

Göteborg Batteri

THE NEW ENERGY PARK

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_Säveån river valley | Kvibergs brovågen

_transect and analysis | Assignment 1.2

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_analysis of the transect

ACTORS:
residents
children
commuters
workers
habitat animals

AGENTS:
DAYLIGHT
WATER FLOW
GEOLOGY
NOISE AND AIR POLLUTION

- good radiation in the park and darker area under the bridge
- not heavy, during rainstorms, water is directed to the river, that flows to the west
- post glacial clay
- low and mostly concentrated on the bridge

ASSETS:
protected area
connected green areas
green corridors
no flooding threat to the built areas

CHALLENGES:
air and noise pollution
social space
habitat expansion
industrial area
zoning
connections

LEGEND

- section line
- Traffic noise (55-60 db)
- National interest conservation area (Natura 2000)
- Worst possible case flooding scenario
- Buildings
- Roads
- River

0 5 10 25 m 50 m



_analysis of the transect

- National interest conservation area (Natura 2000)
- Worst possible case flooding scenario



SOIL
The earth in the area is characterised by a post-glacial clay which leads to a poor drainage: the high clay content makes the soil prone to poor drainage, leading to waterlogging and anaerobic conditions.

GREEN / GRAY AREAS
The plot is characterised by a great green area, mostly protected thanks to Natura 2000, but weakly linked to the residential area. A small platform on the river seems the only tool to get to enjoy the surroundings and the vegetation, so present in this space.

CONNECTION TO THE RIVER BANK
The residential area is closed in itself and weakly connected to the project area and the riverbank itself. An horizontal reading direction has been created by the break (caesura) of the parking lot and of the pedestrian path that avoids a link to the river.
The open green area is not considered and the bridge underpass avoided.

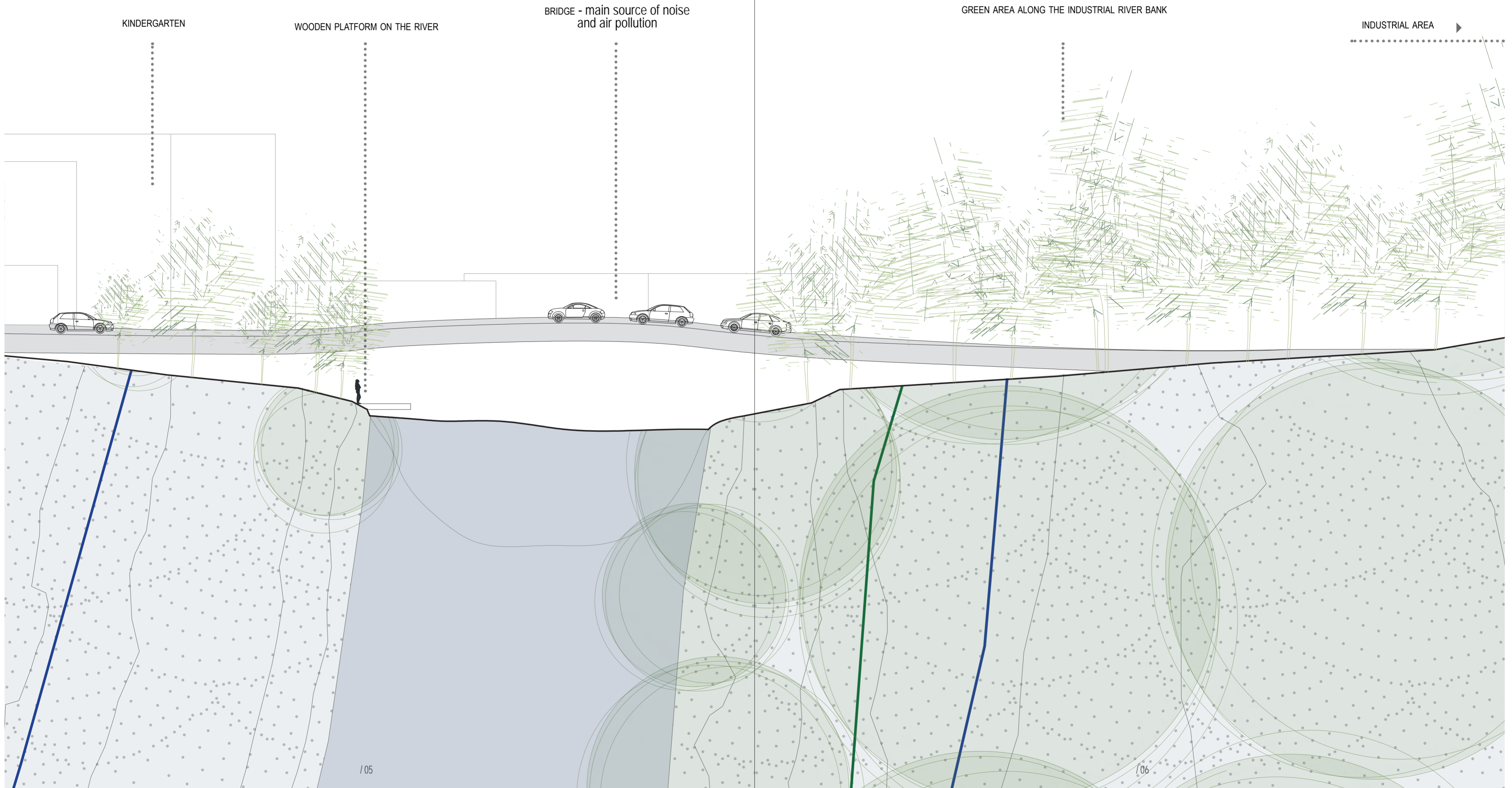


RISKS

The flooding risk doesn't impact the residential area but takes half of the green space.
Air and noise pollution are present but not critical, they can be treated through an addition of high vegetation and greenery.
The industrial area can be a threat for the habitat and the cause of noise pollution, but the vegetation that separates and hides it from the project site is useful to avoid this risk.

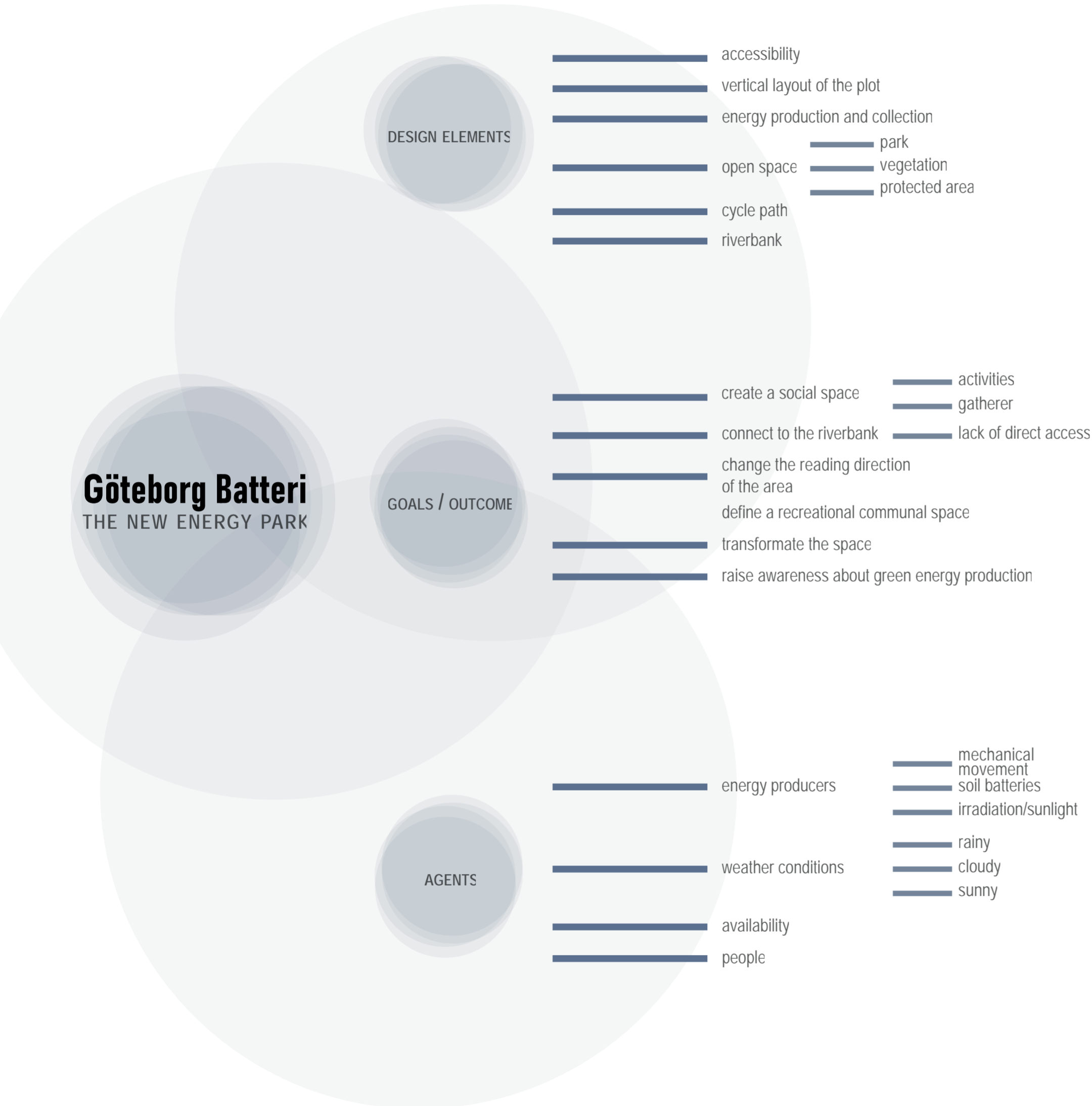
RIVER

The river is characterised by a very flourished habitat and a medium stream, this allows to enjoy the river by the provision of small suspended platform between the bank and the river that let people have a gathering and resting space in a calm area.



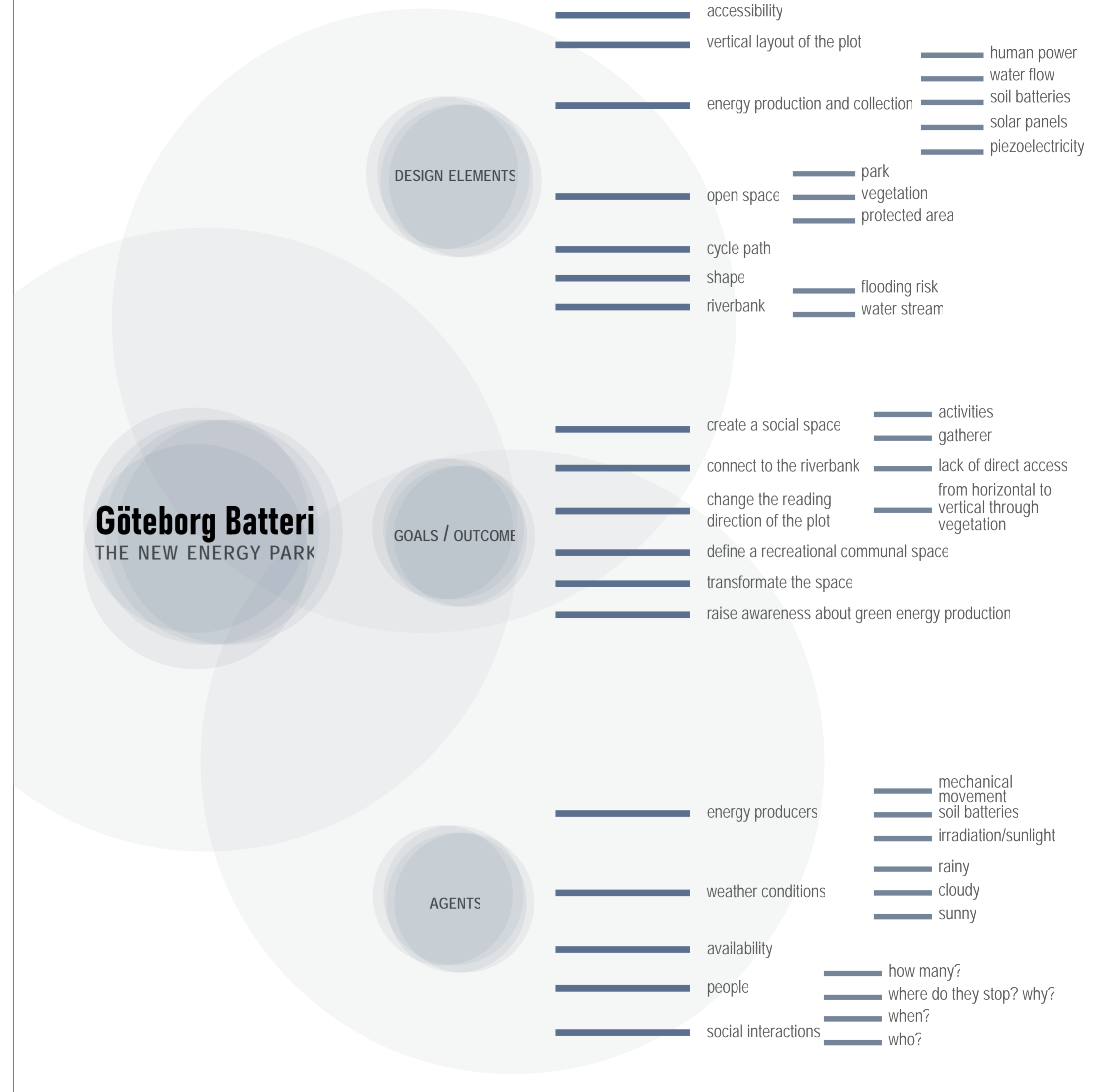
_coggle diagram

_starting point for the project concept



_coggle diagram

_changes during the project concept



_evolutionary tree

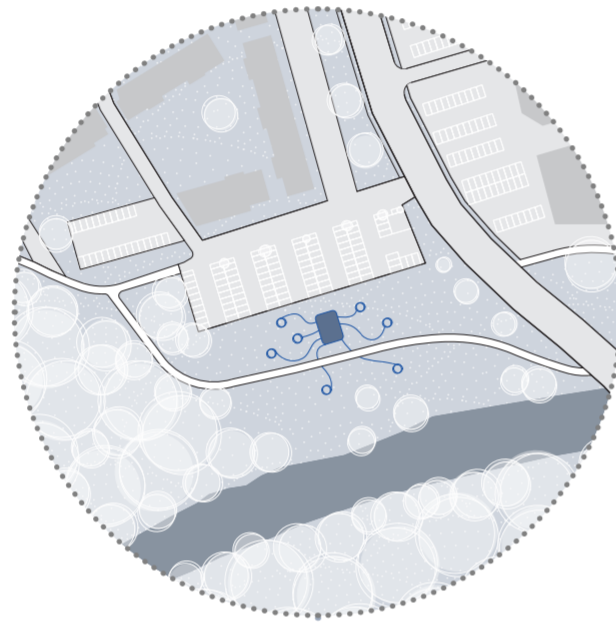
_train of thoughts and process of the project concept

1
As built



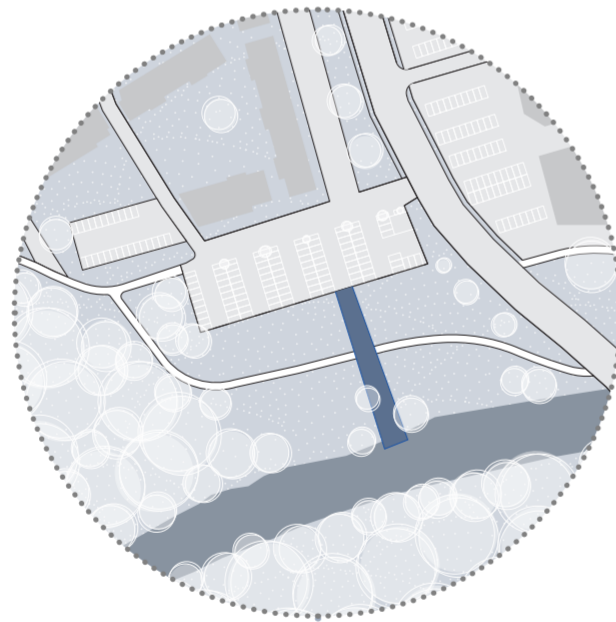
The chosen area is located on the upper bank of the river, delimited by a parking lot serving the residential buildings, a wood, the bridge and the river itself. The social aspect is very present.

2
Energy production:
punctual element



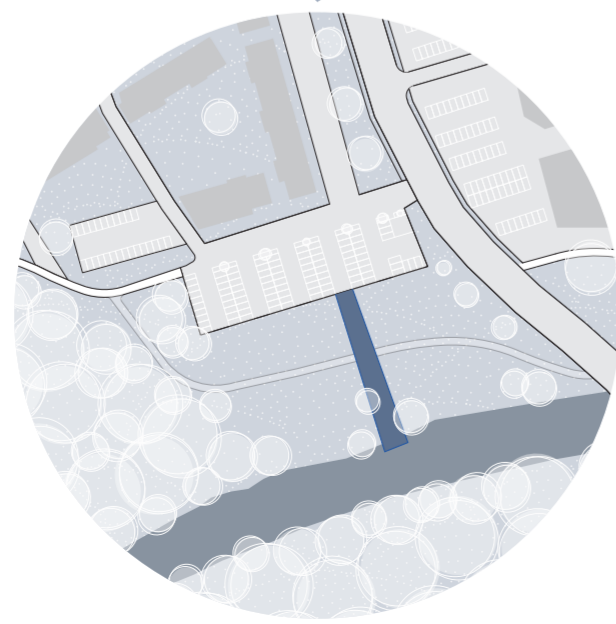
From the idea of production of energy, a system of accumulation and distribution takes place in the plot and through the use of soil and mechanical movement people can be passively or actively involved by passing close to it thanks to the cycle/pedestrian path.

3
Connection to the river



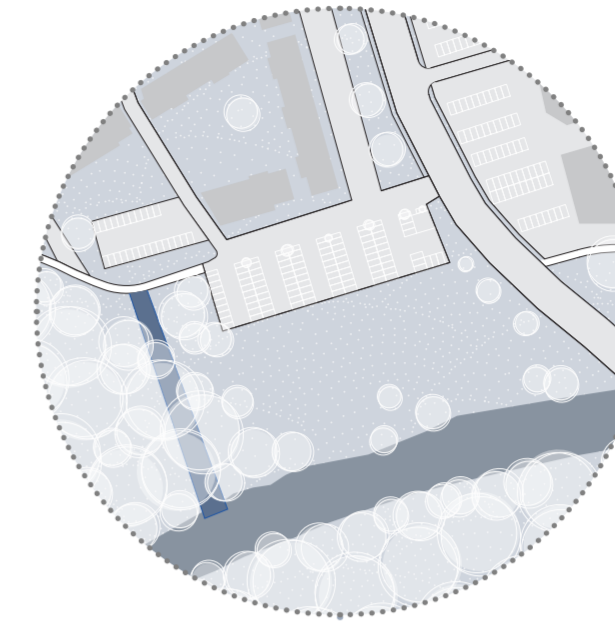
The need to involve people and to invite them to enjoy the river bank lead to the idea of half-suspended device that provides a double usage: as a viewpoint on top and as a shelter to produce and use the energy harvested.

4
Changing the path



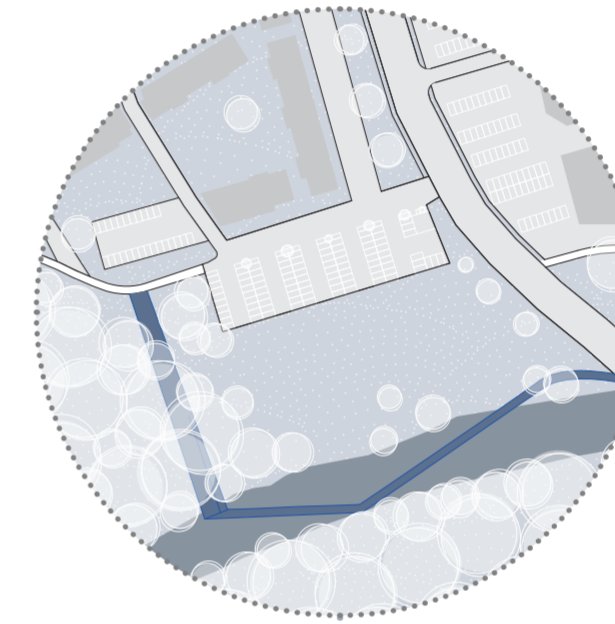
The pedestrian and cycle path make people deviate and almost avoid the river: the focus is kept on the system that creates a double link to it.

5
Energy production as an experience



By moving the path in the wood, a strong link is created with the built environment and mostly with the vegetation: the path is not only a tool to harvest and use energy but also a way to experience the habitat and raise awareness.

6
Reconnecting to the path



Through a passage suspended on the river, visitors can cross it and reach the opposite bank or continue their experience and join the path on the other side of the bridge.

7
An energetic flow



New tall stem plants permit to visually direct visitors to the river without crossing and occupying it, a light change creates the space for a more natural and organically shaped flow that follows the existing axis.

8
The new energy park



The park is equipped and many different areas are provided to harvest, create or use energy. Walking, running, working out, cycling, resting, playing are the main activities that visitors can have access to during their experience.

• Soil batteries are placed in a particular condition to permit a continuous functioning throughout the seasons. Thanks to Swedish weather, they don't need to be regenerated very often.

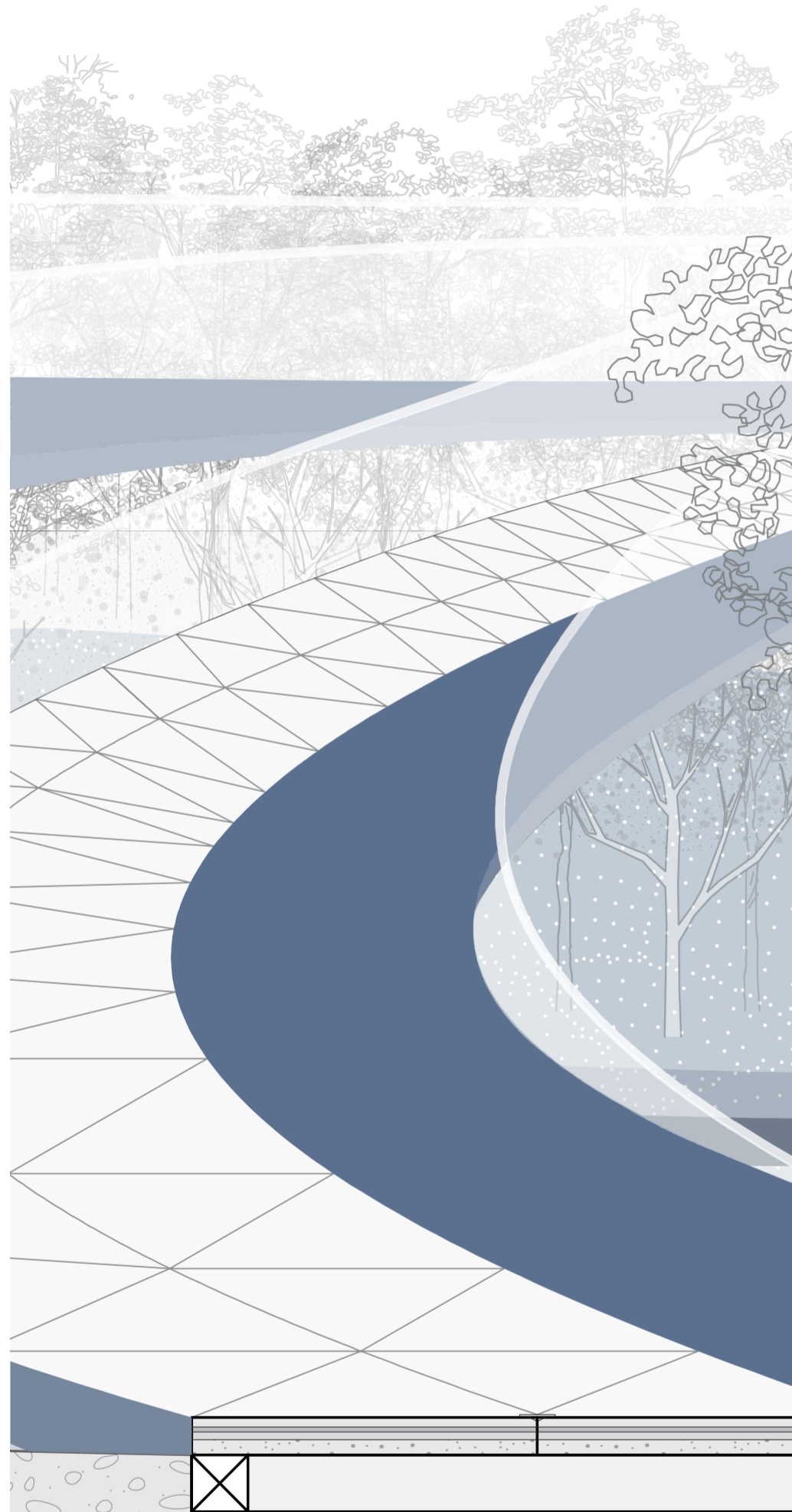
• The experience throughout the wood permits to have a full immersion before or after the journey along the path, during the day as well as during the night, thanks to a lighting system that uses the energy harvested and spreads it out from small benches along this area.

• The uprising of the path creates a belvedere on the river that comes out of the wood and makes visitors discover new points of view on the surroundings.

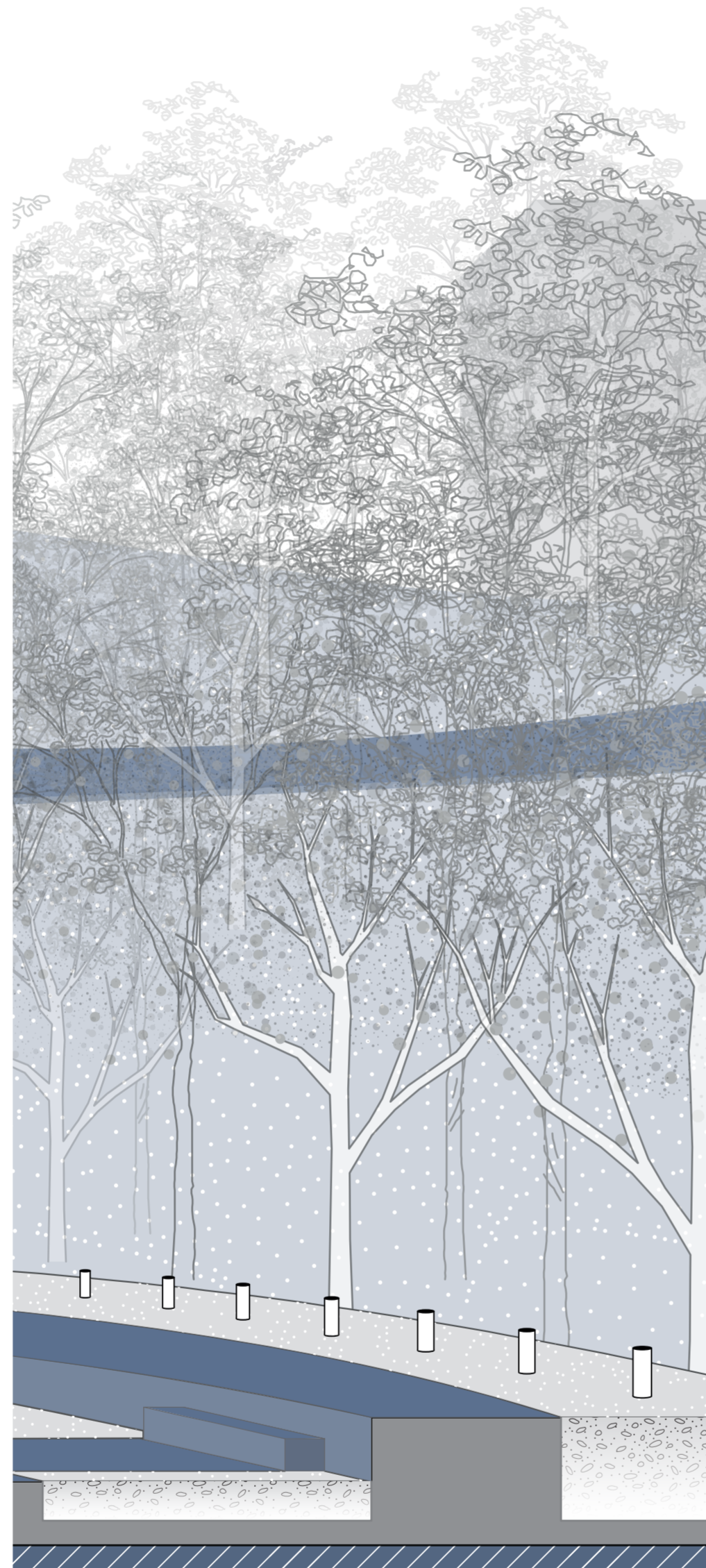
• Solar panels are installed on a platform roof and provide a covered area for people to hang or seize the service of the park.

• Small circular platforms spring like leaves from the main branch, and create specific areas for people to work out and produce energy at the same time.

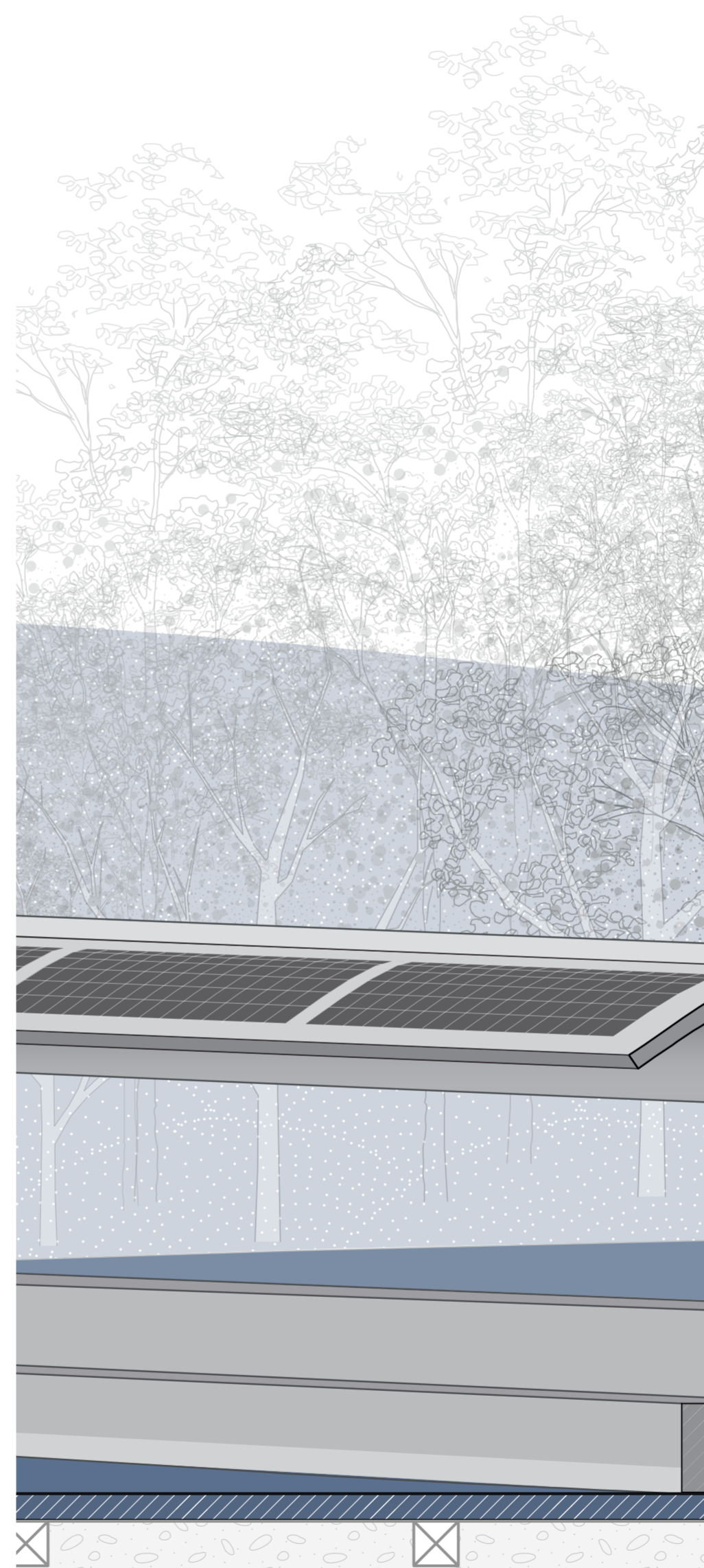
• The platform on the river is kept and expanded. A small ruffle defines a space where people can sit, stand, lay, rest or play.



A piezoelectric floor covering is a type of flooring that can generate electricity when subjected to pressure or mechanical loads. This technology represents an interesting form of renewable and sustainable energy generation, which exploits the kinetic energy produced by people walking along a path.



Soil batteries, or earth batteries, are devices that exploit the difference in electrical potential between soil and air to generate electricity. The main idea is based on the phenomenon of oxidation and reduction that occurs between the soil and the metal that acts as an electrode.



Low voltage solar panels are devices that convert sunlight into electricity using photovoltaic cells. They are often flexible and lightweight, which allows for greater versatility in installation and use. They can be applied to different surfaces, such as roofs, walls or even worn as a garment. Their flexibility allows greater adaptability to various shapes and sizes, offering more design options.



One of the techniques used to accumulate energy during training is the use of generators integrated into sports equipment, such as a bicycle or an exercise bike, which convert the mechanical energy generated during training into electricity. This energy can then be stored in batteries or used to power electronic devices.

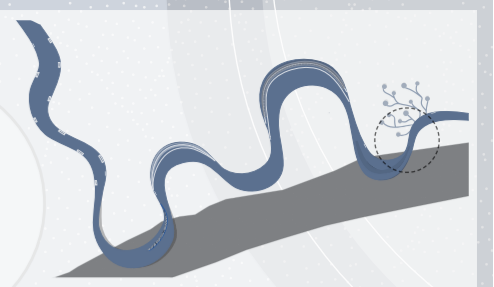


The former idea of the wooden platform on the river is kept and developed. A small ruffle defines a multiple space where visitors can decide to sit, stand, lay, rest, play or simply pass by. The quality of the space is maintained and made bigger to host more visitors and enjoy the river flow in its many aspects: it aims to serve as a multifunctional hub welcoming people with diverse recreational pursuits as well as to transform the riverfront into a vibrant and inclusive space.

Like leaves springing from a main single branch of a tree, these platforms rise at different levels and can be reached through small paths that create a more dedicated area for people to workout and enjoy the plein air.

The flow of the stream is not interrupted and lets the passage on the river for boats and debris to proceed.

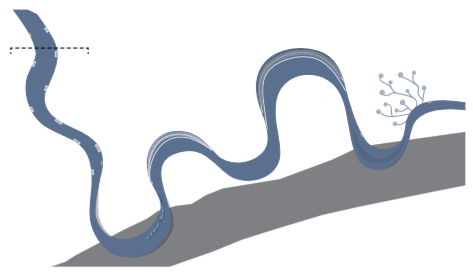
The path is suitable both for bikes and pedestrians. For this reason, the experience along the path benefits of two different speed flows and can be enjoyed through two different points of view.



By clearly communicating that their workouts contribute to a noble cause, such as generating clean energy, gym-goers will be motivated to increase their efforts.

_contextual section

_scale 1 : 100



THE PATHWAY

The walk starts in the wood and leads to a viewpoint hidden among the trees. The path is followed by seats that can be lightened up thanks to the energy produced in the park, but keeping a low impact of light pollution in the area.

VIEWPOINT

The path goes uphill to deal with the topography and create a belvedere suspended on the river. The viewpoint area is characterised by thin pillars that disappear under the structure and a semi-transparent material that permits to see through the parapet. From this point people can be completely absorbed in nature and have an overview glance at the surroundings - and also try to catch some birdwatching moments along the river valley

ENERGY PRODUCTION

A piezoelectric slope leads to the riverbank, giving a qualitative access to it and defining a way to produce energy in a passive way

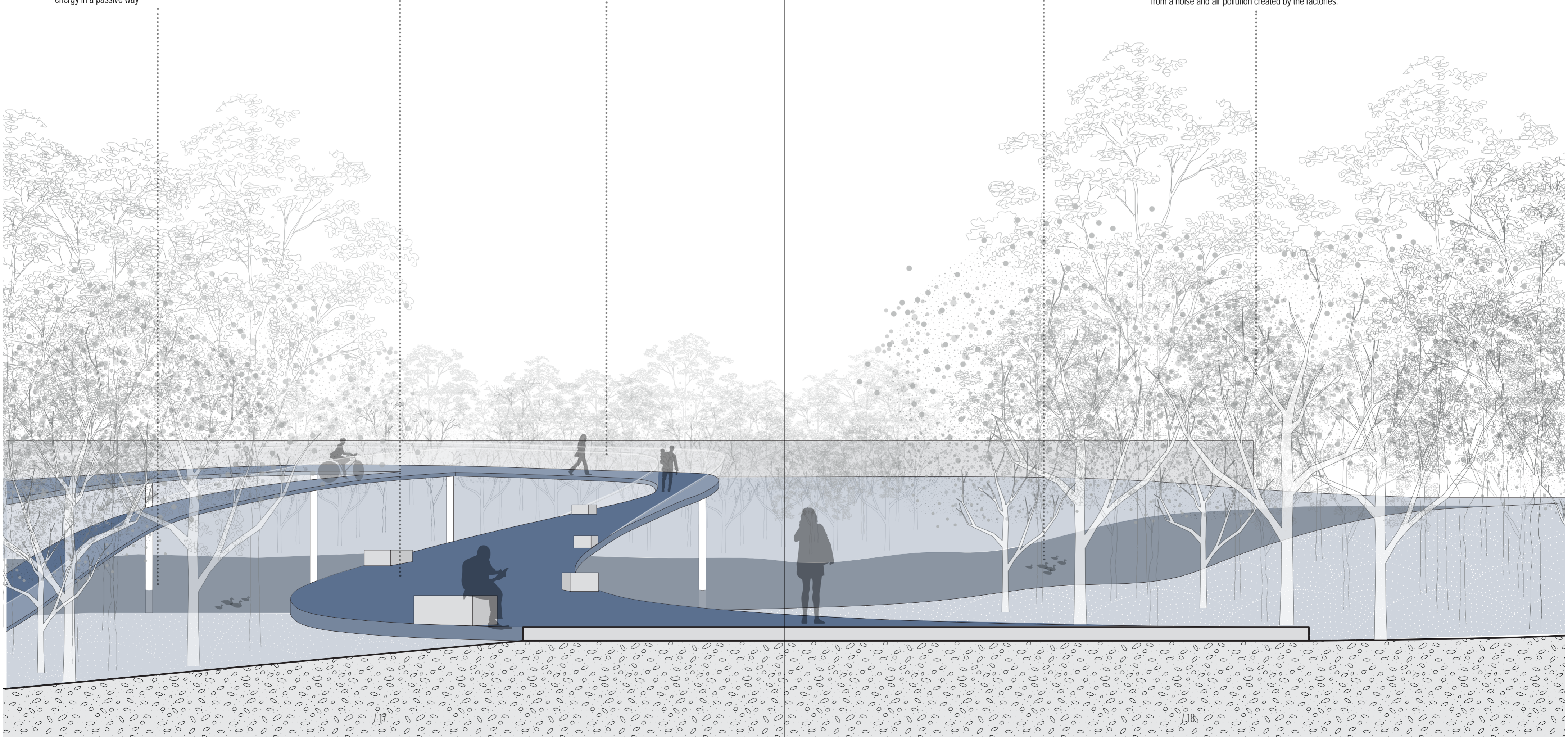
HABITAT

The suspended pathway permits to keep the stream going and let the animals inhabitate the space, maybe finding some shelter and nest under the structure.

In this area many birds and bats find home and leaving them the space to grow up unbothered is also an essential aspect of the project.

INDUSTRIAL AREA

On the other side of the bank, the industrial buildings of SKF dominate the area. An increase of the vegetation also helps to hide and mitigate not only from a visual connection but also from a noise and air pollution created by the factories.



_perspective section

_scale 1 : 50

ANIMAL / BIRDWATCHING
The suspended path allows to discover new points of view and new perspective on the habitat living in the area

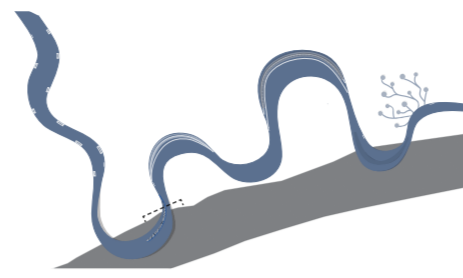
STRUCTURE
Steel pillars lightly sustain the pathway, characterised by a wooden structure with 30x30 cm beams bearing a 1 cm concrete slab covered with wooden lamellas.

ENERGY PRODUCTION
The piezoelectric flooring is fully stimulated during a run - thanks to compression it harvests energy and collects it for the park

COVERED SPACE
Thanks to the suspended path, a space is created underneath, where people can gather or find some rest and enjoy the riverbank during rainy or sunny days

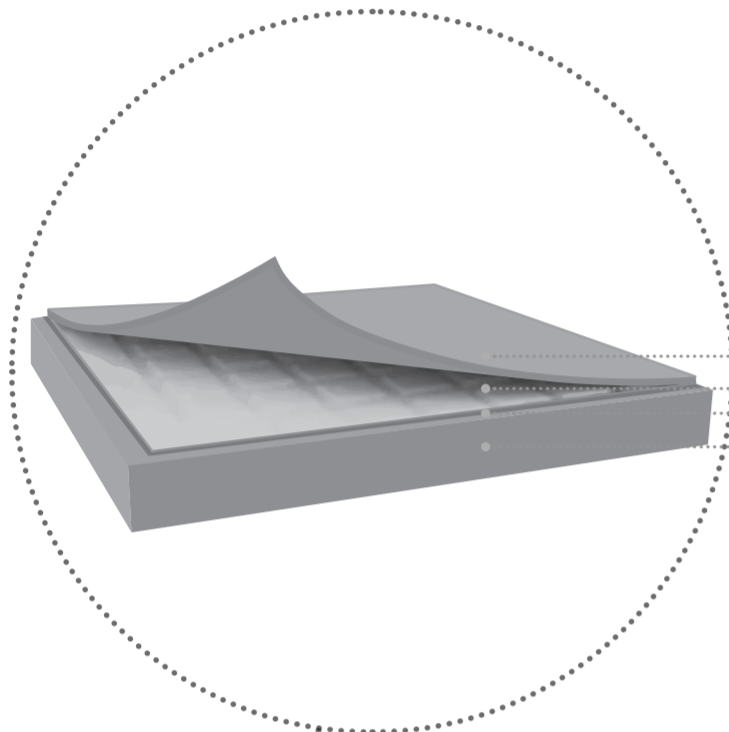
_energy production technologies

_zoom-ins: piezoelectric flooring

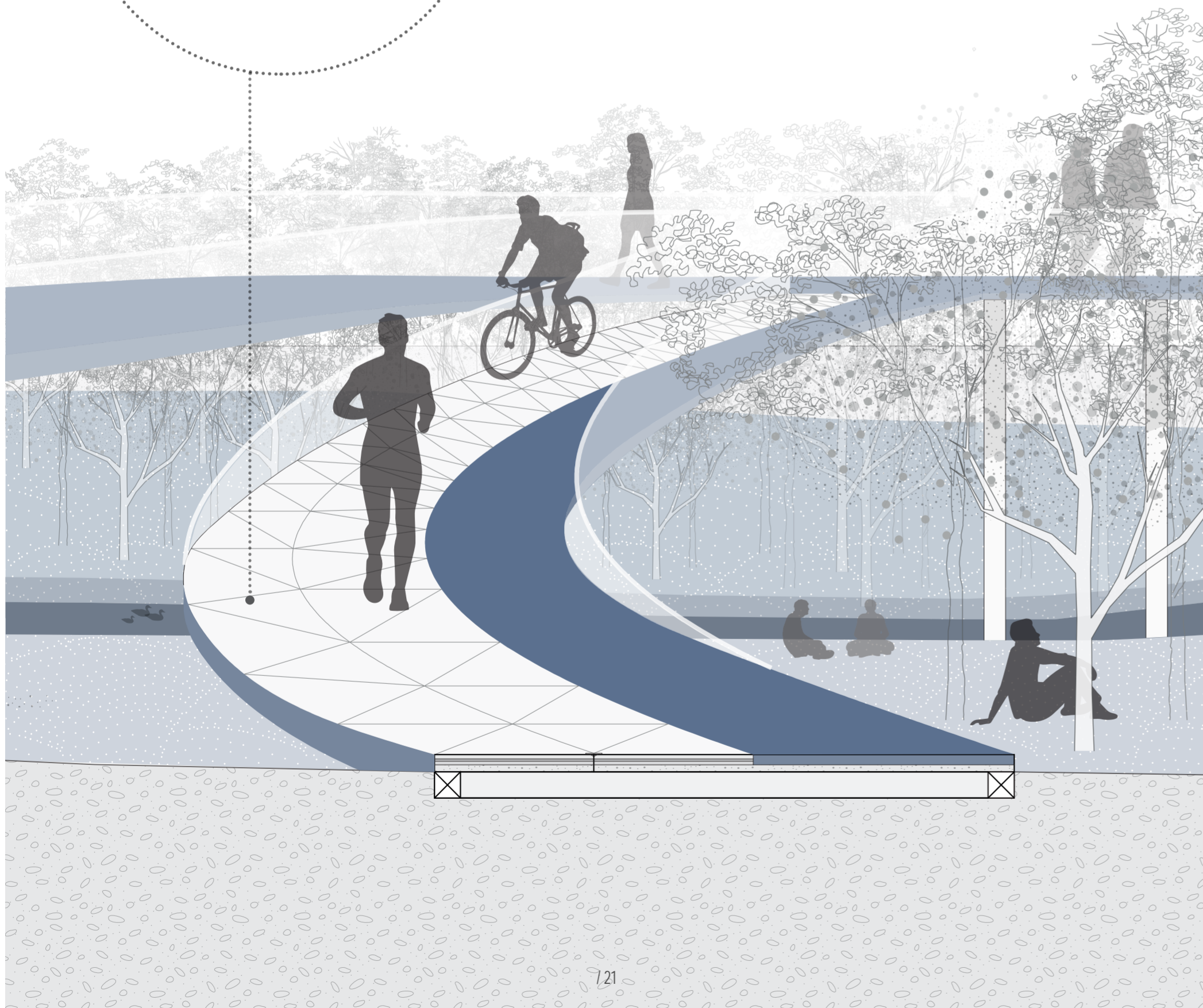


Piezoelectric materials generate an electrical charge when subjected to mechanical stress, such as footsteps. By incorporating piezoelectric materials into the path, the project is able to harness the kinetic energy of visitors and convert it into electricity. This electricity can then be used to power lights or other devices along the path. The main material used in piezoelectric tiles is quartz crystal, lithium selenite or other compound materials such as lead-zirconium titanate. These materials have a property called piezoelectricity, which means that they can generate an electric charge when subjected to mechanical stress.

Inside the piezoelectric tiles there are layers of piezoelectric material that are connected to an electrical circuit. When these tiles are trampled or pressed, the piezoelectric material deforms and generates a difference in electrical potential. This potential difference is then exploited by the electrical circuit to generate electricity, which can be used to power equipment or to be stored in batteries or other forms of energy storage. To avoid losses through significant distances, the energy channelled with the system should be consumed very close to the point at which it is generated. A recharging station is placed right at the beginning of the slope, it stocks all the energy harvested and transforms it into electricity.

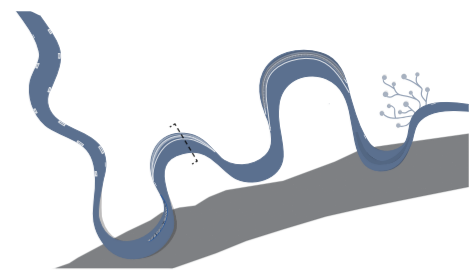


rubberized surface
smartfloor harvester
wireless transmitter
pathway



_energy production technologies

_zoom-ins: soil batteries

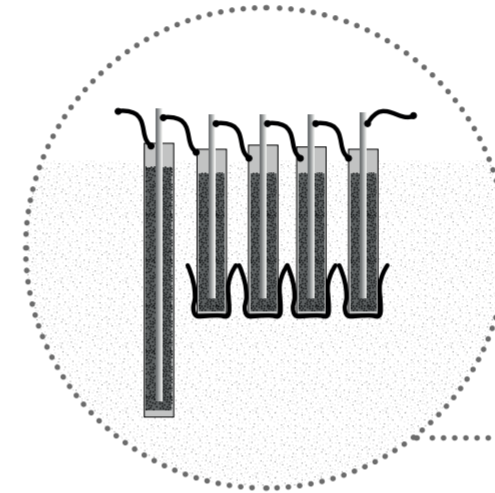


Soil batteries work by using the natural electrical potential difference between different layers of soil to generate a small electrical current. This current can then be harvested and used to power low-voltage devices, such as LED lights or small electronics. By incorporating soil batteries into the path, the project is able to make use of a renewable and sustainable energy source that is readily available in the environment.

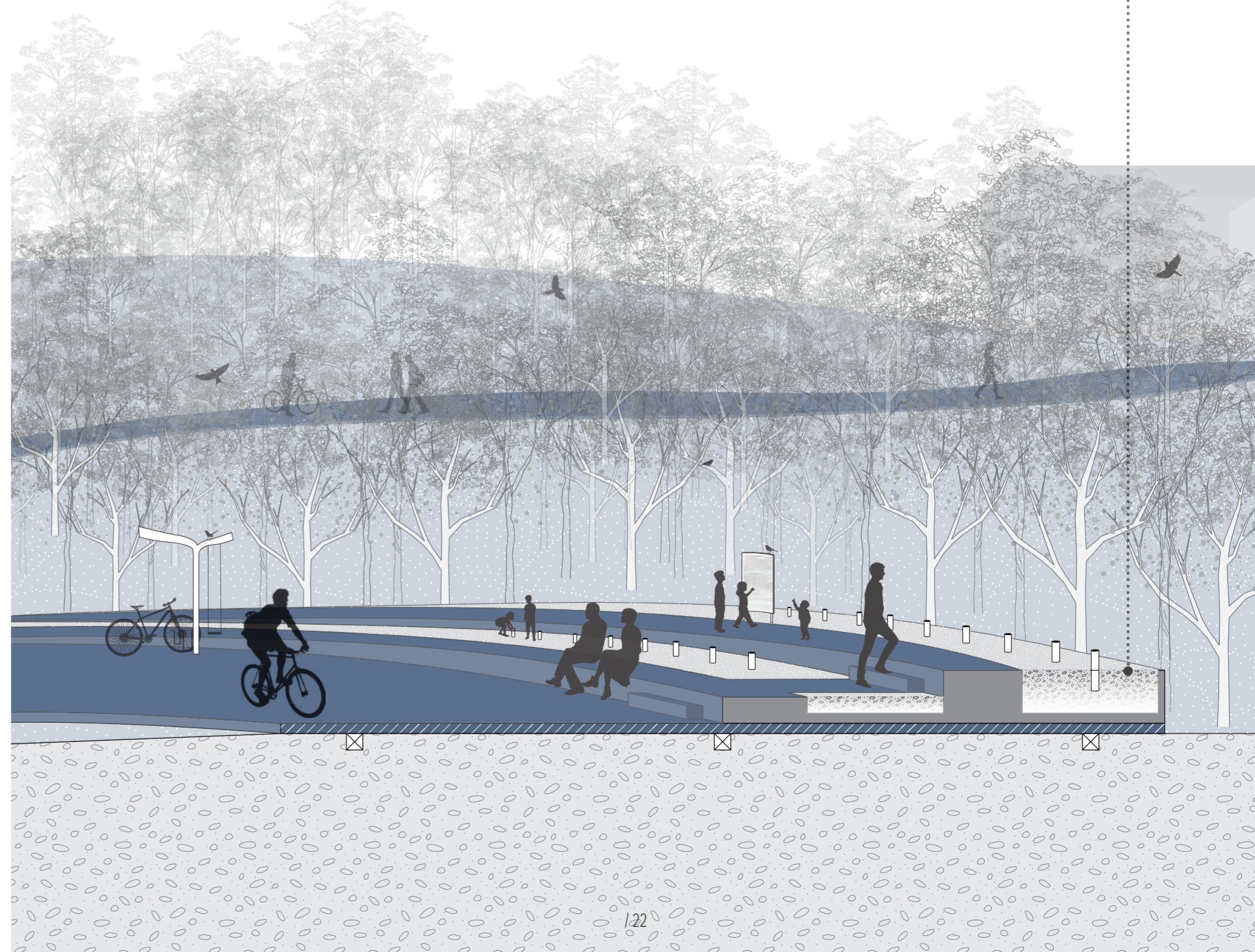
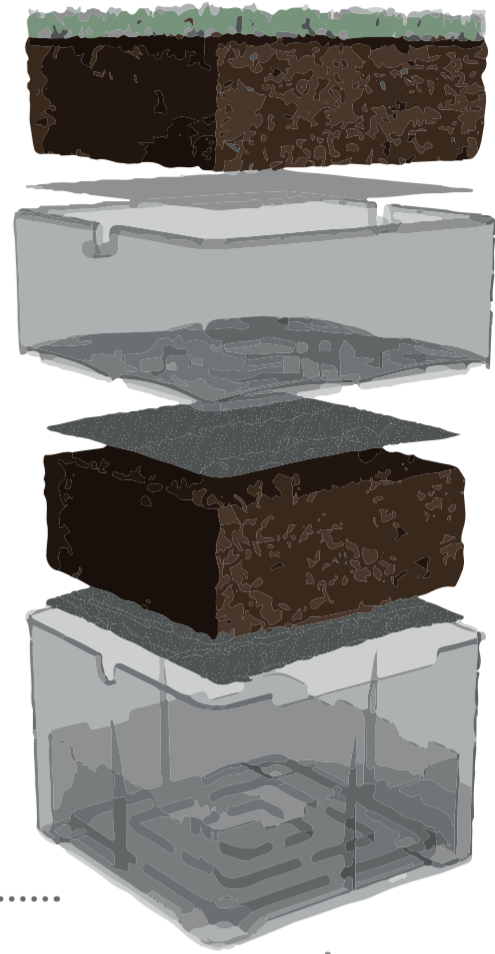
However, the power generated by a single earth battery is generally very low and unable to power complex electrical devices. Therefore, earth batteries are often considered as backup energy sources or to power small electronic devices with low power consumption.

Despite their limited energy efficiency, soil batteries find applications in different areas. For example, they are used to power energy-efficient lighting systems in small areas and in the long term.

In general, soil batteries are considered a form of renewable energy, as they exploit a natural resource such as land to generate energy. However, their efficiency is still being studied and improved, and they are currently not widely used as a major source of energy.



In their simplest form, an earth battery consists of two electrodes: one buried in the ground and the other exposed to air. The soil, being rich in chemicals and minerals, provides ions that can be used as electrical charges. The oxidation of the metal buried in the ground generates electrons that can flow through an external circuit, thus generating electric current.



_energy production technologies

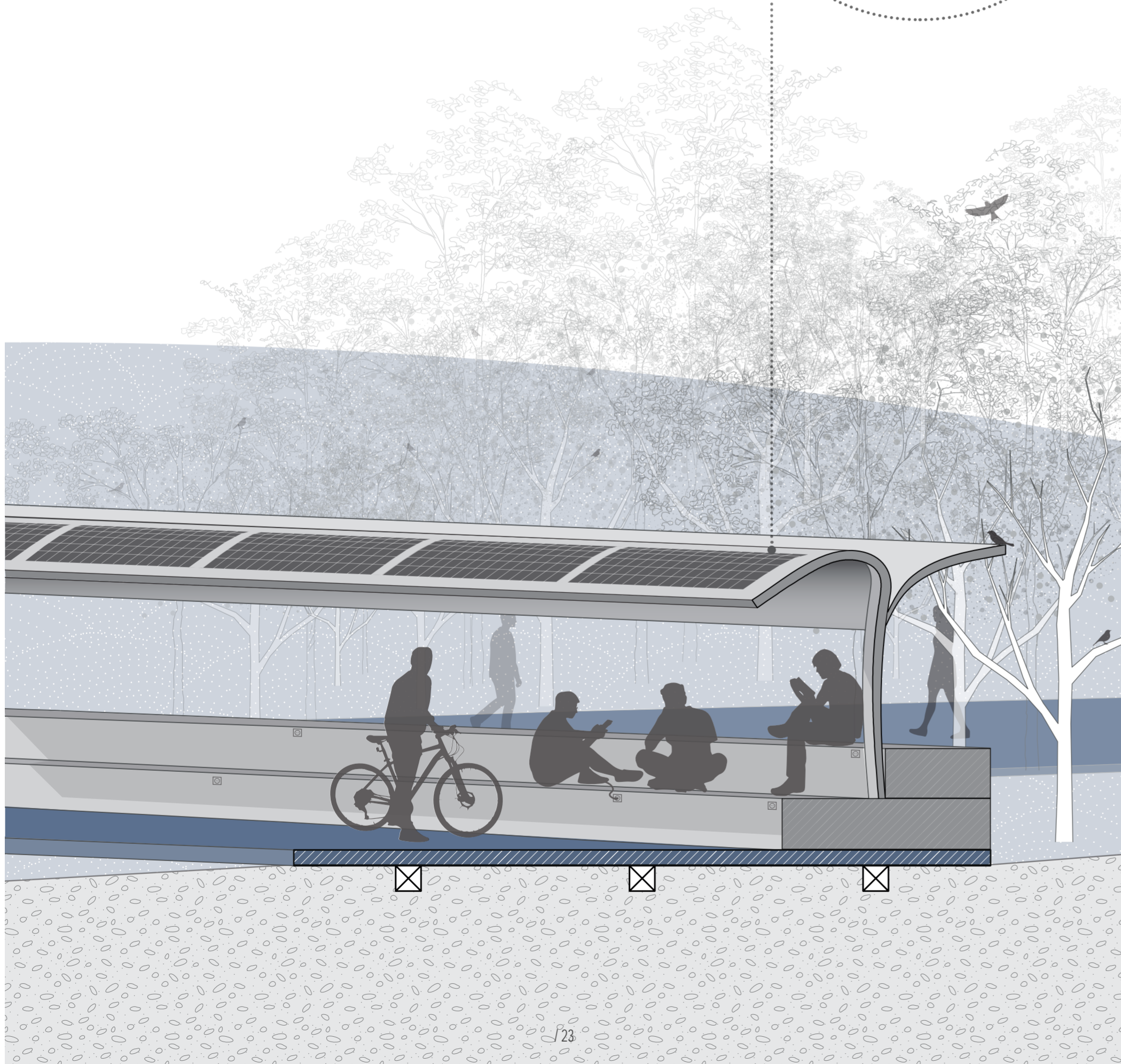
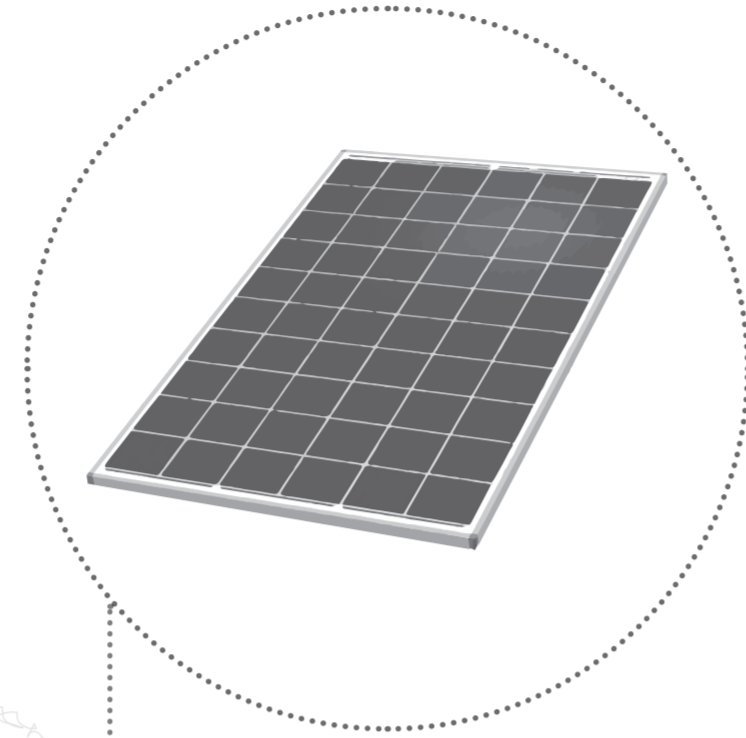
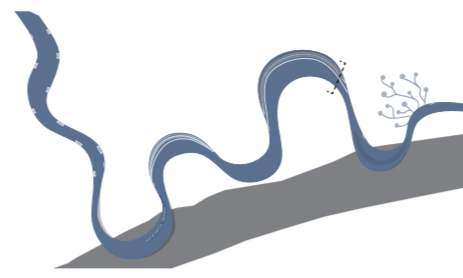
_zoom-ins: solar panels

Solar panels are another key component of the energy production system in this urban project. The panels are strategically placed to make the most of the sun's rays, and can be used to power a variety of devices and systems within the area. In addition to their practical use, the solar panels also serve as a visual reminder of the importance of renewable energy sources.

Low voltage solar panels are often flexible and lightweight, which allows for greater versatility in installation and use. They can be applied on different surfaces, flat or curved as in this case. Their flexibility allows greater adaptability to various shapes and sizes, offering more design options.

Low voltage solar panels produce less energy than higher voltage solar panels. Therefore, more panels may be needed to meet the energy required for certain applications.

In low-voltage solar panels, the energy generated by the sun's rays through the photovoltaic cells is stored in batteries or used directly to power electrical devices, depending on the specific application. The stored energy can also be used at night or in low sunlight.



_energy production technologies

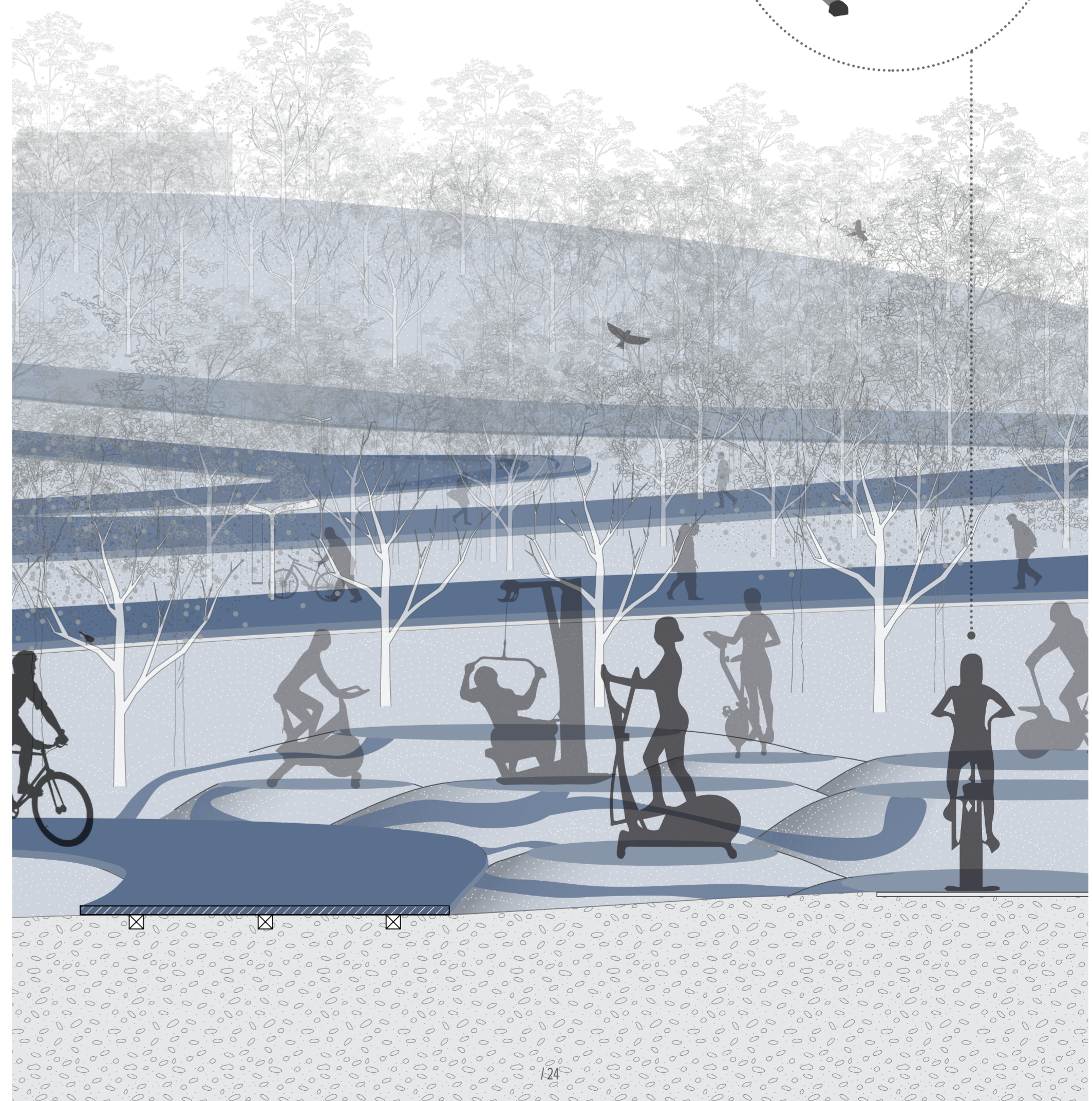
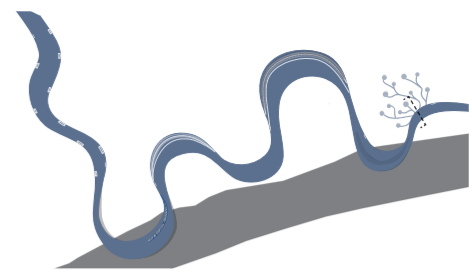
_zoom-ins: mechanical movement through workout equipment

Energy-generating fitness equipment is powered by human energy. When a visitor exercises on an energy-generating machine, they do not only power the machine but contribute actively to generate green renewable energy.

This workout equipment system presents a generator or a dynamo that is connected to the exercise machine. As the user exercises, their movement causes the generator/dynamo to turn, producing electricity or mechanical power. This power can then be used to charge batteries, power lights, or even feed back into the electrical grid.

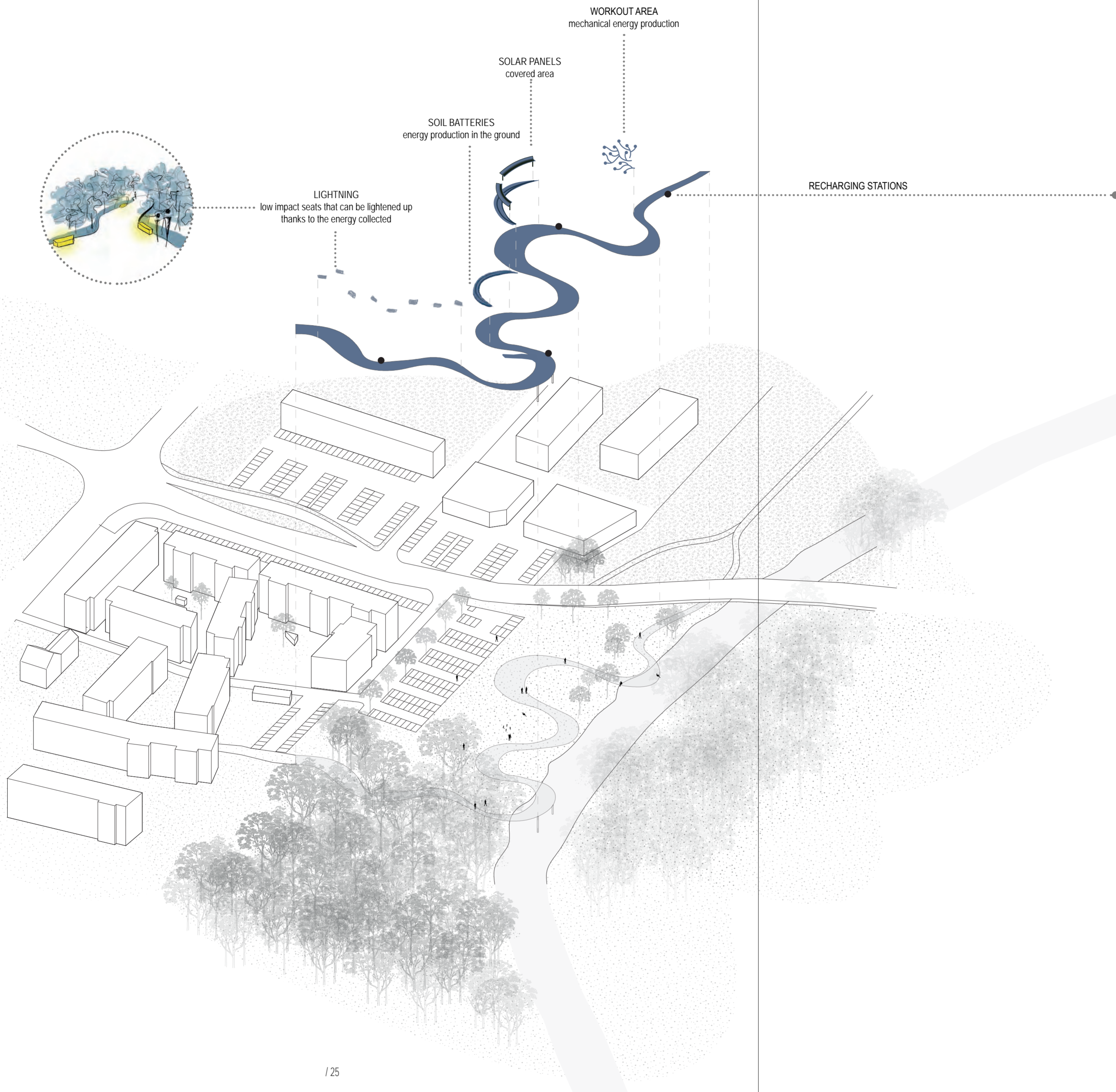
All fitness machines are designed and equipped with a micro-inverter. Sustainable energy can be used to replenish the grid's energy, power lights, mobile phones, laptops, and more. A single machine is designed to produce up to 200 watts of energy per hour.

This space can include machines like ellipticals, spin bikes, treadmills, or rowing machines that generate and collect electricity when used. These features are not only fun and engaging for visitors, but also serve as a reminder of the potential for human-powered energy generation. Additionally, this system can provide a more engaging and interactive workout experience, as users can see the direct impact of their efforts on energy production.

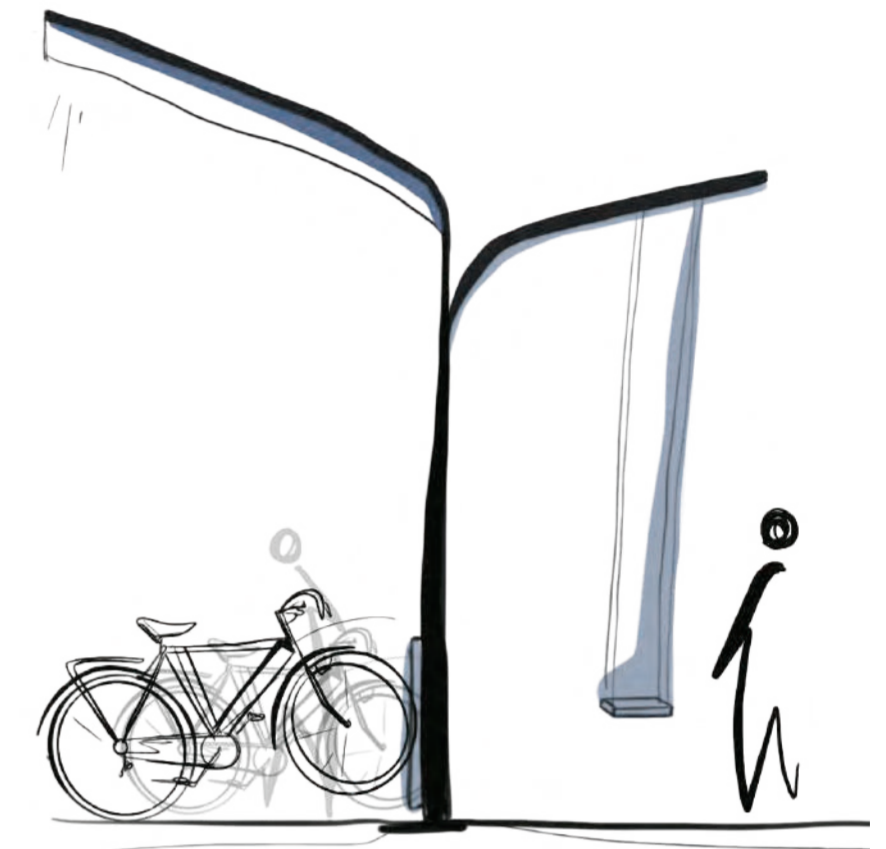


_exploded axonometry

_recharging spots: people condensers

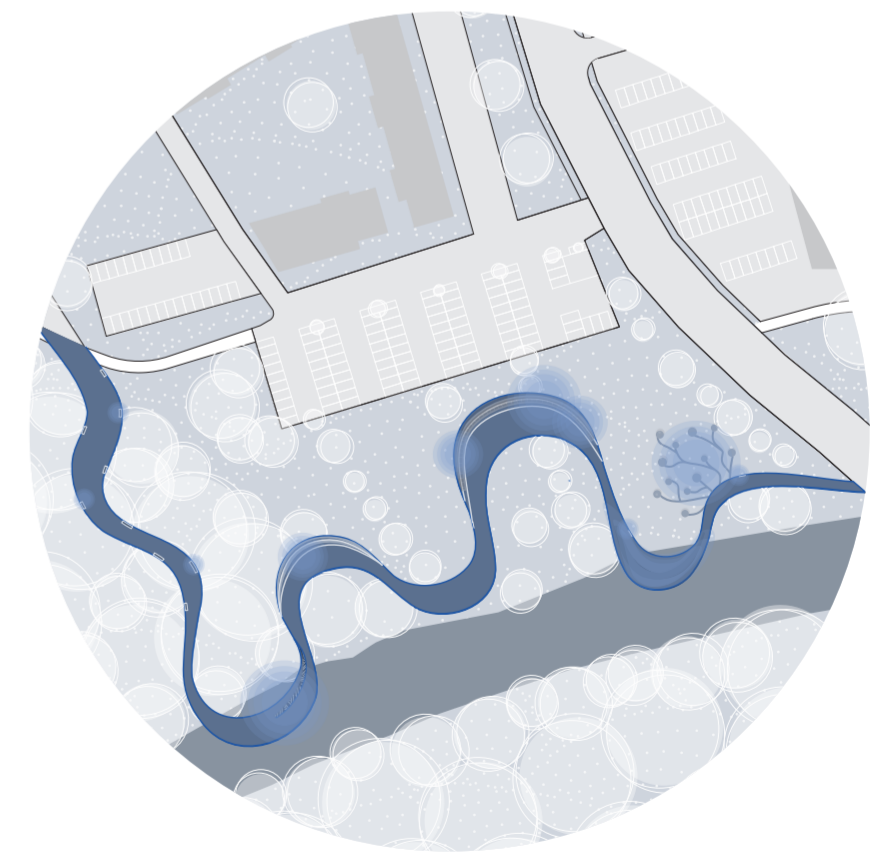


_design of the recharging stations: multifunctional and entertaining, adapting to different conditions



An urban object that can be placed anywhere in the city and harvest energy in different ways depending on the area. It creates a social space and a reference point along the path and/or the river valley. The shape mirrors the concept of the tree, in which every branch is necessary and has a function - here the branches produce light, give electricity, bike racks and a sitting place.

dimensions: 3 m high



The recharging stations provide pitstops along the path, which can host many or few visitors according to the width of the walkway and the activities or furniture provided there. Different flows and speeds of visitors distinguish the different areas - from stopping areas, wide enough to welcome various people or narrower transient sections.

● flow and densification of people along the prototype

_potential expansion in the river valley

The path can assume different shape according to the condition and the function needed - it can be decomposed and readapted to the area.

● recharging stations

The path can be a single loop developed in vertical to guarantee an interesting overpass.

The path can be resumed to a single loop, where many activities are proposed to invite people and create a vibrant atmosphere in an interesting surrounding.

The path can be converted into a space.

The path can be the addition or the integration to an existing path.

The path can be resumed to a single loop, where only one activity is needed.

The path can be an addition to a sport area, where the two functions can merge and create a new park.

The path can be only recreational or take advantage of the present conditions - it can be completely suspended in the forest, it can reach out the street and invite the passers by to enjoy the experience.

PEOPLE FLOW
By studying people flow, the prototype could spread in the surroundings and take place in the most crowded areas.



_evolutionary tree

_the prototype along the timeline



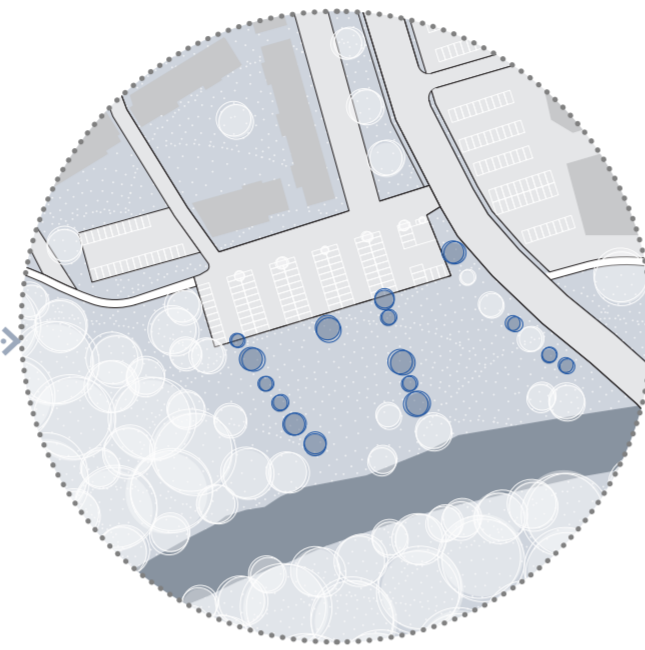
phase 0
As built: weak connection

The pedestrian and cycle path creates a connection between one side and the other of the bridge, through an underpass, but also keeps away from a direct contact with the river.



phase 1
An open green area

The existing pedestrian path is taken away to leave the space to a more inviting area, thought to be a gatherer and condenser for the neighbourhood



phase 2
Vegetation as a tool:
mitigation and redirection

Noise and pollution mitigation is created through the aid of high vegetation that defines different areas in the open green space and changes the reading direction of the plot.



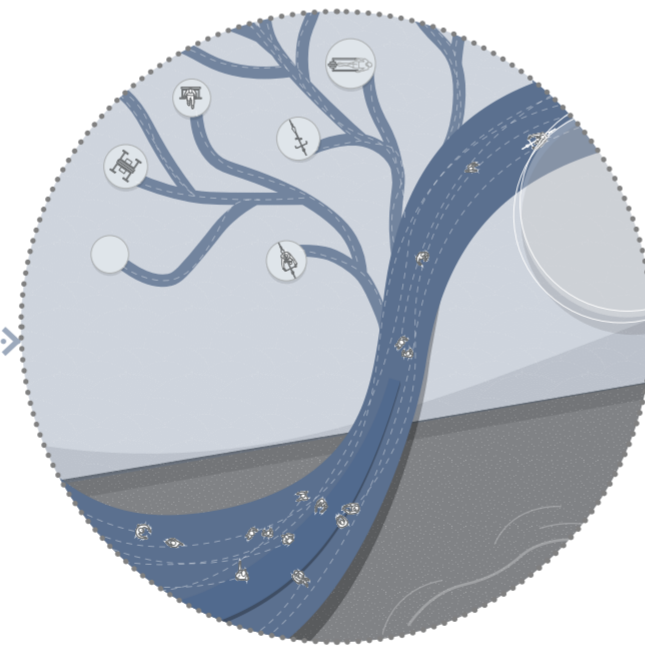
phase 3
The energy park

On the area an organic path creates a sequential experience in energy production that runs through the whole zone, starting in the wood and ending under the bridge.



phase 4
Equipping the park

The park is divided in zones: viewpoints, workout areas, river platforms, interactive production of energy, resting spots and gathering spaces.



phase 5
Receiving visitors and producing energy

Visitors are the power of the park: they produce energy and can directly use it if needed: they spend time in the park and give life to the area by enhancing social connections.

_SWOT analysis

_zoom-out of the project

Weaknesses

- The project happens to be located in a decentralised and industrial area.
- The costs for the implementation of the project could be high seen some kind of new technologies.
- The path can be dispersive, filled of activities and characterised by big dimensions
- The project is very sensible to the weather conditions: the amount of visitors can vary according to that and the technologies could lack of good conditions

Threats

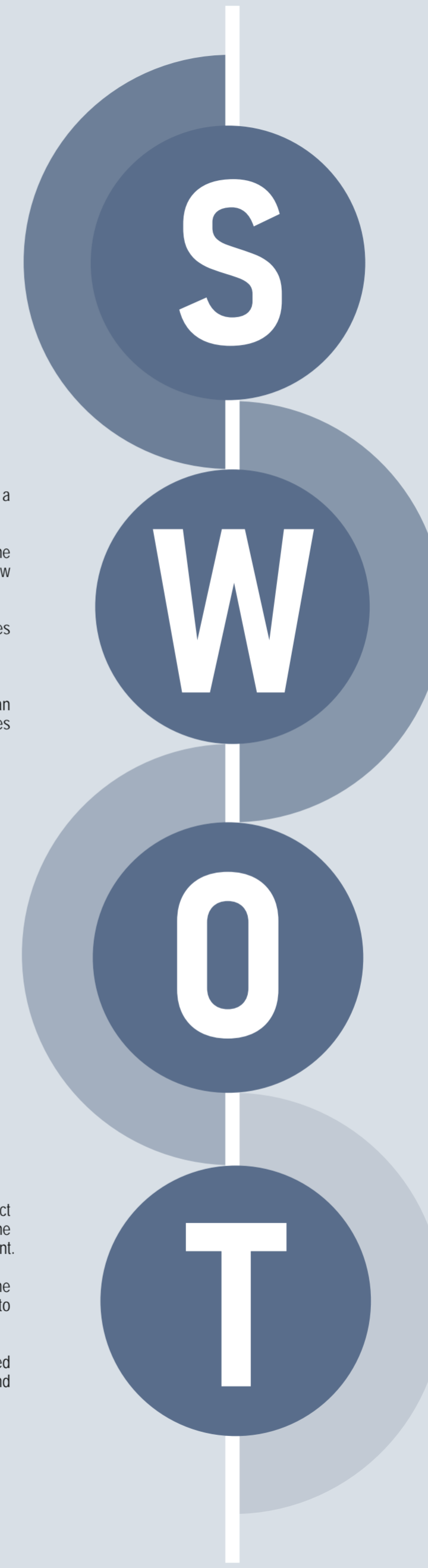
- A low amount of visitors can make the project fall into disuse and some sections of the prototype need human presence to be efficient.
- A bad maintenance could bring the technologies to a malfunctioning also due to weather or others.
- Some sections cannot be merely reproduced anywhere but need the good conditions and agents to work correctly.

Strengths

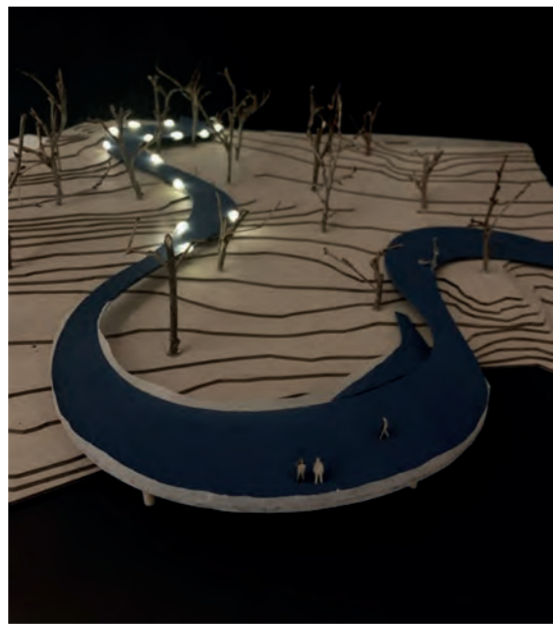
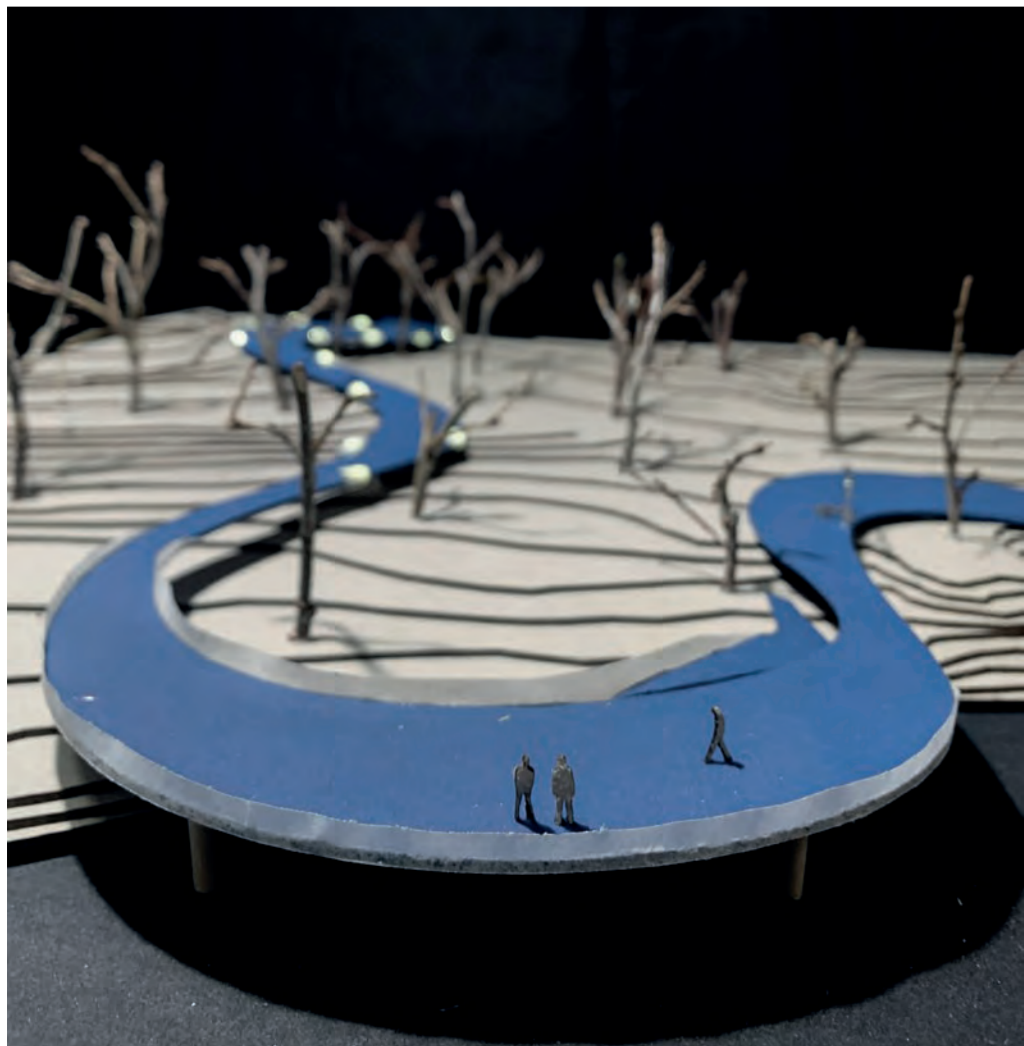
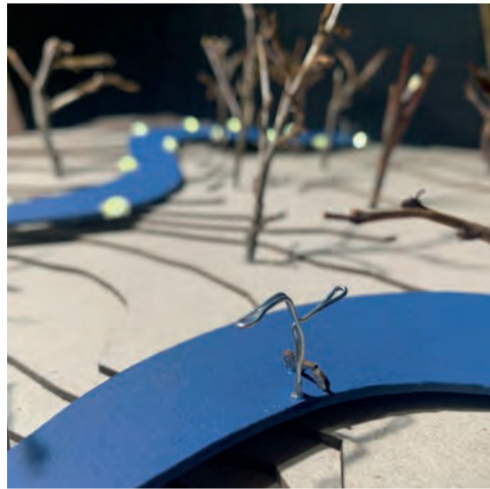
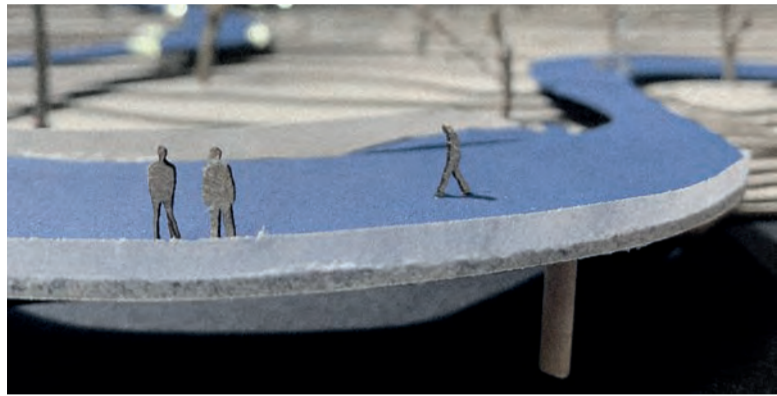
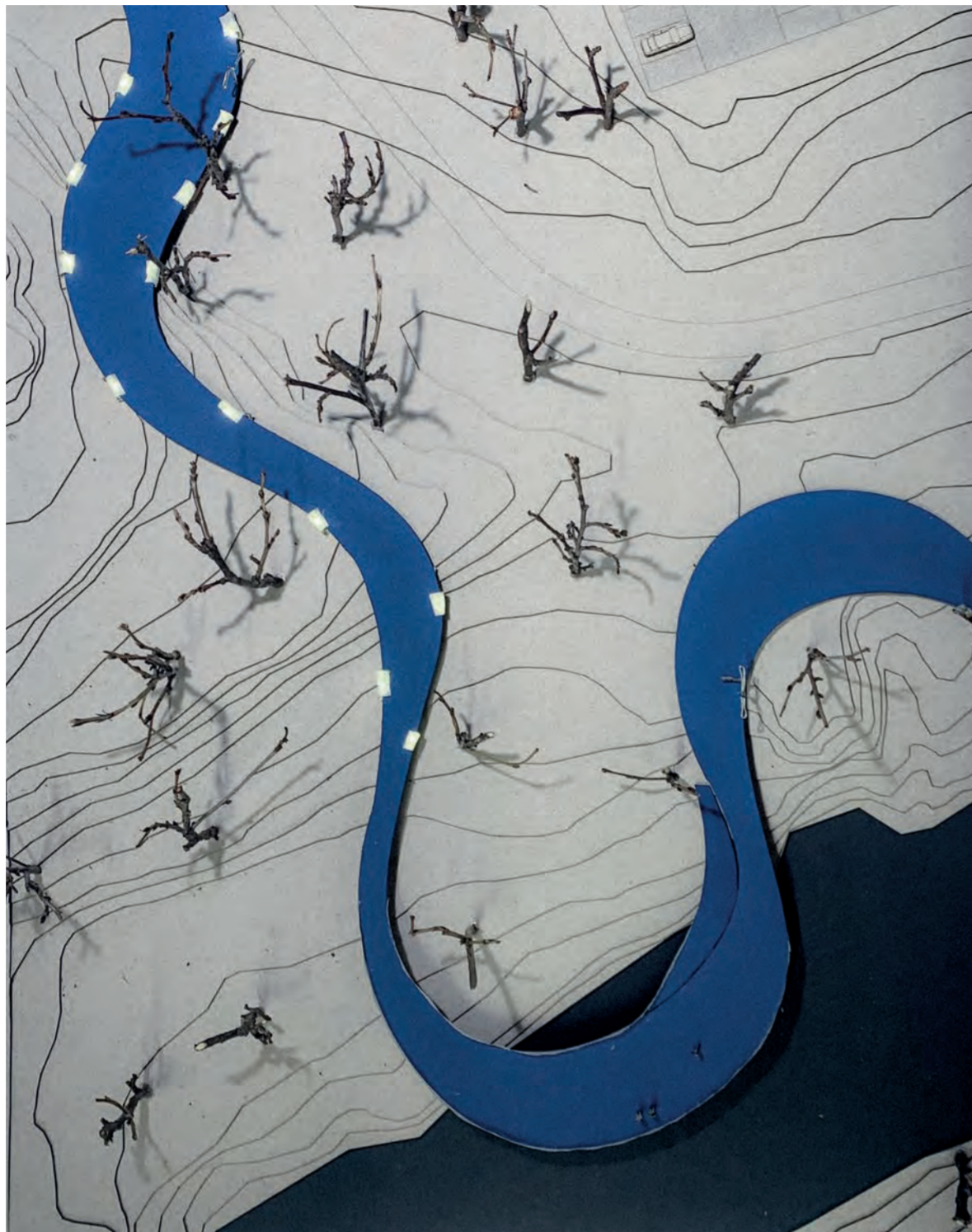
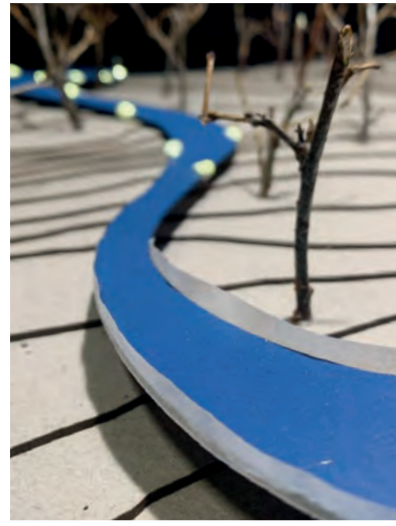
- The social aspect is the focal point of the project, a connection between inhabitants, children, visitors and non-humans is aimed.
- The project can lead to a raising of consciousness towards sustainability and green energy production.
- Different spaces are interconnected and tangled into a same atmosphere of sharing and experiencing.
- A direct link to the river permits an easy access to nature and mitigation is reached to the addition of vegetation in the area.
- The diversity of opportunities makes the project appealing and inviting

Opportunities

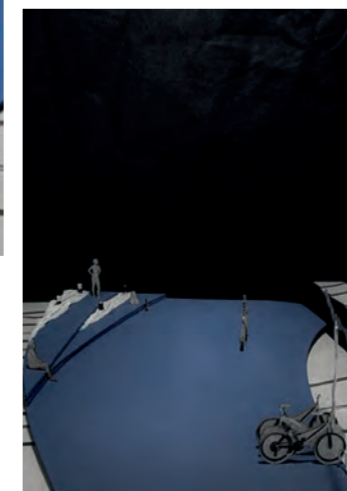
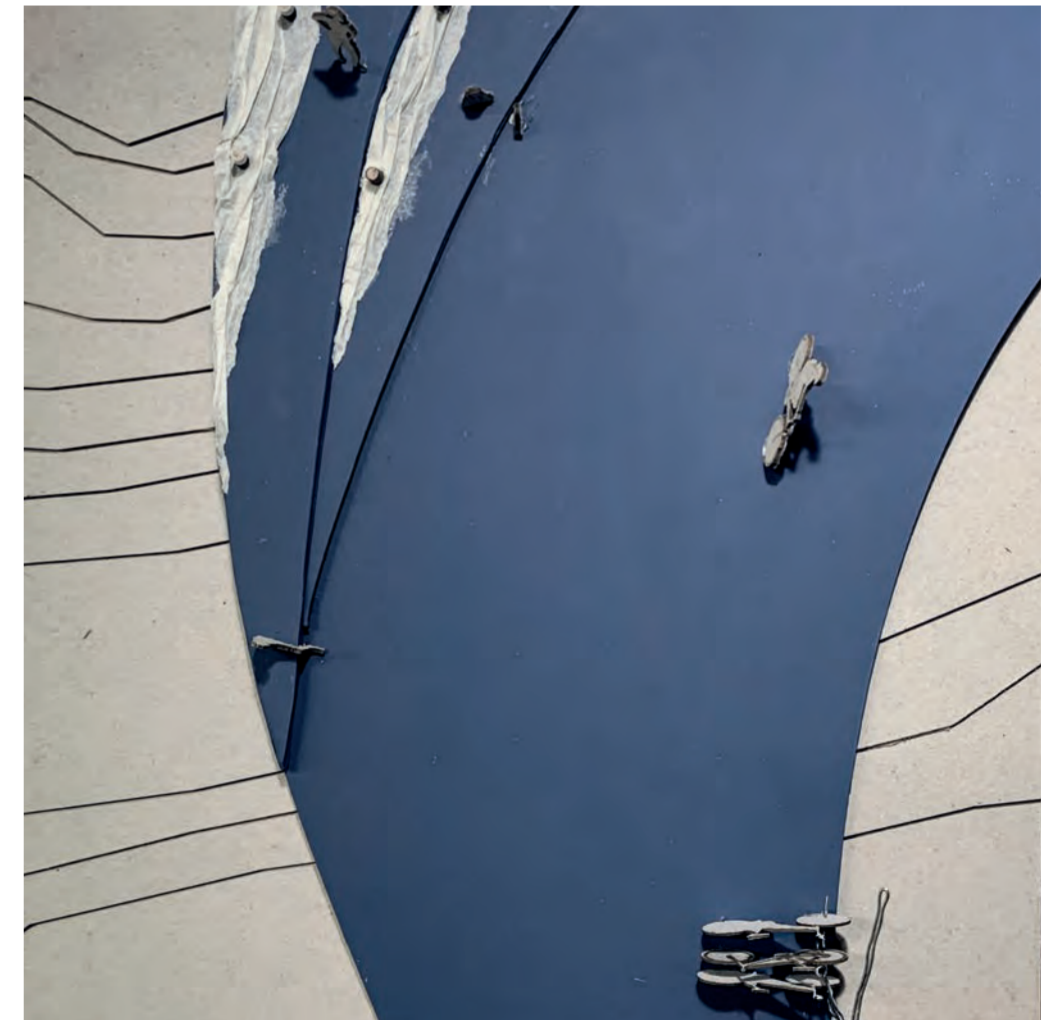
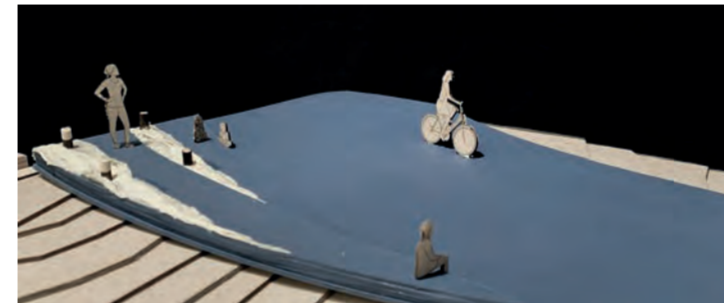
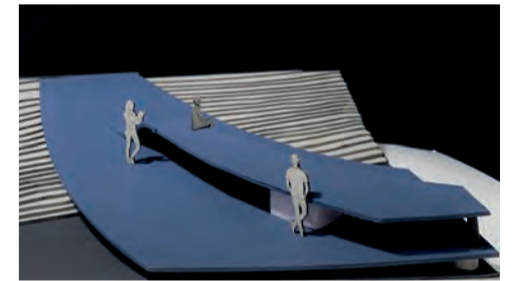
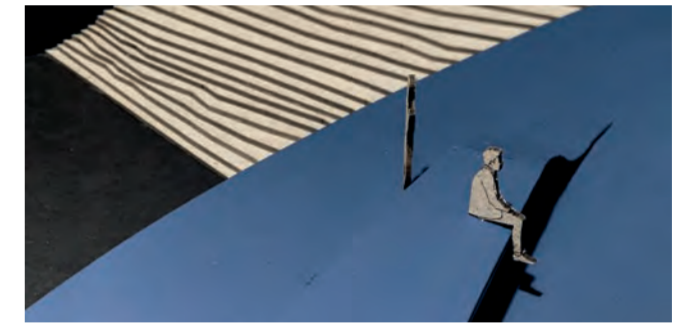
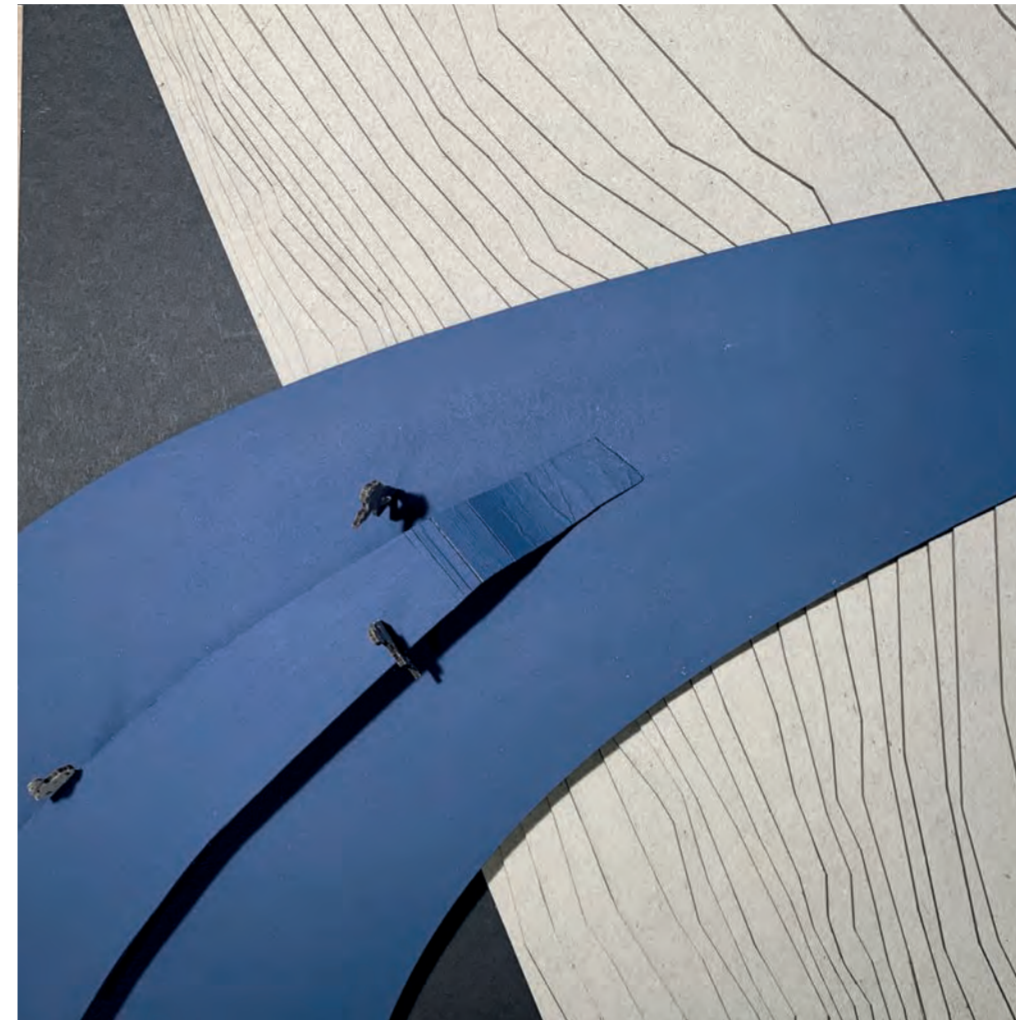
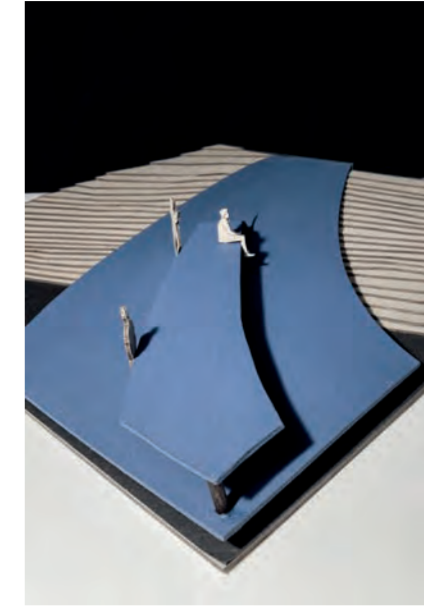
- The project acts as a people condenser - more visitors are invited to visit the area and experience the atmosphere created along the path.
- The project can lead to a consolidation of the neighbourhood and a raise of safety in the area.
- The project can be disassembled and the path can be converted into a space, where a single or various activities are provided.
- This prototype can make people get closer to sustainability and to the environment.



_photos of the process
_maquette 1 : 200



_photos of the process
_maquette 1 : 50



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