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Geothermal Emancipator

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GEOTHERMAL EMANCIPATOR

A hybrid of a Geothermal Power Plant and a SPA in an urban context.

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Glossary

GEOTHERMAL ENERGY-energy gained using the heat from the Earth's interior, particularly in the areas of volcanic and seismic activity. Runoff water penetrates deep into the earth, where in contact with magma, it heats up to substantial temperatures. As a result, it travels to the Earth's surface as hot water or stream.

GEOTHERMAL PLANT-power plant generating electricity fusing the heat of geothermal waters
DISTRICT HEATING – system distribute steam or hot water to multiple buildings. The heat can be provided from a variety of sources, including geothermal, cogeneration plants, waste heat from industry, and purpose-built heating plants.

FUNCTIONALISM-a design movement in the 20th century which focused on a clear expression of function, and purpose in the design and limitation of purely decorative elements.

FORDISM-an economical model which consists of standardization of manufacturing made possible by the invention of an assembly line in 1903 by Henry Ford. The essential idea was that a quicker production of the goods will enable the workers to purchase the goods themselves.

SOLIDARNOSC- nationwide working union formed in 1980 to defend workers' rights, in 1989, also one of the main centers of mass resistance against the governments of the Polish People's Republic

Glossary

COMMUNISM- a radical left-wing ideological system, which derived from socialism, nationalization of private property, mainly the means of production and the attitude of the economy to meet the needs of citizens.

SOCIALISM- ambiguous term, referring to attempts to reduce social inequalities and the spread of social security benefits, or subjected to public control of the economy (through state institutions, local government, corporate or cooperative)

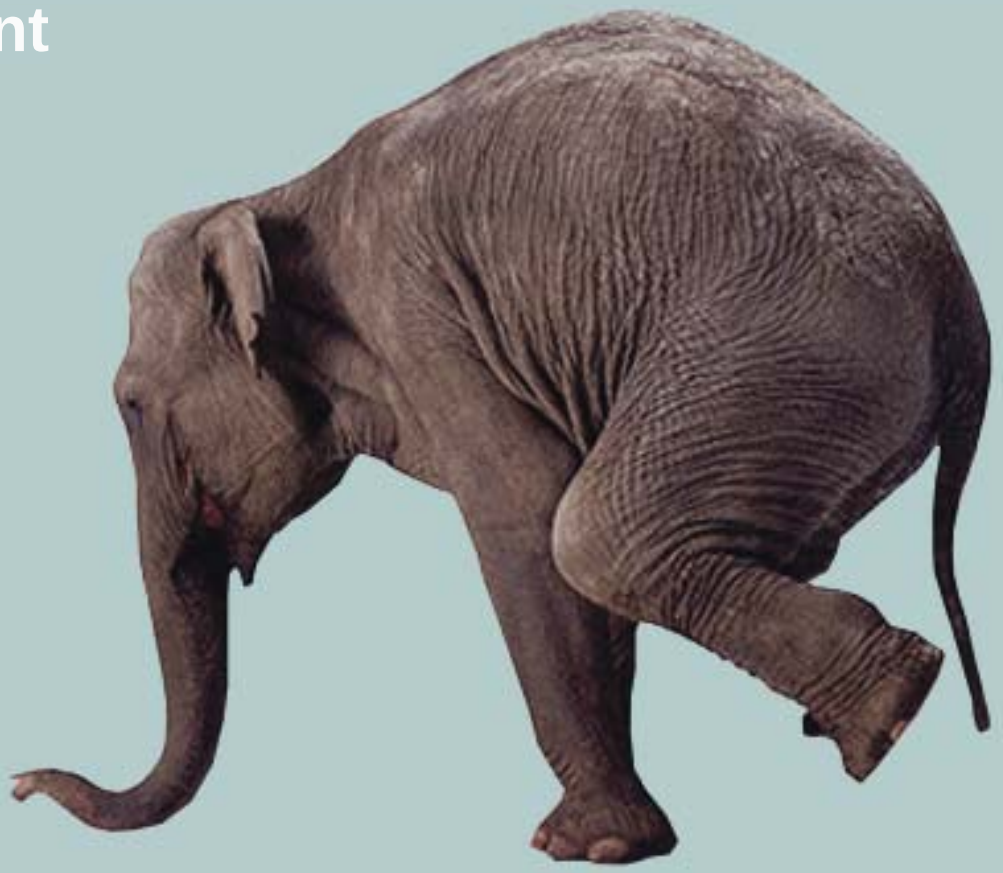
EUROPEAN UNION-The European Union, created November 1, 1993 under the Maastricht Treaty, economic and political union of democratic European countries, which is the result of long process of political integration, economic and social initiated after World War II.

AQUEDUCT-An ancient infrastructure invented in the Roman Empires of which the purpose was to transfer and distribute the water from outside the town to its citizens.

ASSEMBLY LINE- a manufacturing process in which parts are assembled on a moving line, while the workers stay in one place.

INFRASTRUCTURE :
- the basic, underlying framework or features of a system or organization.
- the fundamental facilities and systems serving a country, city, or area, as transportation and communication systems, power plants, and schools.

There’s an elephant in the room and it’s BIG.



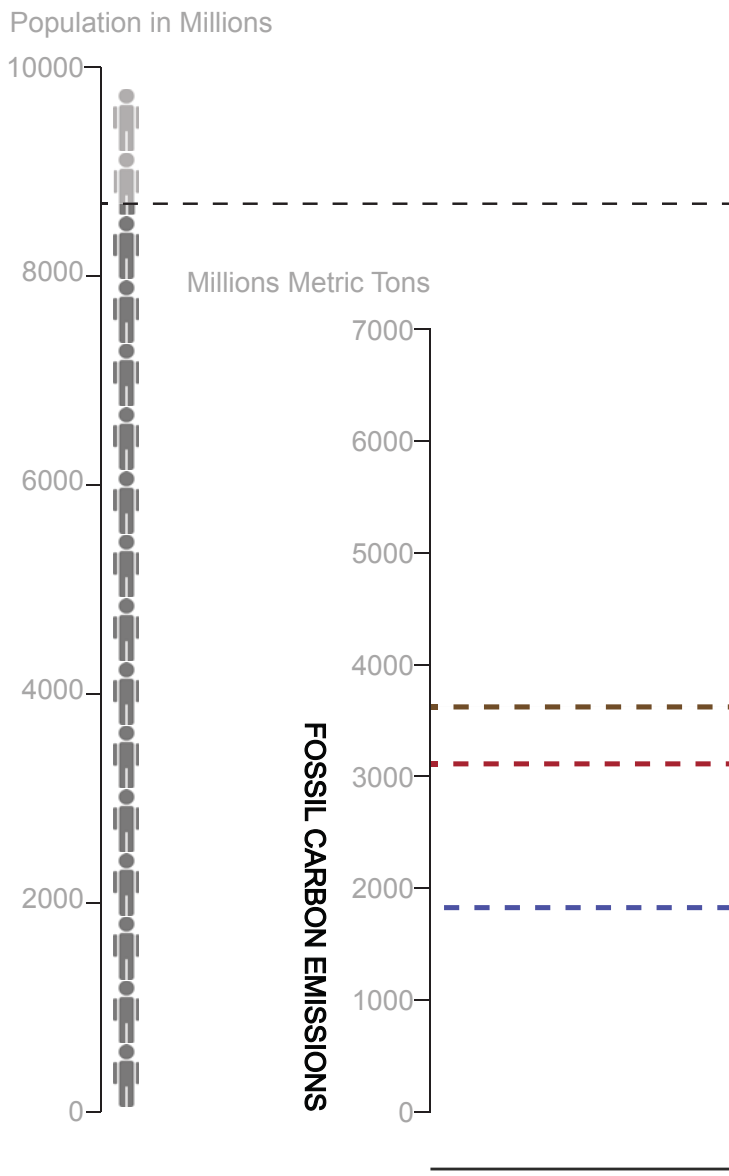
Energy crisis

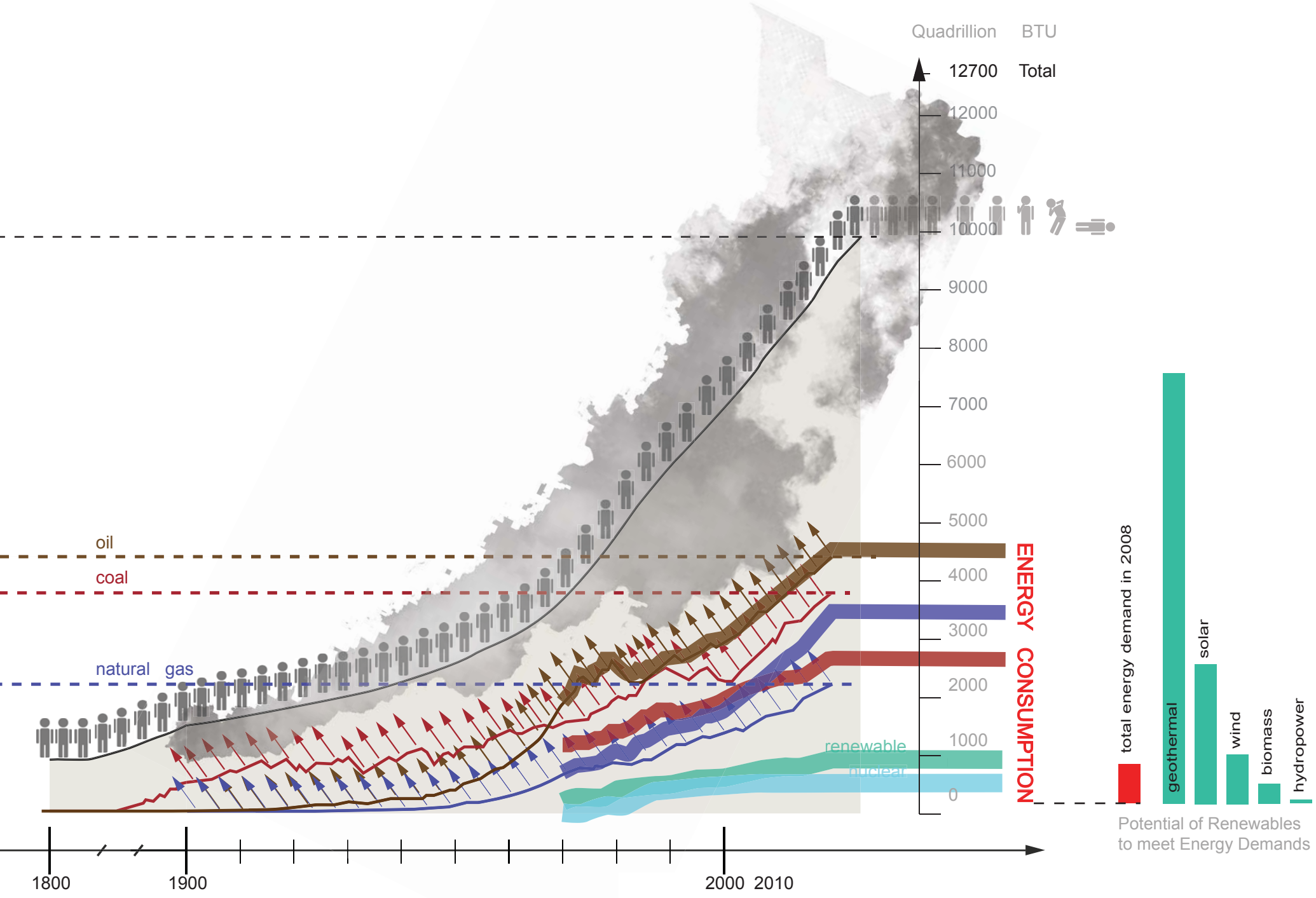
‘The energy future which we are creating is unsustainable. If we continue as before, the energy supply to meet the needs of the world economy over the next twenty-five years is too vulnerable to failure arising from under-investment, environmental catastrophe or sudden supply interruption’.
(Chevalier 7)

Since the middle of 19th century world’s population increased by a factor of 6. As a result, energy demand has proportionately increased to the point that we are now using 1.4 of World’s energy resources annually. Energy consumption is divided into 3 general categories: Industry, transportation and buildings. The last sector is responsible for almost 50% of world’s energy, percentage varying in different parts of the world. Moreover, in the near future the building energy consumption will increase faster than other’s energy consumption sector. At the same time with the growing population which is now 6.5 billion but will increase to 9 by year 2050 (Chevalier 6) , the demand for energy will grow accordingly. The seriousness of the situation necessitates immediate, interventional actions from all disciplines. This applies to architecture as well, especially considering that the building sector is the main contributor to the energy crisis we are facing in the 21st century.

The problems of depletion of energy resources are not completely ignored in teh architectural world. The scale of the problem however, requires a greater engagement and a louder response if we are to deal with the problem effectively.

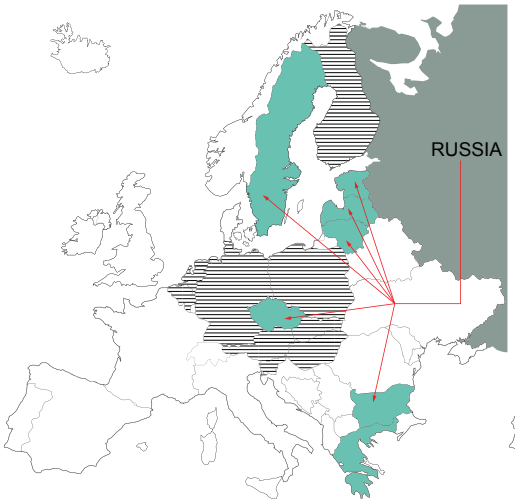
The utilization of renewable resources today still only provides for less than 10 % of the world’s energy consumption. At the same time, the geothermal energy iitself could satisfy more than 10 times the total demand.



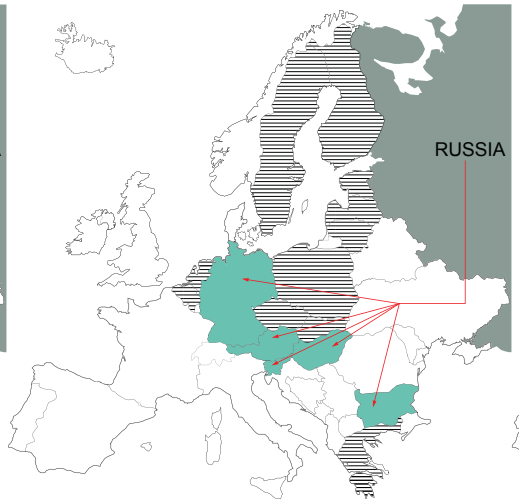

Quadrillion BTU
12700 Total
12000
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
oil
coal
natural gas
renewable
nuclear
ENERGY CONSUMPTION
1800
1900
2000 2010
total energy demand in 2008
geothermal
solar
wind
biomass
hydropower
Potential of Renewables
to meet Energy Demands

Energy dependency in Europe: Russia's largest energy supply recievers

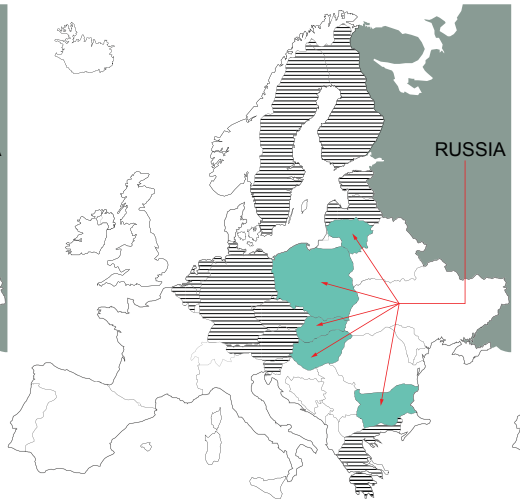
Diminution of resources and a parallel contra proportional emission of greenhouse gases are not the only energy-related problem today. Monopolized gas market of Eastern Europe and its stern regulatory are another enormous concern, for European countries in particaular seeing that Russia is their major gas and oil supplier.



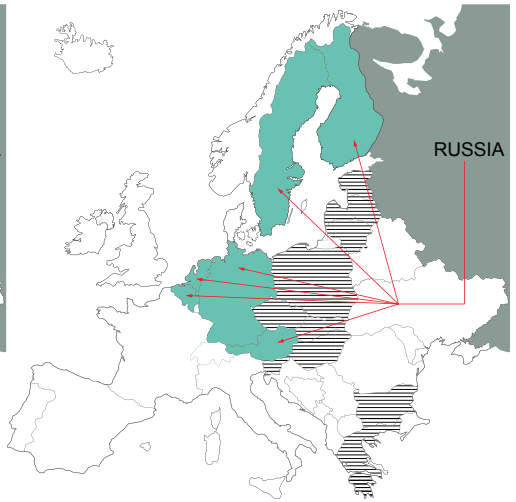
78% of country's total gas supply



39% of country's total gas supply



85% of country's total oil supply



30% of country's total oil supply

maps source: "The Russian-Ukrainian Gas Crisis of January 2006." Oxford Institute for Energy Studies

Energy dependency in Europe: monopoly sets the rules

40% of Europe's total gas supplt comes from Russia.
80% of the total supply goes through Ukraine (Stern 1).

In 2006 Russia when Ukraine failed to paid on time, Russia cut the cut their gas access. As a result a major part of Europe's gass supply was disabled. Similar scenerio took place again in 2009 (Stern 7)

maps source: BBC News - "Russia shuts off gas to Ukraine" <http://news.bbc.co.uk/2/hi/europe/7806870.stm>

Energy wars

The independency today is still challenged but takes a different form. It is defined by the availability and ownership of energy resources. It is not only a concern for Poland but most of the European countries due to fact that 40% of total gas supply for Europe is provided by Russia. On top of this Gazprom-the Russian gas supplier is a state-controlled monopoly (Bigg 1). Needless to say the Russian government has the power to cut off the European gas supplies in case of any conflict with the supplied nations.

Ideally this relationship would be kept strictly economically and the only reason for a failure to supply on Russia's side would be the failure to pay by a gas-receiving nation. This scenario happened several times in the past with Ukraine and even more recently with Belarus. In 2006 an argument between Russia and Ukraine arose concerning Ukraine's gas payment for the year of 2005. Russia claimed that Ukraine was stealing gas from the European supply pipes running through its land and Ukraine argued that the shortage in the European pipes was caused by Russia's failure to supply enough gas (Stern 5). As a result, in January 1st 2006 Russia cut off gas supplies to Ukraine's, disabling the gas flow to most of the European countries (Stern 7). Similar situation happened in 2009 when Ukraine, once again, failed to make the payment for the previous year. For the following year of 2009 Russia nearly doubled the prices of gas (Gazprom Cuts off Ukraine's Gas Supply – CNN).

Another country that has recently suffered from gas supply cuts treats is Belarus, earlier this year, on January, due to their bad financial situation Belarus could not meet the payment requirements, but offered to start to pay with machinery. Russia refused the offer, and begun to cut the supplies to Belarus by 15% for every day the payment is delayed (The Associated Press).

While 80% of the pipes supplying gas from Russia to Europe go through Ukraine, the remaining 20% is transferred through Belarus.

'Gazprom cannot accept debt repayments in anything, be it pies, butter, cheese or other means of payment'

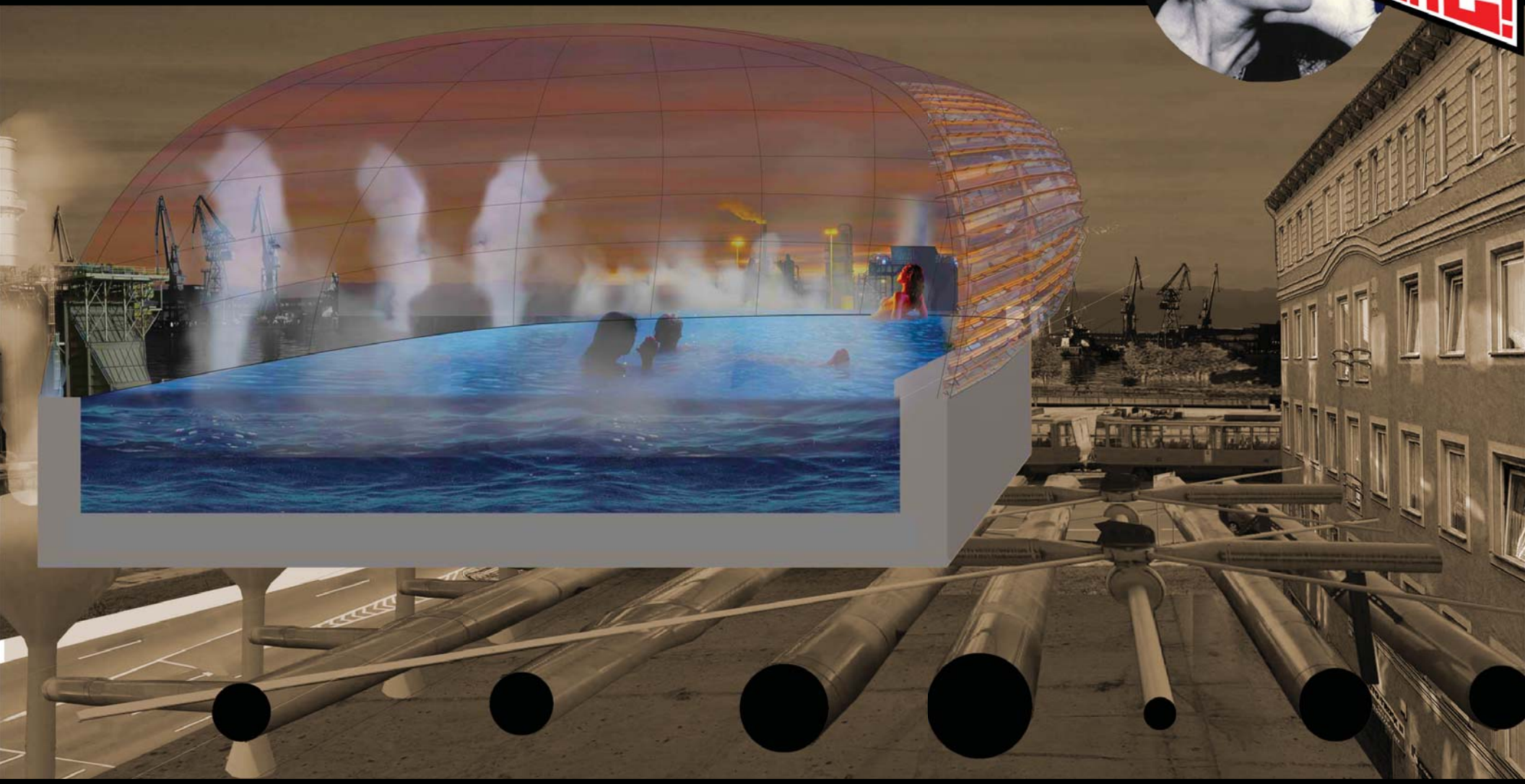
Dmitry Medvedev, Russian President as of 2010, in reposnse to Bielarus' offer to make the gas payment with machinery (BBC News - Russia Cuts Belarus Gas Supplies over Debt).

ENERGY INDEPENDENCE = POLITICAL INDEPENDENCE

Russia assures that it will continue to play a role of a reliable gas supplier for Europe. Meanwhile, the concern in European countries raises after the release of the Russian policy paper, regarding national security for the next decade. In the paper it is being stated that: “The attention of international politics in the long-term perspective will be concentrated on the acquisition of energy resources… … Amid competitive struggle for resources, attempts to use military force to solve emerging problems can’t be excluded.” (Moscow Warns of Future Energy Wars - Europe - Al Jazeera English.)

[1]image: Soviet propagandist poster of 19 translation: ‘Don’t Gossip’; ‘Be on the lookout: These days, the walls talk.’
source: http://www.davno.ru/soviet-posters/propaganda/

GEOTHERMAL EMANCIPATOR



‘The struggle for designers and planners lies not with spatial form and aesthetic appearances alone but with the advancement of more socially just, politically emancipatory and ecological sane mix(es)of spatio-temporal production processes’

/David Harvey/

THESIS CONTENTION

Application of renewable resources in the world has been happening for decades already and its use is both urgent and inevitable. With increasing energy scarcity worldwide, energy independence will be a vital facet of future growth for emerging economics.

Poland, one of the post-communist, European countries has struggled with the issue of independence for centuries. Russia has often played a role of the invader in the historical events the two countries shared. In 1908, soon after Poland emancipated itself, from 123 years long, German, Austrian and Russian occupation, Russia quickly reinforced Poland with the ideas of socialism and communism which lead to Poland's inclusion to the Soviet Union. Finally in 1989 due to the intervention of a democrat party 'Solidarnosc', Poland has once again re-gained its independence and has been developing ever since, especially productively after joining the European Union in December 2002.

Today as the factors determining nation's independence are changing, Poland has a chance to decide on its political future and avoid the involvement in the foreseen energy wars. It can happen through an appropriate utilization of its renewable energy resources on a larger scale, which can ensure its nation's energy demand stability and therefore political concord.

The types of renewable resource that can best support the energy economy vary in different countries and climates. The choice of renewable technology to be applied in a location should be supported by existing site conditions in order to determine which has the best energy generation potential.

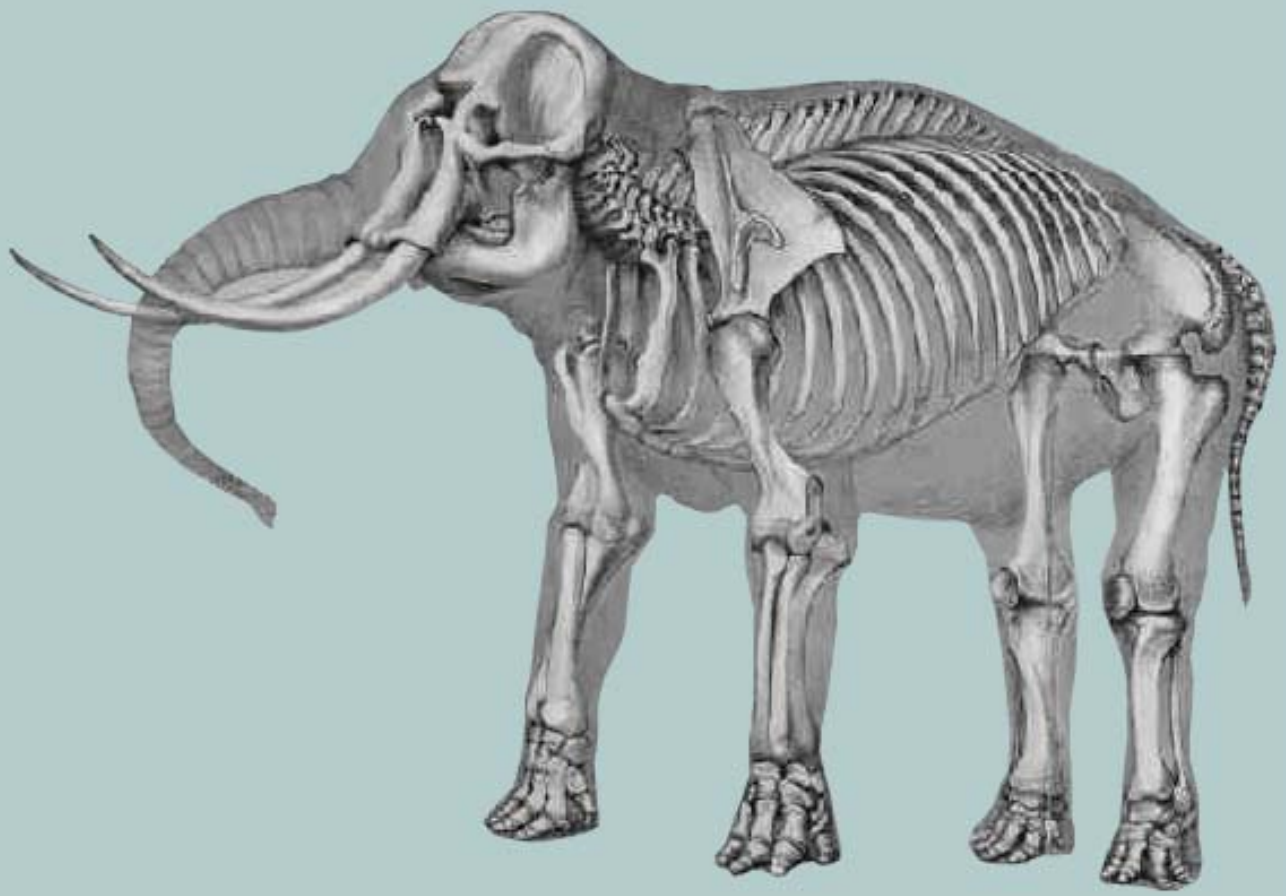
For Poland it is geothermal energy. Architecture that capitalizes on geothermal energy can function both as a local resource in itself, liberating it from the contemporary, energy dependency on Russia; and a roadmap framework for future growth.

A new design model of an infrastructure, independent of the power grid, will be a test of manifestation of the energy's new political idea of power and independence.

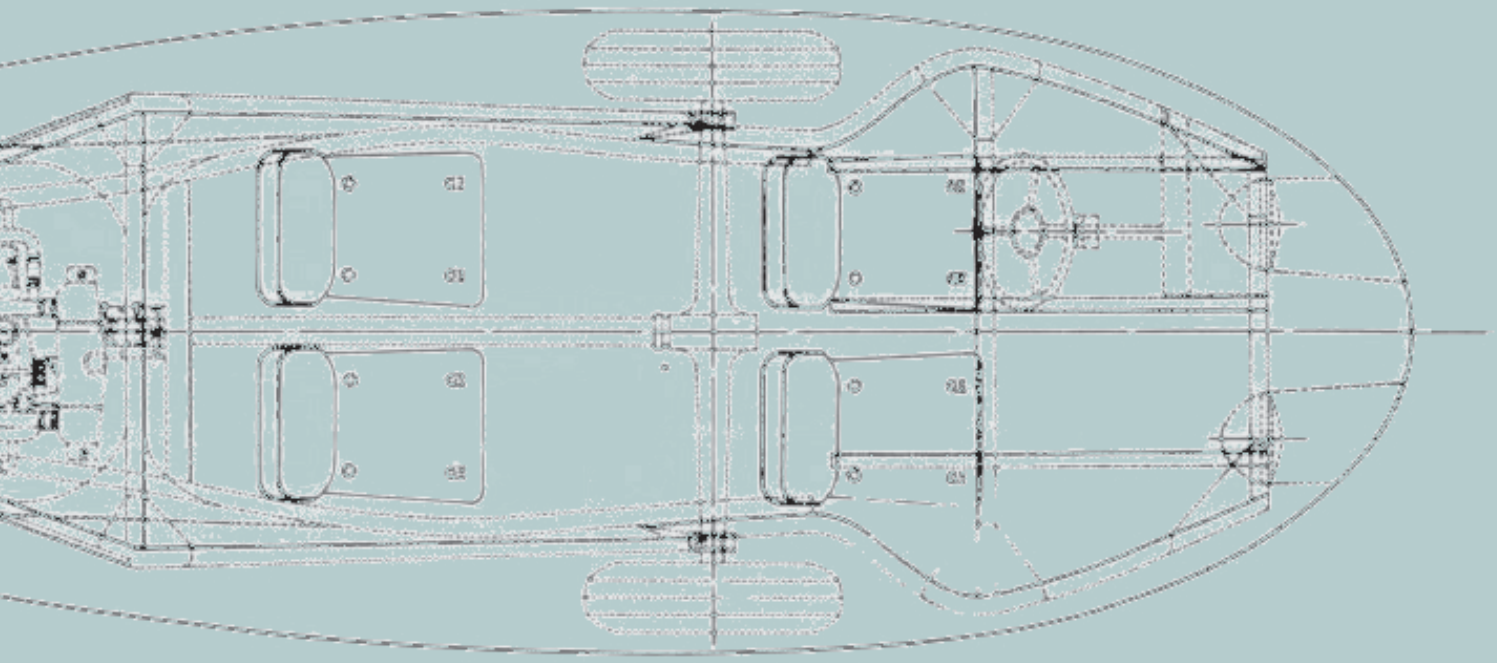
The reality is that the world we live in today is a much polluted, technology and power driven place. However, as much as we have damaged it over the centuries, we have also came up with many inventive ways to harmonize with nature instead of acting as its predator. The technological knowledge and invention of our century, when applied right, can be the solution to the problems to which it contributed. Sustainability today is indispensability and simply cannot be disregarded in the contemporary design world. That does not mean that we are sentenced to live in a world full of thermal boxes covered with solar panels. The role of architects is to make sure that does not happen by combining the industrial trends of the design world that continue today with ecological responsibility our century carries. Combining the poetics of an architectural design with intricacies of a functional, engineering infrastructure is not a new concept. It can be traced back all the way to Antiquity when the first Aqueducts were designed. They were highly functional, engineering invention, which supplied the necessary means [water] of living to towns of the Roman Empire. In its design it demonstrated hydraulics expertise as well as the architecture of the best Roman period (Chanson 48), all together symbolizing the prosperity of the Roman Empire.

Thus, the ultimate goal of this proposal is to create an infrastructure that ideologically could act as a contemporary embodiment of a Roman Aqueduct.

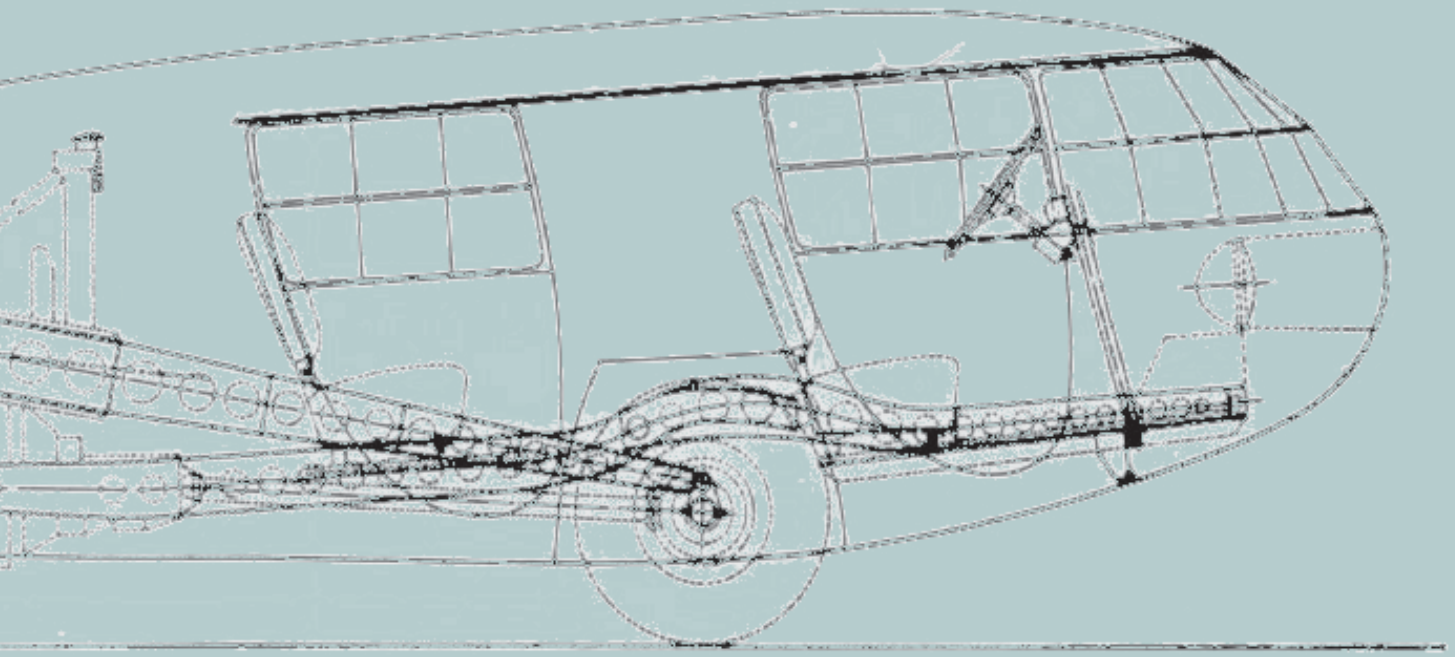
How do we deal with the problem architecturally?



Buckminister Fuller: Dymaxion Car



TURE + INDUSTRIAL TRENDS



The early Modernsits decided that design should be in tune with ‘zeitgeist’ -from German ‘spirit of the age’

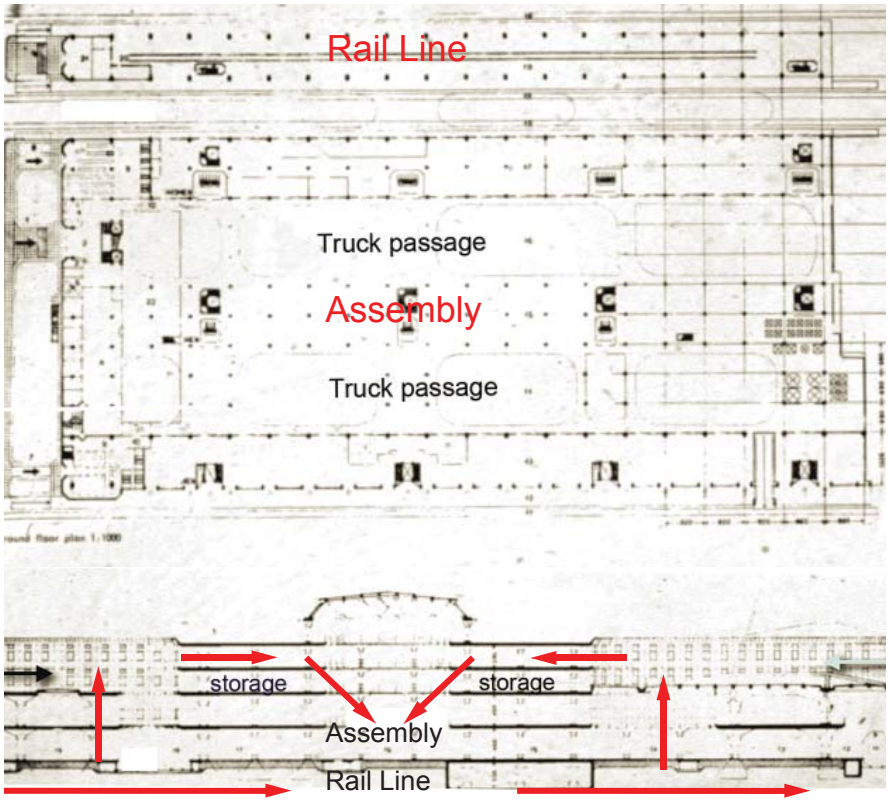
Fordism-functionalism-capitalism

The 21st century's problem of exhausting the energy resources has to do directly with the common availability of the products that need energy to power them in order to serve their purpose; from TVs, hairdryers, microwaves, to heaters, air conditioners, to cars, airplanes etc. Through the invention of the assembly line in 1903, mass production and factory efficiency has distributed these products on the global scale. Modern industrialization has made humans dependent on this type of production, leading to significant energy consumption and resource depletion.This date also begun the era of industrialization that this century is the offspring of. Looking at the diagram on page 6, it is not too difficult to believe that it is the era of industrialization that started the rapid energy use increase in the past 100 years.

During industrialism, as mass production and technology related to it were arousing they gave birth to several political movements.
Fordism initially was an idea of a quicker/cheaper production of cars started by Henry Ford, the inventor of the assembly line.(annotate).This concept later on developed into an economical model consisting of standardization of manufacturing which would enable the worker to afford produced goods himself. It was the drive of the capitalism in the United States at the beginning of industrialization.

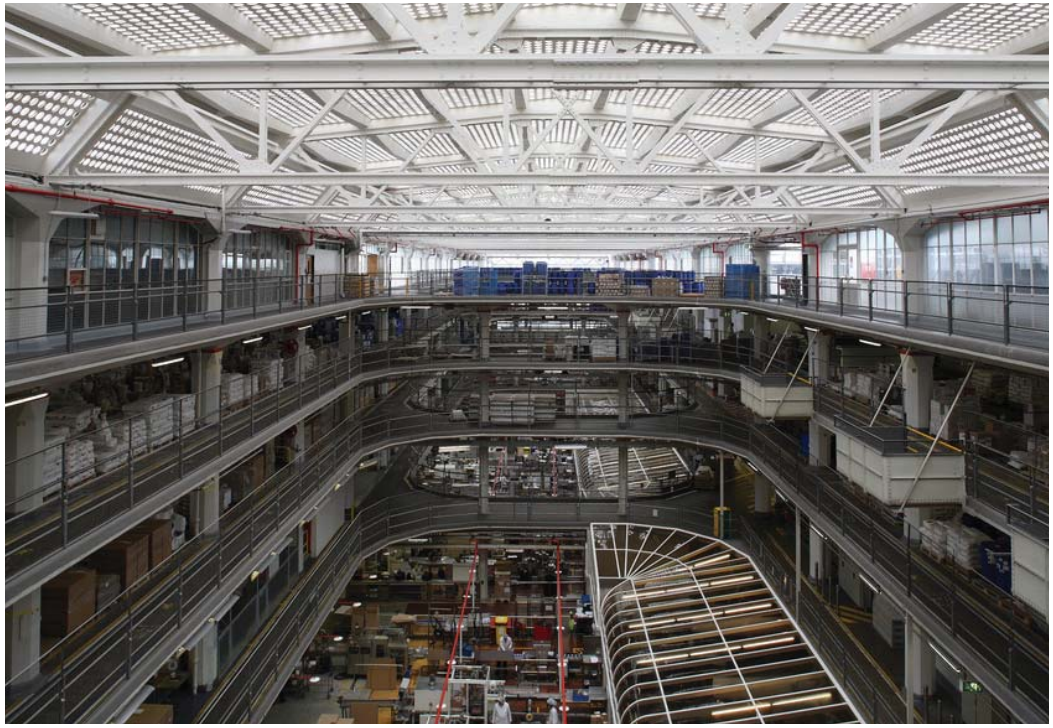
During that time a factory to become a dominant commercial building type. Architectural design and structure were greatly influenced by function and form; and aesthetics of buildings were linked in every possible way to those of a machine. The concepts of mass production, repetition and standardization took over the industrial as well as the artistic world of the time.

Assembly line: Both section and plan designed according to the process of assembling goods in a factory.



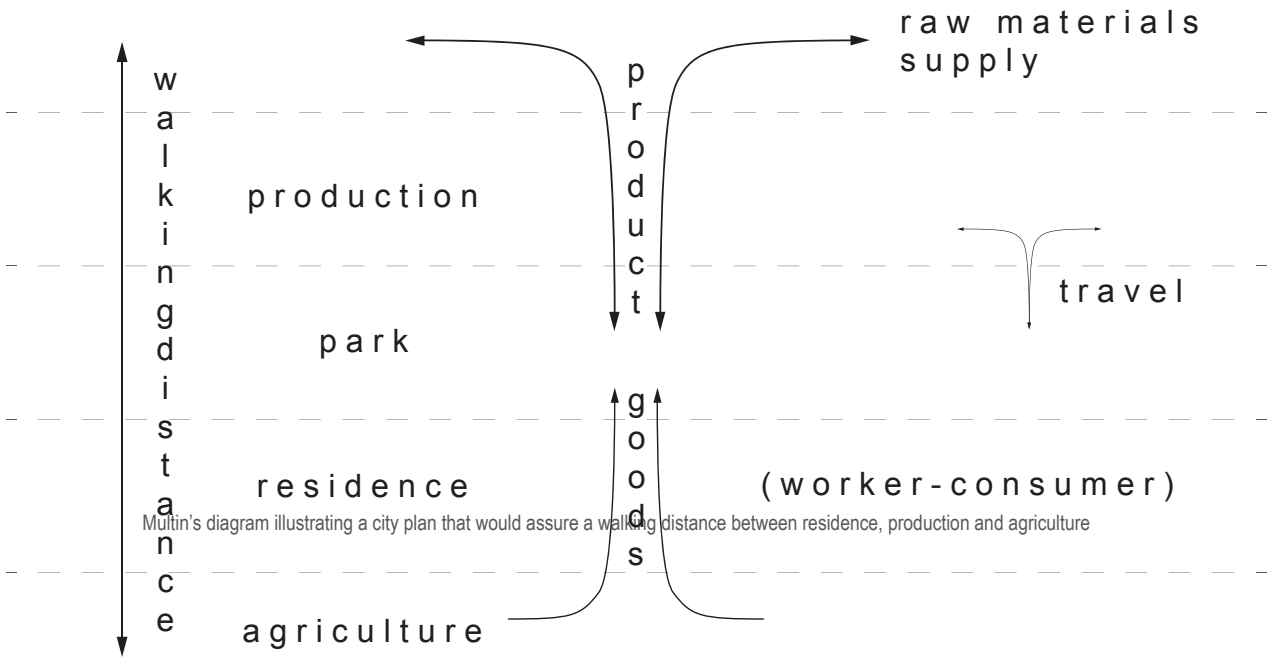
'Wets' Building, Boots Factory, Beeston, England; architect: Owen Williams, 1930

Curtain Wall: Day light in the working place is provided by the use of curtain wall and an open section.



Fordism-socialism-communism

“The establishment of socialism in our country cannot help but entail the systematic betterment of the material condition of the workers” (J. Stalin)



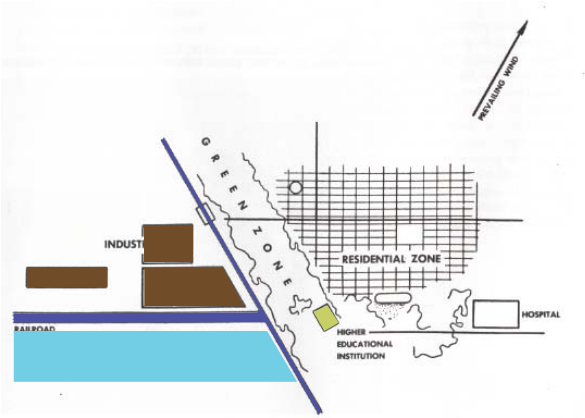
Multin’s diagram illustrating a city plan that would assure a walking distance between residence, production and agriculture

Ideas of Fordism affected the development of capitalism in United States and architectural implications of industrialism in functionalism. These trends of Fordism and mass production continued in Soviet Union which during that time competed with the U.S. in matters of production (Milutin 20). Russia’s political views however, were leaning towards a new movement: socialism.

The government’s Five Year Plan (annot.) of a socio-economic transformation of the country lead to new organization and design of city planning.
Contemporary architects incorporated the function of an assembly line in the schemes of a city plan that of which the aim was the working class.

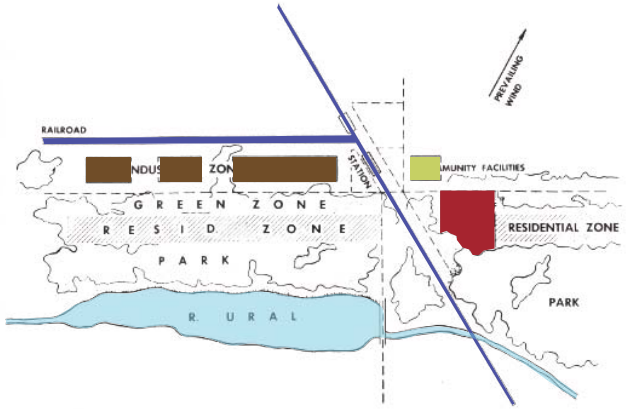
Fordism-socialism-communism: city planning on the example od Magnitogorsk

Typical city plan solution

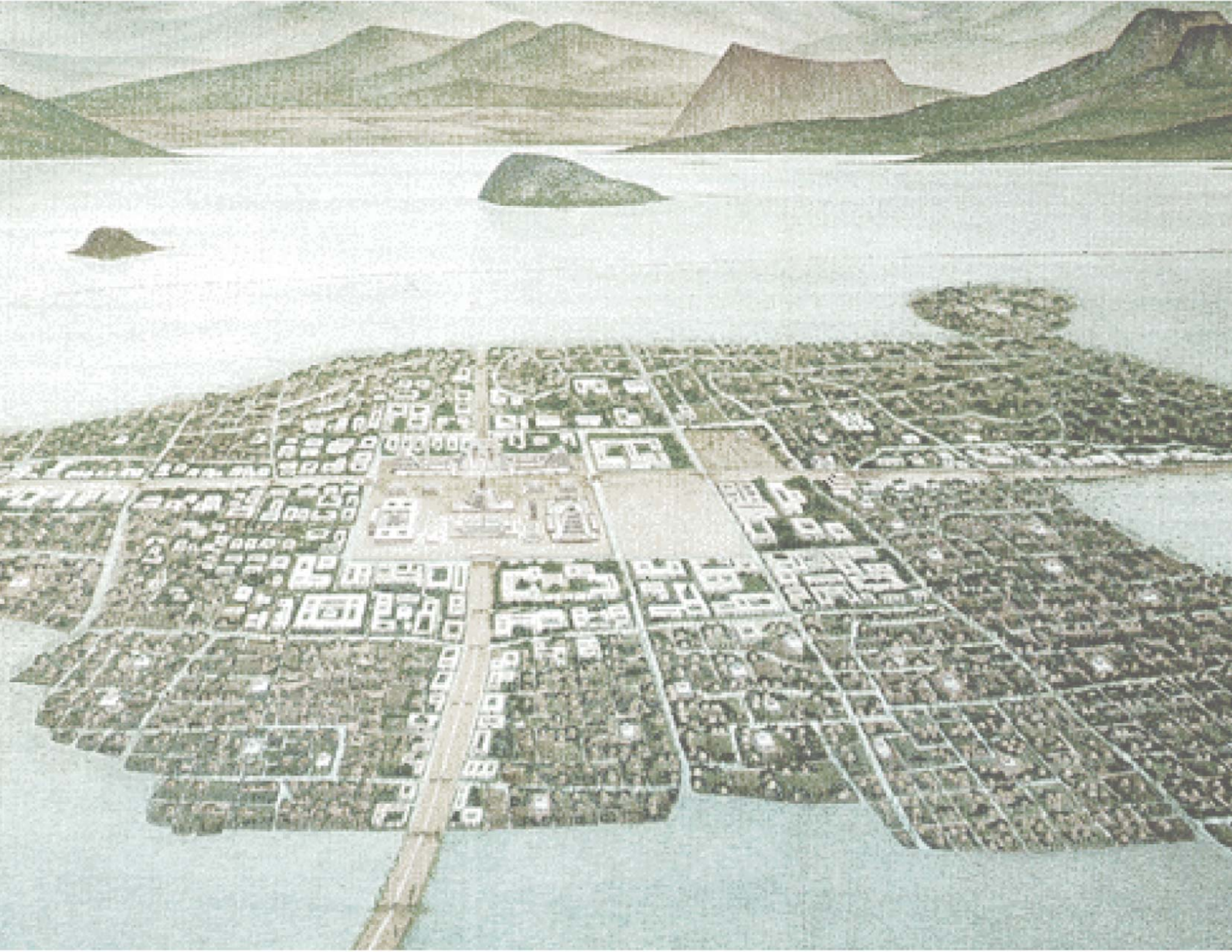


1. Factory territory is heaped in one lump; there is nowhere to expand;
2. The railroad lines cut off the factories from the residential areas;
3. The institute of higher learning is separated from the factory;
4. The Soviet institutions are also cut heaped about contact with rural life;
5. The water basin (Ural River) is not used to at all for the settlement;
6. The streets are overextended due to the rectangular layout;
7. The influence of wind blowing from the factory to the settlement has not been entirely estimated.

Assembly-line city plan system



The aim of socialist city planning was to create a spatial organization of buildings so that one task leads to another, and ‘a worker’ has walking distance to all destinations. At the same time the residential component has to be separated from the factory with a green zone so that it is not disturbed with noises of the factory. The lay out also needed to follow, like in an assembly line, the order of the processes associated with a factory production.



WATER + HISTORY

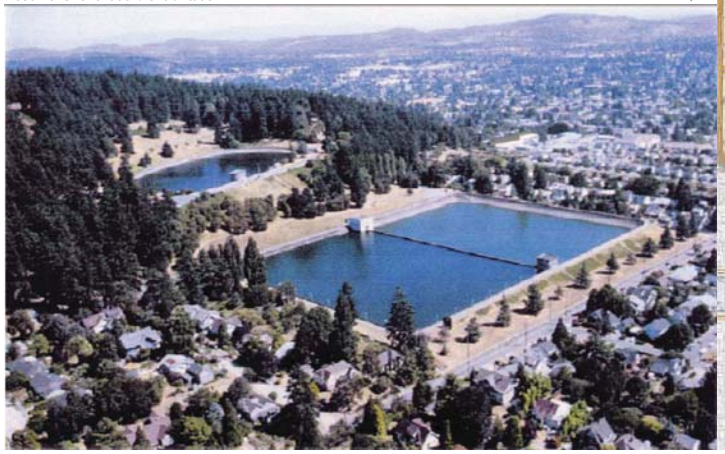
medium

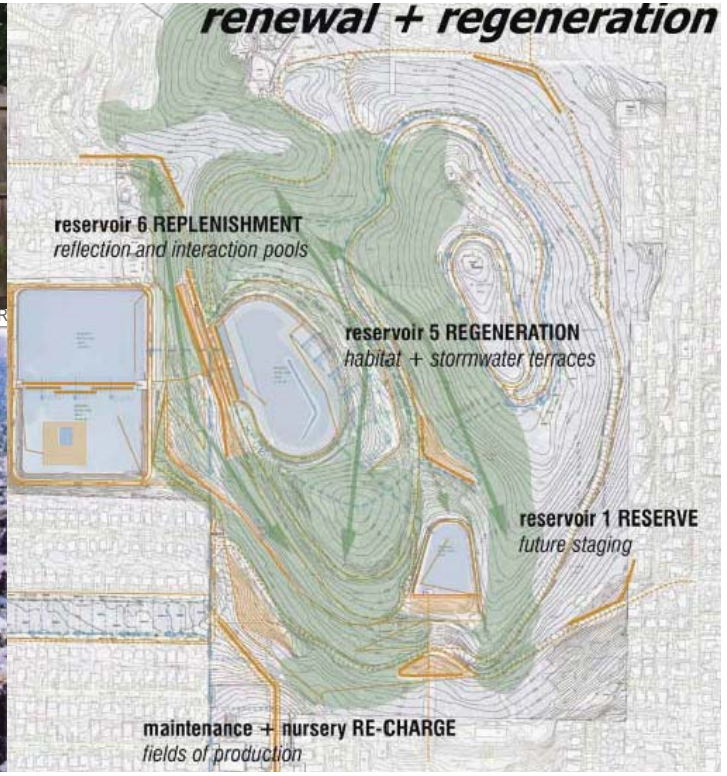
Human relationship to water

Throughout history human settlements have been organized around water. Whether it was for the purpose of agriculture such as the Aztecs' Chinampas: artificial islands created on top of shallow lakes for the crops; trade and transportation: here virtually any settlement that developed along the river or ocean side, or for its primal use for survival. These were the purposes for which previous centuries utilized water.
Now in the 21st century, while the scholars are pursuing new methods of preventing the depletion of the natural resources, water can once again becomes a center of human contemporary settlements: cities. Environmentalists, ecologists and engineers have been directly involved with finding alternative solutions for societies' energy demands for many years. In this process water played its role as a source of geothermal energy. case study.

A project in Portland, or was commissioned to cap existing reservoirs due to a concern of pollution. The project met with an immediate response from the local citizens who approached the architect himself in hope they could stop the progress in further design. Understanding that the reservoirs can no longer be used as a source of drinking water the citizens did not want the presence of a relatively big water body in their settlement to vanish.
The design turned out to satisfy both sides: the people and the government who issued it by creating multipurpose public space that could both use the existing reservoirs and, when covered, the spaces on top of it.

Reservoirs renovation/rehabilitation Portland, OR



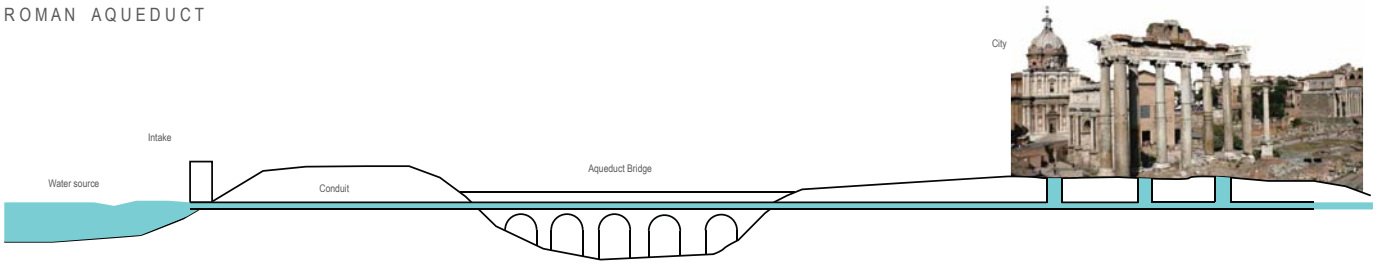


Water infrastructure

Aqueducts-water supply system which delivered water to the town from a local source in Ancient Rome, are considered one of the best examples of hydraulic expertise of Antiquity (Chanson 48).
At the same time: “The architecture of the best Roman period can be well studied from an examination of [them]” (Butler, 21). It is a perfect example of a design influenced by function. A system of pipes supplying the water was distributed around the city using its topography to control the flow pressure and supported by the structure of arcades. It was the architecture that integrated and refined the design of the infrastructure as a whole transforming the idea of the aqueducts from a hydraulic system to a functional yet monumental design.

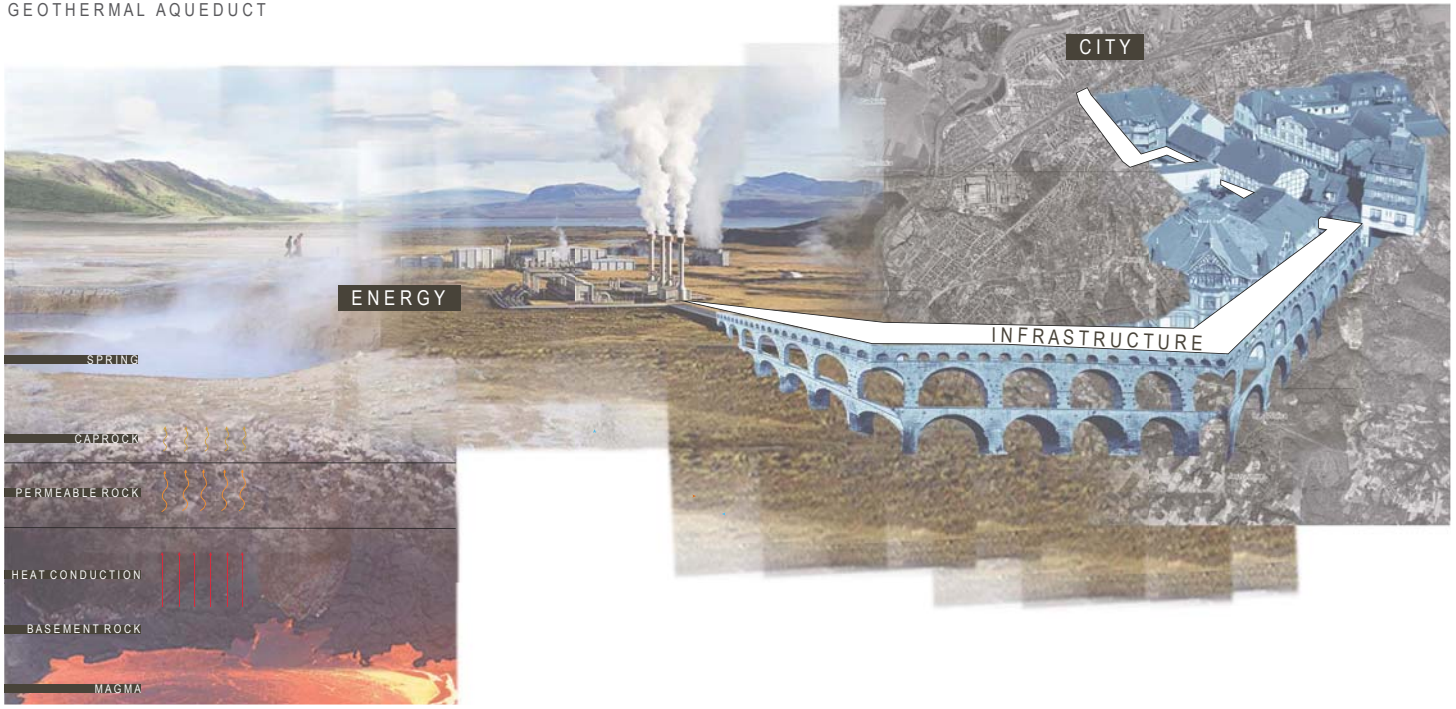
Water in a Roman Aqueducts was transported from site to site as a living resource-its primary purpose. Today water gains another function. It can be used as a medium to transfer geothermal energy which is what this project aims to do

ROMAN AQUEDUCT



MODERN AQUEDUCT

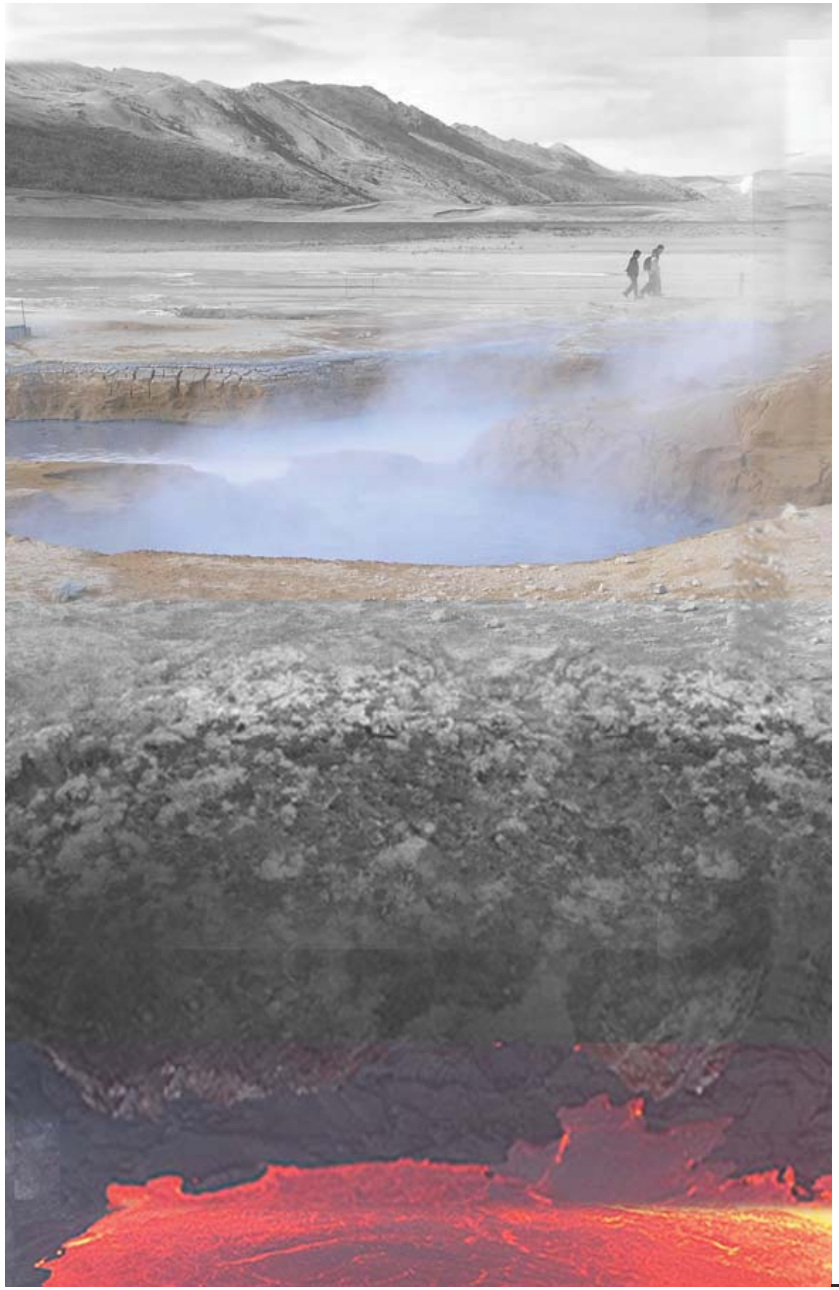
GEOTHERMAL AQUEDUCT



resource

GEOTHERMAL ENERGY

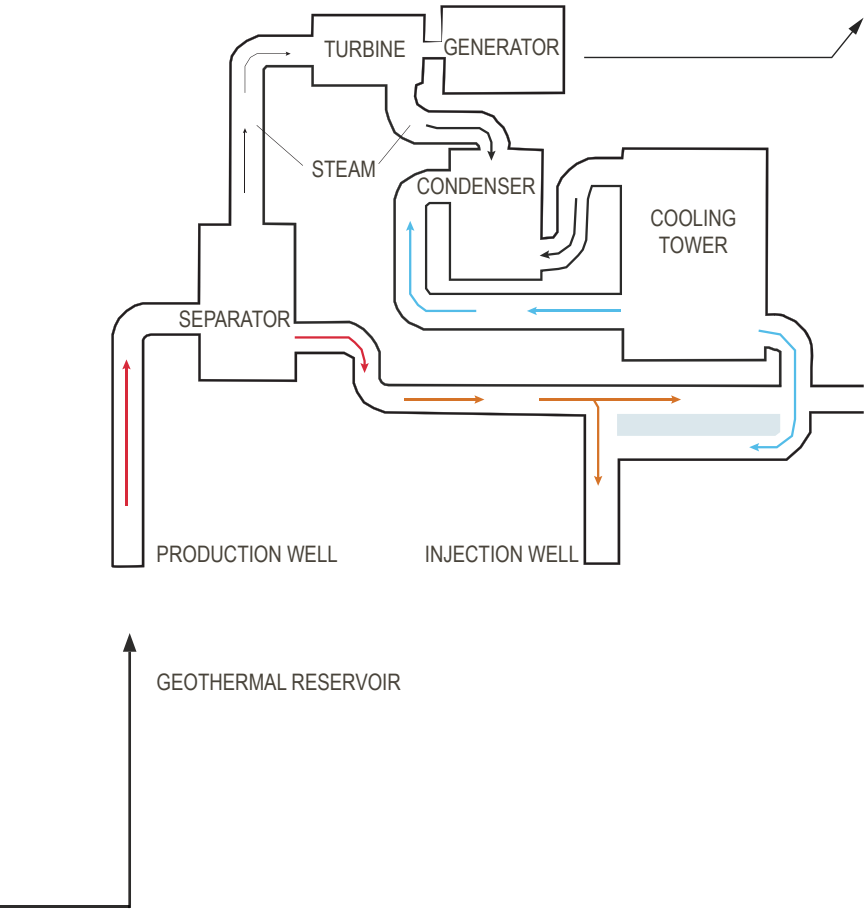
What is it ?



Geothermal energy is gained using the heat from the Earth's interior, particularly in the areas of volcanic and seismic activity. Runoff water penetrates deep into the earth, where in contact with magma, it heats up to substantial temperatures. As a result, it travels to the earth's surface as hot water or steam.
Geothermal energy is a renewable resource, because the heat that can be exploited from the hot interior of the globe - is virtually inexhaustible. The estimated temperature at the core of Earth is 6,500 degree Celsius.

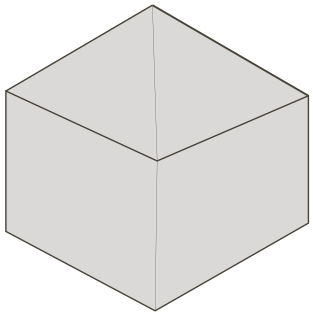
In order to extract geothermal waters to the surface, a well is drilled at the depth of the waters (production well). At a certain distance from the opening draw a second well is drilled (injection well), where the geothermal water, after receiving the heat from it, is injected back into the reservoir. The water is then reheated by the earth's heat and can be used again as the medium for transferring the heat.

How does it work?



ELECTRICITY

DIRECT HEAT USE



°C
0
10
20 Aquaculture
30 Warm water year-round mining in cold climates, de-icing
40 Swimming pools, biodegradation, beleoogical baths
50
60 Greenhouse space & hotbed heating
70 Refrigeration low temperature
80 Space heating including greenhouse
90
100 Drying of organic materials, seaweed, grass, vegeables
110
120 Fresh water by destilation, multiple effect evaporation & concentration
130 Drying of organic materials, seaweed, grass, vegeables
140 Food canning; drying farm products at high rate
150
160
170
180
200
210
220
230

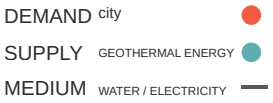
HEATING

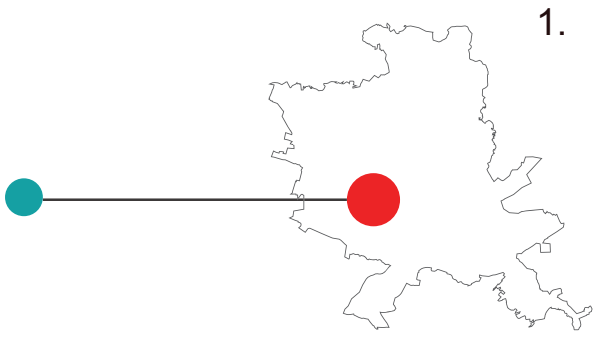
ELECTRIC POWER

Geothermal Energy utilization: site lay-outs

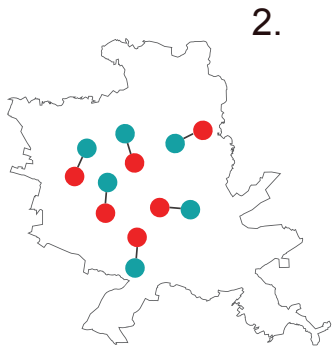
This proposal aims to celebrate the renewable geothermal energy as a significant factor contributing to Poland's political and infrastructural independence. A muliti-programmed infrastructure will become an urban monument of the renewable energy which it will distribute to the local housing along with utilizing it in the infrastructure itself.

An important component needed to be considered is: the proximity of the site location to the energy source. In order for the project to be efficient as intended, the proportion between the heat loss and the distance between the source and the site need to be kept, so that the temperature of the water, at the end of the travel, is still high enough to be used in a heating system

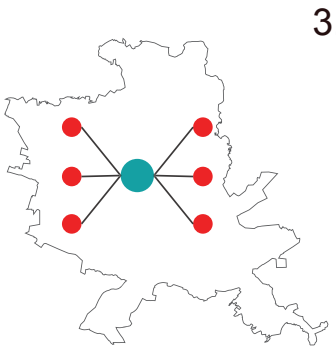




Not in my backyard: typical geothermal plant location. Option one is the most common solution for supplying geothermal energy to the city when geothermal waters' temperature is high enough to generate electricity. Geothermal Plant is located outside the city where all the necessary processes occur. The driving reason to use this scheme, aside from technical analysis of the site, is the social desire to keep it away from the inhabited areas due to its aesthetically unpleasant presence.



1 to 1 relationship: private residential heating. Option two is mostly used when geothermal waters are used as a heat source in a direct or indirect system. It is used in for a residential heating purpose when the various looping systems can be installed directly near under the house which the system will be providing for.



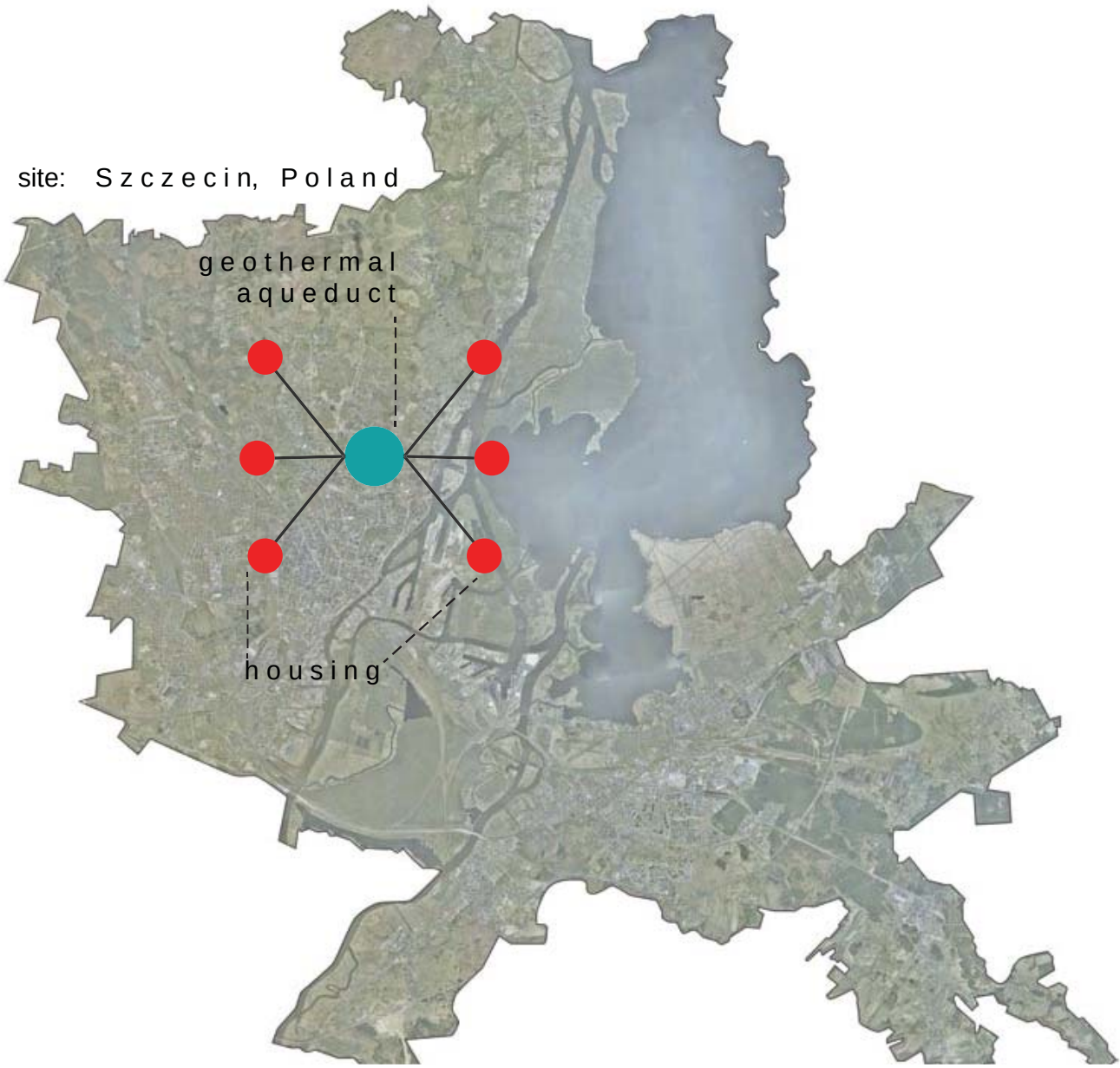
Spider-like, on site distribution. Third option can be thought of as a combination of the options 1 and 2. The idea of a structure, in which the heat obtaining process happens and further distribution to multiple locations, is taken from a geothermal plant as in option 1. The site location however : a 1 to 1 relationship from the energy source to the demand location is carried out from the systems described in option 2.

Proposed thesis will use the third option considering the following arguments:

Using the direct transfer of the heat obtained from geothermal waters into the infrastructure and housing that it will provide the heating to, shortens the travel distance therefore greatly increases the efficiency of the system.

Placing the structure extracting the geothermal heat (geothermal heating plant) on site-within the city provides an architectural opportunity to emphasize the importance of renewable energy resources in a contemporary city

Speculating that the geothermal resources on a chosen site: Szczecin, Poland will be used as a heat supply and will not be used to generate electricity, allows for some of the issues associated with the social response to the performance of the structure to be omitted. E.g. the noise of a working power plant.



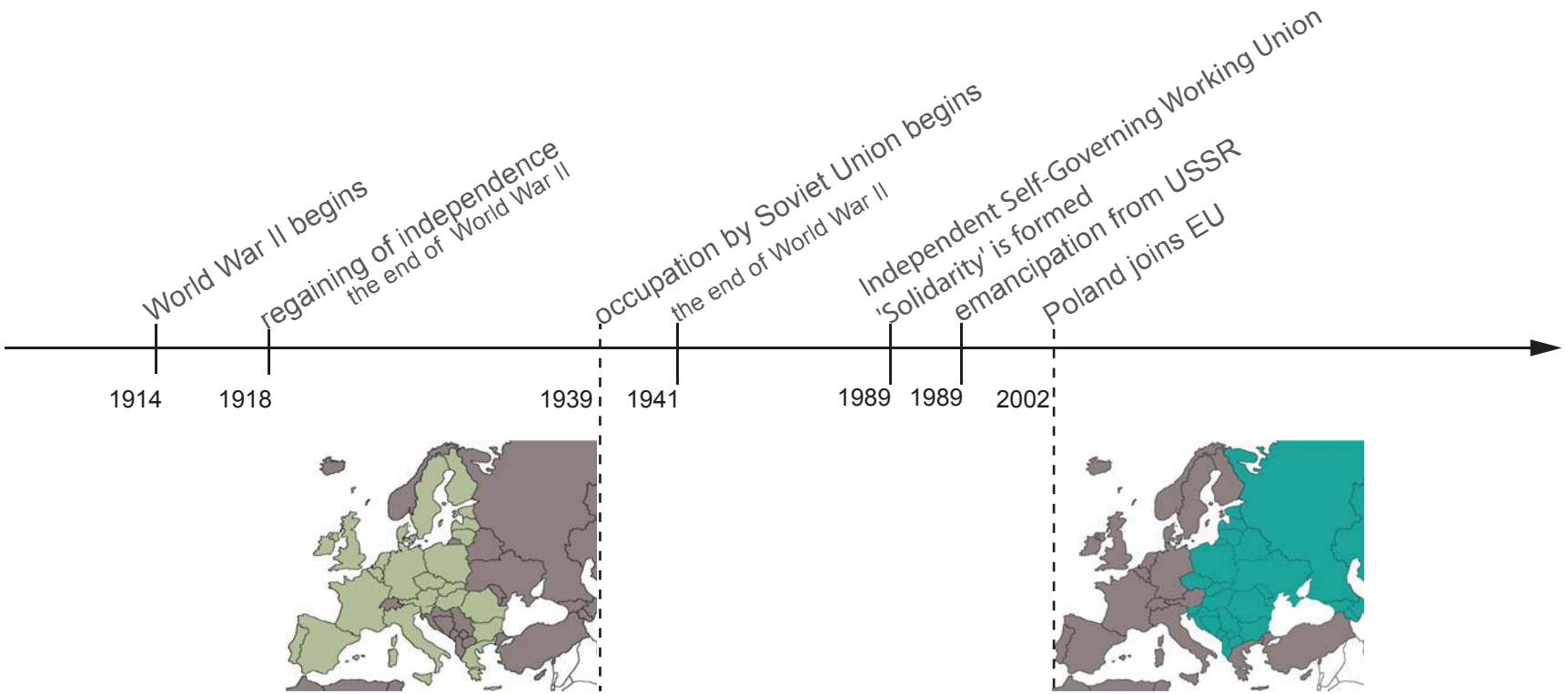
site: Why Poland?

Post-communist countries + energy-dependency issues in Europe + EU + geothermal resources of Poland.

Independency

Poland is one of the European countries that can be categorized as both: post-communist and emerging, quickly developing European Union member. Throughout the history, its borders have been transforming multiple times dues to the loss of independence under various nations' control. Russia has often played a role of the invader in the historical events the two countries shared. In 1908, soon after Poland emancipated itself, from 123 years long, German, Austrian and Russian occupation, Russia quickly reinforced Poland with the ideas of socialism and communism which lead to Poland's inclusion to the Soviet Union. Finally in 1989 due to the intervention of a democrat party 'Solidarnosc', Poland has once again re-gained its independence and has been developing ever since, especially productively after joining the European Union in December 2002.

Today as the factors determining nation's independence are changing, Poland has a chance to decide on its political future and avoid the involvement in the foreseen energy wars. It can happen through an appropriate utilization of its renewable energy resources on a larger scale, which can ensure its nation's energy demand stability and therefore political concord.



European Union: incentives for projects utilizing renewable energy

According to a research firm Frost & Sullivan, the limited so far, use of geothermal energy in Poland is due to the high initial costs. However, due to rising oil prices and an awareness of the negative impact of greenhouse gases, geothermal energy is generating greater interest. Efficiency of wind or solar energy is estimated to be only 20 to 35 percent and that of geothermal up to 70 percent.
It is predicted that cost of producing electricity from geothermal sources will decline. In 2005 it varied from 50-150 euros / MWh. It is expected that production cost would fall to 40-100 euros / MWh in 2010 and 40 to 80 euros / MWh in 2020.

In addition to these economical predictions there is a great amount of incentives provided by European Union.
In the European Union Incentives Documents under the Operational Program of Infrastructure and Environment for the Ministry of Regional Development in the article 9.4 we can learn:

9.4 OPERATION OF POWER GENERATION FROM RENEWABLE SOURCES
Sample types of projects
1. Wind farm construction
2. Construction of a hydroelectric power plant to 10 MW
3. Construction of power plants using biomass or biogas
4. Construction of a geothermal plant
5. Installing solar panels

Beneficiaries
1st Entrepreneurs
2. Local government units and their groups - unions, associations and local government agreements
3. Public service obligations as part of their local government units,
4. Churches, church legal persons and their associations and other religious associations.

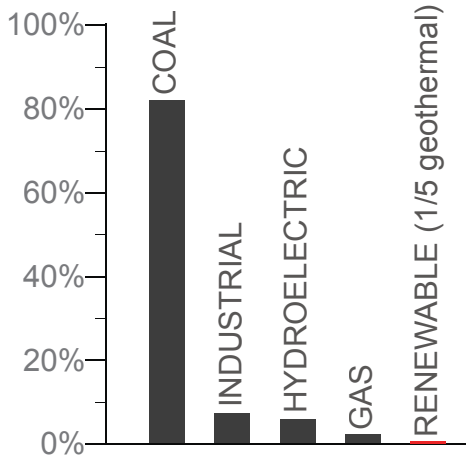
For this project EU intended 1.7 billion euro
Maximum level of funding: 60%
The maximum amount of grant: 40 million

Current energy use in Poland

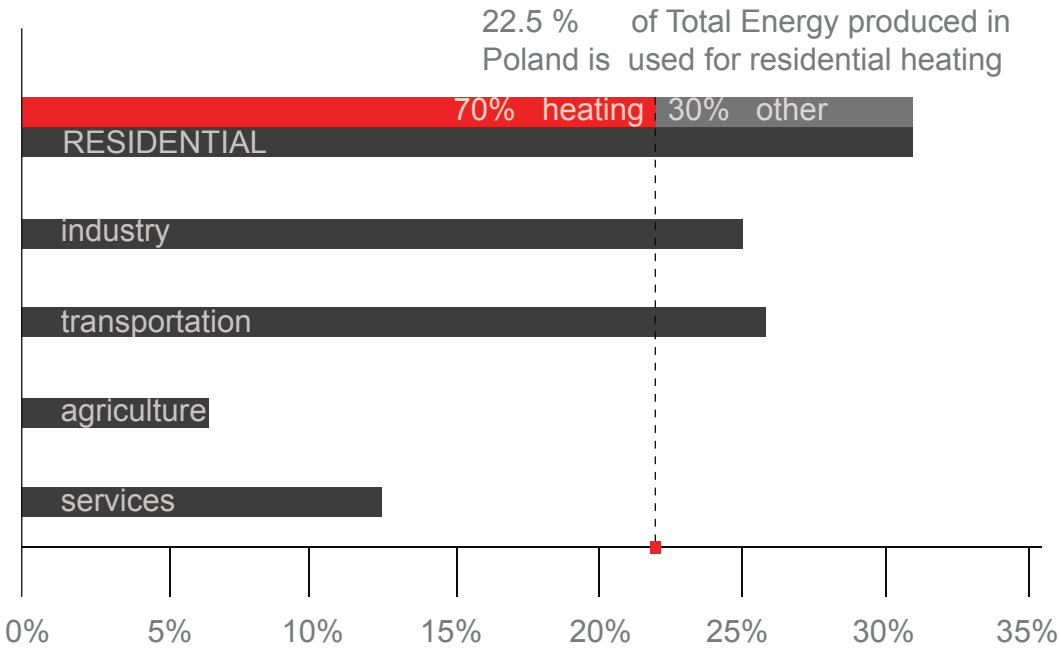
The number one energy resource of Poland is coal. Due to its extensive availability, over the years it has become the indispensable for the country's energy demand. It is also one of the highest gas emittors out of all the non-renewable resources.

In Poland's energy distribution lay out, residential heating is the sector of the highest demand. If geothermal heating plants were installed were appropriate they could provide for 22.5% of country's total energy demand.
This is not including the potential for installing geothermal power plants.

TOTAL ENERGY USE IN POLAND BY FUEL



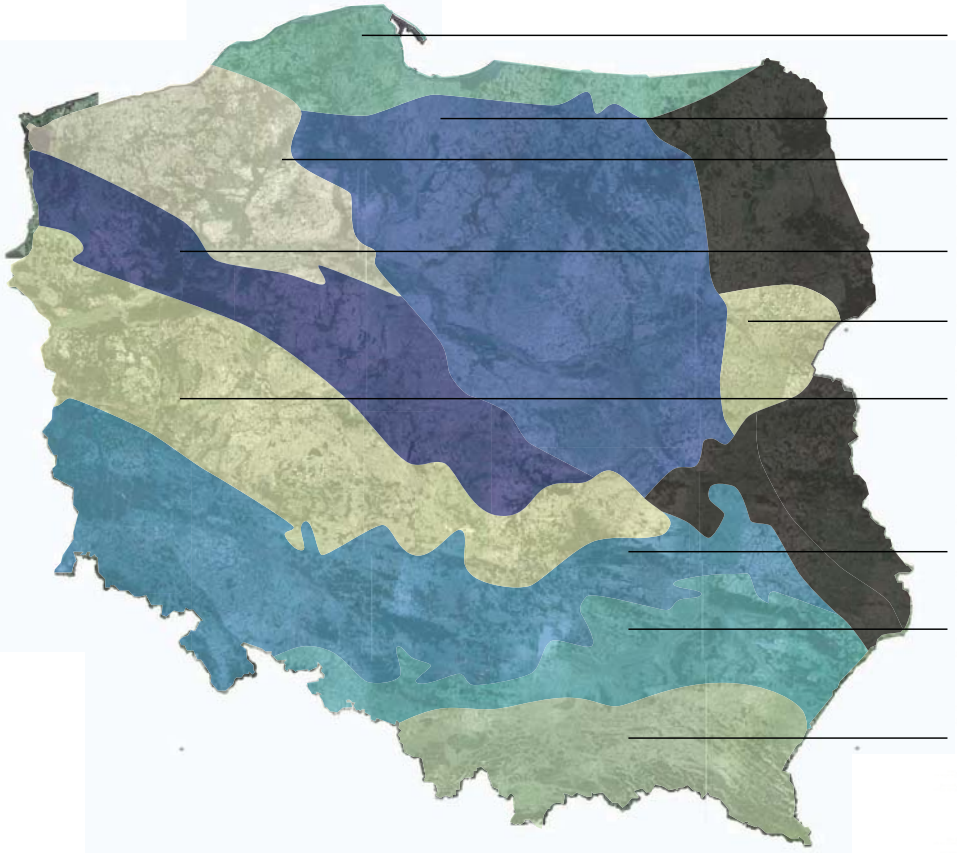
TOTAL ENERGY USE IN POLAND BY SECTOR



The single most accessible and efficient resource Earth can provide us with is geothermal energy.
Looking at a diagram on page 6 we learn that the available geothermal resources out number the total demand for world's energy by the factor of 10.

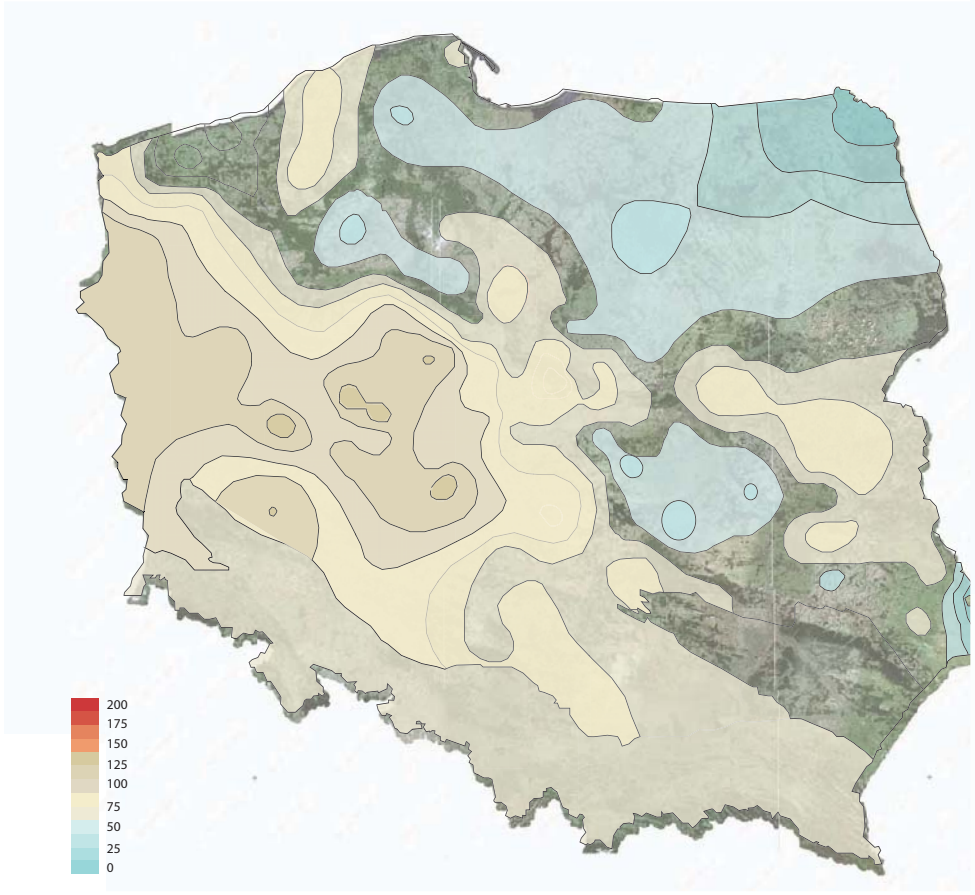
In case of Poland it is even more extreme. Due to a lower energy need then in most western countries (here United States being a major energy consumer) and higher accessibility to geothermal resources then in most Europe the ration between the demand for energy and the potential of geothermal energy utilization is 1:150. The maps on the following few pages show the amounts of available geothermal waters and energy potential in different regions on the land of poland.

TOTAL GEOTHERMAL RESOURCES BY REGION

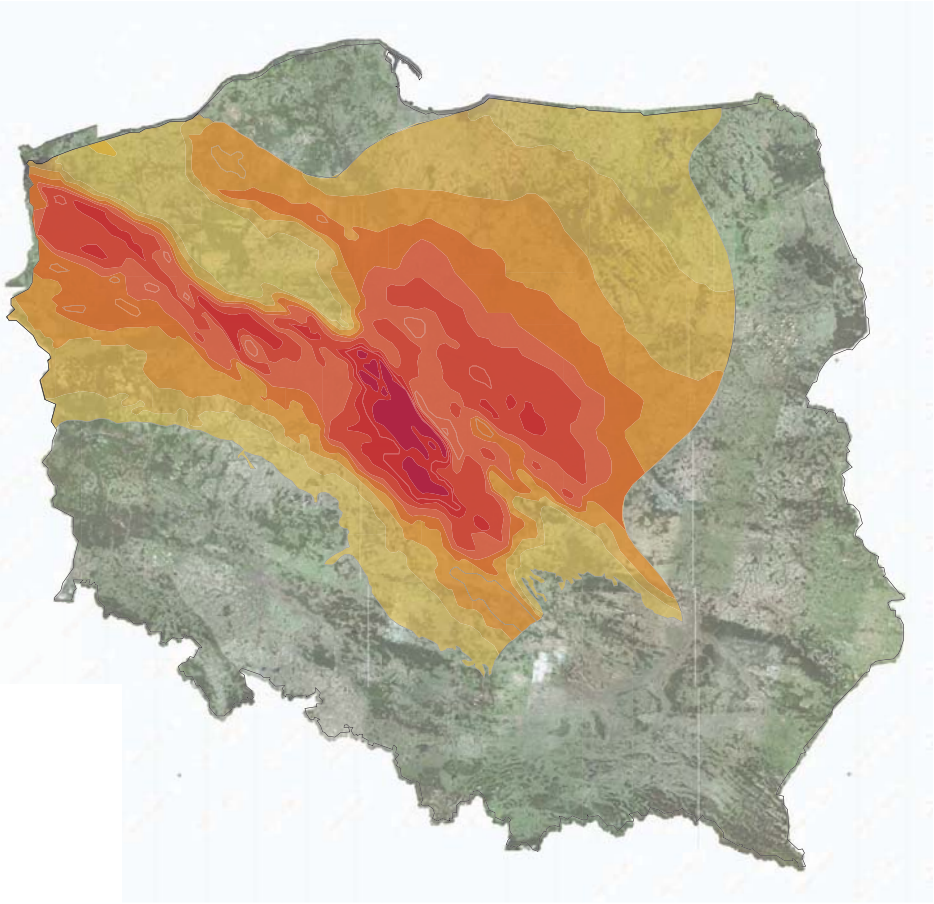


REGION	AREA km 2	Energy MT p.u.	Volume of GT waters m 3/ km 2	GT energy t.p.u./km 2
Przybaltycki	15,000	241	2,500,000	16,000
Grudziacko-Warszawski	70,000	23,902	44,134,400	168,000
Pomorski	12,000	162	1,600,000	13,000
Szczecinsko-Lodzki	67,000	37,624	42,266,600	246,000
Podlaski	7,000	116	2,500,000	16,000
Lubelski	12,000	193	2,500,000	16,000
Sudecko-Swietokrzyski	39,00	955	3,900,000	26,000
Przedkarpacki	16,000	1555	22,600,000	97,000
Karpacki	13,000	714	7,700,000	55,000

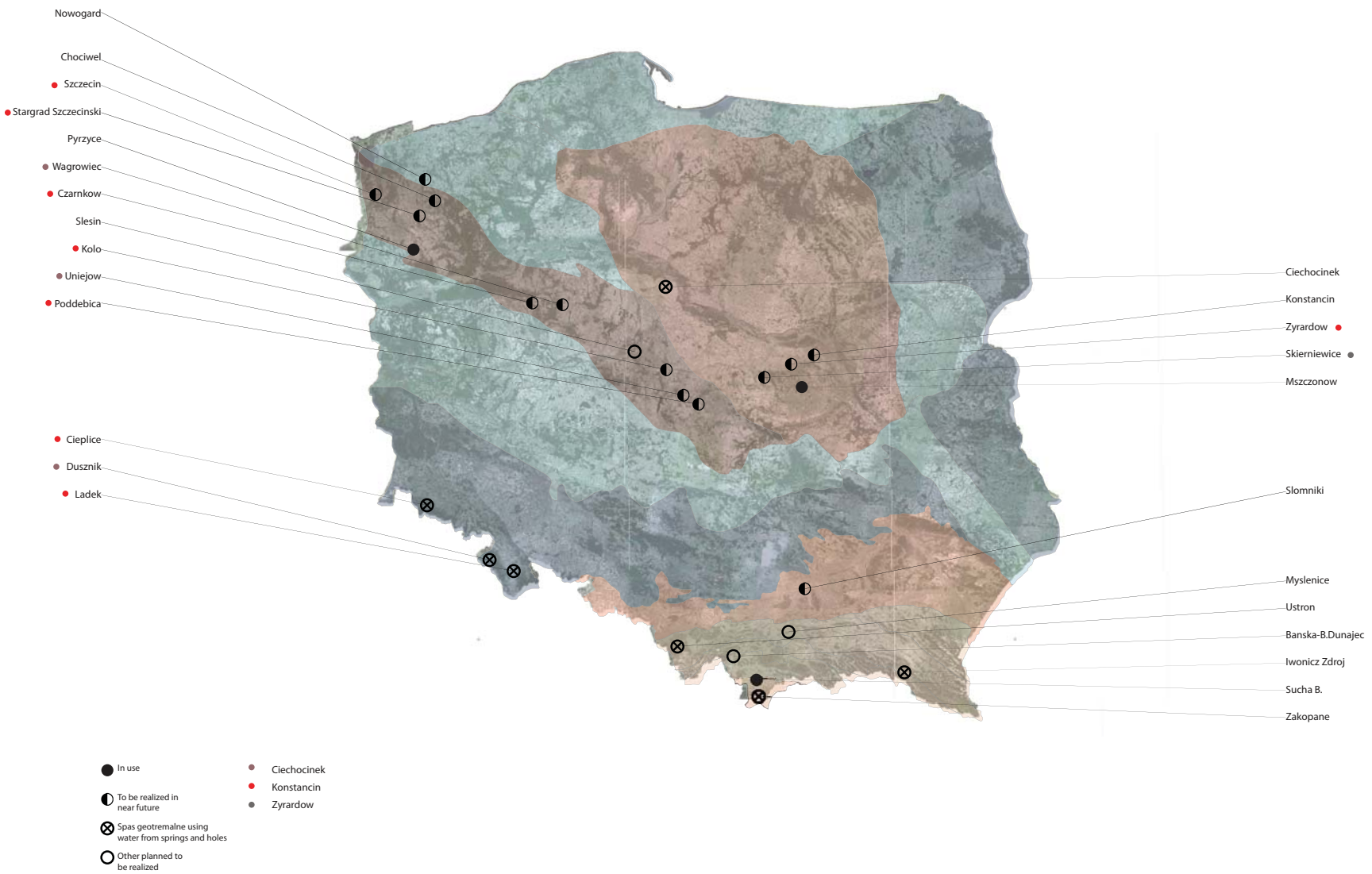
DISTRIBUTION MAP OF TEMPERATURES AT 2,000M DEPTH BELOW SURFACE



DISTRIBUTION MAP OF TEMPERATURES AT 4,000M DEPTH BELOW SURFACE



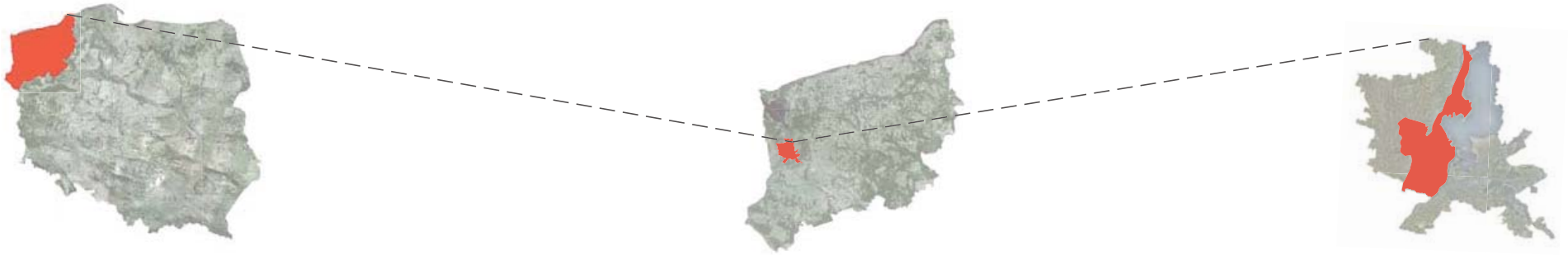
EXISTING AND PLANNED GEOTHERMAL HEATING PLANTS, AND SPAS



Some of the geothermal resources in Poland have been already utilized on a small scale but with promising results. Map above shows cities where geothermal heating plants are already in use, are planned to be constructed in near future and spas using geothermal waters.

Szczecin

Site: spatial history of the city



Szczecin is a city in the region of Zachodnio-Pomorskie in the North West of Poland. Heavy fortifications by the Prussian military prevented it from urban development in the 19th century. The visual way of how Szczecin is portrayed today, was born in the in 1873 when the city authorities managed to successfully discontinue the fortifications and began to destroy the forts and city walls. Since then, dynamic expansion of the city begun. The new urban, spatial arrangement clearly defined structure of the city with classic geometric pattern of urban design. This pattern was mimicking spatial arrangement of Paris with starry squares and triangular Neoclassical and Art Nouveau building plots of both: private residential and public buildings.

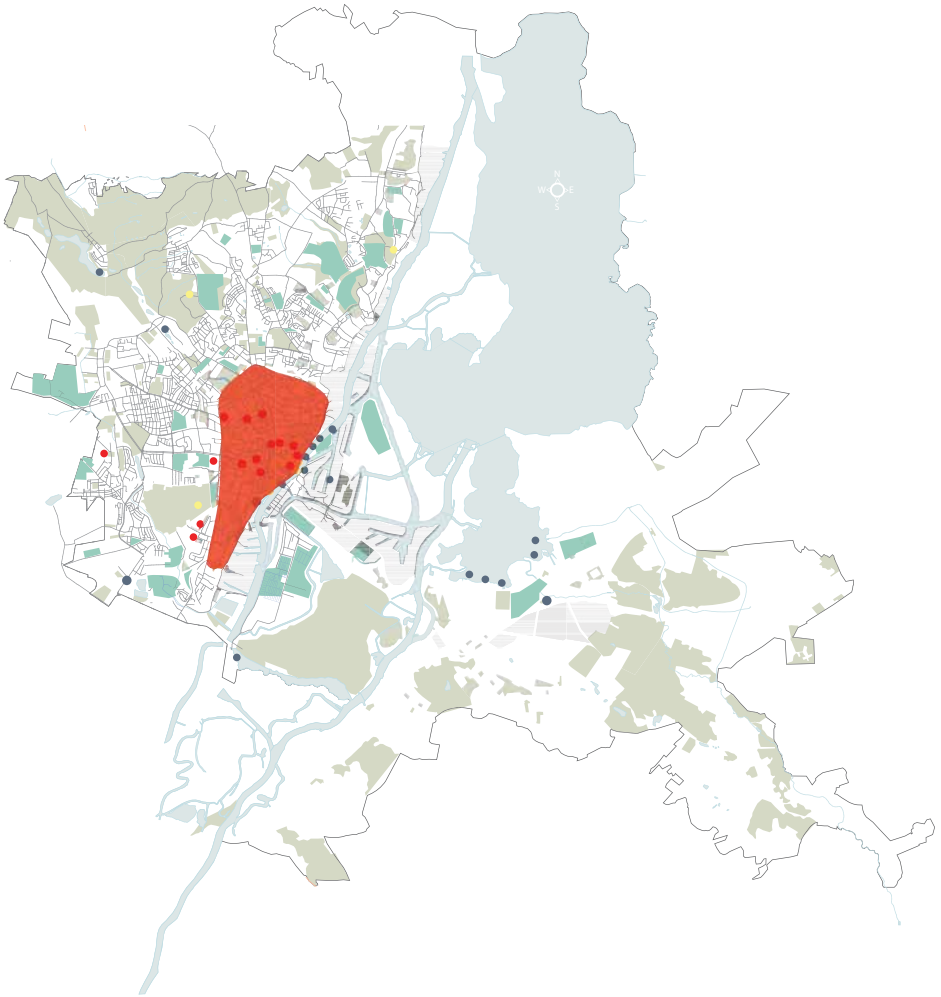
Another important stage in the spatial development of the city began in the late nineteenth and early twentieth century, when the integration of Szczecin into already urbanized yet independent suburban towns took place. This development was associated with a significant expansion of infrastructure and following basic city structure formation:

1. wide streets to ensure collision-free communication system.
2. downtown became a center of urban life, concentration of trade, services and cultural facilities, residential are with carefully designed apartment buildings, rich greenery and recreational areas. These areas are now known as Pogodno, Gumieńce and the area of Lake Glebokie.
3. Industry and trade were located in the northern part of the city. During the post-war years the city was being reconstructed for a new society. The influx of population and the growing housing needs have resulted in construction sites on the right side the lake Glebokie. Anew type of urban design, mainly large panel construction systems have changed the face of Szczecin.

Current circumstances, incuding the ‘Floating Garden’ city redevelopment proposal allow for further dynamic development of the city. Some of the attributes of the cit include large green area embodied within the city, mix of Art Nouveau buildings with modern architecture and an unique geographic location. It has an access to the Baltic Sea and the Odra River which makes up for an enormous capital of a touristic, port city.

Major road system

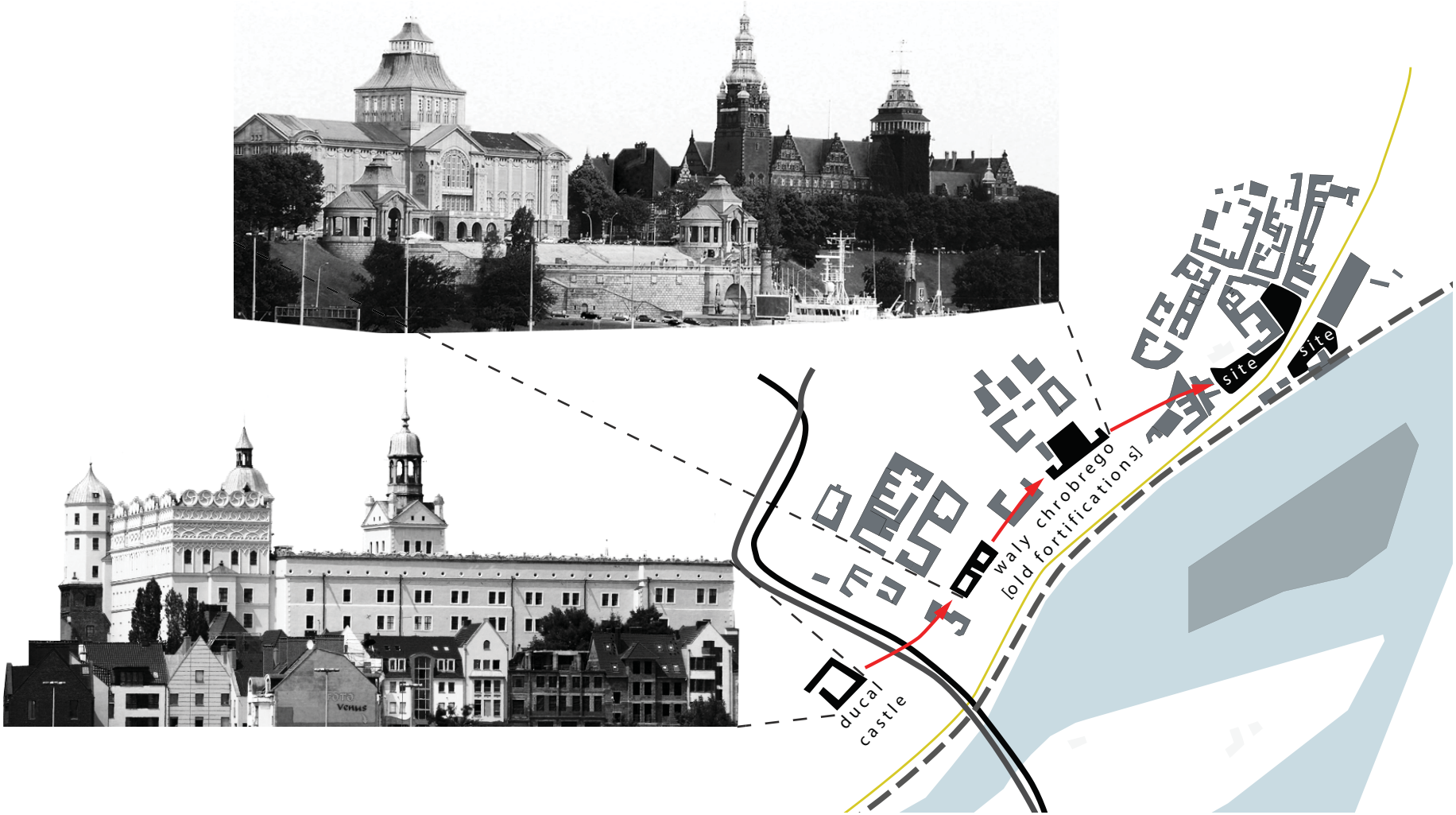
Industrial Area vs. City Center



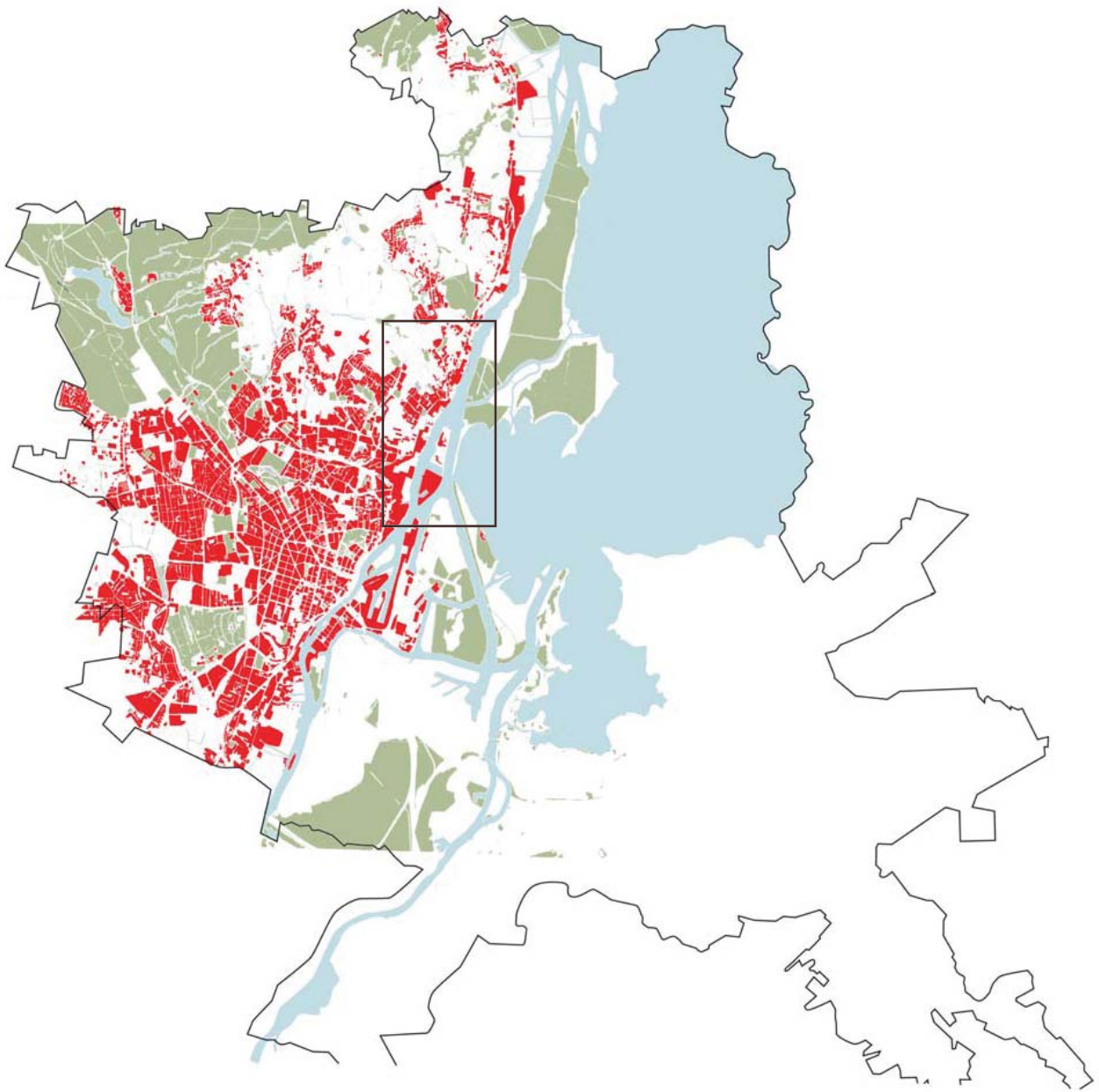
Site: definition of power in architecture and theory in Szczecin

The city is located on the cross-roads of the main roads of all parts of Europe, this aspect as well as the presence of a sea port makes it a logistic transport center.
Szczecin is the capital of the province, the metropolis and the center of supra-regional services. It is an important center of political, social and cultural activities throughout the north-western part of Poland, north-eastern Germany and southern provinces of Sweden. Szczecin authorities want the city's position on the water to be a major asset in the future urban and architectural development. The policy that aims to utilize the natural values of Szczecin is one that the city promotes.

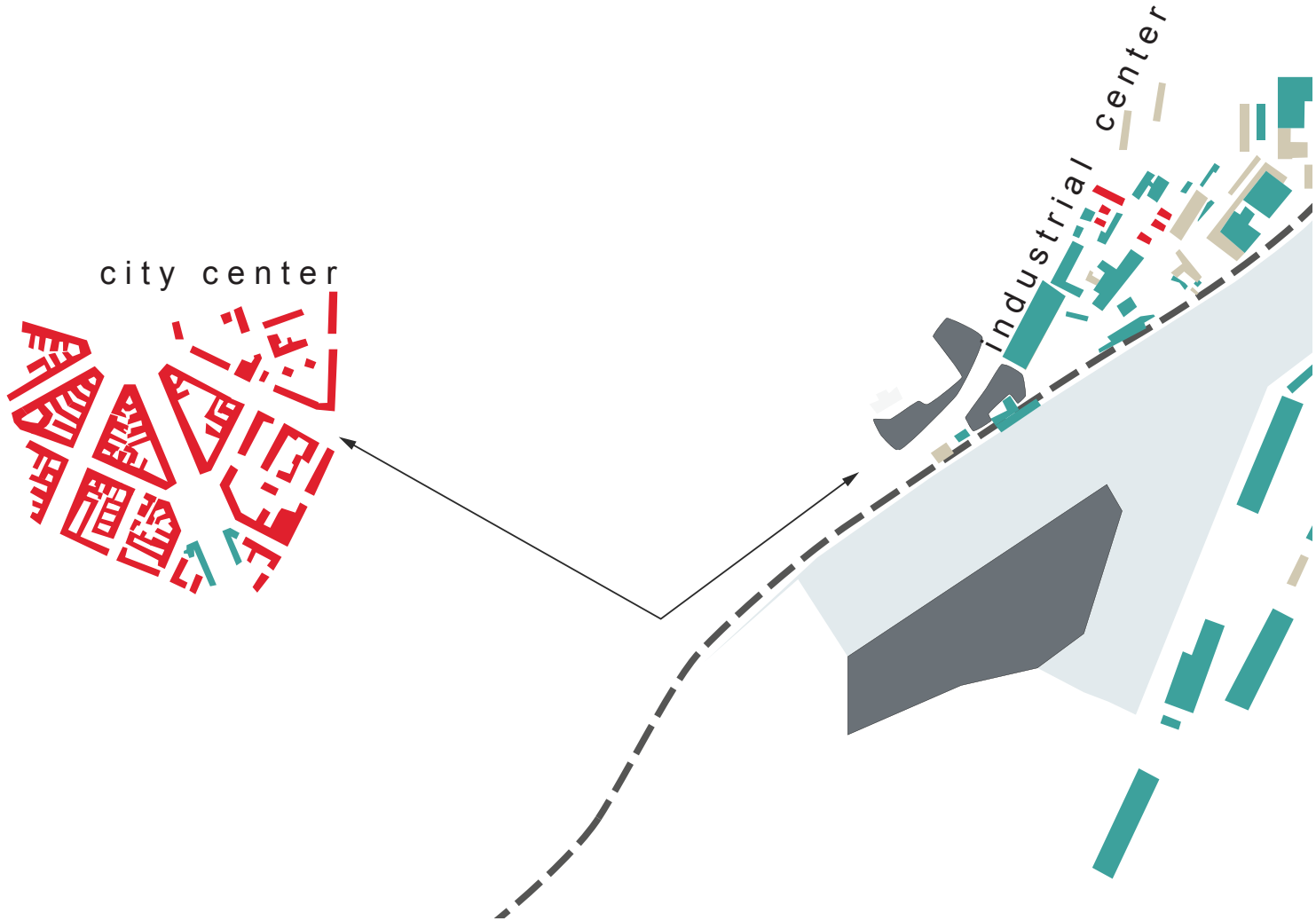
Site: power alignment



Site: location

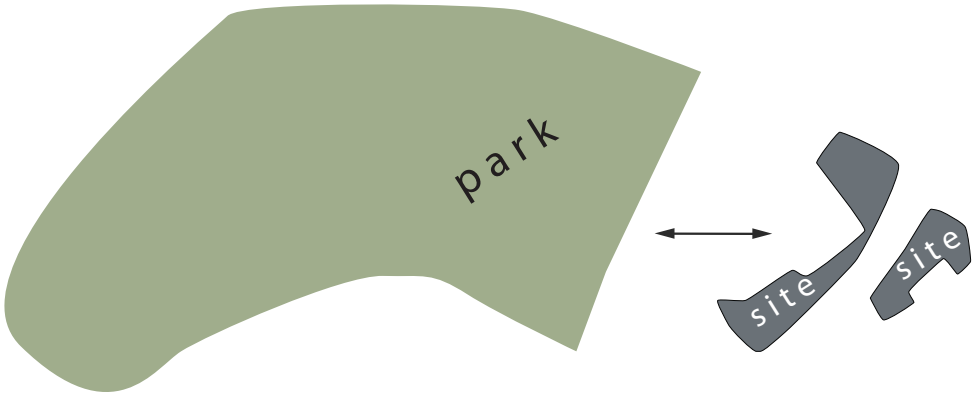


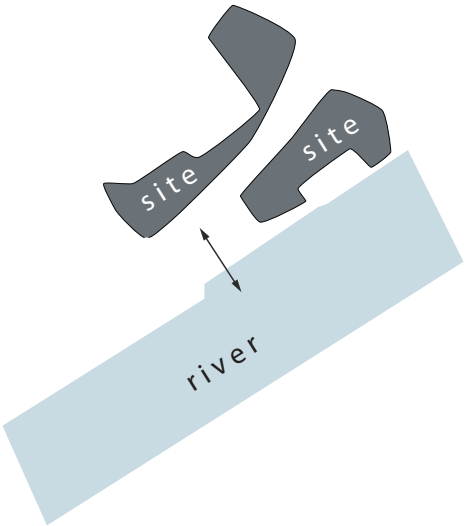
Site: city center vs. industrial center



Site: site vs. residential district

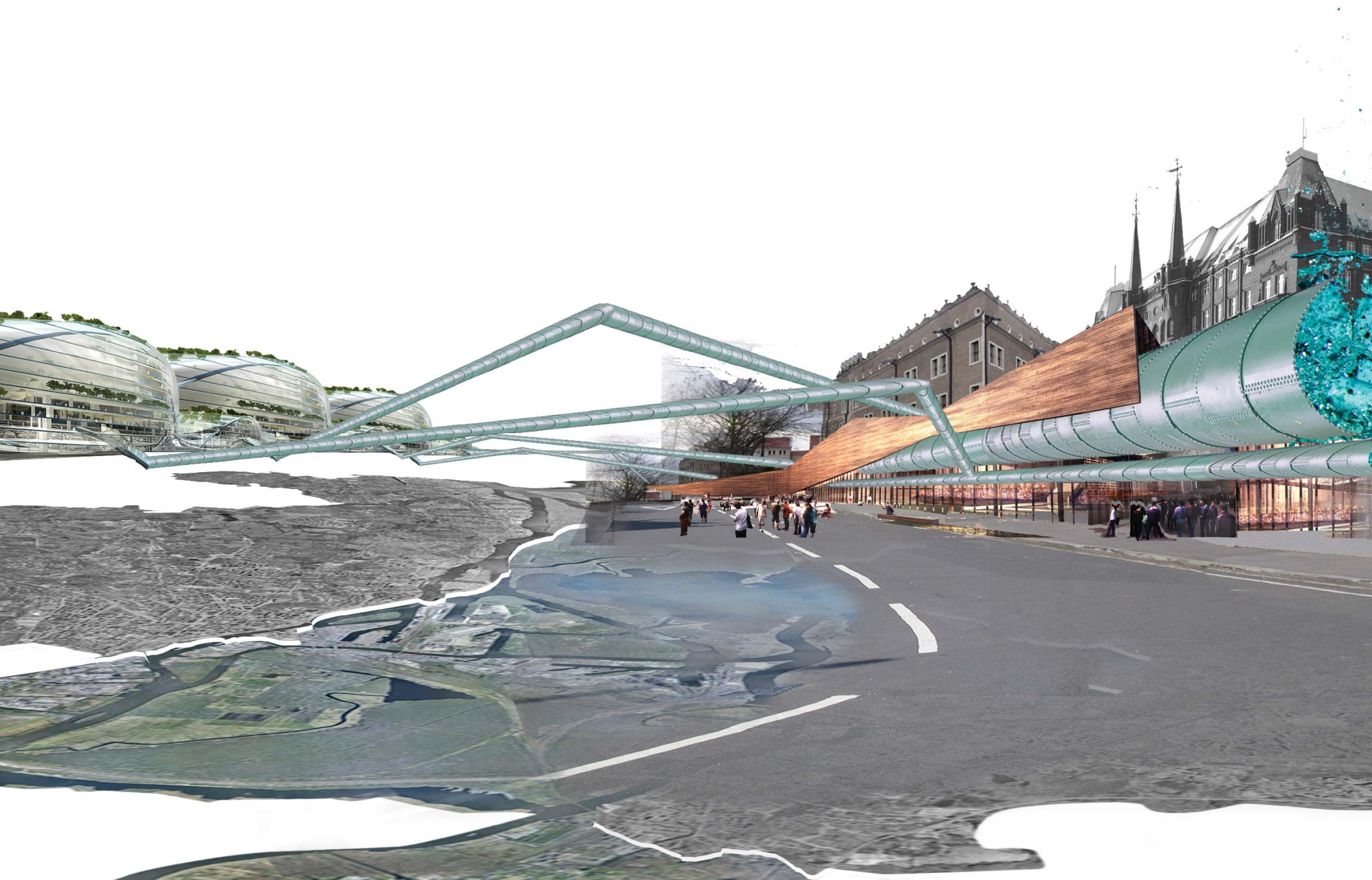
Site: green space + river connection

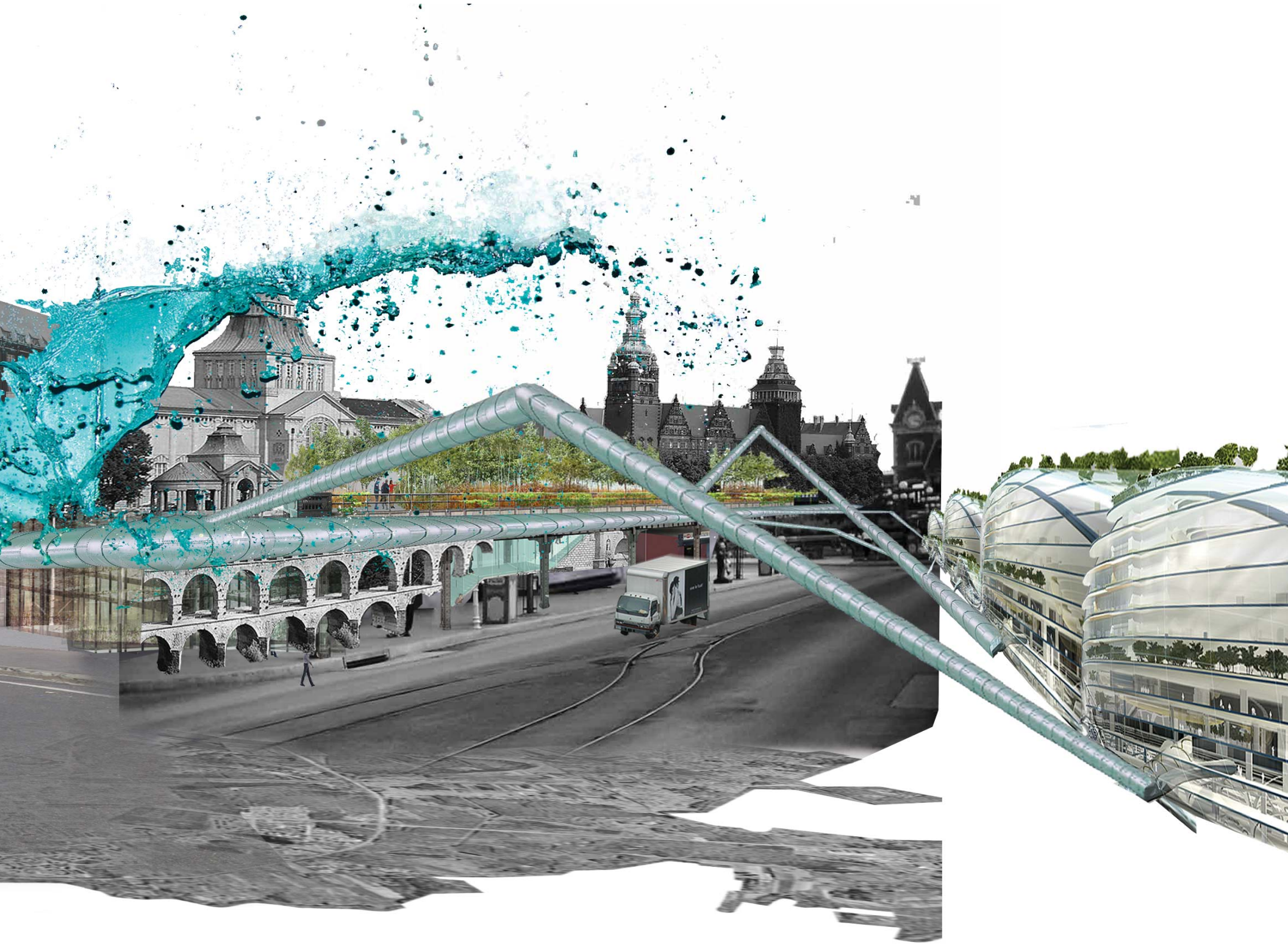




A new design model of an infrastructure, independent of the power grid, will be a test of manifestation of the energy's new political idea of power and independence in Post-Soviet Europe.

Design : conceptual scheme



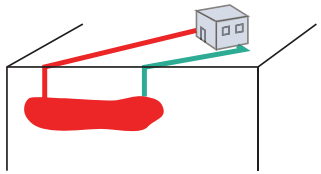


Design: early scheme

incorporation of the systems

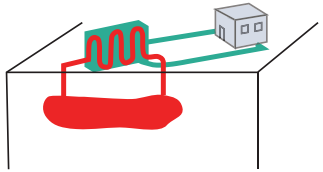
system 1

Direct use of geothermal water for heating



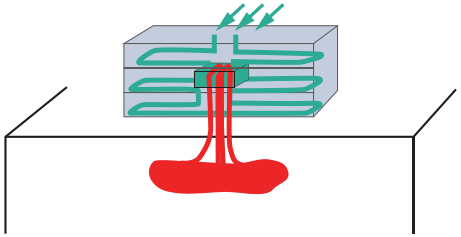
system 2

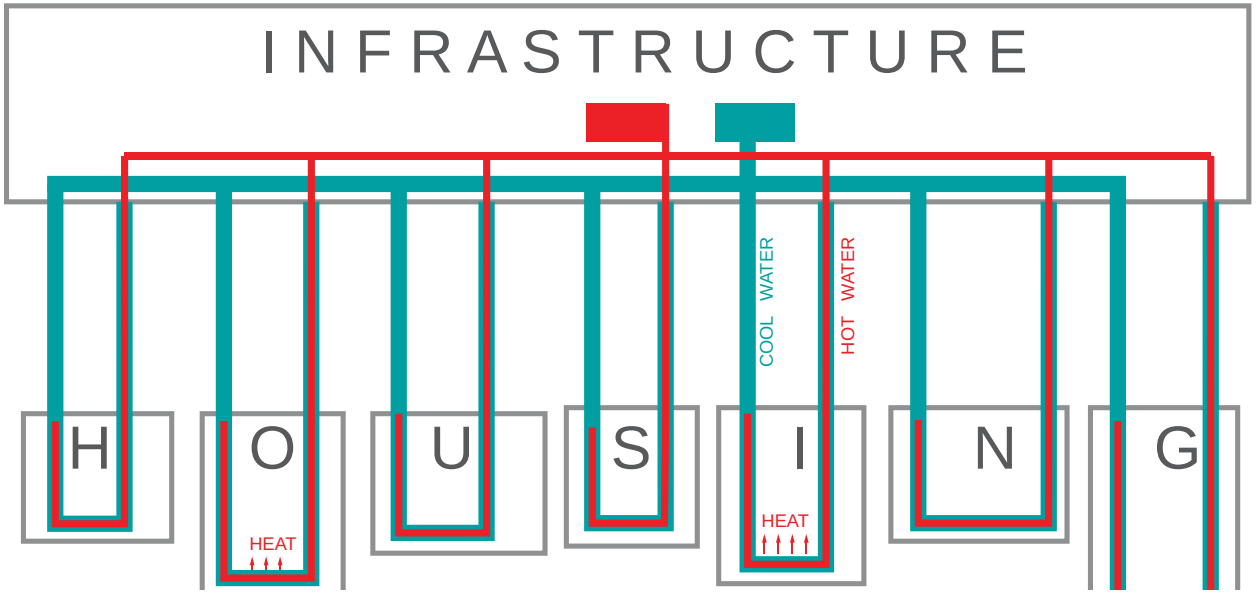
Geothermal water goes through a heat exchanger where it transfer its heat to a working fluid



proposal

System 2 using rainwater as the working fluid

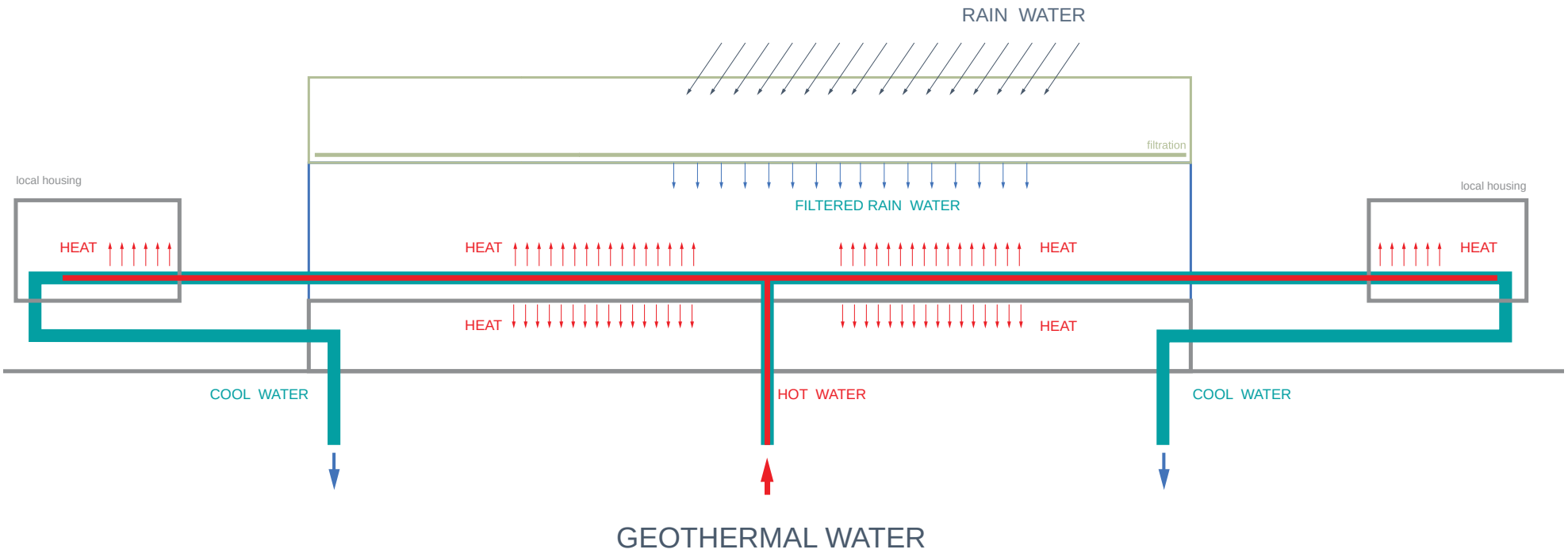




Design:

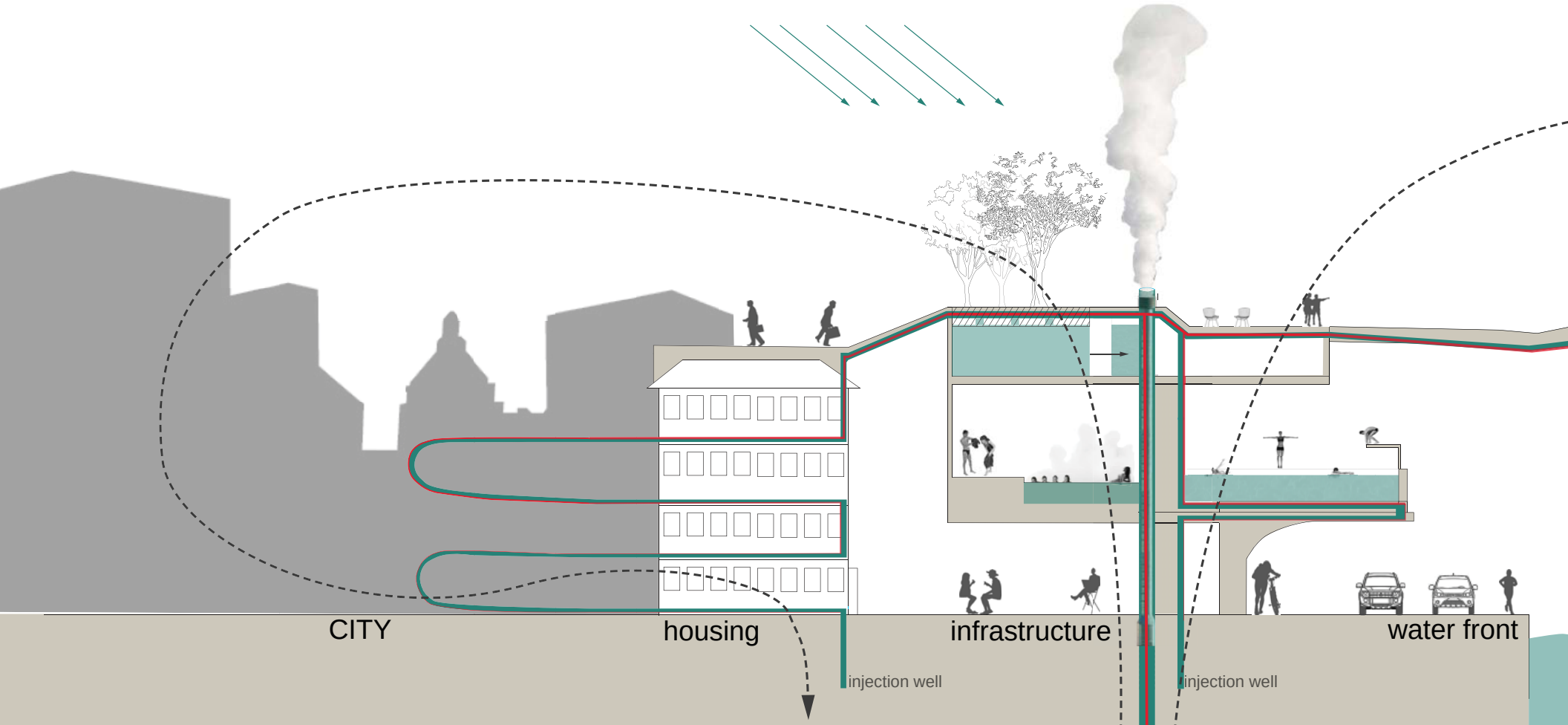
early scheme

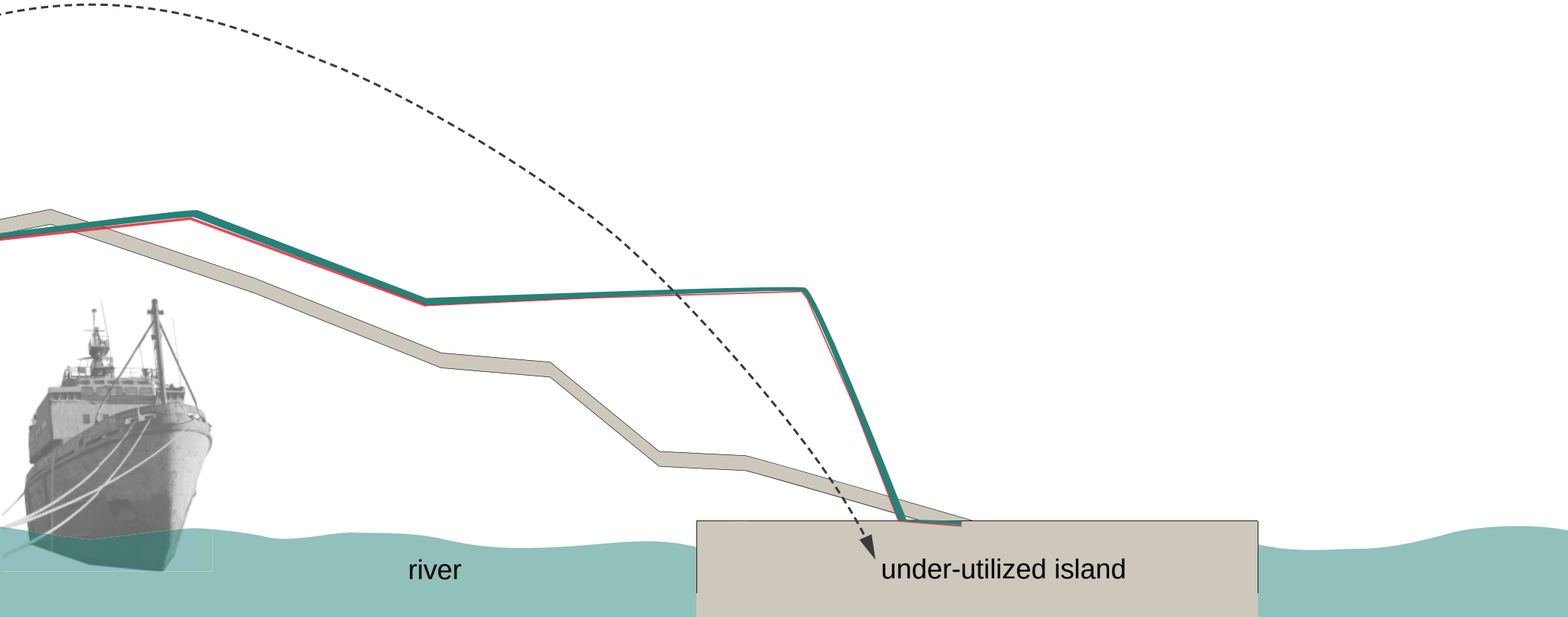
incorporation of the systems



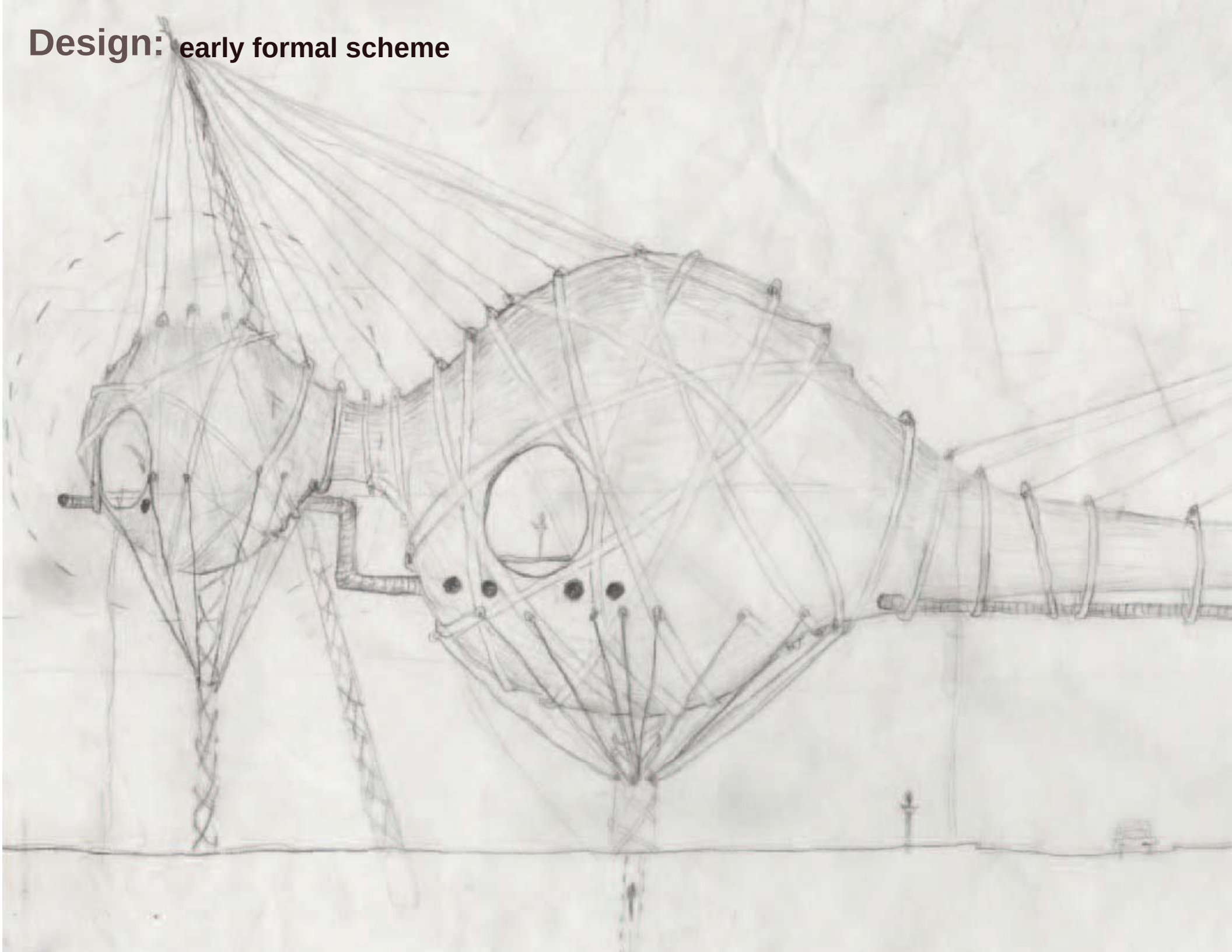
Program: early scheme

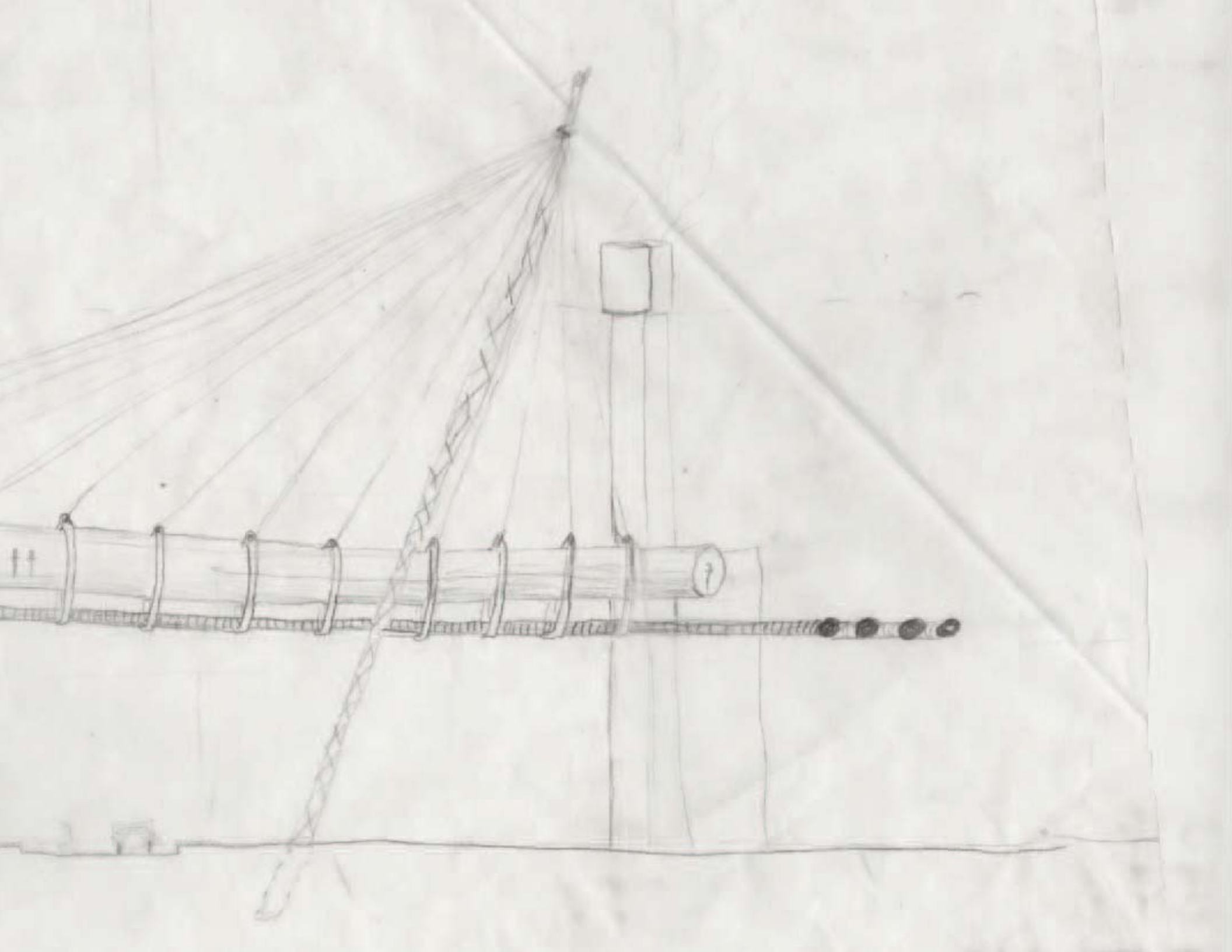
integration of the design and the city in section



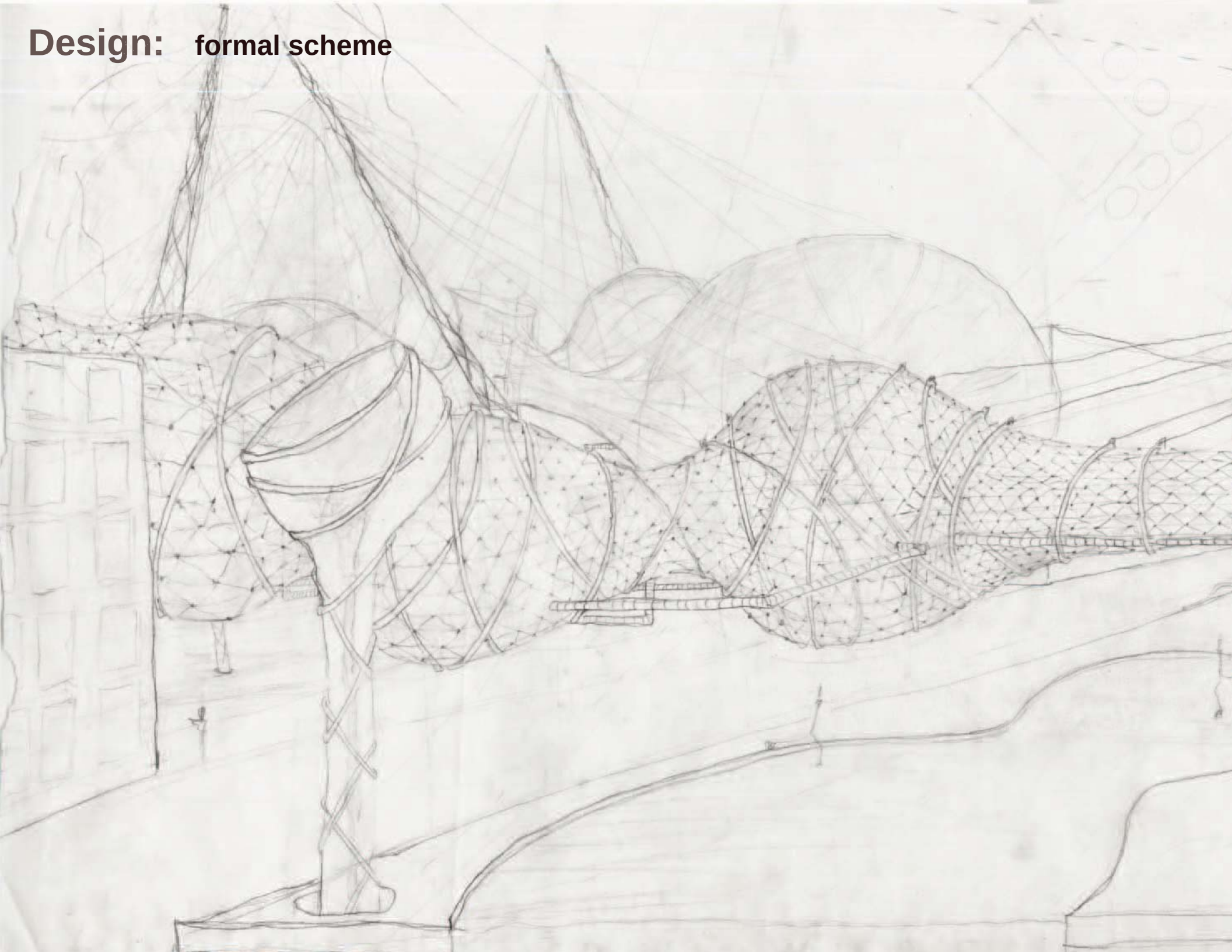

river
under-utilized island

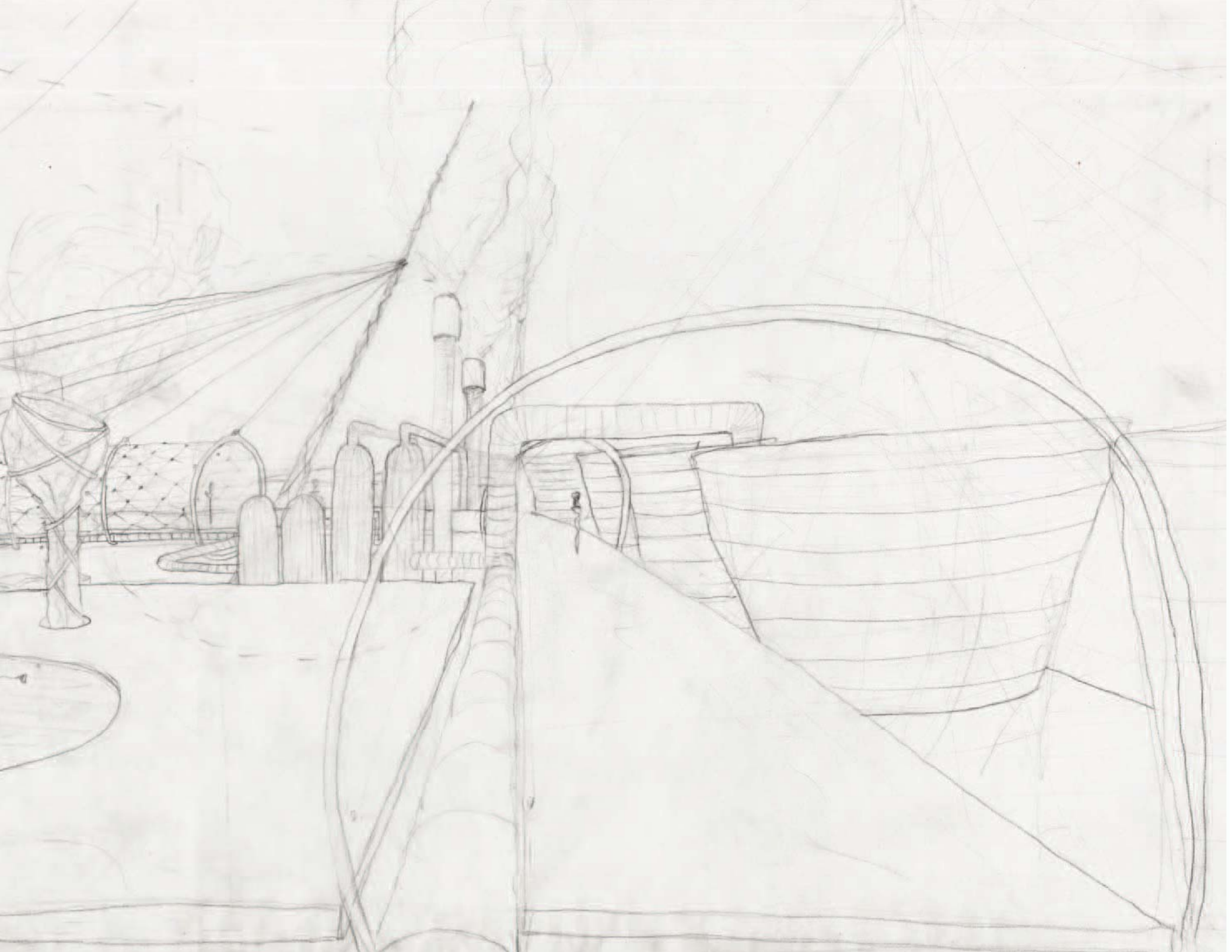
Design: early formal scheme



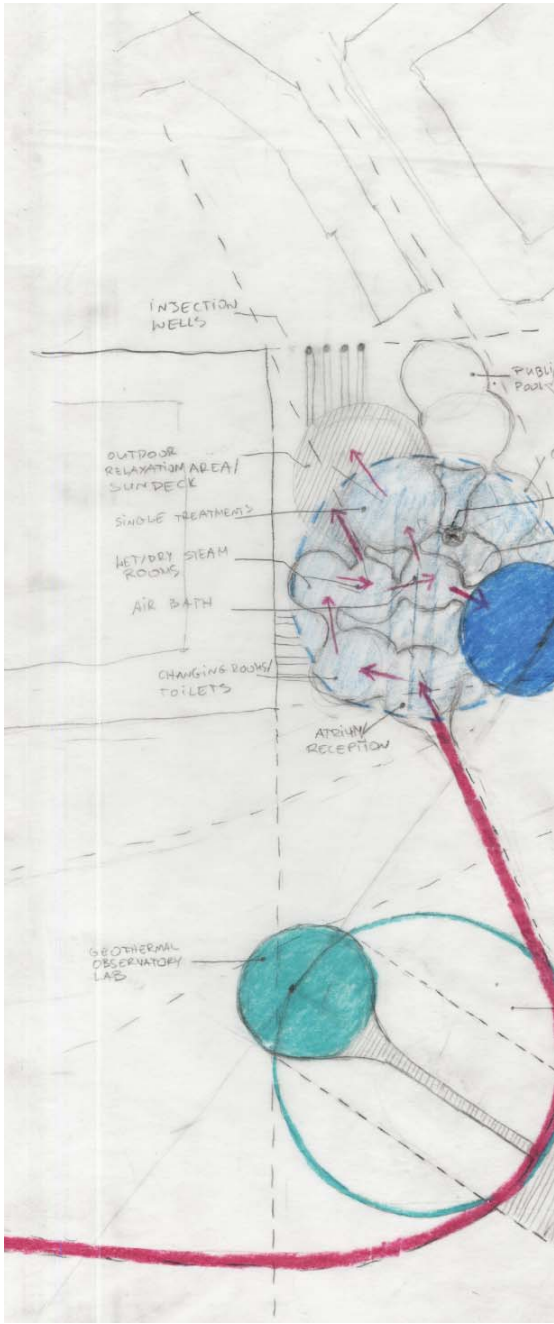


Design: formal scheme





Design: system, program, form




CIRCULATION + PROGRAM TYPE
CHANGING ROOMS/ TOILETS
VERTICAL CIRCULATION
STEAM PRESSURE REGULATORS
MAIN PUBLIC BATH
GEOTHERMAL POWER PLANT
RESIDENTIAL
PROMANADE EXTENSION
INDUSTRIAL EXTENSION
GOVERNMENTAL EXTENSION
OUTDOOR
COOLING TOWERS

Site: view towards the industrial district + view at the civic connection-theater

Site view from the promanade

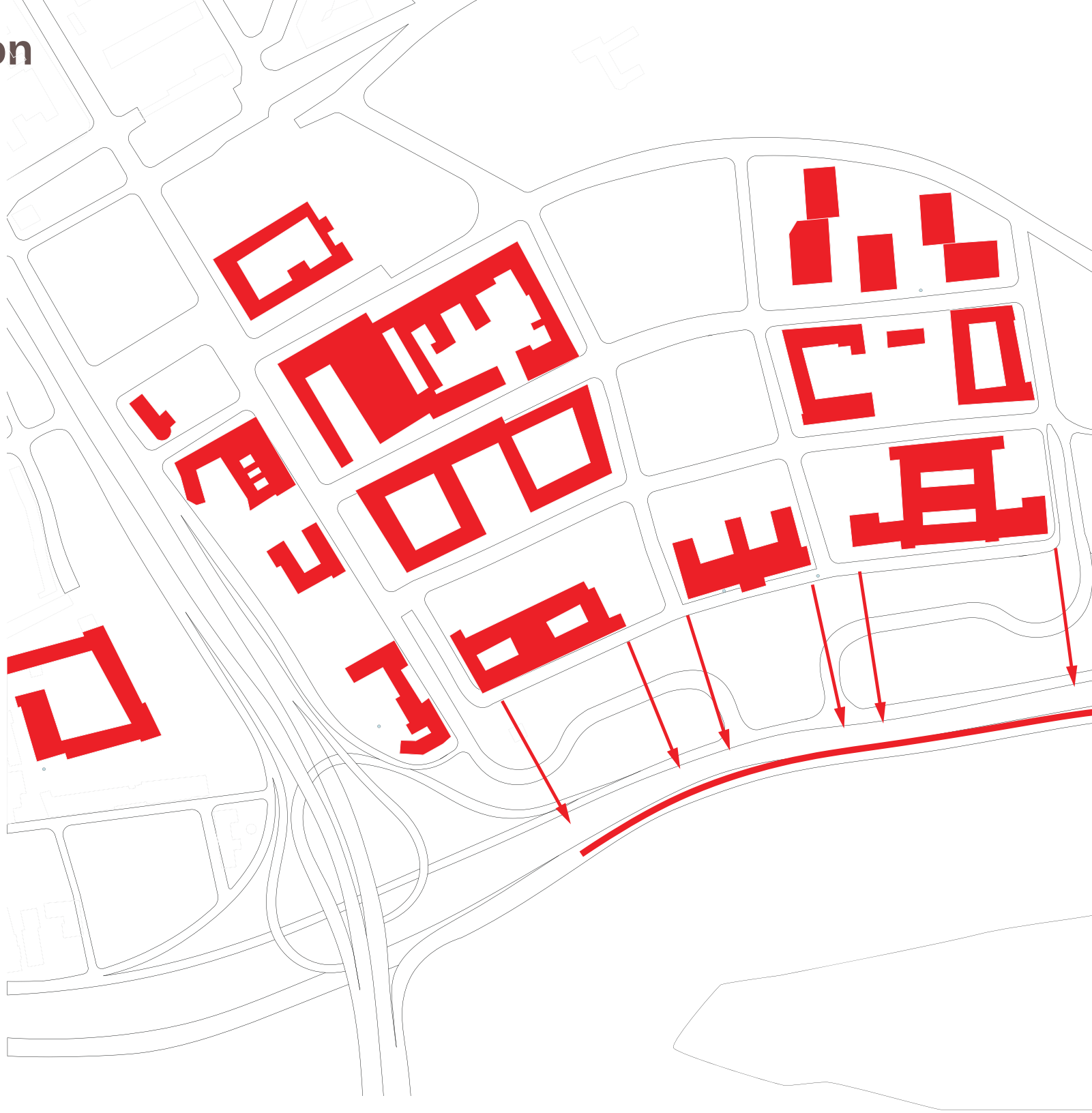
Site


residential district
industrial district
civic district

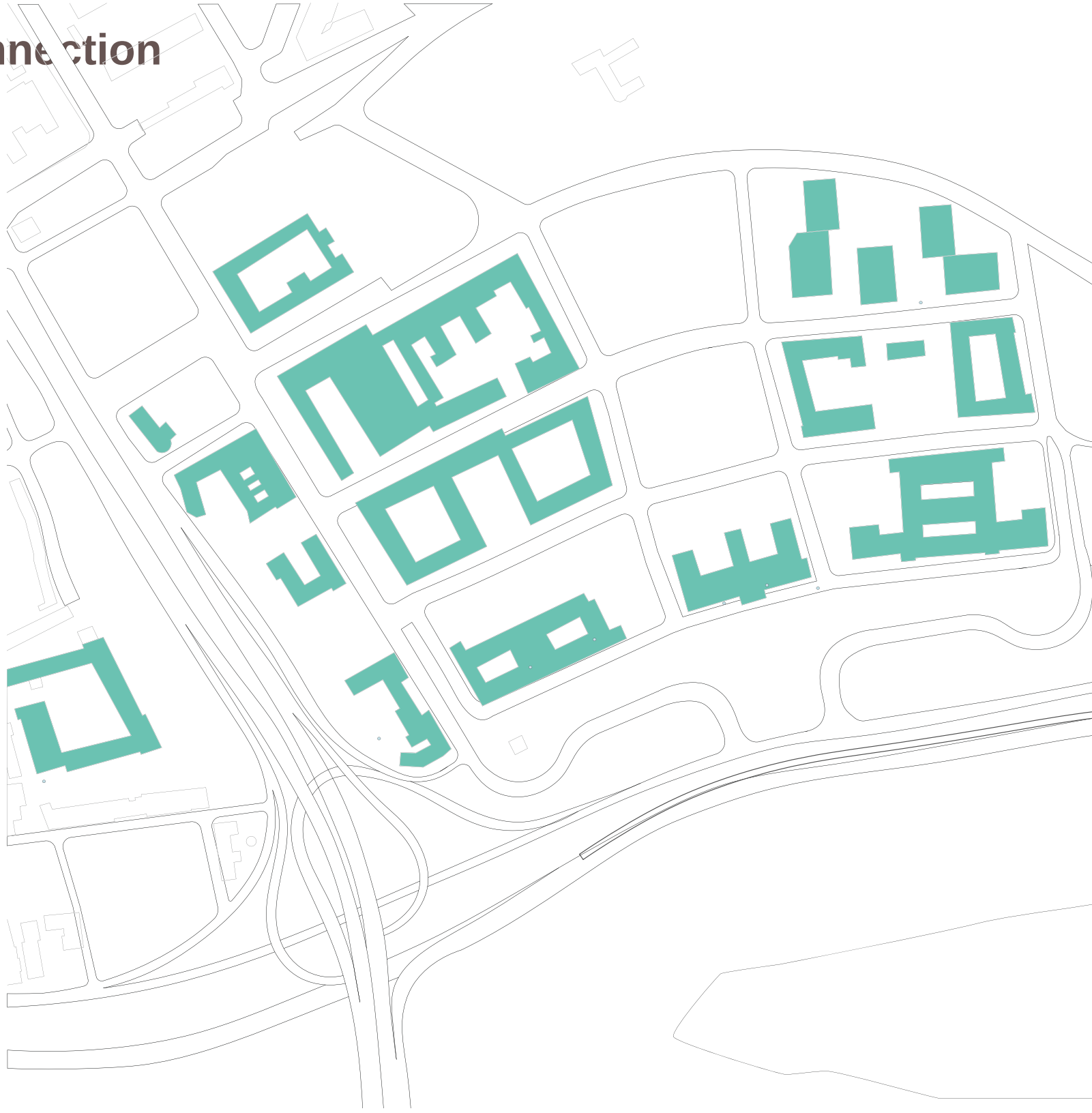
Site strategies


residential district
industrial district
civic district
geothermal water
heating system
electric power
produced in a geothermal
power plant

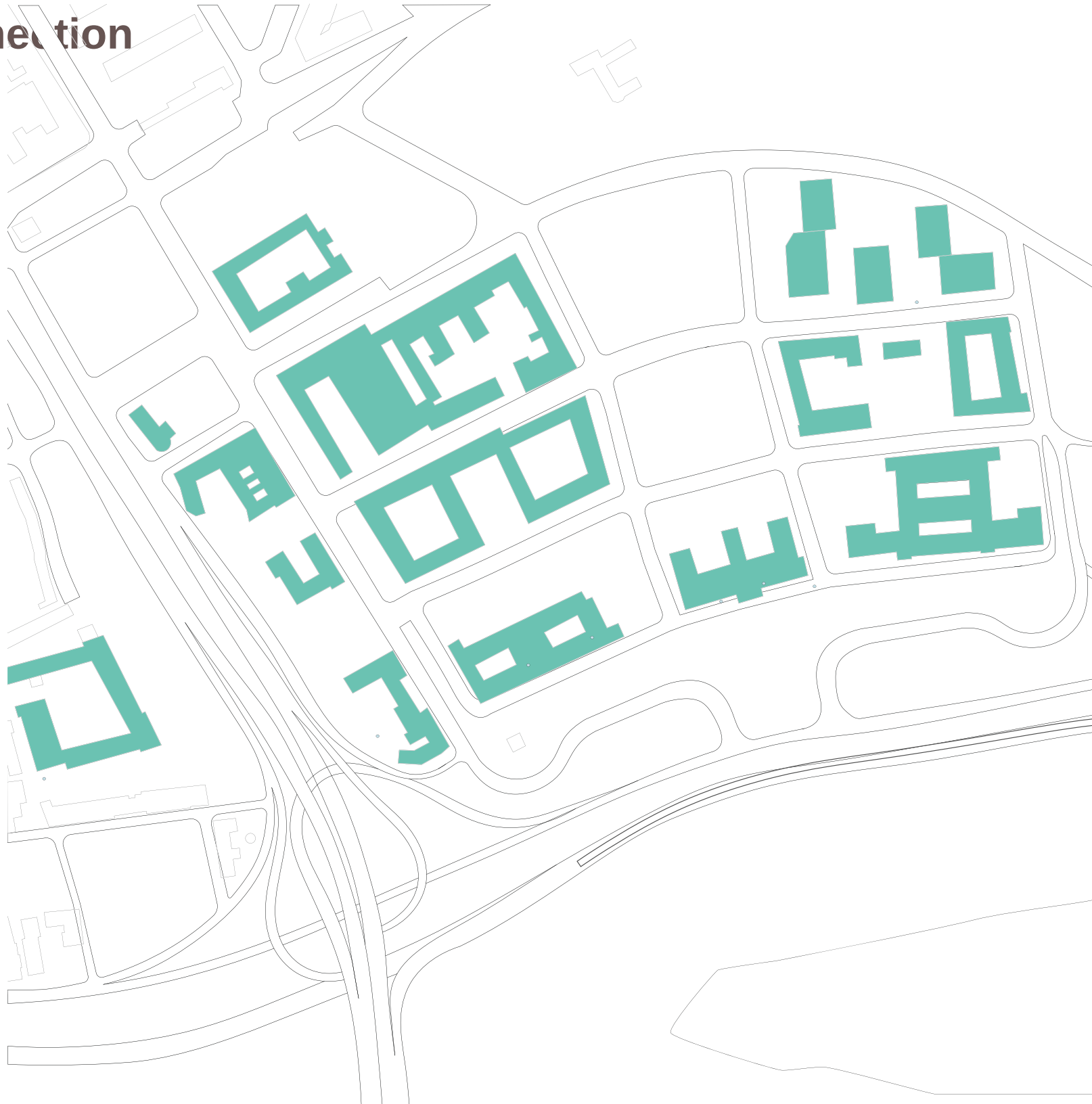
Civic connection



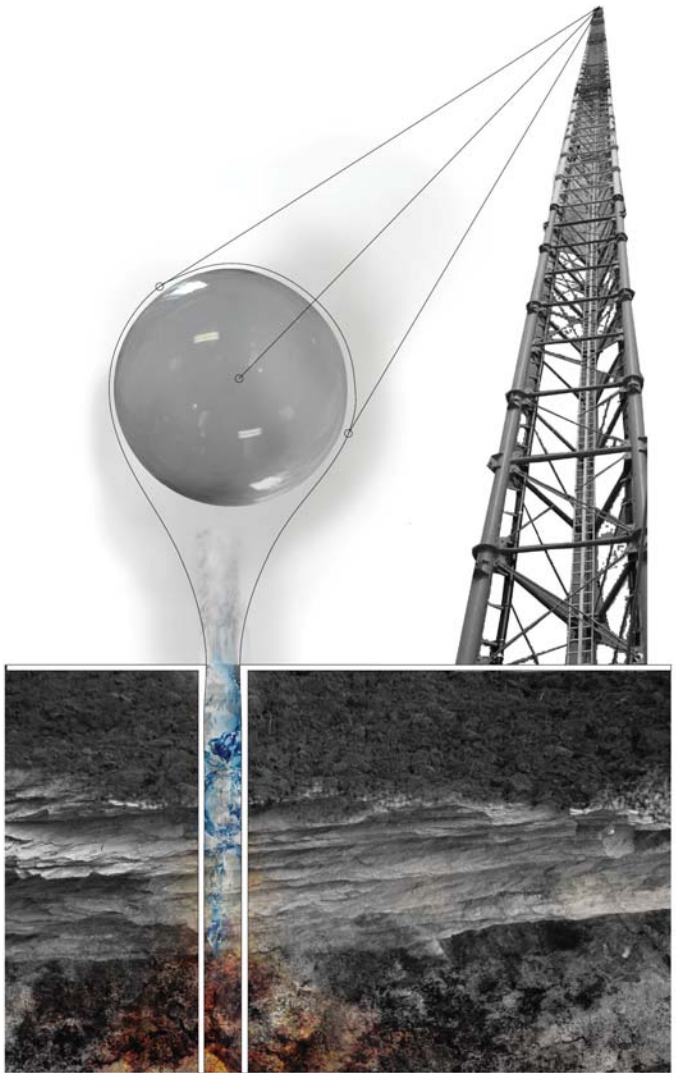
Residential connection

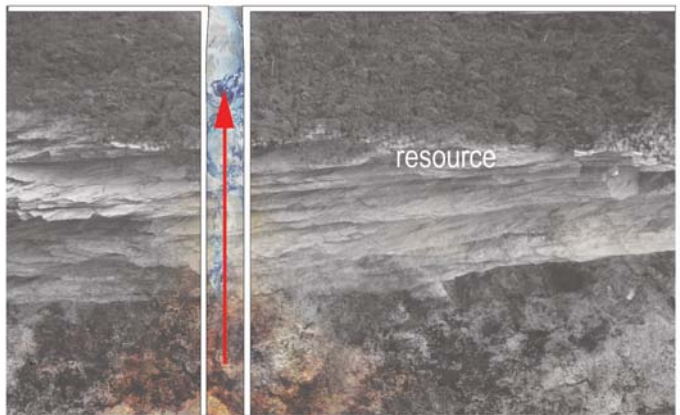


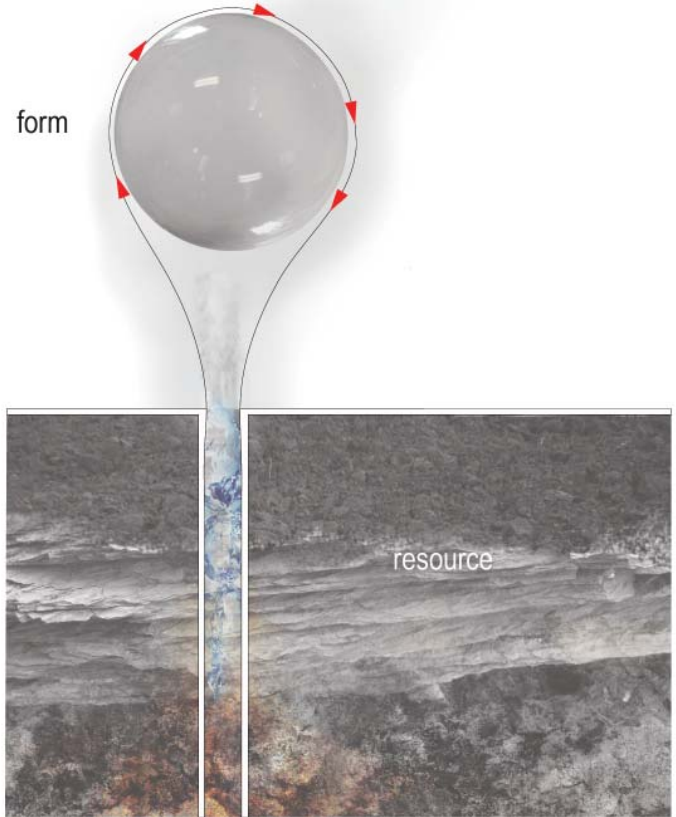
Industrial connection

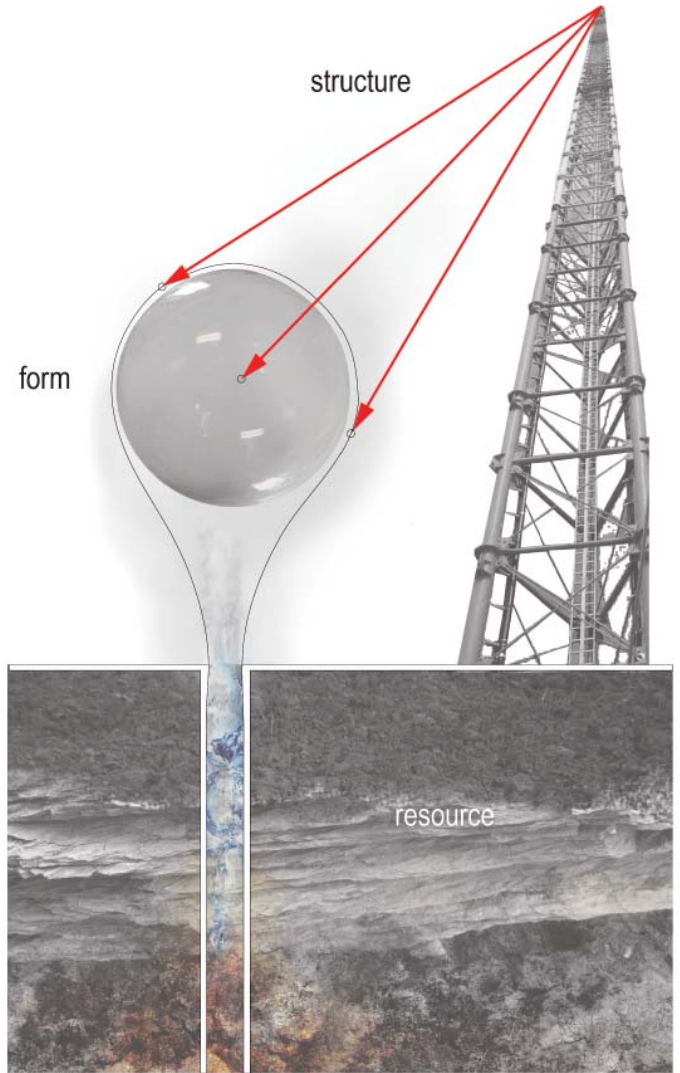


Resource to form to structure

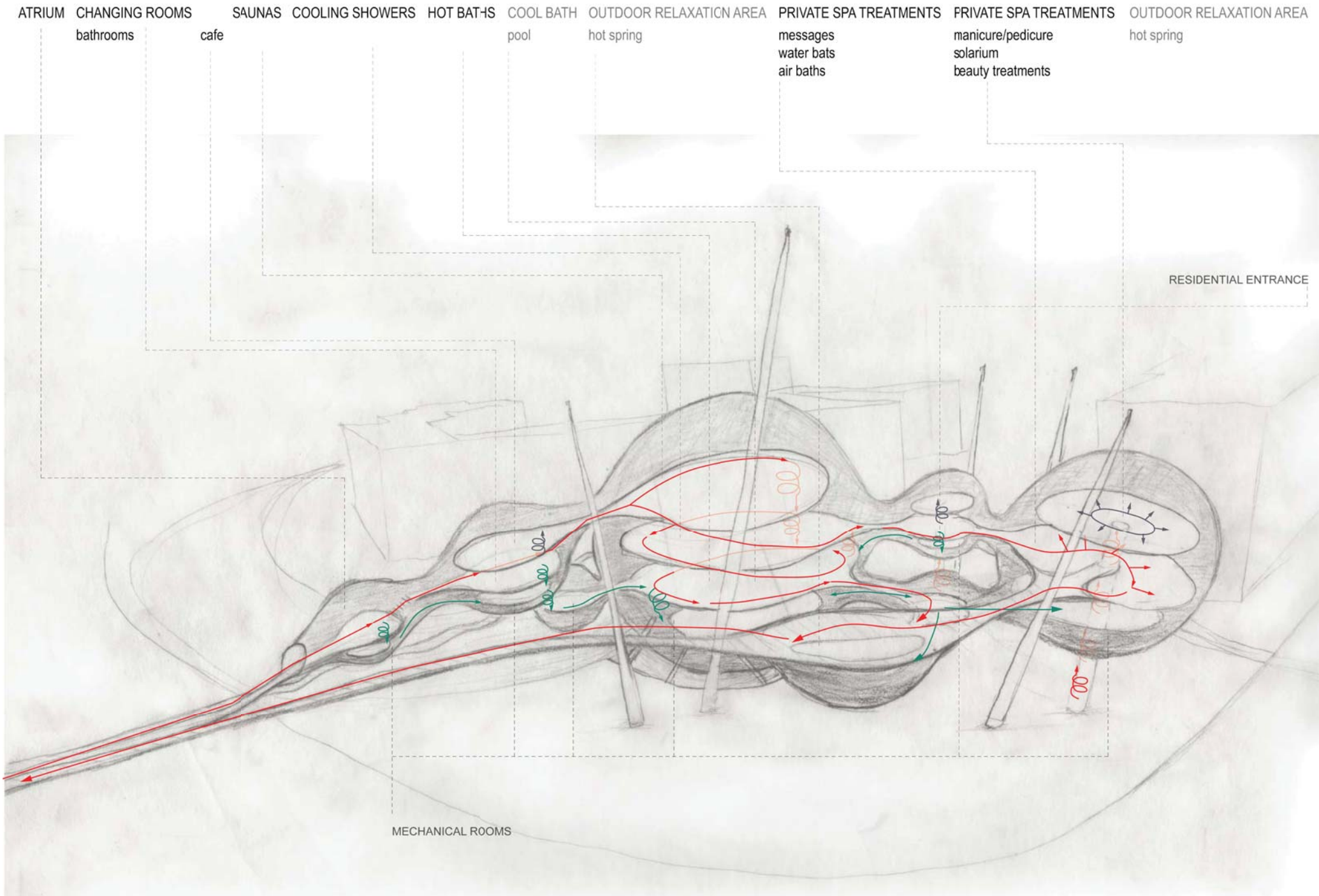





form
resource

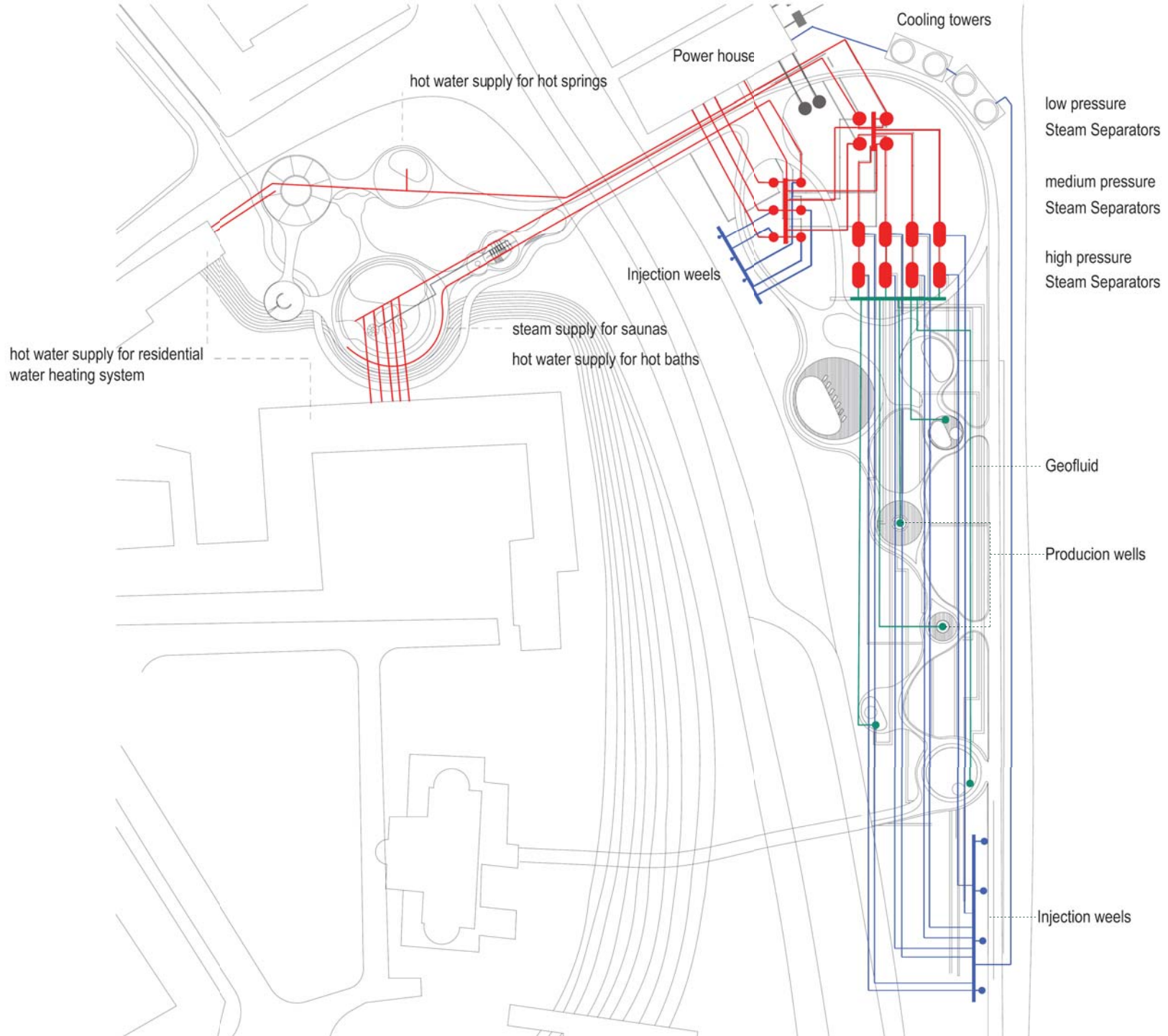

structure
form
resource

Program + circulation

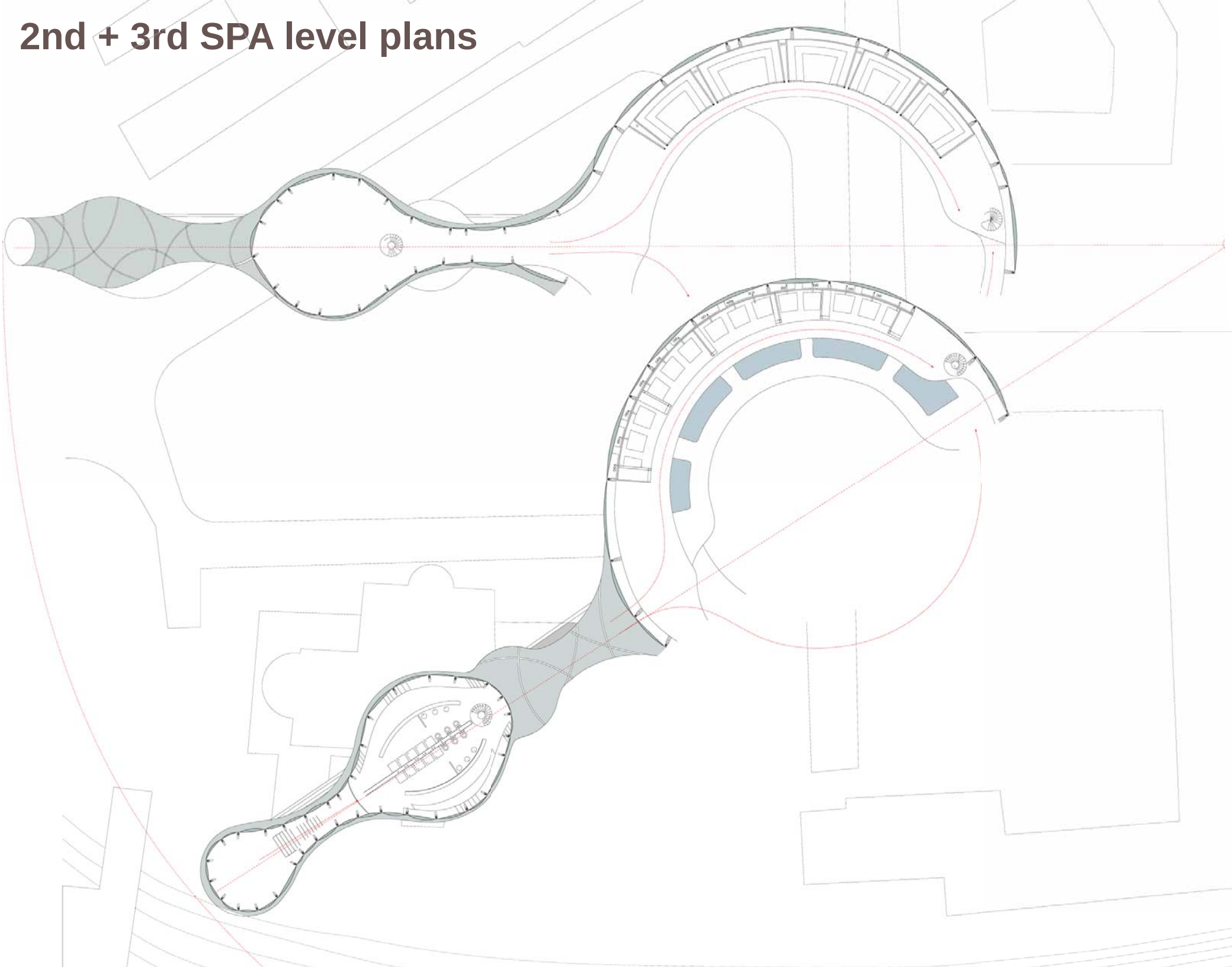


System in plan

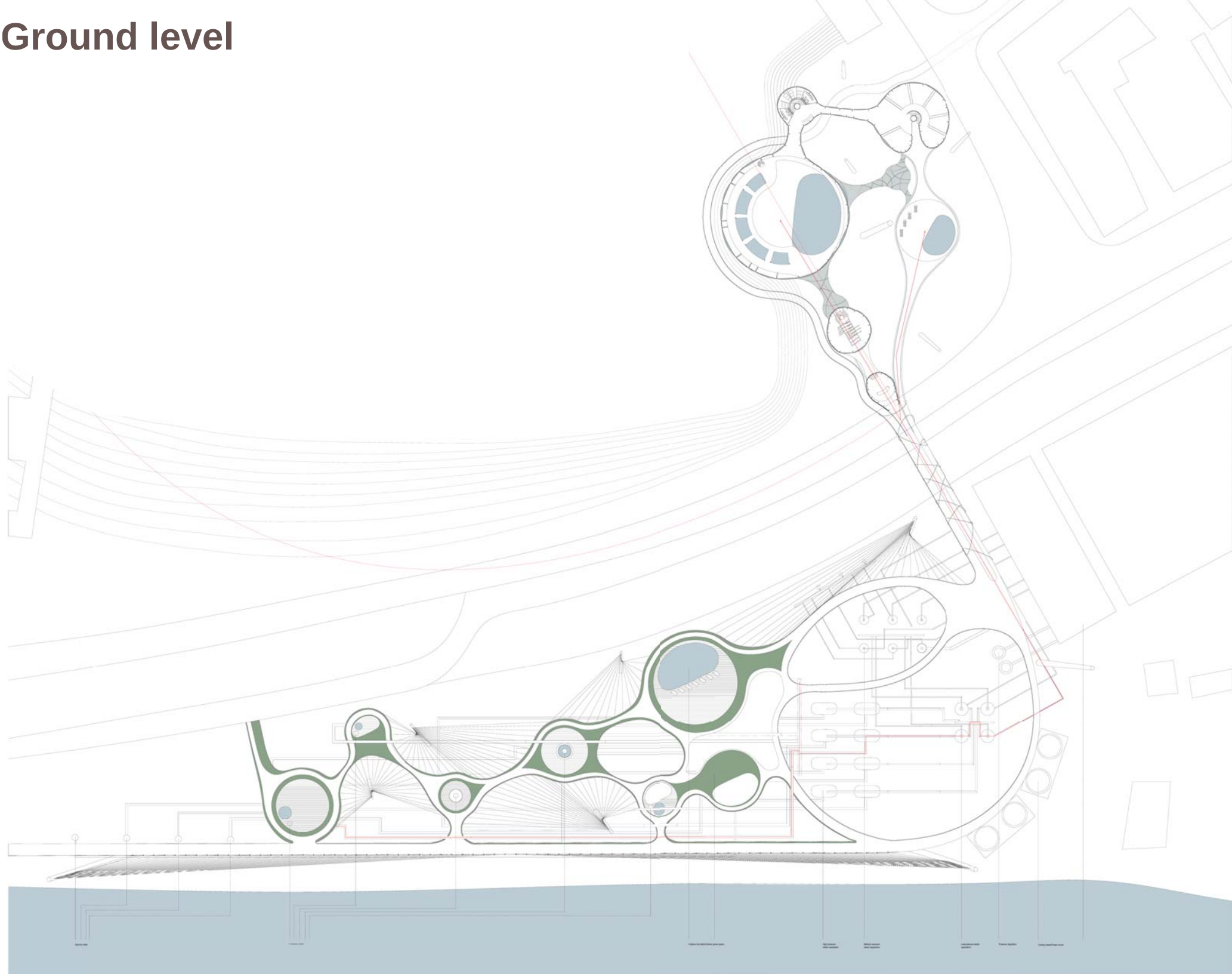
Geothermal power plant process in relationship to the program



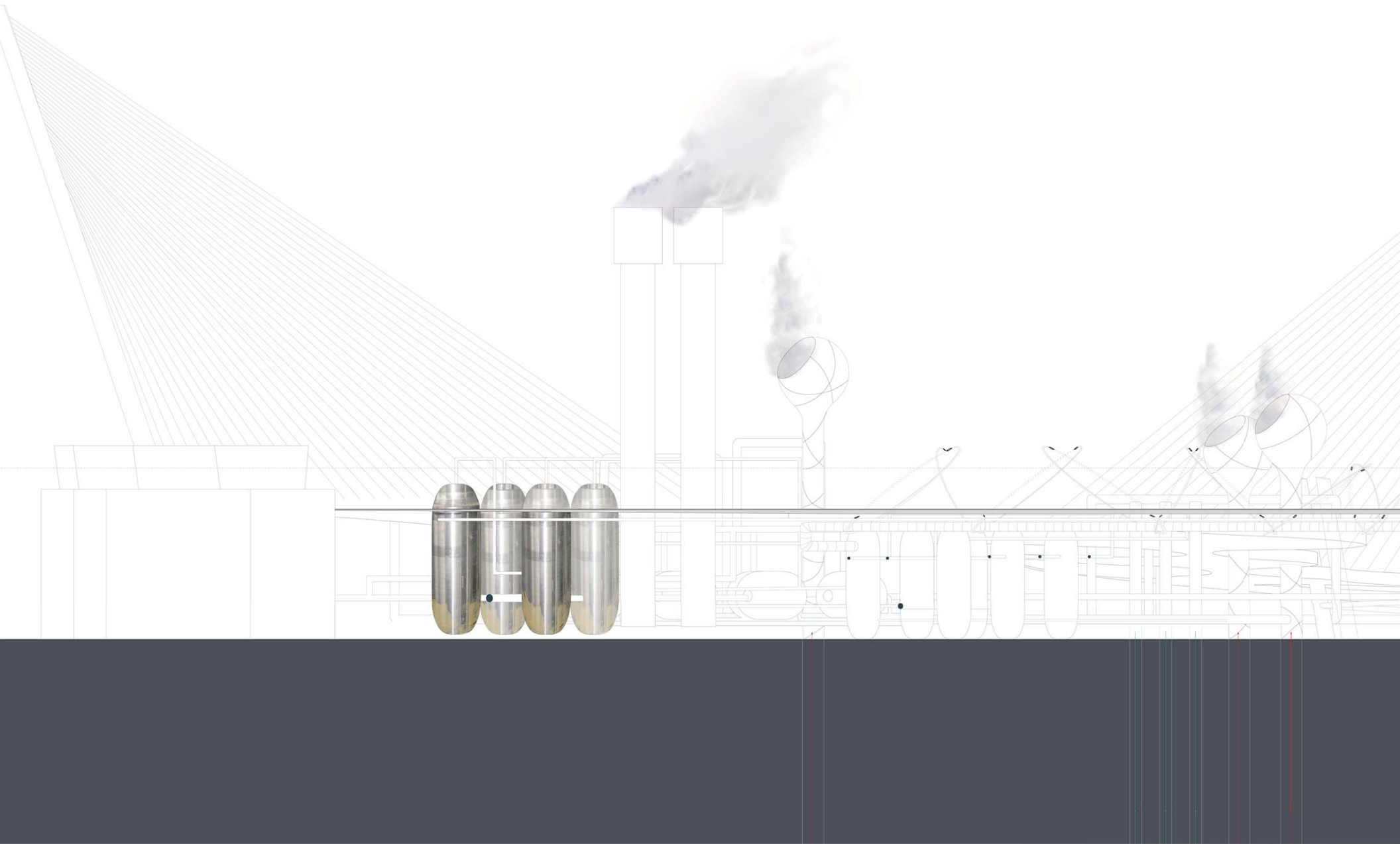
2nd + 3rd SPA level plans

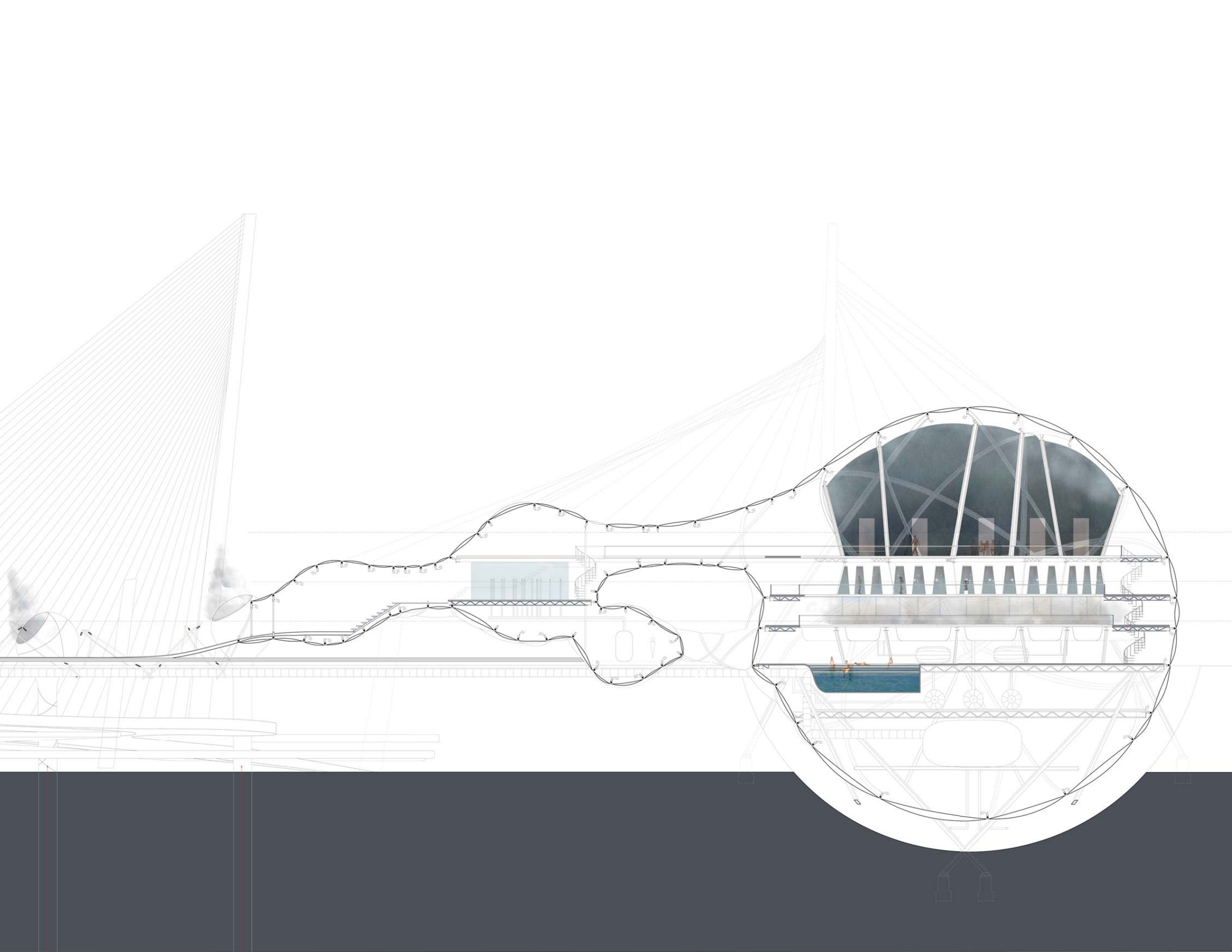


Ground level

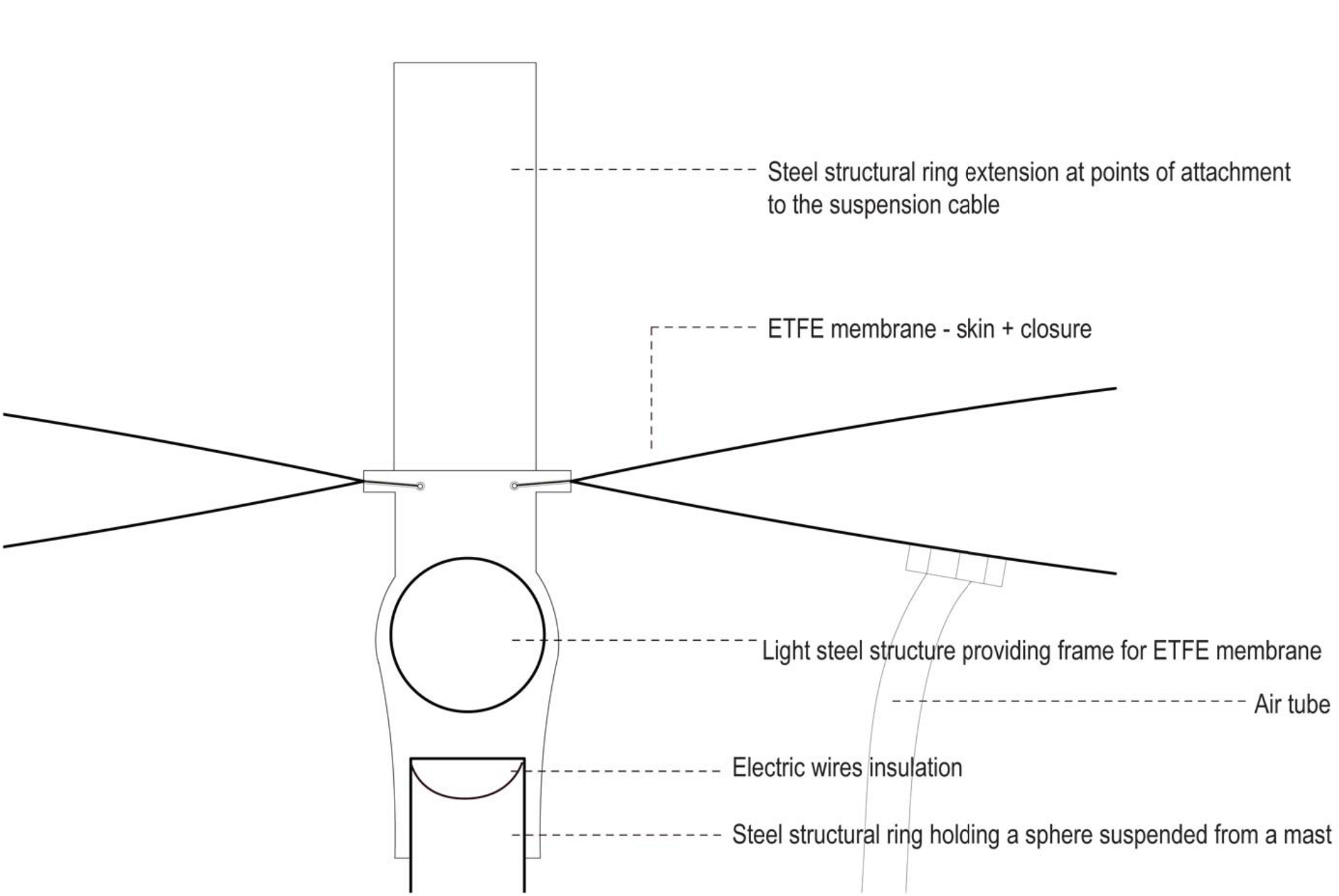


Section looking South

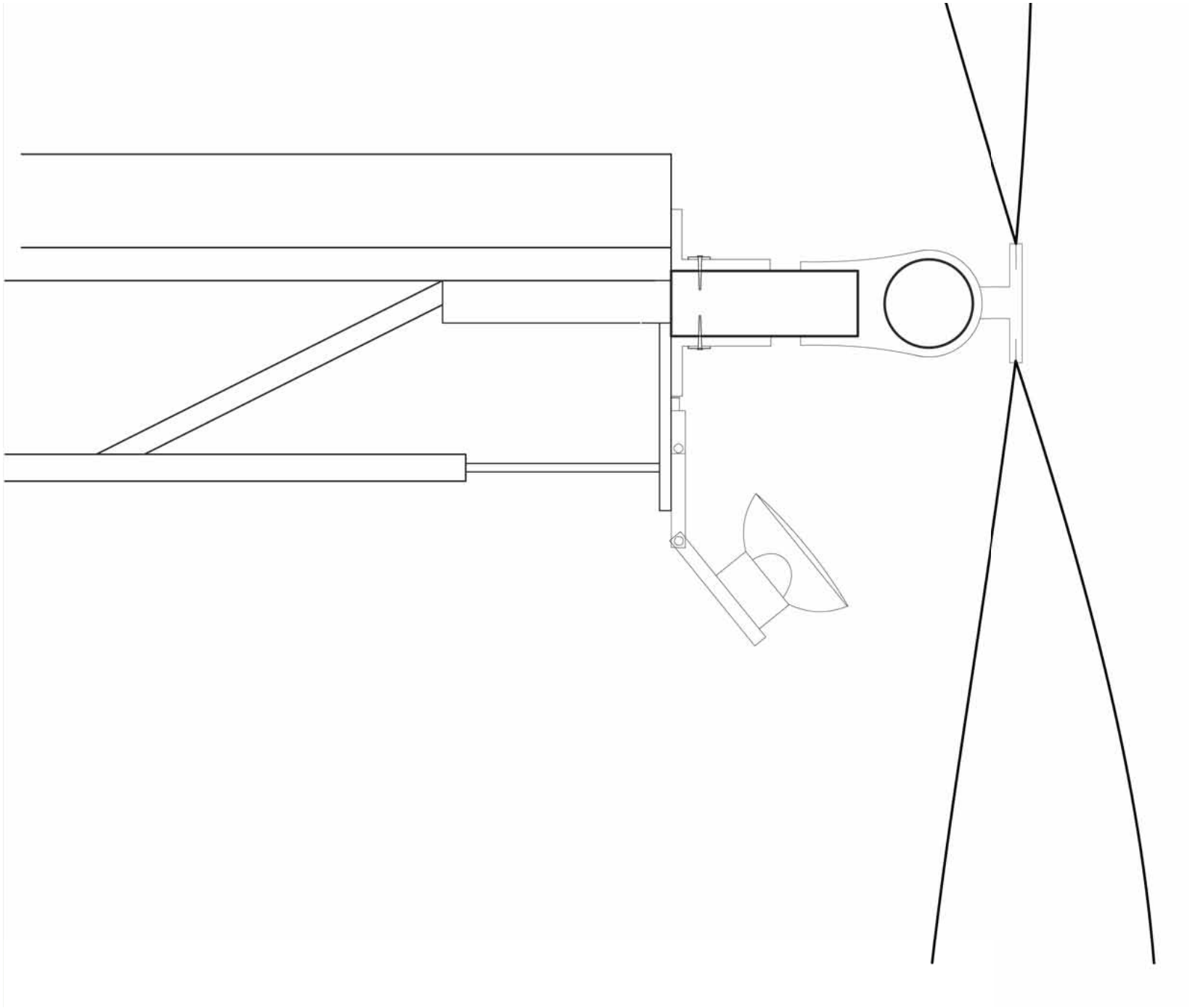




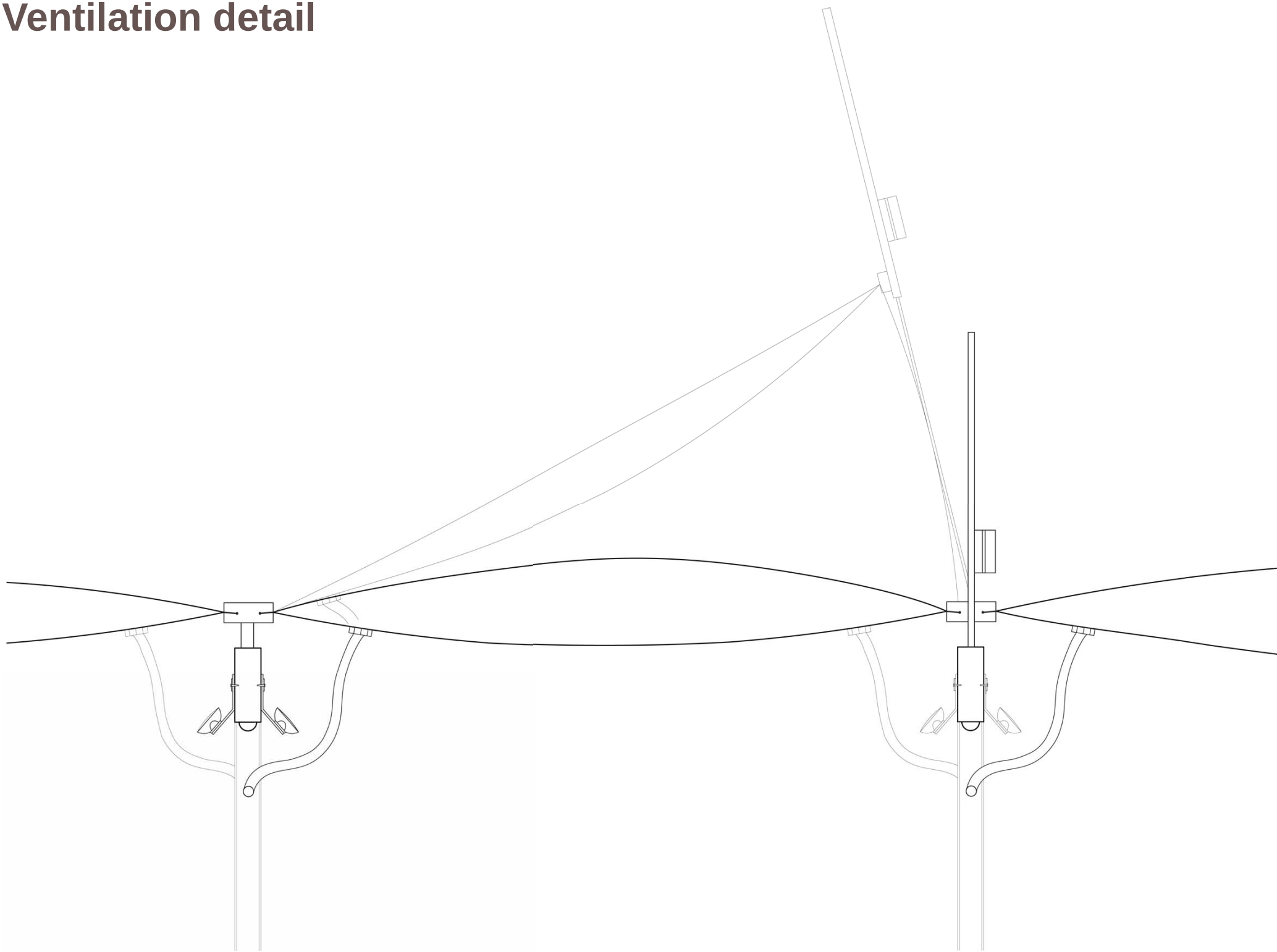
ETFE + structure detail

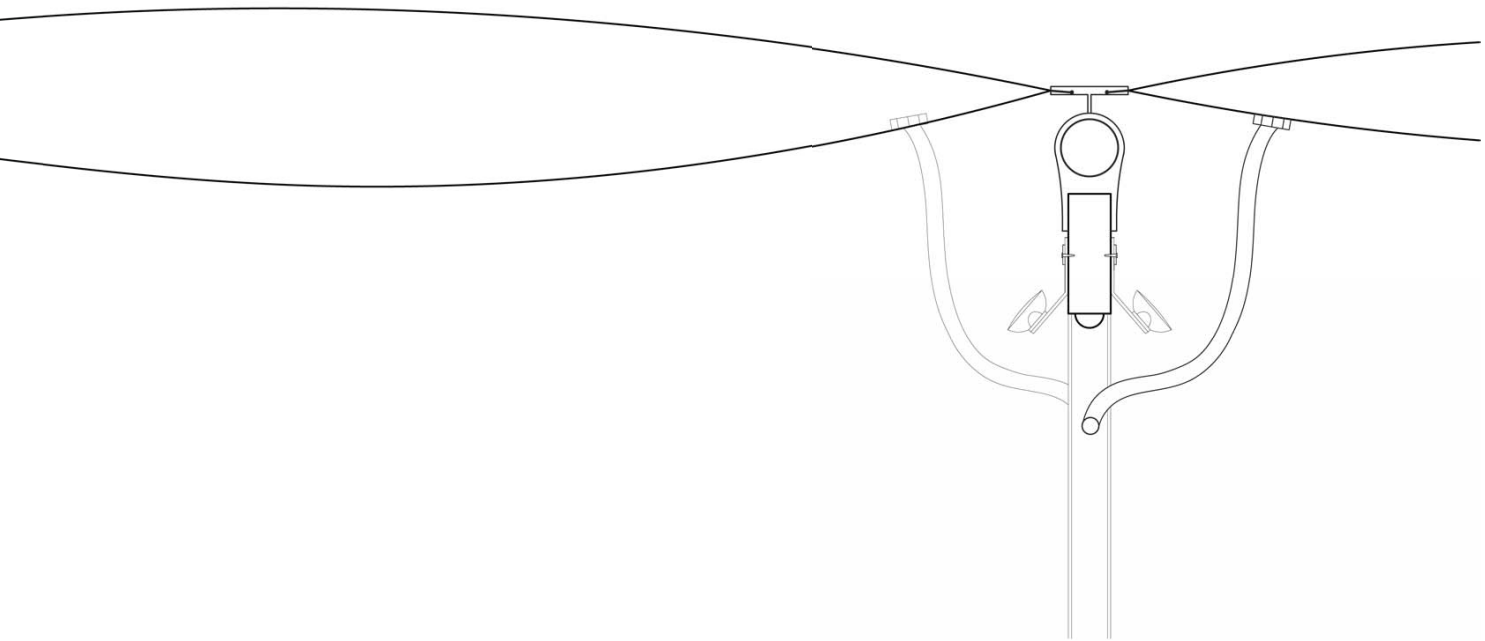


Typical floor + exterior structure

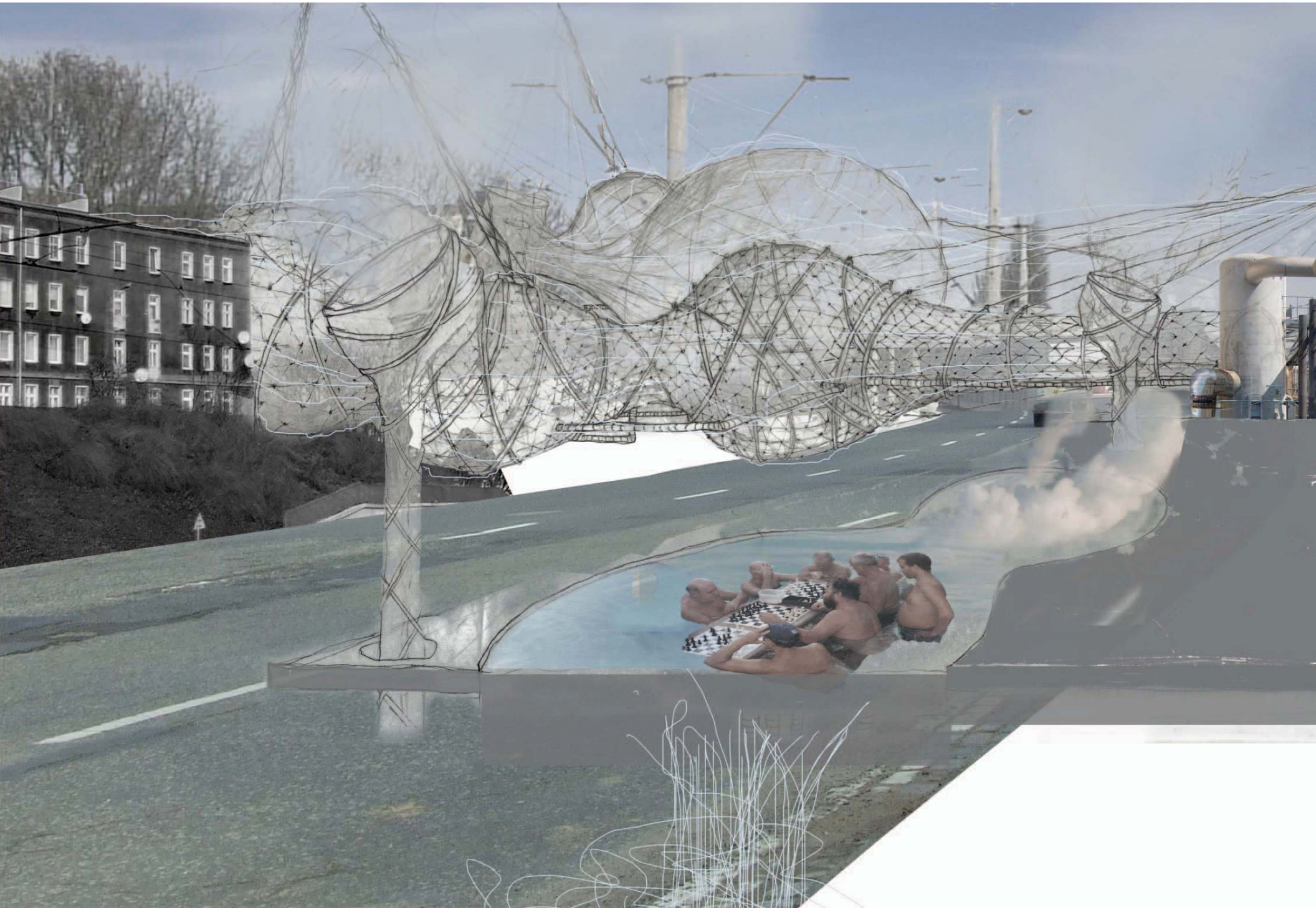


Ventilation detail





Exterior montage

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SNC

View from the main SPA area

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