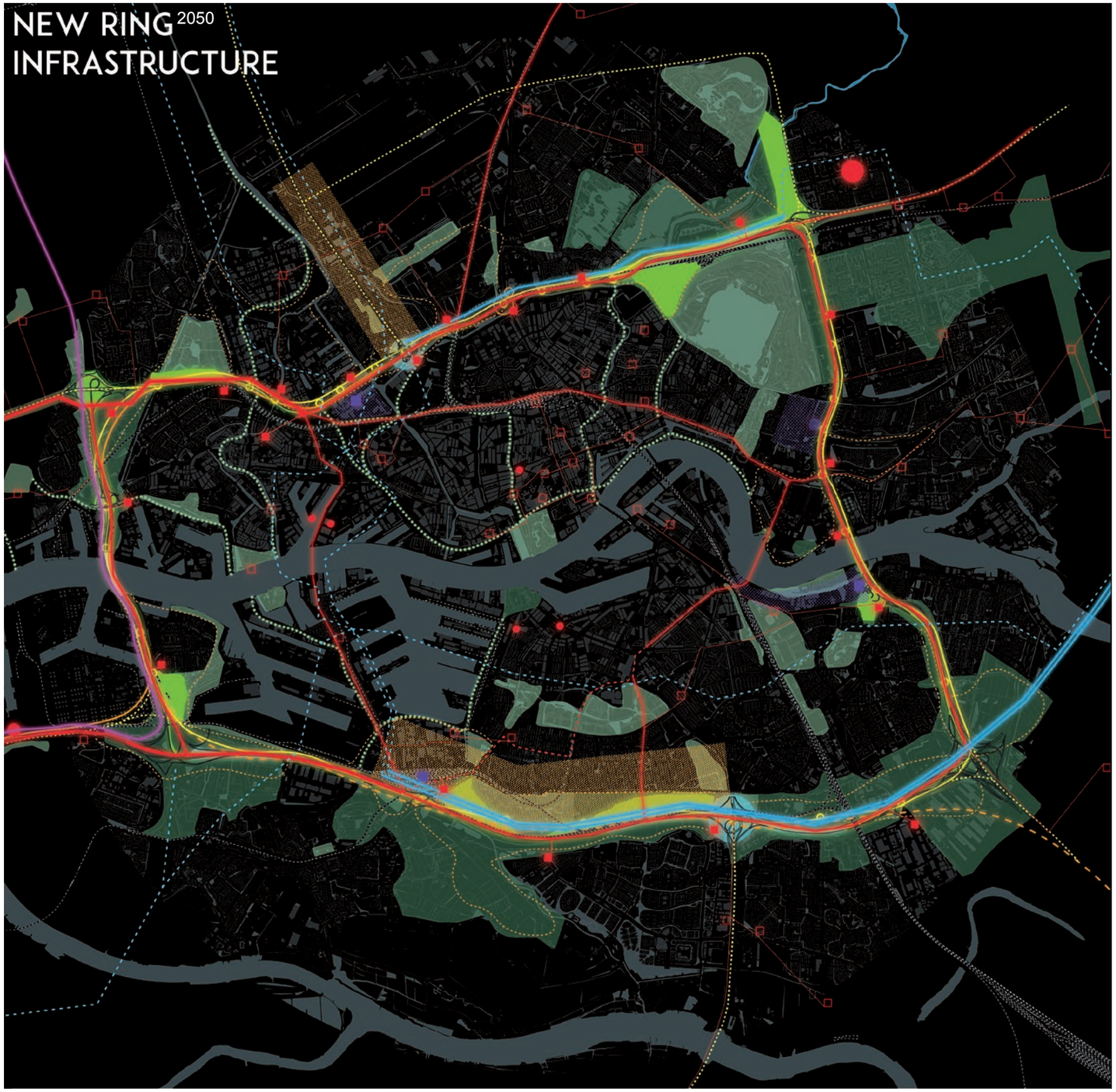
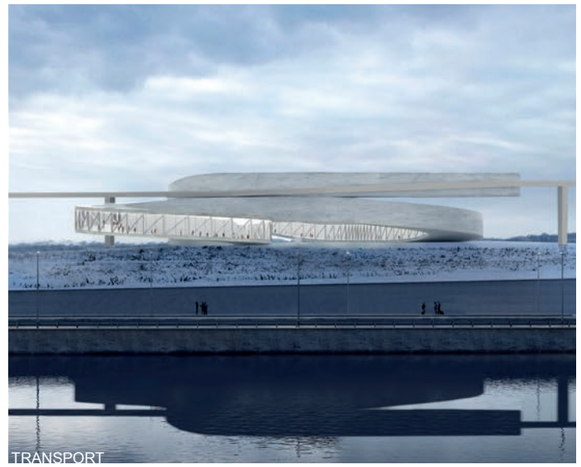
DECOMMISSIONING THE ROAD FOR A





Country / City	Italy, Ferrara
University / School	University of Ferrara / Architecture Department / Sealine Research Center
Academic year	2017/2018
Title of the project	RINGCITY. An infrastructural scenario for 2050 Rotterdam
Authors	Matteo Pavanello

TECHNICAL DOSSIER

Title of the project	RINGCITY. An infrastructural scenario for 2050 Rotterdam
Authors	Matteo Pavanello
Title of the course	Master Thesis Laboratory in Landscape Architecture and Infrastructures
Academic year	2017/2018
Teaching Staff	Luca Emanueli (Supervisor), Gianni Lobosco, Thomas Ponds (Co-Supervisors)
Department/Section/Program of belonging	Architecture Department / Sealine Research Centre
University/School	University of Ferrara

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

The European strategy for the reduction of greenhouse gas emission involves actions to reach the complete diffusion of autonomous vehicles by 2050. Important Dutch cities like Rotterdam are scheduling the decommissioning of large urban roads that turn to be obsolete. Here, the thesis addresses the set of issues related to the reuse of the city ring road by defining an alternative scenario to its demolition. The investigation sets a 30 years horizon to transform the current highway in a multimodal system capable of integrating existing and future networks (of energy, ecology and mobility) with the aim of facing climate change effects (such as floods, heat islands and loss of biodiversity) and providing the city with new green and blue infrastructures. Starting from 2023, 6 km of the A20 between Overschie and Kralingen will be progressively declassified and dismissed due to the opening of a new bypass close to the airport; this highway section will offer the opportunity to test exemplar solutions to be replicated in the next phases. The applicative case-studies developed in this context synthesize a design approach grounded on the objectification of the infrastructure as a found artifact in the landscape; its own spatial and systematic potentialities are exploited in relation to the surroundings to fulfill multiple goals: from water management and energy distribution, to the creation of new paths and shared public spaces. As a result, a new intensified infrastructural corridor will give to the city the chance to improve resilience and the relationships between urban sectors for long time separated by the road.

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CLIMATE CHANGE AGAIN

11th International Biennial Landscape Barcelona

Barcelona September 2020

SCHOOL PRIZE

SYSTEMS, OBJECTS

ENERGY

Many power-plants populate Rotterdam harbor and discard huge quantity of hot water in the river. Recovering this waste to heat the city would make the city more clean and energy efficient. The redesign of the powerlines runs along the highway in many parts.

ECOLOGY

Rotterdam lies in the Rhine Delta, an area presenting a rich biodiversity. Nevertheless, the high growing-density of the area put it at risk Different ecological systems need to be connected to strengthen their position.

TRANSPORT

Rotterdam is the biggest cargo harbor in Europe and the highway has been mainly built to serve the port. New modes of transportation have been investigated to decrease the load that is burdening the city.

N

1:150.000

Energy Network
- 380 kV powerline project
- Pipeline
- Windmills

Heat
- Heat source
- District heating
- Geothermic sources
- Heat-cold storage
- Heat flow (approximation)
- Heat backbones

Geothermic potential
- 50% chance: 5 to <15 MW
- 50% chance: 10 to> 20 MW

Powerplants | CO2 emitters

Water system
- Salt water (-20m - -5m)
- River gradient salt-sweet
- Lower irrigation/discharge
- Fresh water basins
- Dredge disposal
- Drinking water basin

Drainage system
- Primary pumps
- Dikes

Salination (in m. below NAP)
- Above NAP
- 5 - 0
- 10 - 5
- 25 - 10
- 50 - 25
- 100 - 50
- 200 - 100
- 300 - 200

Transport Modes
- Train
- Cargo
- Sea Routes

Transport Intensity
- Ship intensity
- Motorway intensity

- Poor Neighborood
- Hyperloop proposed route
- New cargo hub
- Light train proposed route

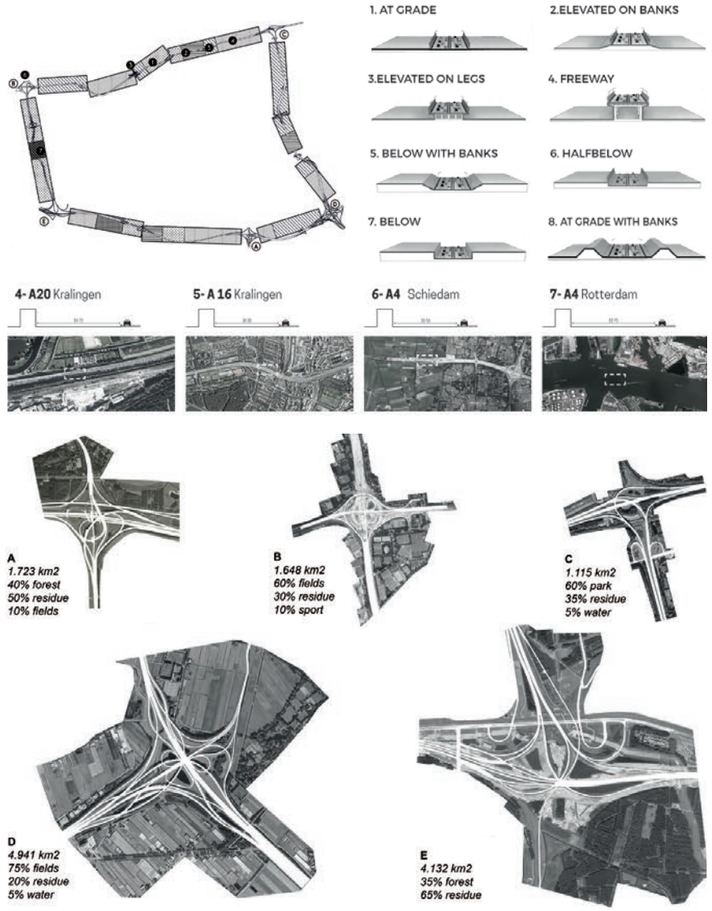
Sources
Port of Rotterdam
http://changeyourperspec-
Municipality of Rotterdam
Rijkswaterstaat, Ministerie van Economische verkenning Rotterdam

< NETWORK ANALISYS

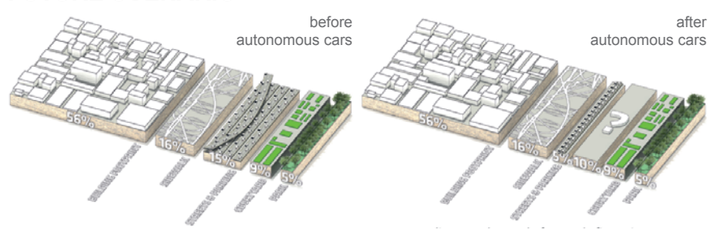
In search for solutions to future critical issues, three systems were analyzed in their spatial relationship with the territory and the highway: energy, ecology and transport.
The harbor, and its powerful presence, results as a huge protagonist in every system, confirming the city dependency to it.

RING ROAD TAXONOMY

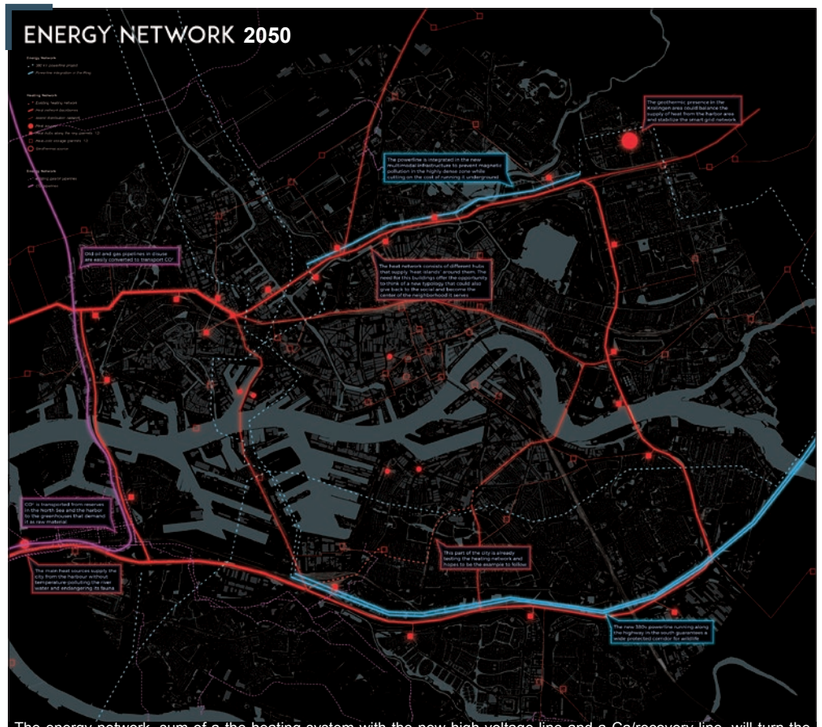
By the end of 2030 decade, the new bypass in Rotterdam would have opened, making the A20 a test field for developing a new infrastructure affecting subsequently all the ring road. In such perspective the present infrastructure's spatial features have been analyzed in order to understand the opportunities raising from its decommission.



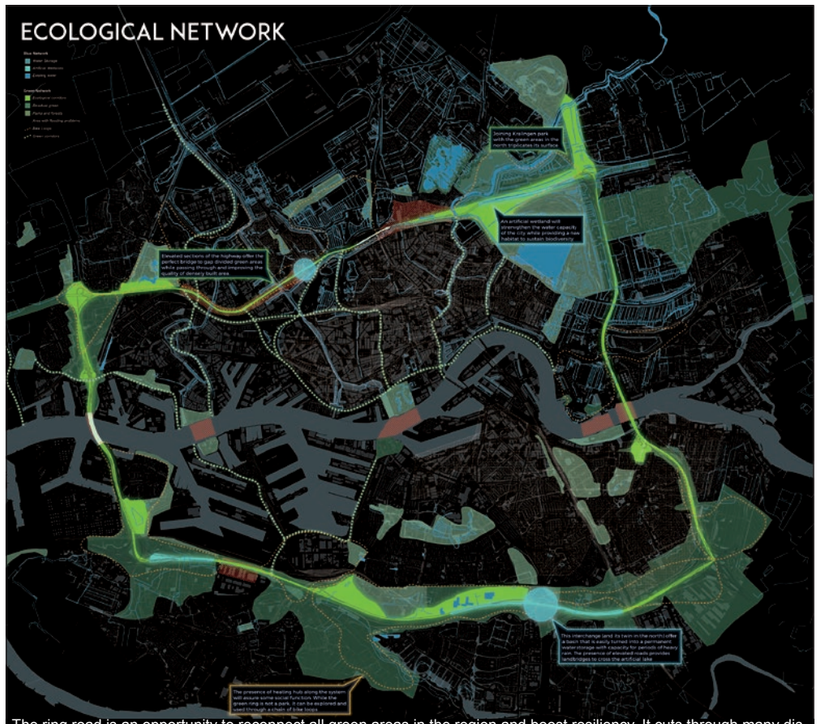
FUTURE SCENARIO



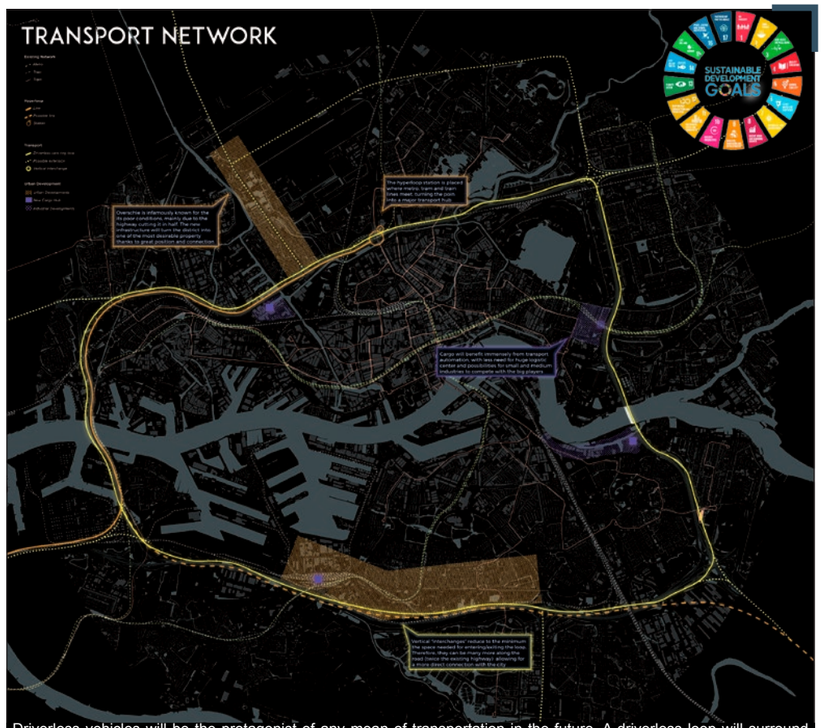
2050 defines the scenario temporal horizon mainly due to the expectation that by then, fully automated cars will make up to 91%. Current policies aimed at reducing emissions in Europe by 20% will have been realized and Rotterdam port would have a strong energy production from wind capable of powering the heating network of the city with its residual energy. The global transport would see the rise of hyperloop systems affecting passengers and cargo.
In such scenario, the 3 systems analyzed in the region provide inspiration for 3 different networks that will convert the ring road areas into an intensified infrastructural corridor.



The energy network, sum of a the heating system with the new high voltage line and a Ca/recovery line, will turn the relationship between the city and the port into a symbiosis. They will share the heating network, reusing energy [hat is currently wasted, and geothermic sources, while at the same Lime providing the city of community centers in every district. Disused pipelines will take CO) from the harbor to the greenhouses where it is a valuable raw material. Finally, the ring road will represents the boundaries of the city smart energy grid while charging driverless cars constantly.



The ring road is an opportunity to reconnect all green areas in the region and boost resiliency. It cuts through many disconnection points where can easily be turned into an ecological corridor. Sometimes it is itself the barrier that separates green areas: here, the new infrastructure becomes an artificial wetland with ecoducts at the ground level, offering connection for different habitats. Water storage is provided all along the ring, in order to offer the city relief from heavy rain. In particular, many interchanges have already the proper morphology to be converted into retention basins.



Driverless vehicles will be the protagonist of any mean of transportation in the future. A driverless loop will surround Rotterdam in a new elevated infrastructure that will first flank the old ring road and eventually take its role. Together with the hyperloop system, the driverless loop will make a new kind of transit possible: an autonomous pod will pick you up at your requested point of origin, drive you in the loop (where the pod will be charged while driving) till the hyperloop station. Here the pod will smoothly enter the transponder and get you to Paris in less than 20 minutes.

HEATING NETWORK

Great benefits can be reaped from the recycling of residual heat which is primarily produced by chemical industries and power plants. This heated water, which is currently discharged directly into the harbor basins, could be used to meet the regional demand for heat. This heat is presented in a concentrated form, and is therefore relatively easy to use for the hating. By linking the heating network to geothermal heat, a very stable networks is created that can respond to different demands and evolutions in the time to come.


HEATING SOURCES


GEOTHERMAL WELLS


TEMPERATURE ISLAND

MAIN PIPELINES

HEAT HUBS

CO_2 RECOVERY

The many empty gas and oil fields at the bottom of the North Sea can be used to storage of CO2.
They can be accessed relatively easily using pipelines from Rotterdam.

CO2 CAPTURE

PIPELINE

OFFSHORE STORAGE

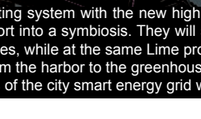
ELECTRIC LINES

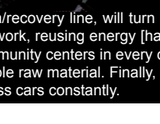
A new energy corridor as been proposed with the use of newly designed pillars that can reduce pollution and landuse. The new system represents an opportunity for the creation of an ecological corridor.

BATTERIES

HIGH VOLTAGE

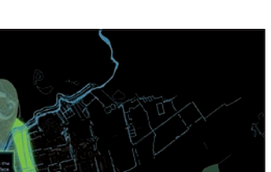
SOLAR PANELS


wind potential in the area


SMART GRID

GREEN NETWORK

Rotterdam lies at a point where river, peat-meadow and dune landscape converge. Because of the urbanization that has taken place over the past few decades, only a few green and blue structures are linked up. As a results of fragmentation and more intensive farming methods, many of the species monitored have decreased considerably in number. A ring around the city offers the perfect solution in spatial terms to connect and strengthen the different biotopes.


green link main issues (in red)

HIGH VOLTAGE LINE

ECODUCTS

HEAT PUBLIC HUB

NATURE REHABILITATION

RESIDUAL LANDSCAPE

ECOLOGICAL CORRIDOR

BIKE LOOPS

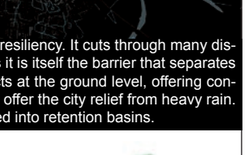
ARTIFICIAL WETLAND

BLUE NETWORK

Due to climate change it rains more often an intense. The nature of the Rhine is changing from a glacier river to a rain-fed river.
The ring system offers this space and represents a natural barrier against the second main problem of the water system in the region: salinization of agricultural land.

WATER STORAGE

ARTIFICIAL WETLAND


areas with water discharge problems

DRIVERLESS LOOP

Like any transportation technology driverless cars are most optimal when they have their own dedicated place of infrastructure. The presence of the hyperloop elevated structure triggers the possibility of creating an elevated loop around the city dedicated only to driverless car that will pair the highway and slowly replace it: in an early stage cars would be driverless only in the ‘safe’ environment of the loop; afterwards the technology will take over the entire road system.

loop and vertical interchanges

VERTICAL INTERCHANGE

ELEVATED ROAD

HYPERLOOP

Hyperloop is a trade-name for the high speed transportation of passengers and goods in partially evacuated tubes. It is a technology under development. Many routes have been studied by different companies: among these, a route from Amsterdam to Paris with the intermediate stops in Schipol Airport, Rotterdam, Rotterdam Port and Antwerp.

STATION

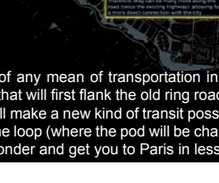
TUBE

TRANSPORTER

NEW DEVELOPMENTS

Rotterdam is expected to increase its population by 80,000 people before 2050 (10%). The city planning has defined several developments to sustain this growth. The new infrastructure wuold make this development of much more interest and value, re-qualifying old districts and opening up possibilities of new ones.

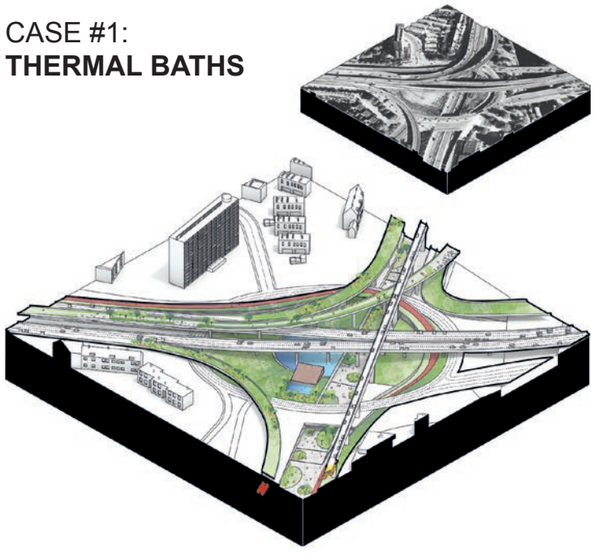
future planned developments



6KM IN THE NORTH

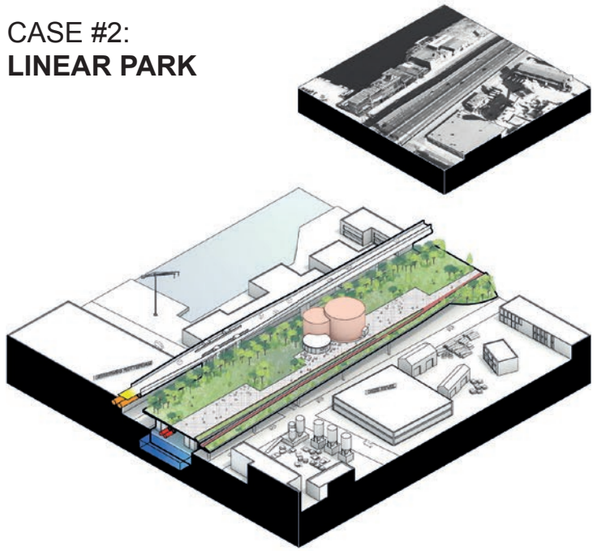
The A20 in the north cast part of the Diamond will be the first part to be dismissed due to the opening of a new bypass close to the airport. It will then offer opportunities to test the new infrastructure and its potentiality, offering models that could be replicated. In particular, four case studies have been studied: the first two are linear parts crossing through different surroundings, while the other two concern the reuse of interchanges.

CASE #1: **THERMAL BATHS**



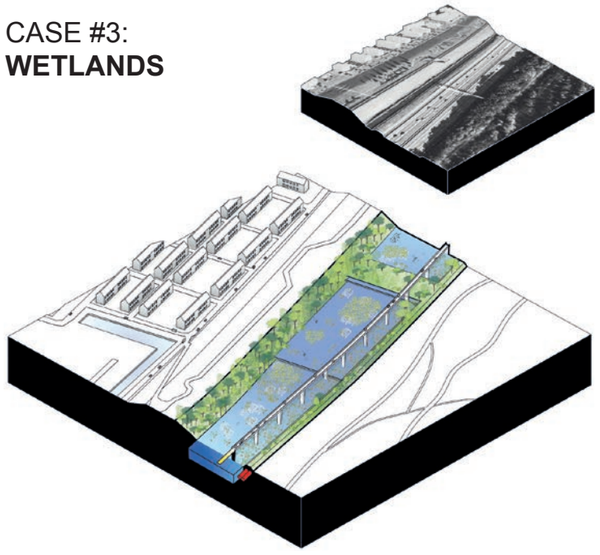
The interchange in Overschie is an historical landmark in the Dutch highway history: it is the first case of 4 vertical layers of street in the old continent. Its redevelopment leave the monumentality of the structure untouched, while taking full advantage of its layered character. The main green corridor continues at the lowest level as a water square that can easily turn into water storage in case of need. At the ground level the interchange is defined by a roundabout around a basin: water is collected here and the district heating hub discharges the surplus heat: a thermal bath under an expressway! The interchange branches above ground level provide the function of a landbridge over the traffic simply by accommodating spontaneous vegetation.

CASE #2: **LINEAR PARK**



The elevated highway crossing the Overschie industrial area represents the perfect structure to develop a green artery, able to bridge different parks at its end while offering a qualitative linear park in the gray district.
A bike path will run through it, providing a safer and healthier way for people to get to their workplaces.
The underside will be dedicated to store flooding waters and the materials dredged from the harbor canals. In this way, the new infrastructure becomes a urban metabolic device where to arrange and treat the different types of soil (according to their pollution range) through phytoremediation areas, capped or open-air landfills.

CASE #3: **WETLANDS**



Kralingen is the biggest park in Rotterdam inside the ring roads that surround it on two sides.
Turning the road and its residual areas into a permeable landscape will allow for the ecosystem to connect to the close parks outside the ring diminishing ecosystem fragmentation and improving wildlife.
In doing so, the ring road is re-imagined as a constructed wetland able to provide one of the original Dutch landscapes that cities pushed out of their boundaries. The system will work, at the same time, as a resilient blue infrastructure (especially against flooding events) and as a urban facility for recreation.

CASE #4: **MOBILITY HUB**

One of the simplest interchange in the Rotterdam Diamond presents a peculiar characteristic: an underground metro line, a below ground train line, the ring road and a urban road originating in Rotterdam central station (10 min walking), overlay in such a place. With the redeveloping of the ring road this potentiality has to be used to create a transport hub that is the final representation of a multi-modal infrastructure.