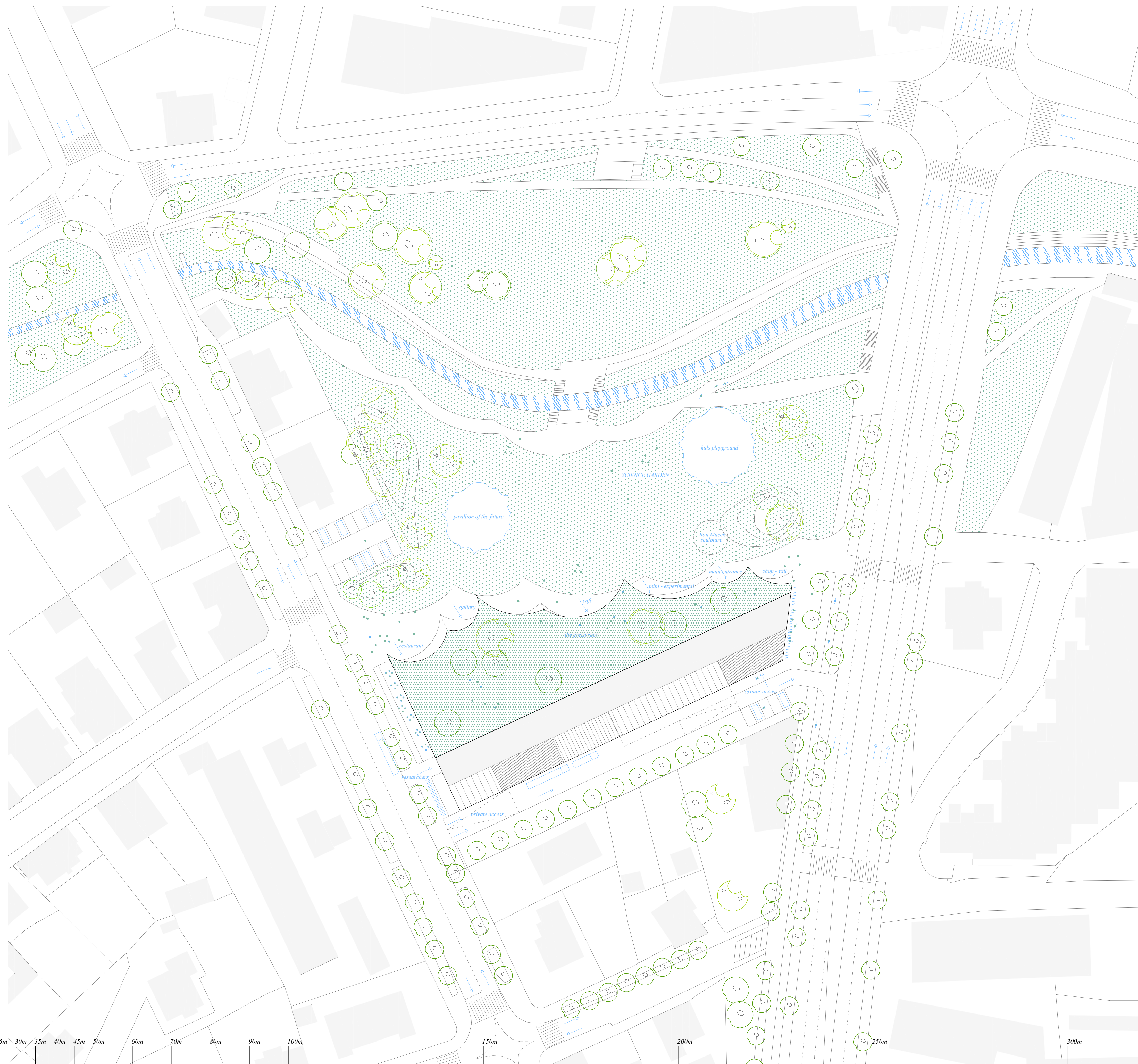
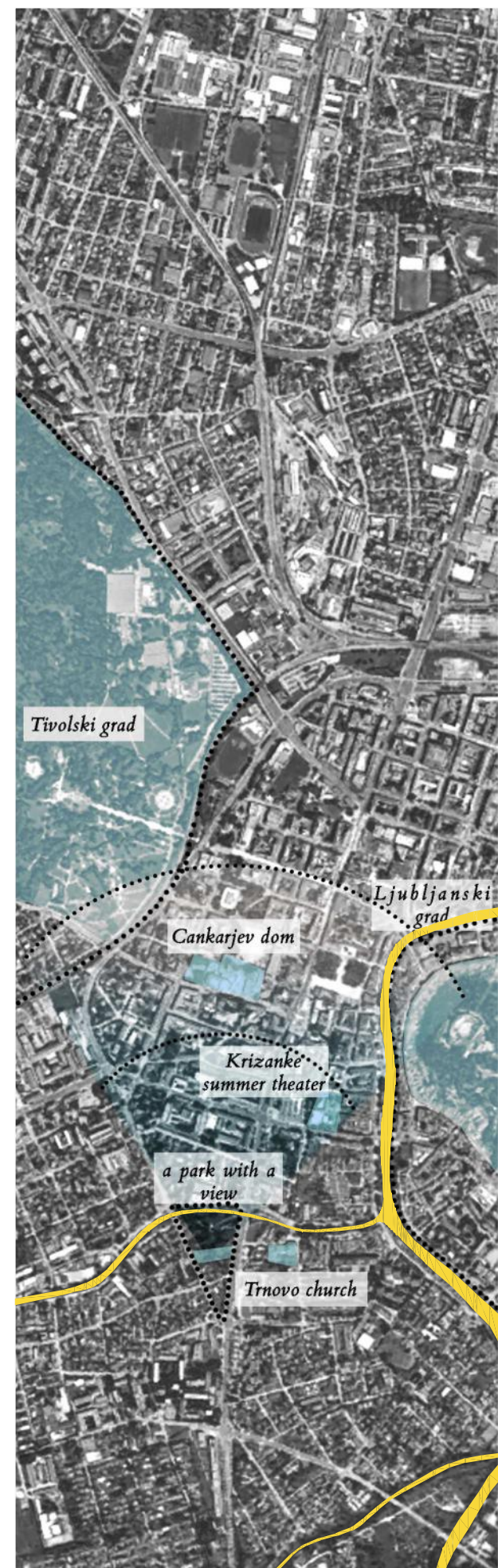
## 02 Program extension



## 03 Second Phase OPPN81



## 04 A park with a view



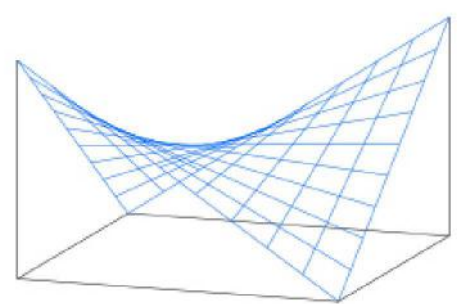




Interior View of Central space: Visual connection with Mini experimental space



Curved limits between natural and artificial



Parabolic Surfaces

### Space planning

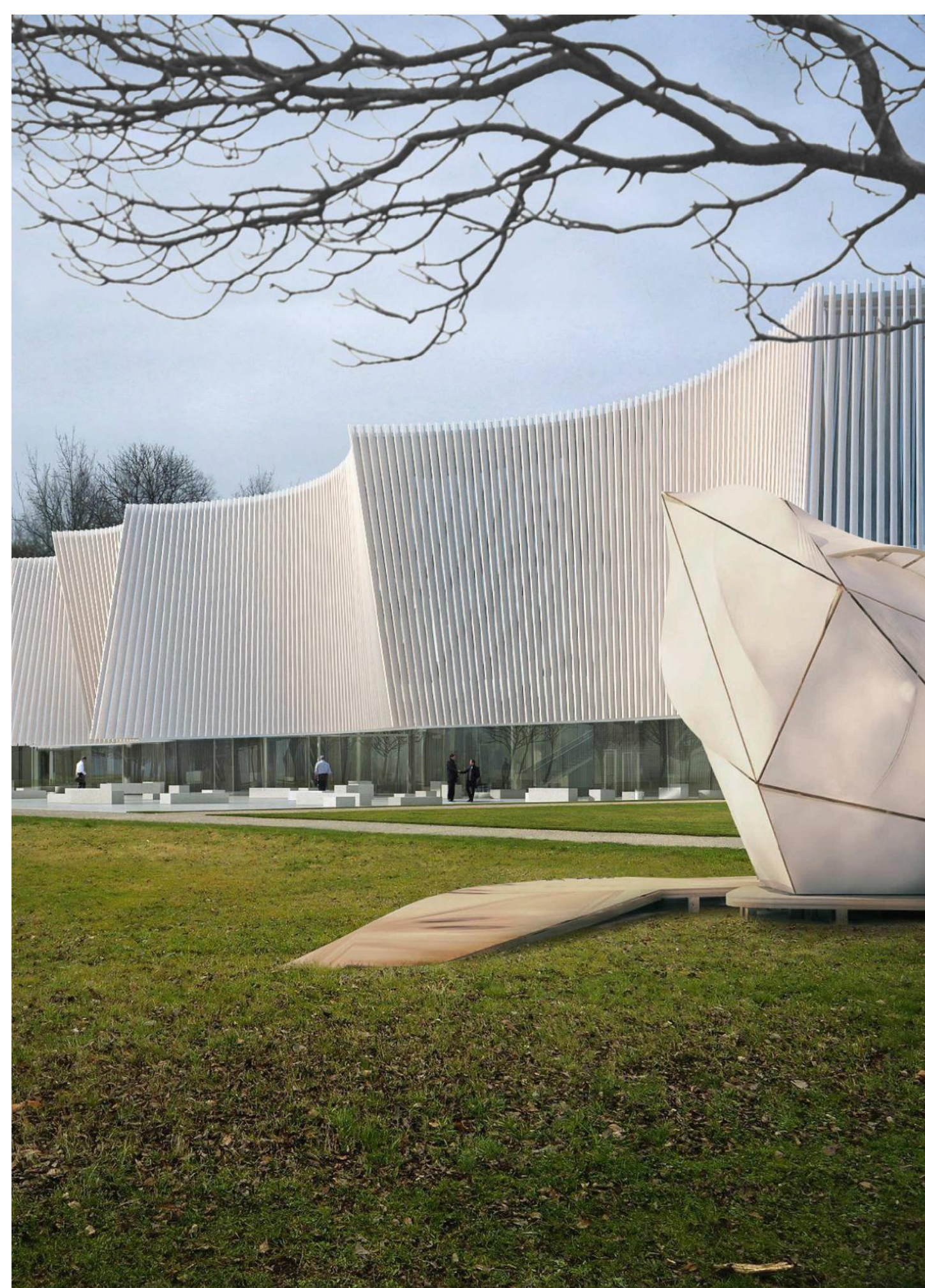
The project works with two types of geometries, one linear and straight to the south, linked to the fast pace of the new city, and another, parabolic, linked to slow nature and flow of the river and the new science park, which should function as a visual attractor from the old town (north).

This parabolic geometry is inspired both by the abstract and creative movements of nature and the complex parametric geometries of mathematics. Their carved texture continues in the plinth towards the science park and with stepped stone terraces to the water channel that flow effortlessly towards the river.

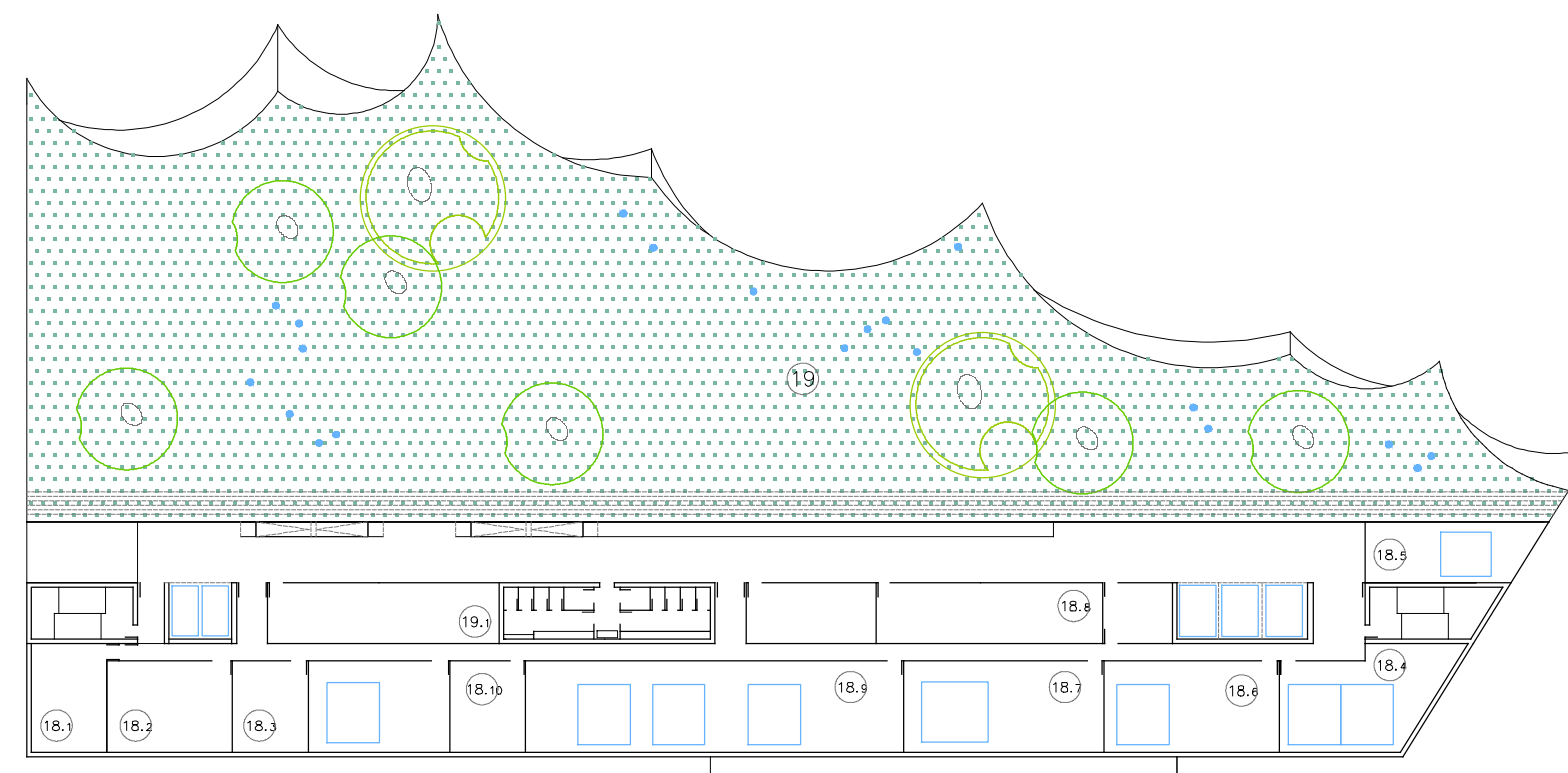
Public accesses to the complex are located on the east and west façades, via two urban squares. Staff and service personnel access via the southern façade, which also acts as loading bay, underground access and surface parking.

Outdoor performances and live experiments can be enjoyed from the science park and also from the roof garden that can hold small concerts overlooking the old town.

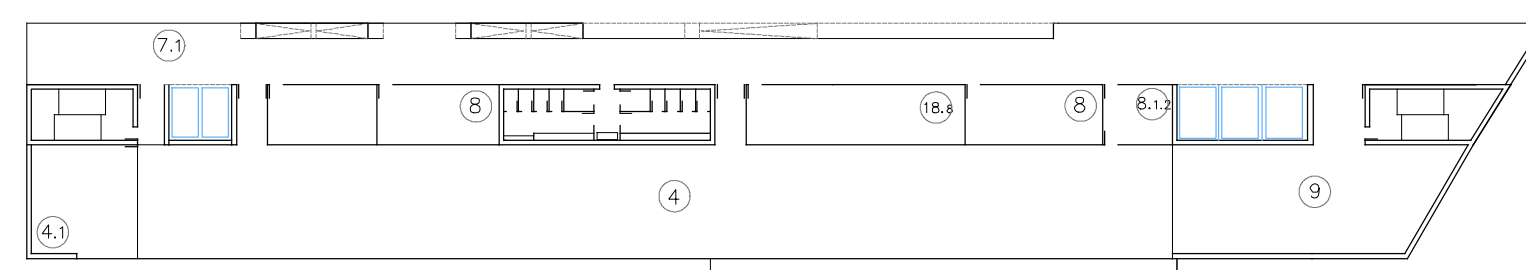
The complex must become a new icon for the city, an attractor and a vital pulse generator, so it wants to be a protagonist, it does not want to hide. The idea is therefore clear and strong, taken to the extreme.



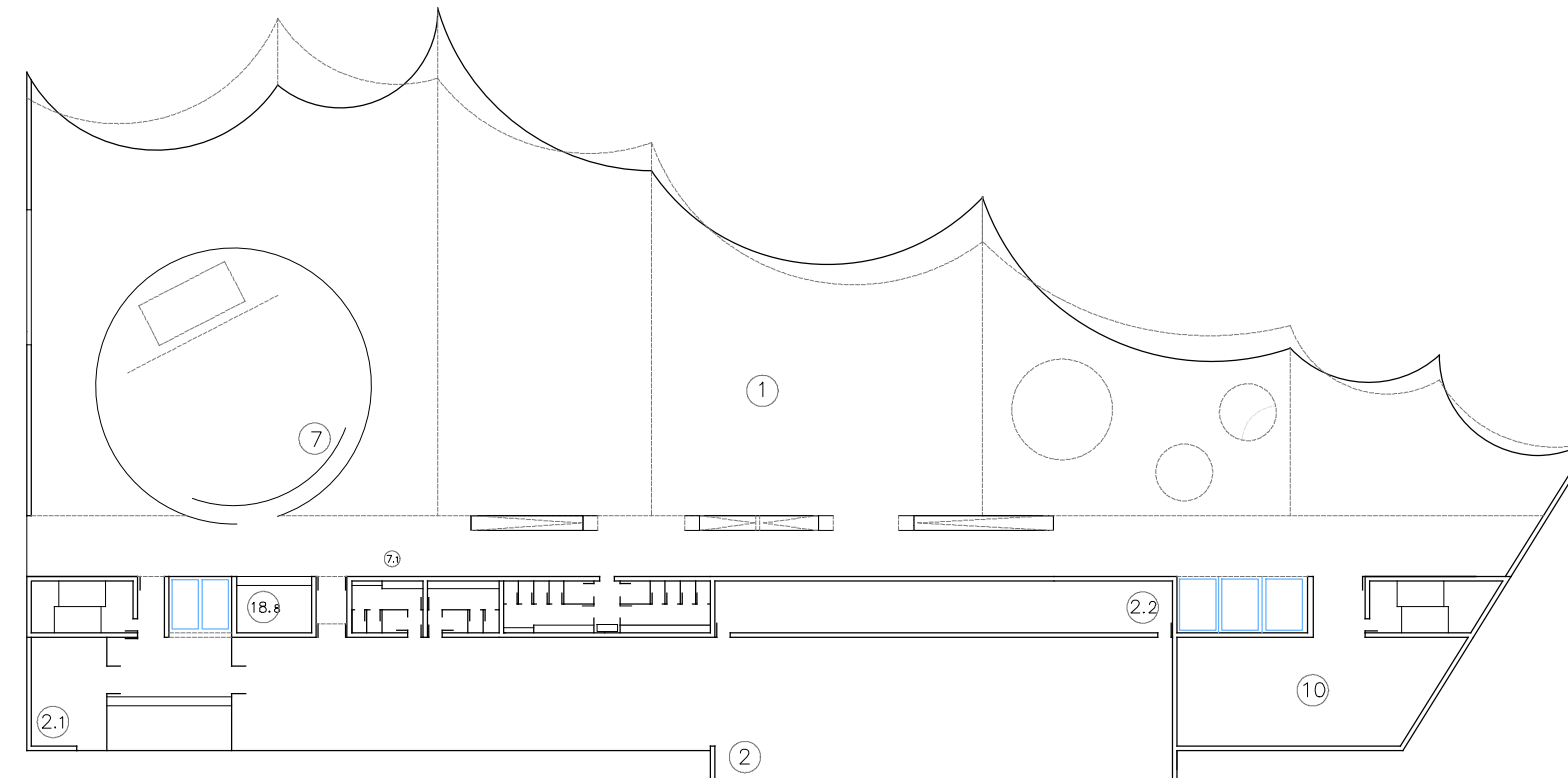
Exterior View of the North Façade: with the pavilion of the future



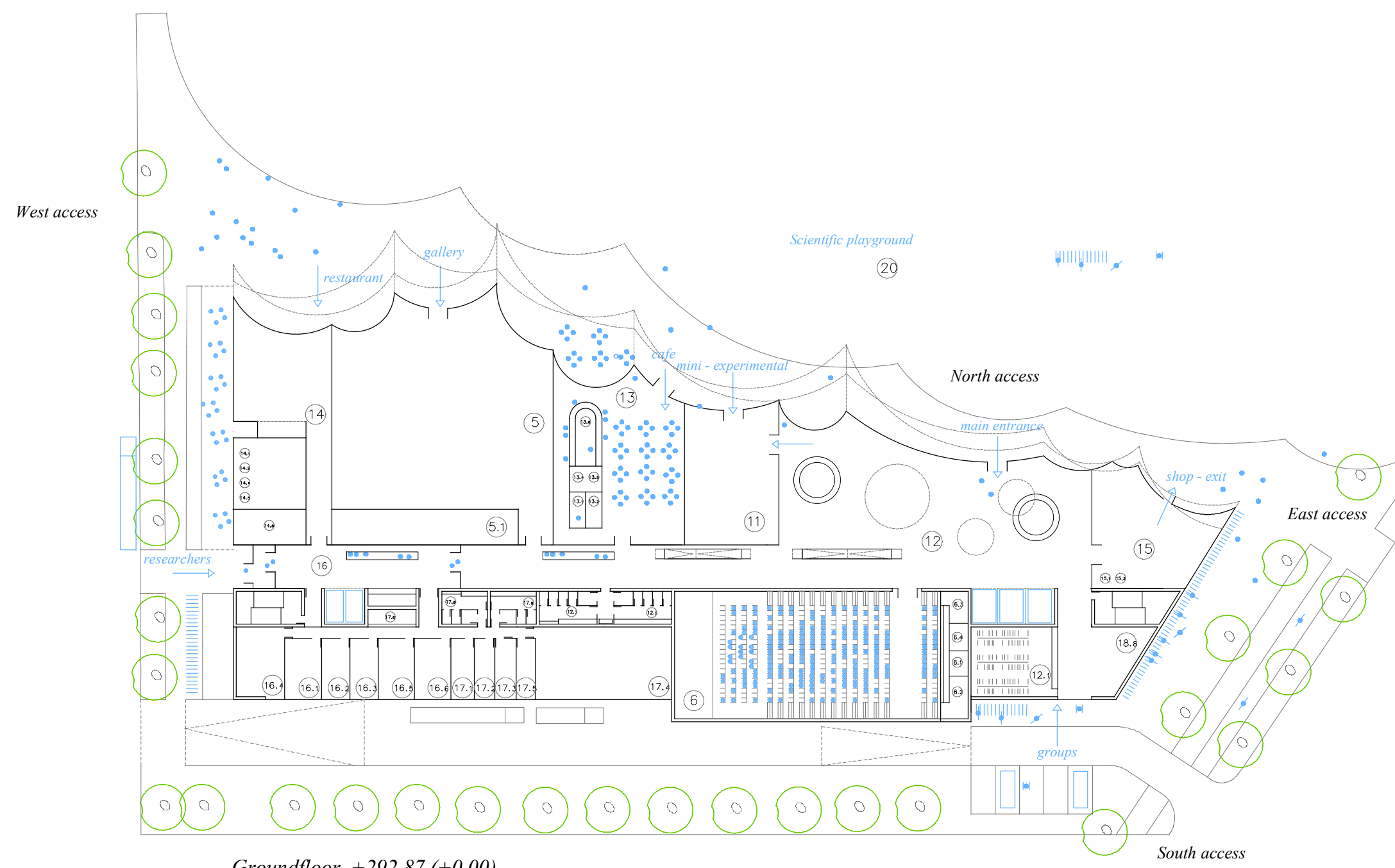
Third Floor, +303,37 (+14,00)



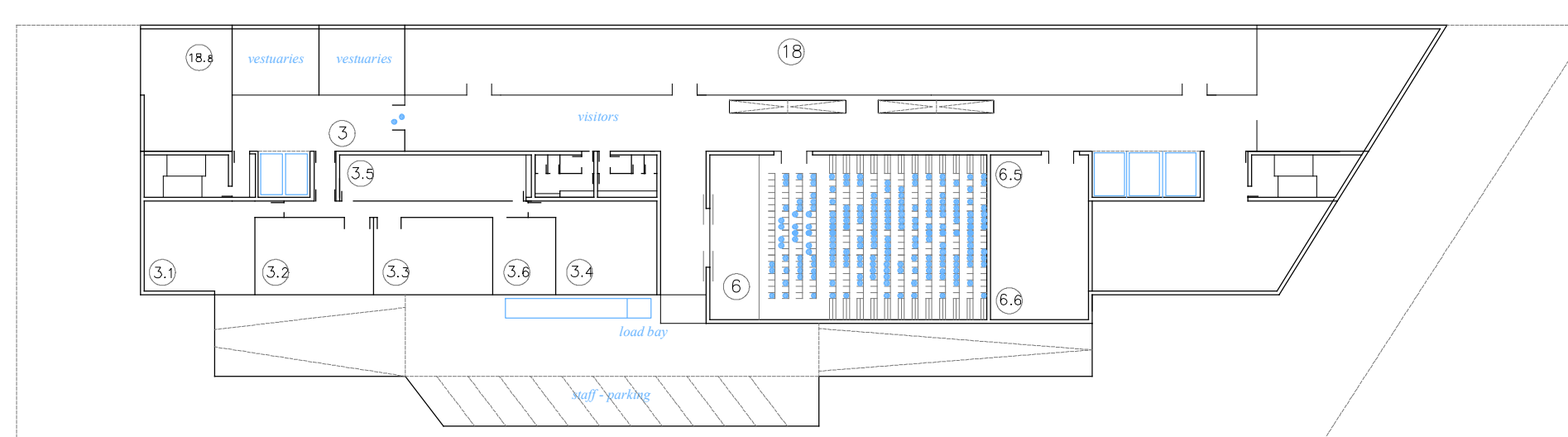
Second Floor, +300,77 (+7,90)



First Floor, +296,97 (+4,10)



Ground floor, +292,87 (+0,00)



Basement, +289,37 (-3,50)

### SCHEDULE OF THE MAIN SPACES

#### Programme Spaces

1. Central Space
2. "Fab - Lab"
  - 2.1. Offices
  - 2.2. Convenient warehouse
3. Laboratories
  - 3.1. Physics laboratory
  - 3.2. Chemistry laboratory
  - 3.3. Biology laboratory
  - 3.4. Laboratory for materials
- Service rooms
  - 3.5. Preparing rooms
  - 3.6. Technician in the laboratory
4. Demonstration centre "Showroom"
  - 4.1. Technical space
5. Gallery
  - 5.1. Technical space
6. Conference room
  - 6.1. Projection booth
  - 6.2. Translation booth
  - 6.3. Translation booth
  - 6.4. Translation booth
  - 6.5. Equipment storage
  - 6.6. Backstage
7. Planetarium
  - 7.1. Vestibule
8. Meeting rooms
  - 8.1. Kitchenettes
  - 8.2. Dressing rooms
9. Media centre
10. Virtual hub
  - 10.1. Space for the control system
11. Mini experimental room

#### Support rooms

12. Entrance hall
  - 12.1. Dressing room
  - 12.2. Women's restroom
  - 12.3. Men's restroom
  - 12.4. Restroom for functionally impaired persons
  - 12.5. Central control system
13. Scientific café
  - 13.1. Women's restroom
  - 13.2. Men's restroom
  - 13.3. Restroom for functionally impaired persons
  - 13.4. Dressing room for employees
  - 13.5. Restroom for employees (men, women)
  - 13.6. Convenient warehouse
14. Scientific café
  - 14.1. Women's restroom
  - 14.2. Men's restroom
  - 14.3. Restroom for functionally impaired persons
  - 14.4. Dressing room for employees
  - 14.5. Restroom for employees (men, women)
  - 14.6. Convenient warehouse
15. "Maker shop"
  - 15.1. Dressing room for employees
  - 15.2. Convenient warehouse

#### Administrative premises

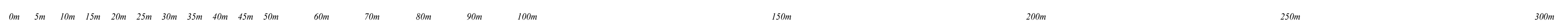
16. Vestibule for researchers
  - 16.1. Director
  - 16.2. Assistant Director
  - 16.3. Secretary and assistant in the secretariat
  - 16.4. PR 2x, graphic designer
  - 16.5. Finance officer
  - 16.6. Staff manager and assistant
17. Head of the "Science centre" programme
  - 17.1. Head of the Development
  - 17.2. Head of education
  - 17.3. Head of education
  - 17.4. Service rooms
  - 17.5. Kitchenettes
  - 17.6. Dressing room for employees
  - 17.7. Men's restroom
  - 17.8. Men's restroom
  - 17.9. Women's restroom

#### Technical premises

18. Central storage space
  - 18.1. Workshop for maintenance workers
  - 18.2. Technical facilities for TC-networks
  - 18.3. Premises for floor TC-hubs
  - 18.4. Outdoor air conditioning
  - 18.5. Outer space for the heat pump/cooling unit
  - 18.6. Heat station
  - 18.7. Air conditioning engine rooms
  - 18.8. Space for the control systems
  - 18.9. Engine room for the pavilion "Technologies of the Future"
  - 18.10. Space for separate storage of waste

#### Outer spaces

19. Green roof
  - 19.1. Warehouse
20. Scientific playground
21. Pavilion "Technologies of the Future"





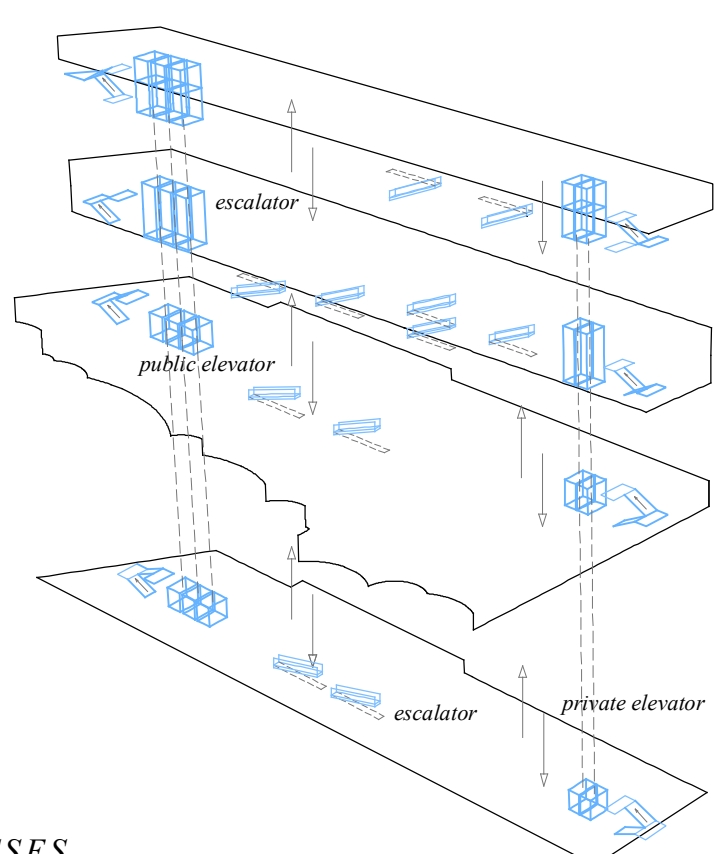


Public Spaces

The spatial distribution of the Center is extremely clear for the visitor. There's a new outdoor path between Barjanska road (east) and Riharjeva street (west) that runs parallel to the North facade of the building, (remembering the old existing passage) From that path is possible to access all the groundfloor public facilities and of course the Main hall. Once inside the orientation is very simple because the linear foyer connects the full building, while the staff and service areas have access from the South facade, without interfering in the visitors areas. Linear Foyer allows simple operation for exhibitions and events, as well as small improvised activities.

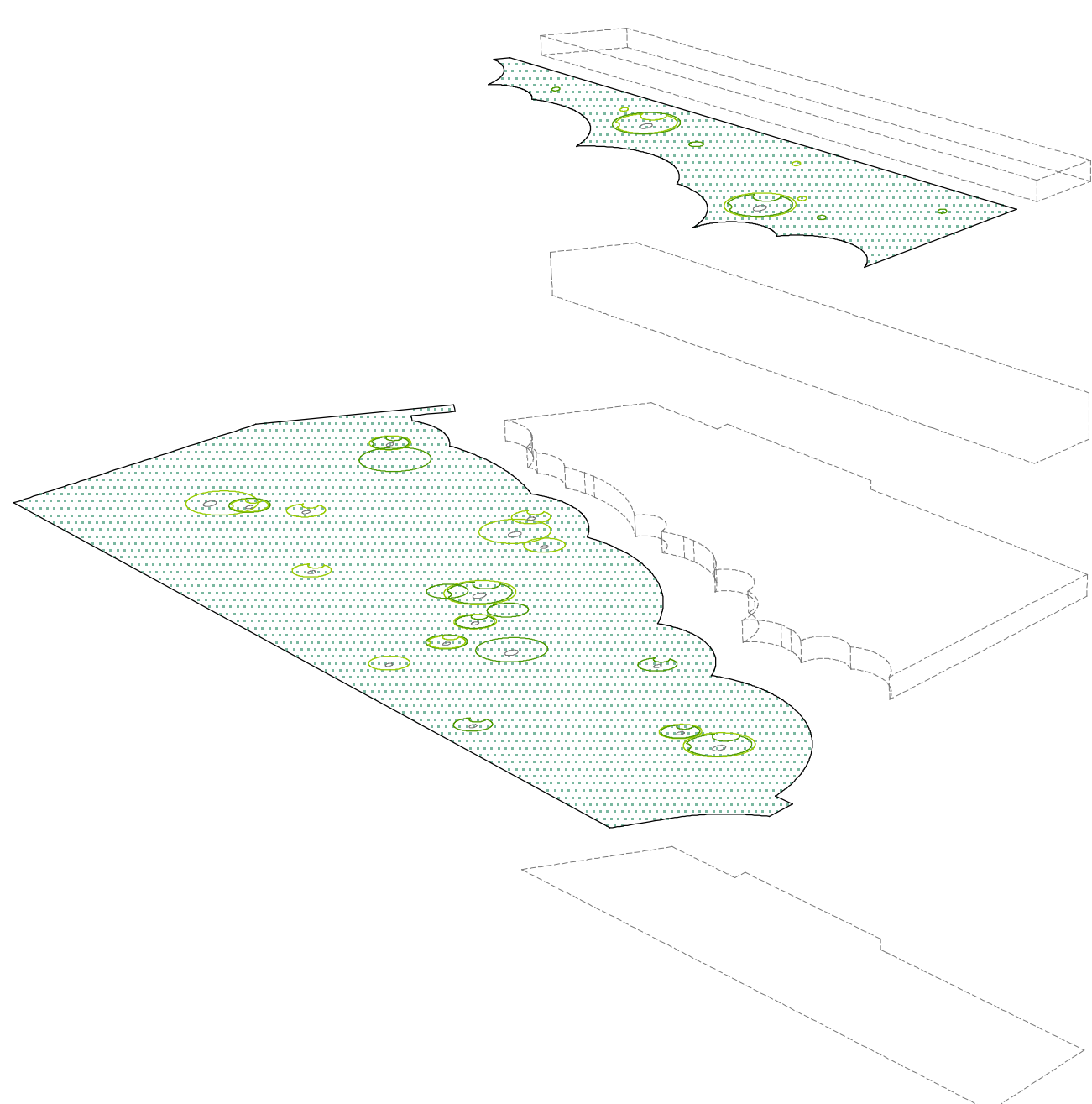
COMMUNICATIONS

Each communication nucleus have big-size elevators in order to move goods easily inside the project



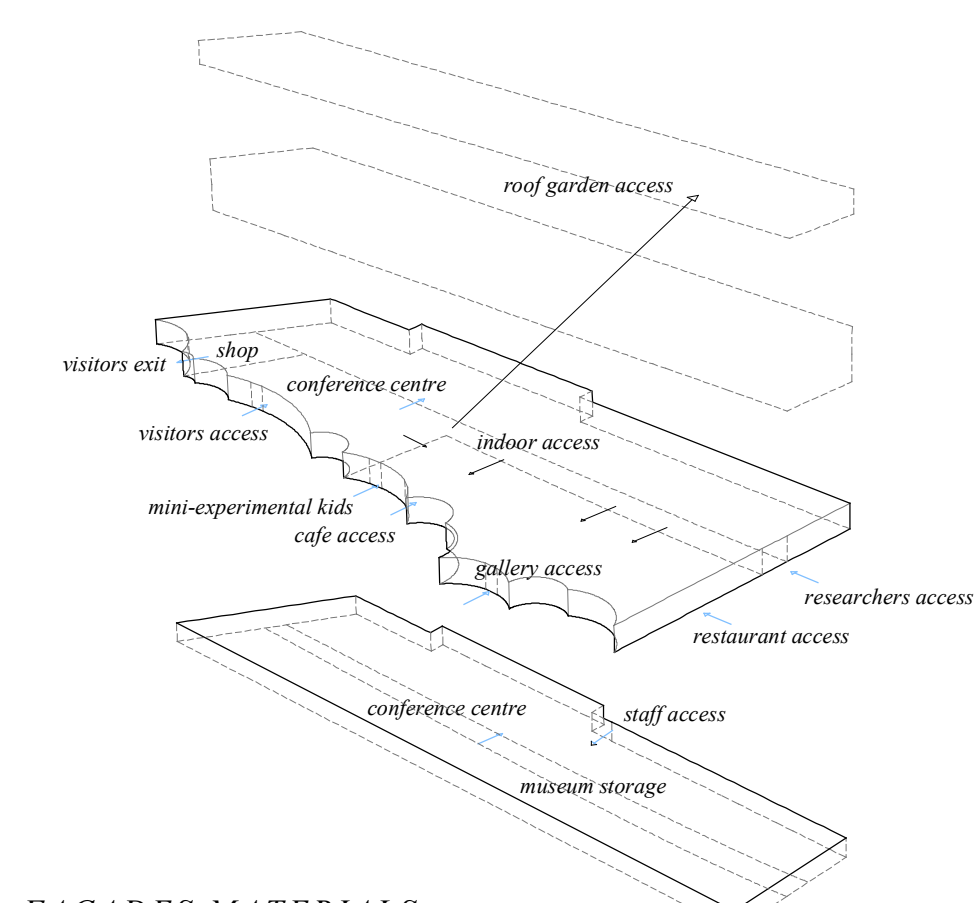
PARK-ROOF CONNECTION

The green roof is considered as an extension of the existing park. A garden in height which frames the city views.



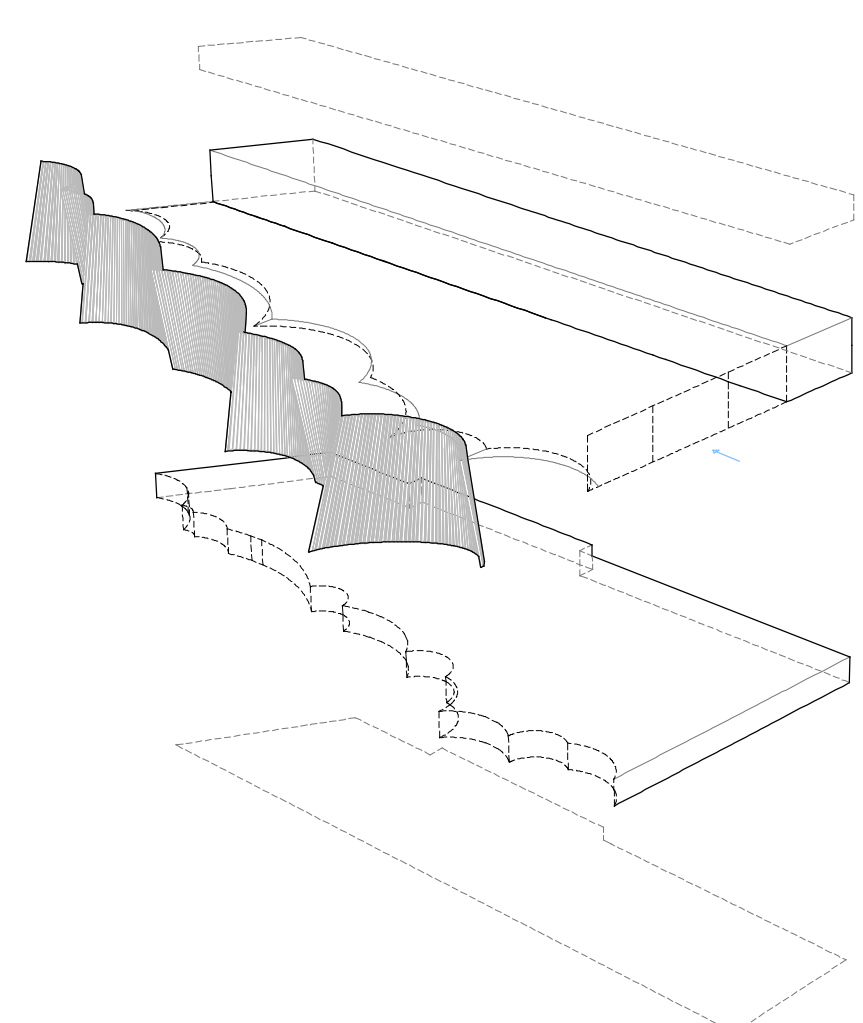
ACCESSES

The main accesses, which are meant for the centre visitors, are located in the main façade. Secondary accesses will be provided for both centre personal and investigators.



FAÇADES MATERIALS

The north façade will be composed with recycled aluminium louvers. The rest of the façades will be built with self-cleaning exposed white concrete

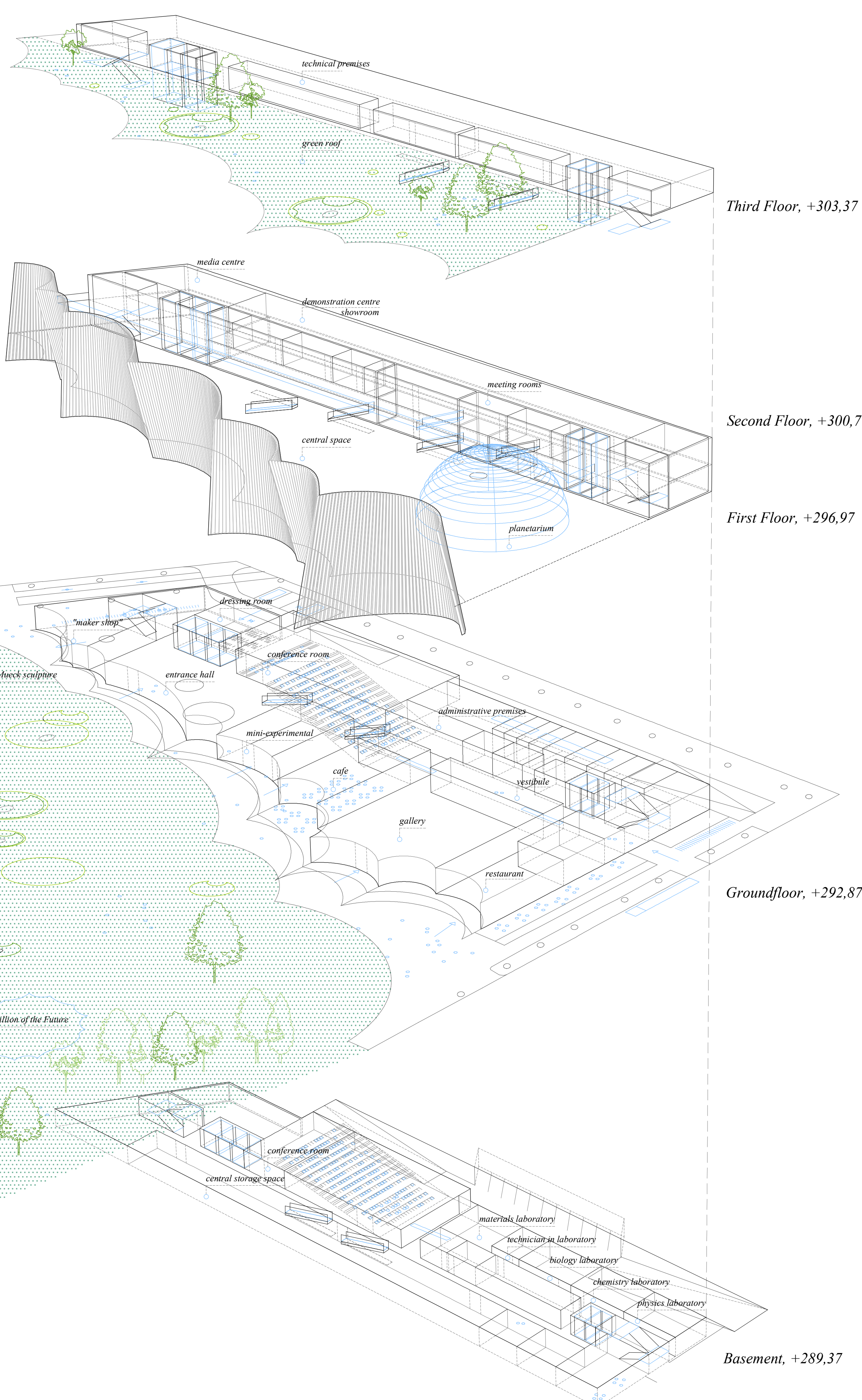


Functionality is key in this proposal. The entrance hall is bright, inviting and impactful. Natural light and a visual connection to the 'Science park' is provided by a great glass wall offering panoramic views of the northern part of the city across the park and river channel.

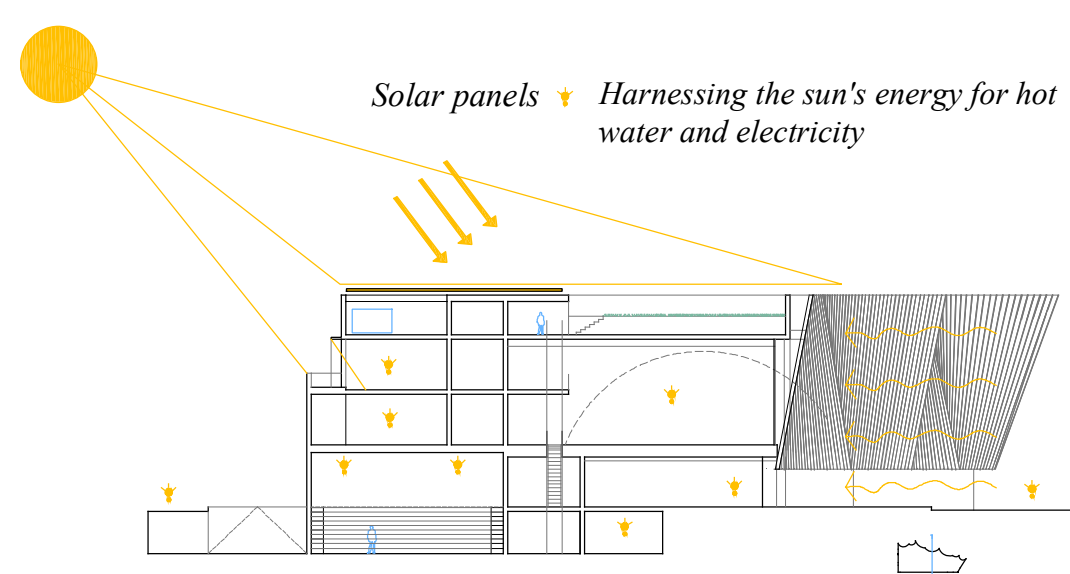
The Linear Foyer runs parallel to the Park, which means orientation (once inside the building) is clear and intuitive. Access to the different services (cafe, mini experimental kids, restaurant, Gallery and shop) is perpendicular to this axis, via outside park and main corridor inside. All these spaces have direct access from outside and they are protected from the rain with the building itself, flooded in natural light from the north garden. (Each element has outside and inside entrances so as to allow for versatile time uses)

Staff back-of-house traffic is also longitudinal and permits clear communication between different areas. Offices, storage, maintenance, Auditorium, staff and service personnel remain hidden from North view. A modern museum need rapid assembly and shorter preparation times for their operations. This has been one of the guiding principles in this proposal.

The green roof can be accessed from several elevators and a promenade of escalators, as a beautiful ending of the museum journey. This roof can be reached independently from the entrance museum (form the researchers or the group entrance), allowing different activities.







**Natural Light**

*Let the Sun Shine In!*  
Daylight is an essential natural asset. The design is perfect to achieve a maximum comfort in terms of natural light: Linear distribution of laboratories, Fab Labs, Offices, and Demonstration spaces, with controlled direct light from the south and a diffuse light from the north to the public areas (the beneficial effect of sunlight is easy to recognize). Natural light is energy, is sustainability, is happy and is healthy. The Labs and offices will keep 500 lx on the working desks, and lobbies and open areas will be between 150 and 300lx. A system of lighting sensors will be installed in every space to maintain the required illuminance levels, vacancy sensors will be installed as well, connected to the control system of the building.

**Humidity**

Humidity will be in range of 30 to 60%, because keeping it between 40-50 consumes a lot more energy than heating itself. Laboratories of course will have a special dehumidification protocol, as the Fab Labs.

**Air velocity**

A radiant and cooling system with TABS system, combined with natural ventilation will assure an extremely low velocity of the air, around 0,15m/s. Thanks to the opening in the roof garden (linear hall), a natural ventilation effect can be produced during summer days, and according ventilation needs. Displacement ventilation will include a very high and efficient heat recovery system, when natural ventilation can be used, unless laboratories (for obvious reasons) that will use mechanical ventilation.

**Energy consumption**

Temperatures in the Building must be in comfort Range, between 20° in winter period and 26° in summer. Offices will maintain an average of 23° during the whole year. The highly insulated envelope ( $U=0,09 \text{ W/m}^2\text{K}$ ) and the radiant heating/cooling system will keep the energy consumption as low as 40 kWh/m<sup>2</sup> for the heating, and 7kWh/m<sup>2</sup> for cooling. For insulating the envelope 40 cm of insulation will be used, and 50 cm in the roof garden. The chosen material will be FOAM glass thanks to the lasting life material and the cost efficiency. Free energy sources as solar panels and geothermal energy piles in the foundations will reduce the electricity needs.

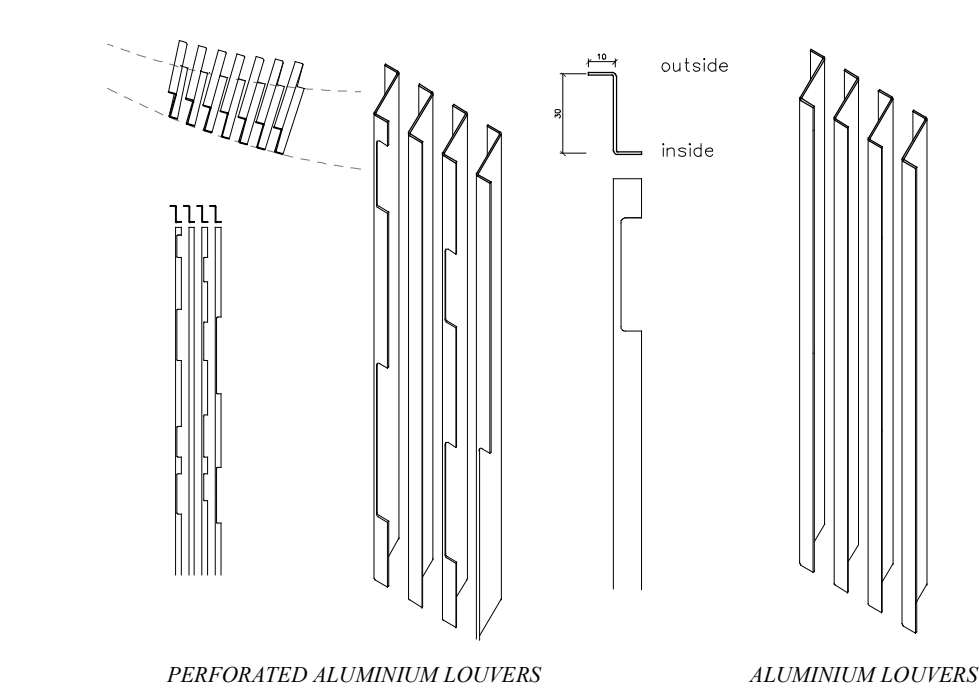
Windows will be triple glazed with thermally broken frames, the high G value and high visual transmittance support the heating against overheating, the opaque part of the walls will be placed in east and west facades where the control of the direct sun is much more complicated because of the low position of the sun.

**Lyfe cycle of construction materials**

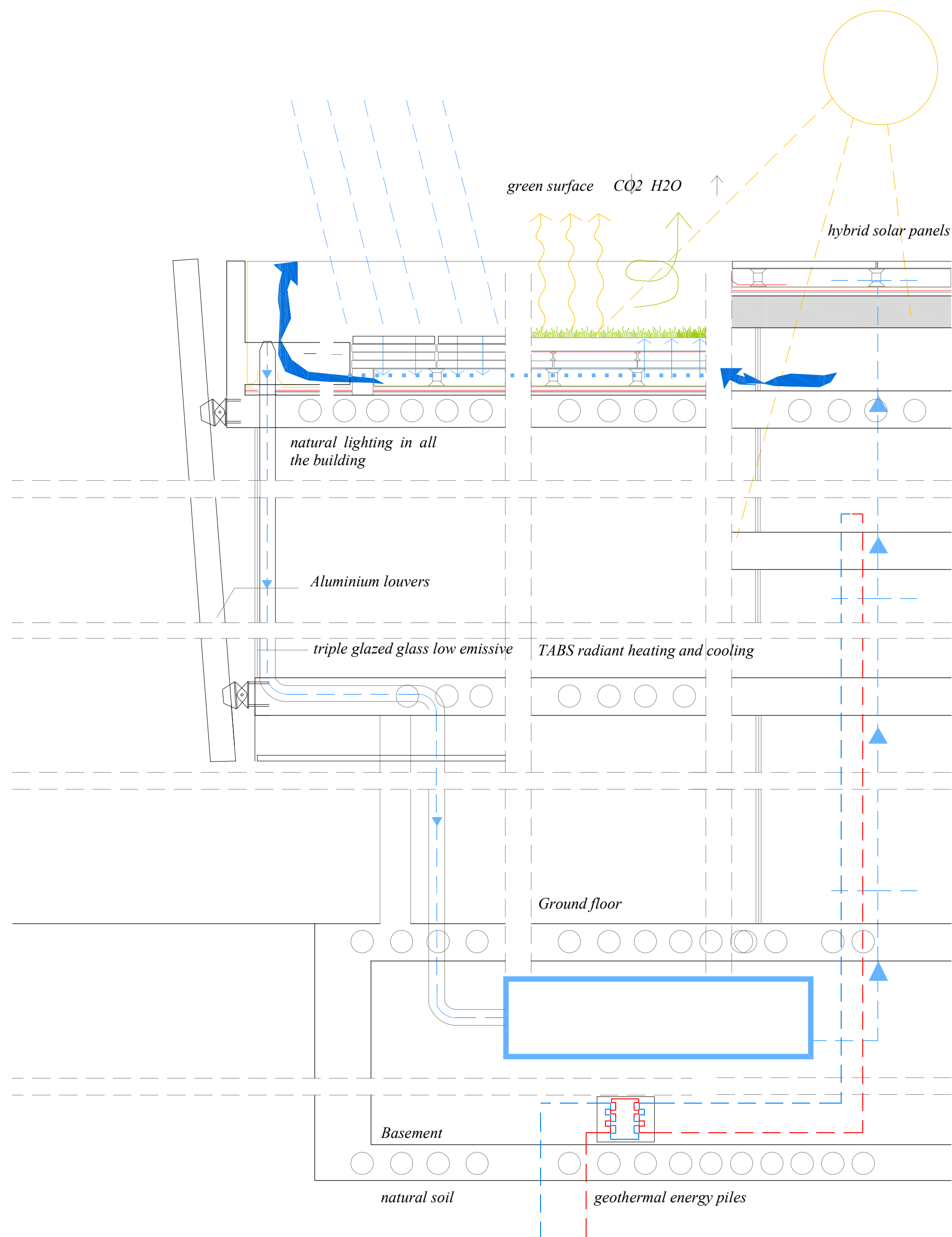
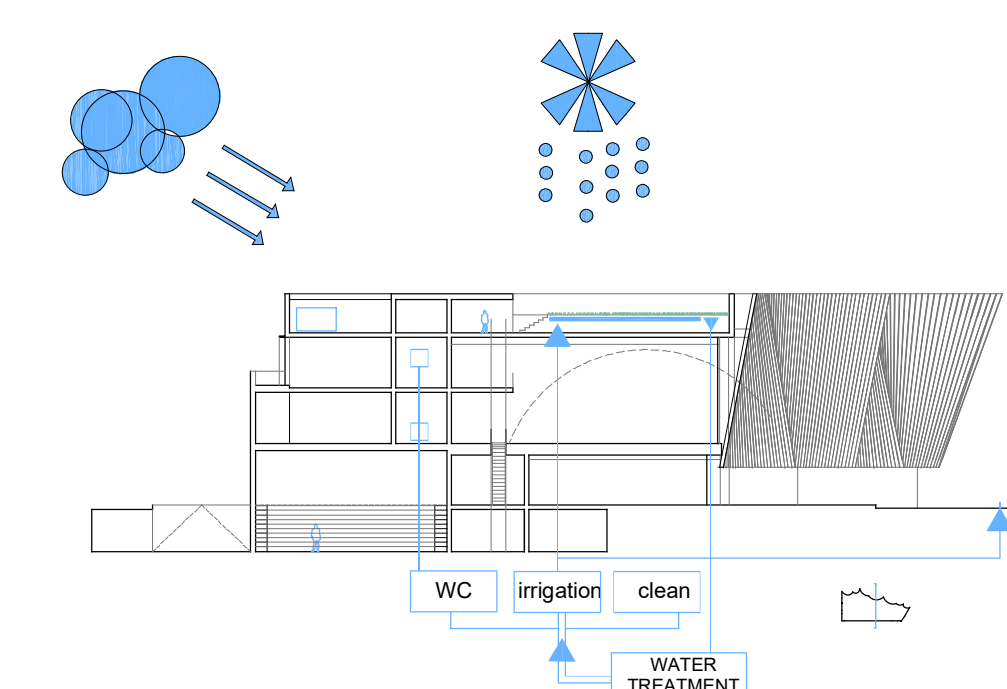
The main construction material will be steel that has a much longer Life cycle and there's not downgrade in recycling, than other materials as e.g. wood. The loading capacity is assured and the industrialization is guaranteed for low construction time. Reused metal allows to lower the global warming and energy consumption for production. Also less material than any other structural component is required, reducing even more the GWP. The facades will be designed with composites panels of recycled wood. All the materials used in the project will be 100% recyclables and reusable.

**Water Management**

Grey water are treated through a series of tanks and its treated liquid effluent reused for wc, irrigation and cleanliness. The roof acts as a system-water collection. Sloping roof has been designed to evacuate rain and snow. There are special spaces open but cover to protect of rain and snow.



The curved surface of North façade is produced with 'z' shape louvers of recycled aluminium, is a cost effective solution that, like a sort of white curtain, reduce direct light in the museum and allows to create a powerful image towards the science park. This light is given back to the city at night when the activity of the Museum appears on the park like a big screen. Amazing effects with artificial light can be displayed towards the city like. Some of the louvers will be perforated inside the Building creating an interesting play of shines and textures.



**ENERGY CONCEPT. SUSTAINABLE DESIGN**

The building must be durable, easy to maintain, and above all economically viable.

To this end, the design makes use of simple geometries, which allow cost-effective construction employing industrialised local materials. Only the facade facing the old city is slightly more complex and elaborate.

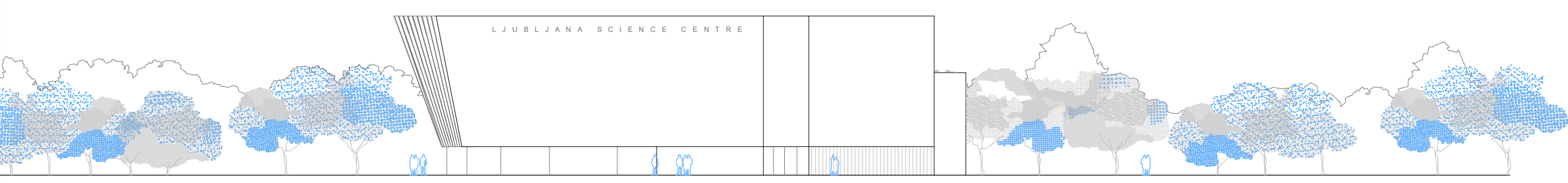
The green roof acts as an extension to the park, collecting and recycling rainwater. It also acts as an energy collector, thanks to the solar panels incorporated into the garden.

Exterior View of the North Façade: with the Ron Mueck sculpture

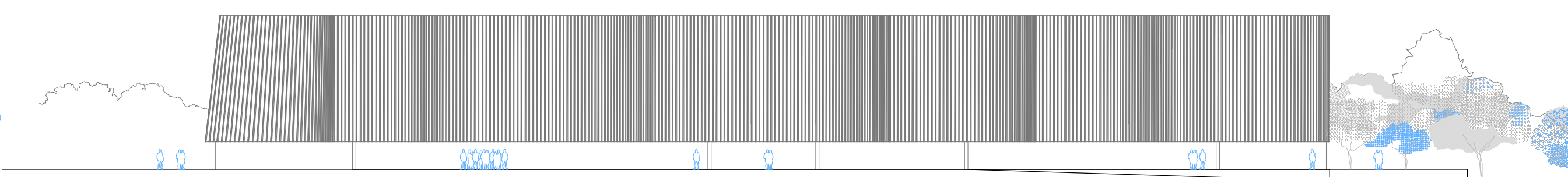




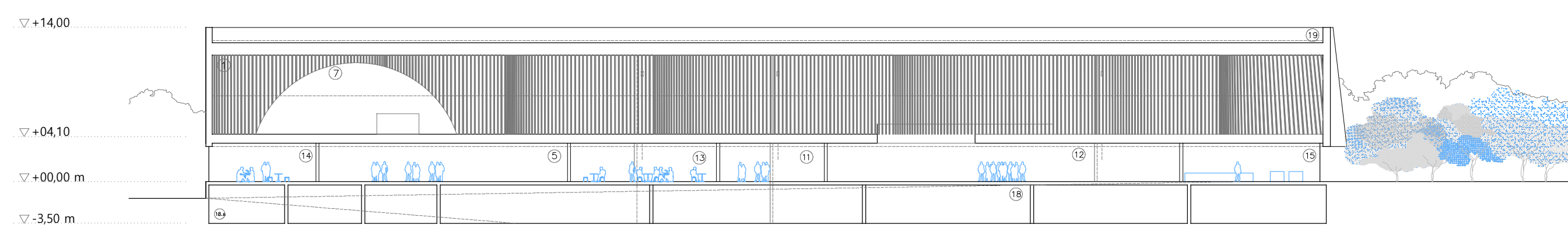
Exterior View of the West Façade: integration in the urban fabric



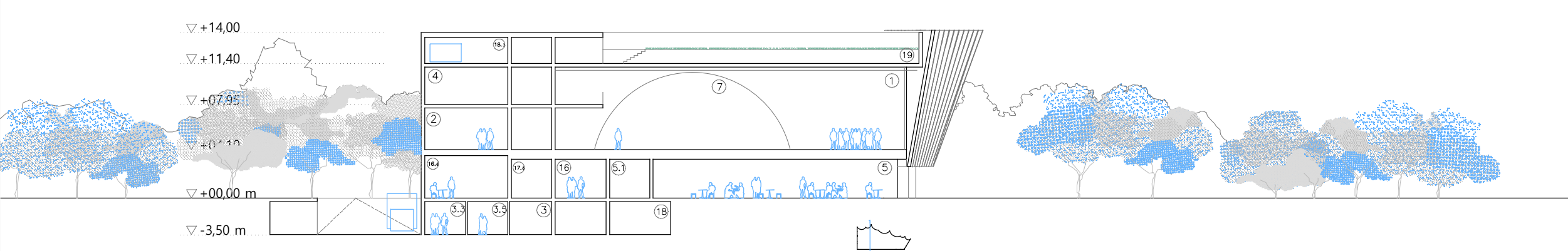
West Elevation



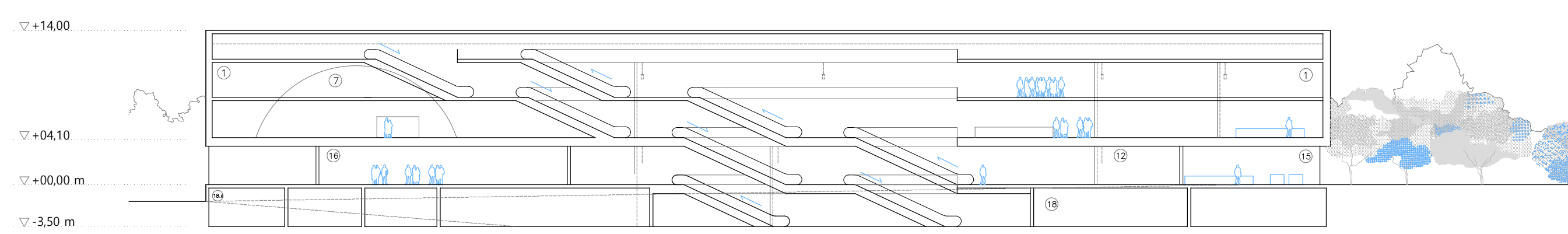
North Elevation



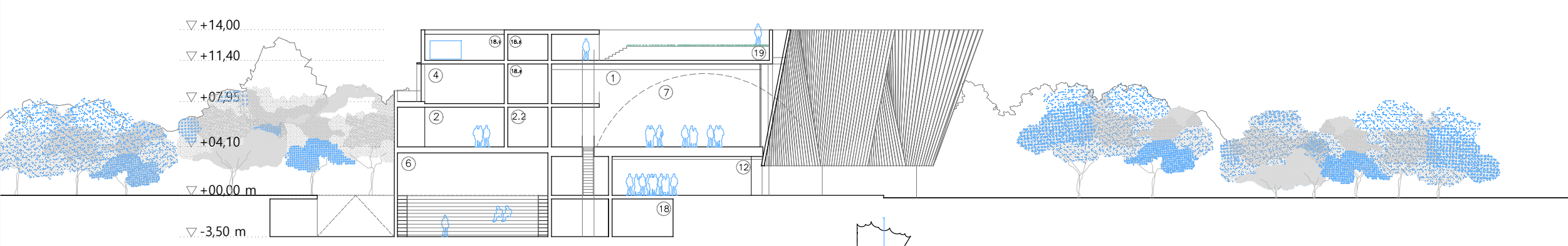
Longitudinal Section A-A'



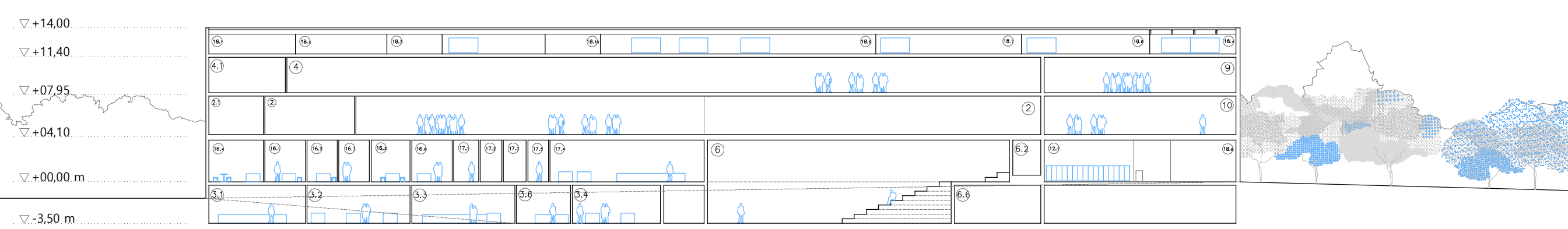
Cross Section D-D'



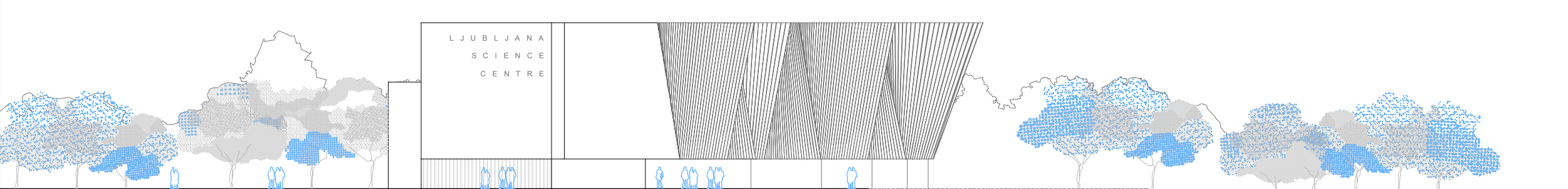
Longitudinal Section B-B'



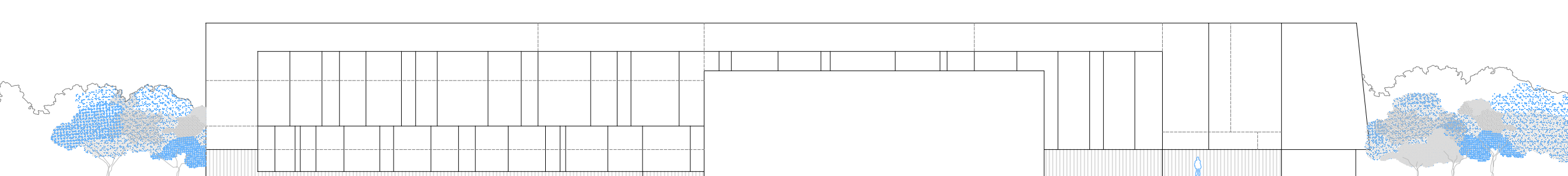
Cross Section E-E'



Longitudinal Section C-C'



East Elevation



South Elevation