

# INTEGRATION BY LANDSCAPE

INTEGRATION BY USING LANDSCAPE AS INFRASTRUCTURE

FLOWSCAPES :Infrastructure as landscape,landscape as infrastructure

Graduation lab landscape architecture 2016-2017

YIXIONG MIAO

Mentors:Steffen and Els

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## I INTRODUCTION

# 1. PROBLEM STATEMENT



In metropolitan regions such as the Ruhr area, a clear boundary between urban and rural landscapes does not exist anymore. One can speak of a urban-rural continuity or urban landscape with specific patterns of spaces and where built and open landscape are intermingled (Nijhuis, 2016).

The mixes of industrial, residential, infrastructural, recreational and other kinds of urban tissues that penetrate agricultural or natural areas are characterized by varying densities and forms of built and unbuilt spaces and differ clearly from that of compact (historical) urban spaces and the open rural countryside. Spatial and ecological fragmentation and unclear open spaces are often the result. What is at stake in these spaces is the hybridization of landscape, but also the need for coherent landscape structures and the protection and development of cultural, ecological and recreational values (Nijhuis, 2016).

## Timeline of Ruhr

To understand this phenomenon, it will study the history of Ruhr area. This diagram shows the development of the Ruhr area over time. The urban context keep growing along the road and the nature space has been getting more and more fragmented in Ruhr. There are some theories can prove this assumption.

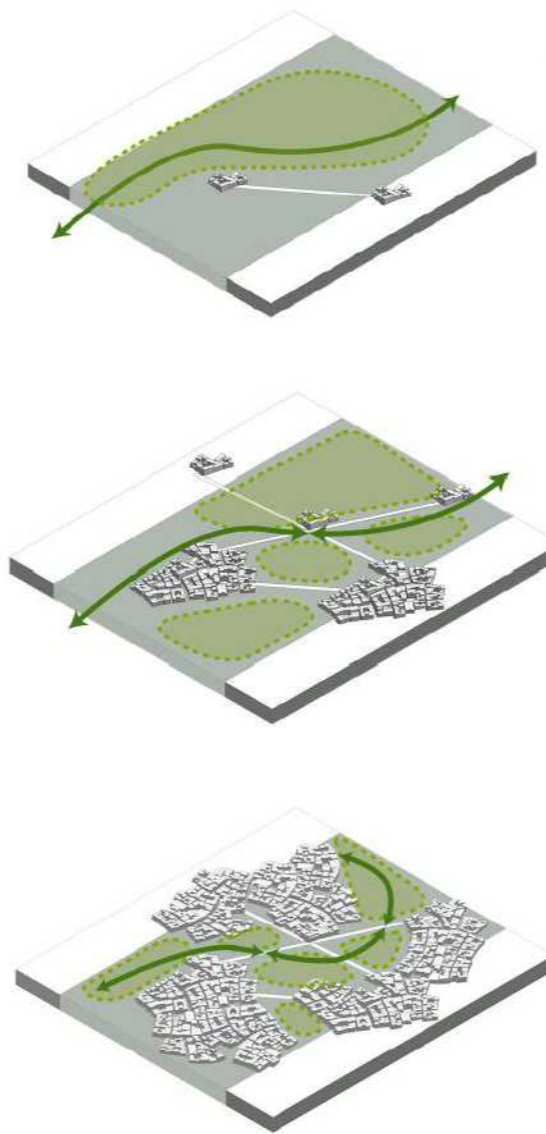


Figure:Timeline of Ruhr

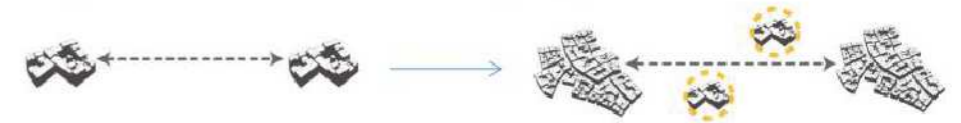
## Urban expansion theory

The diagram below shows the urban expansion can be guided by road and then happens along the road.

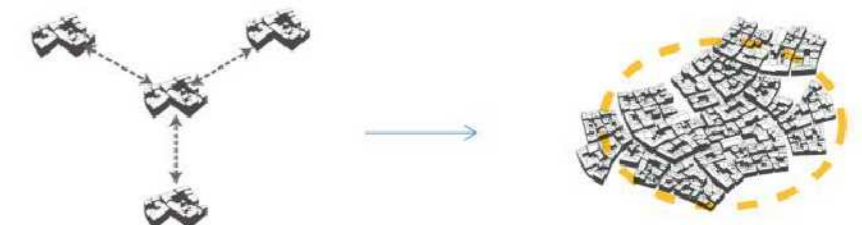
Those urban expansion models are "integration by road infrastructure" which is the typical spatial planning methods in Ruhr.

For example, POLE-AXIS urban growth theory, it says that the urban context expands along the road .

### POLE-AXIS URBAN GROWTH THEORY.(SOMBART)



### MULTI CORE GROWTH THEORY(HARRIS&ULLMAN,1945)



### MEGALOPOLIS THEORY(J.GOTTMANN)



## Fragmentation is the result

Such urban expansion causes the Greenspace become highly fragmented. However, the urban expansion is still continue .What about the future greenspace in Ruhr area? will the nature be totally destroyed in the future



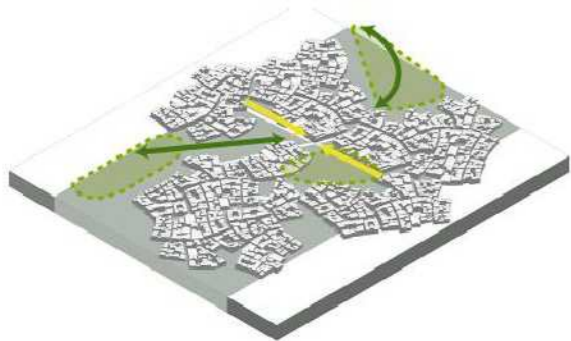
Current Emscher proposal

If urban context still grows along the road in Ruhr, the nature will be totally destroyed. To avoid this, the municipality propose the greenstructure should be used as the backbone for further development instead of road infrastructure. For example the Emscher greenstructure.

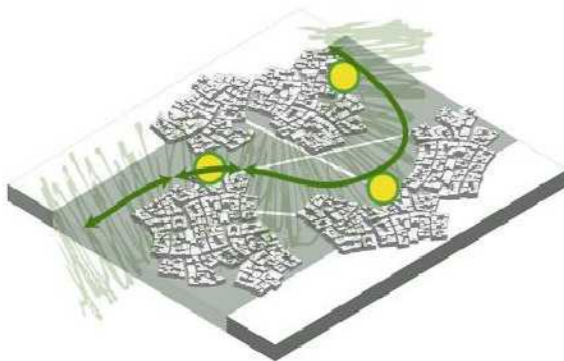
Current situation



If urban still grows along the road



Current Emscher proposal



Is the current Emscher the right solution?

Here is the current Emscher greenstructure which is considered as the backbone for both natural and urban development. It will integrate human habitats and natural habitats. This is the integration by using landscape as infrastructure. However there are still some problems with this Emscher thinking.

Current Emscher proposal and not successful projects:

The project based on this idea is not successful. For example, Duisburg landscape park is a nice heritage park based on this Emscher thinking. (figure 6c) However, it's isolated in a spatial island and segregated with a larger greenstructure.



Figure: Isolated Duisburg landscape park



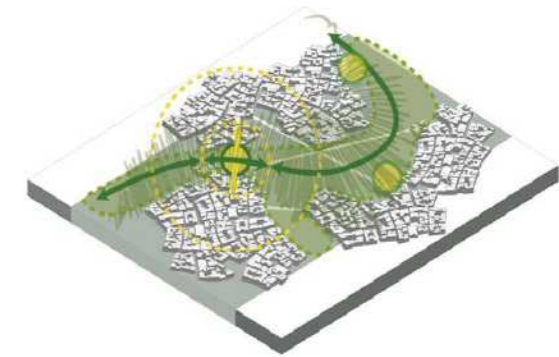
Improved Emscher proposal

This research proposes that the related projects based on Emscher thinking should be well contextualized and thought in hierarchy scales. The project should be a part of larger operative greenstructure. It shouldn't be a spatial island and cause further fragments to the greenstructure.

Current Emscher thinking



Improved Emscher thinking



## 2 RESEARCH OBJECTIVE&QUESTION

### 2.1 Research objective&question

It researches on how to use landscape (as infrastructure) to "integrate" .The objective of this study is learning how to guide the urban expansion and development in a over developed country. Within the academic framework "flowscape",the "integration" is not the typical tool that only make physical connections between areas. It needs a deep understanding on all flows in the dynamic landscape structure and uses landscape(as infrastructure) to provide room for flows,and thus achieve natural , social and economics co-prosperity. In order to meet the objective,the study addresses the following research questions:

1. The Typical integration uses only road infrastructure to guide the urban expansion,and only achieve human prosperity.It ignores the profits that landscape could bring and the integrity of natural layer.How can 'landscape integration' integrates the fragments in both natural layers and artificial layers,and thus achieve con prosperity

2. There are some unsuccessful projects based on the thinking of landscape integration .For example,Duisburg landscape park is isolated as a spatial island , it isn't connected to a larger greenstructure and even cause a further fragmentation.The question is how to use landscape integration to well contextualize the projects.

3. As a landscape architect,the main tool of making intervention is spatial design.This practical question is how to use spatial design approach to integrates natural and artificial layers.

### 2.2 Application

The study on "landscape integration" could helps the current nature gain additional value.It will transform invalid and fragmentary landscape infrastructure into a coherent network by developing contextualized projects. Only if the landscape (as infrastructure) being coherent will it gain the operative power and facilitate the development.

There are some existing study about the "landscape integration", for example, the Emscher park. However, there are still some drawbacks with the Emscher projects. The Ruhr area and Dortmund serves as a case study.Thus ,this study can be considered as the possible improvement of the Emscher idea.

## II METHODOLOGICAL FRAMEWORK

Within the academic framework "flowscape", the "integration" is not the typical concept that only make physical connections between areas. It needs a deep understanding on all flows in the dynamic landscape structure and uses landscape (as infrastructure) to provide room for flows, and thus achieve natural, social and economic co-prosperity.

### 1. FLOWSCAPE AS AN ADVANCED LANDSCAPE DESIGN FRAMEWORK

Regarding to Nijhuis, S., Bobbink, I. and Jauslin, O. (2011), landscape architecture field is consisted of natural, urban, cultural and architectonic elements. Our profession is to integrate the inter disciplines in design and use the value of landscape. The "Flowscape" is regarded as an advanced landscape design framework because it aims at solving problems and synthesizing the dynamic landscape processes and facilitate development of natural and human society. The spatial integration in this paper is based within this "flowscape" framework which is used as the tool to transform the nature-opposite infrastructure into a nature-harmony landscape infrastructure.

### 2. CONCEPTUALIZATION

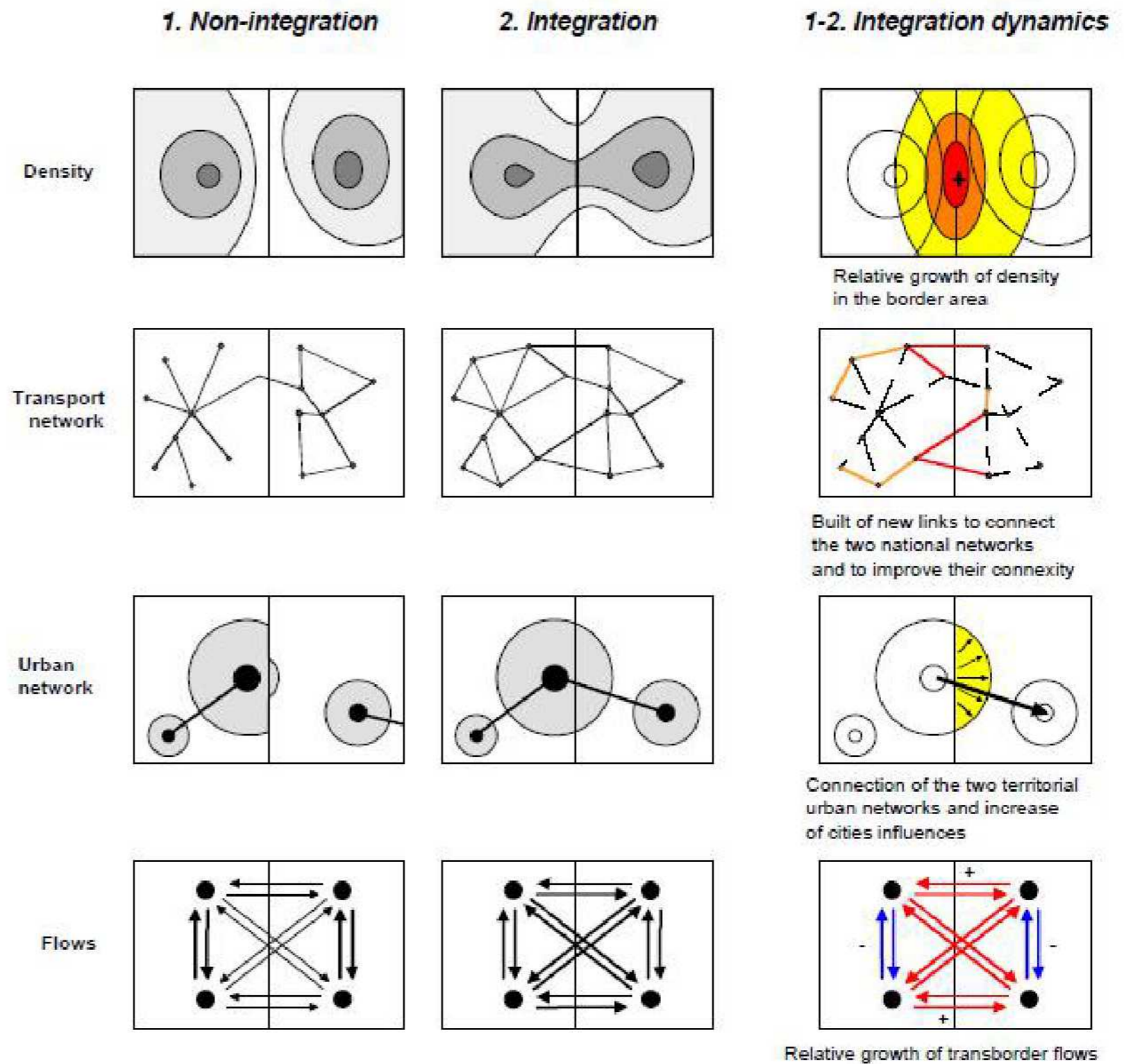
2.1 The typical concept of "spatial integration" within Flowscape framework

A growing range of economic, social, cultural and ecological interactions which are "both in place and out of place" (Adams, 1995). When we consider the natural, and social development of a place, we cannot ignore the opportunities out of place. "Opportunities for and level of interaction within and between areas". The ESDP define the spatial integration like this.

The "spatial integration" can be explained in another way. Geoff Mulgan (1997) labels the current era one of 'Connexity'. Infrastructure play a crucial role in facilitating the interconnections and cooperation between different areas and structures. It connects different area with single-function infrastructure

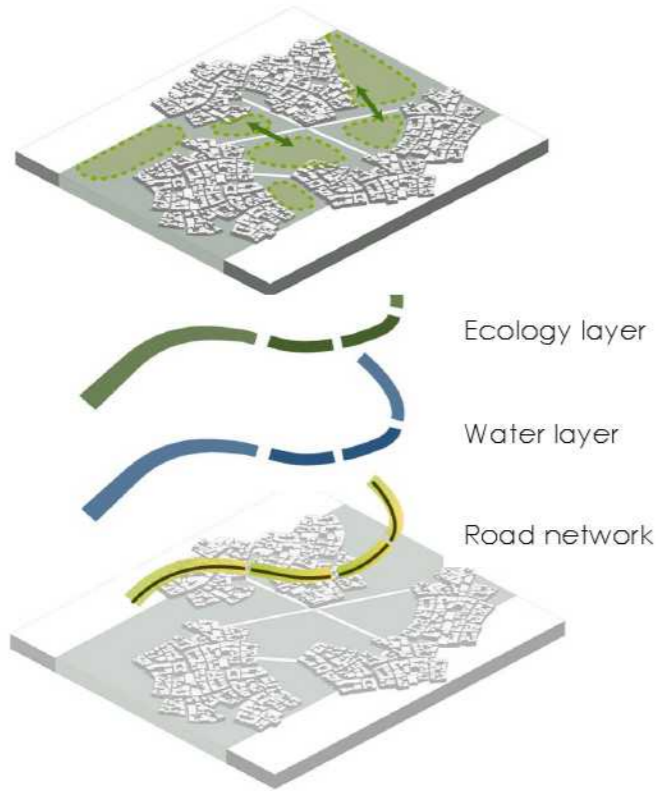
2.2 The concept of "spatial integration" by using landscape as infrastructure

However, in the existing study about "spatial integration", it totally ignores the natural flows and value that landscape can bring. The "integration" should not only facilitate flows for human need but also natural flows. Thus, we can use landscape as infrastructure to "integrate" and thus facilitate the development.



The existing pilot projects in Emscher have been shown as wrong examples. To prevent further mistakes, it should follow this conceptual implementation guide .

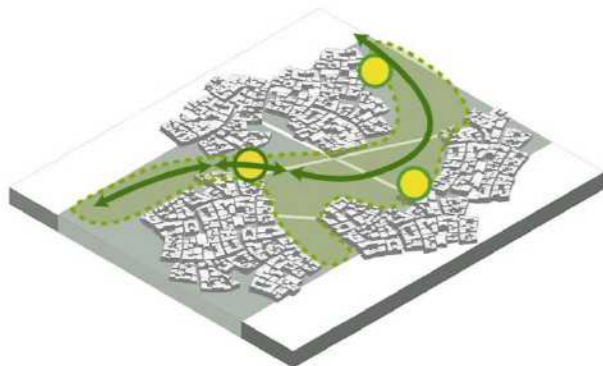
STEP1:Connect the fragments



STEP2:Hierarchy scales



STEP3:Industrial and projects design



The implementation of the conceptual tool This conceptual tool will guide the future projects make a better Emscher.

- 1.The project will be a part of larger operative greenstructure.
- 2.The contextualized new project will connect the fragments in different layers and designed through hierarchical scales.
- 3.The possible program and industrial will be proposed based on the Emscher idea

### 3.RESEARCH METHODOLOGY

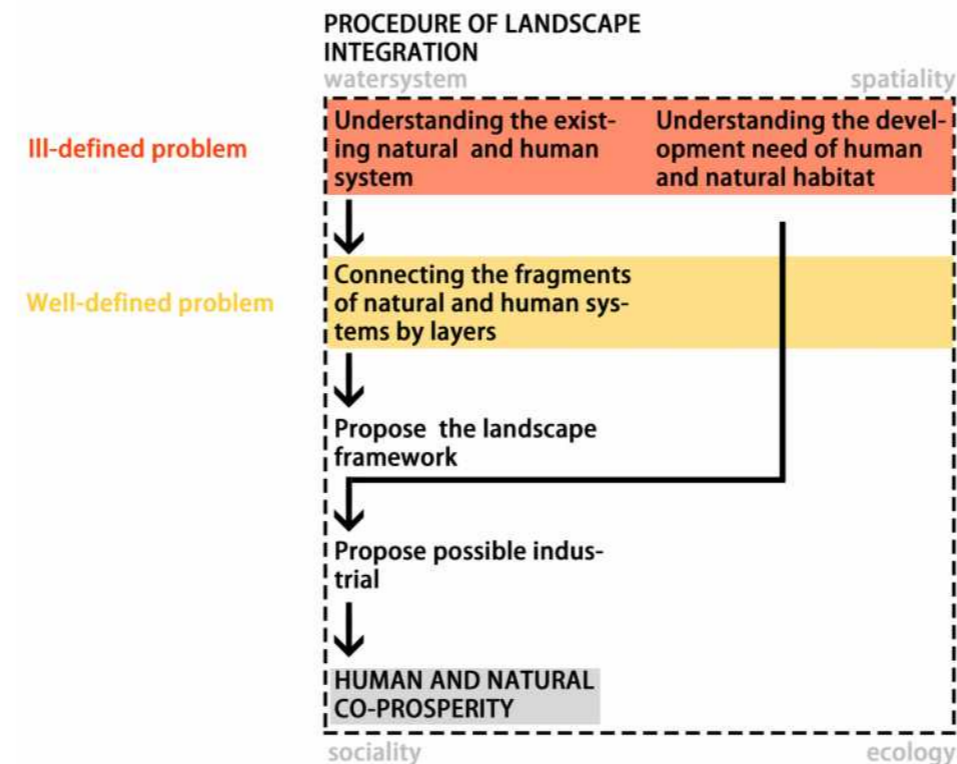
#### 3.1 Method:Design related approach

Design-related research which is heuristics lead to new discoveries and inventions.(Nijhuis,S., Bobbink,I.and Jauslin,D.,2011 )Research begins with a generic field 'flowscape',when it is related with my fascination and profession it is narrowed down on the research objective: how to use landscape (as infrastructure) to "integrate" areas ,and then narrowed down on a specific site .Design process is the most important stage in the whole research process.

In the design process,it will experiments with the procedure of "integration"The design result can be generalized for other projects.

#### 3.2Elaboration on the design related approach

Design process is a crucial step in design related research. The aims of design is to test with the procedure of "integration" by using landscape as infrastructure.



Based on this implementation procedure, it will elaborate and come up with the whole design procedure which includes the analytic phase,creative phase and executive phase.

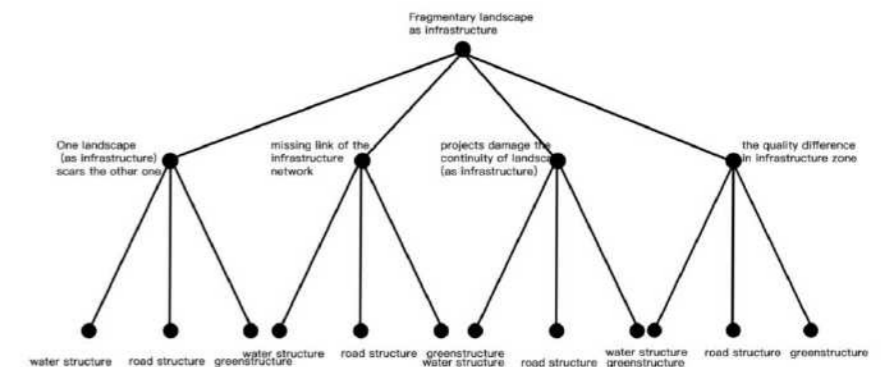
This whole "integrating"procedure includes the step of defining ill-defined problems and defining well-defined problems.The demands for development is ill-defined ,and "connects" the fragmentary landscape infrastructure is a well-defined problem.

#### Analytic phase

In the analytic phase ,the paper will illustrates the method to define the demands for development and define the fragmentary problems. To understand the demands for development, it will analyze the context ,existing natural and human flows.

There are two basic procedure to define demands for development .They are top-down defining and bottom up defining .

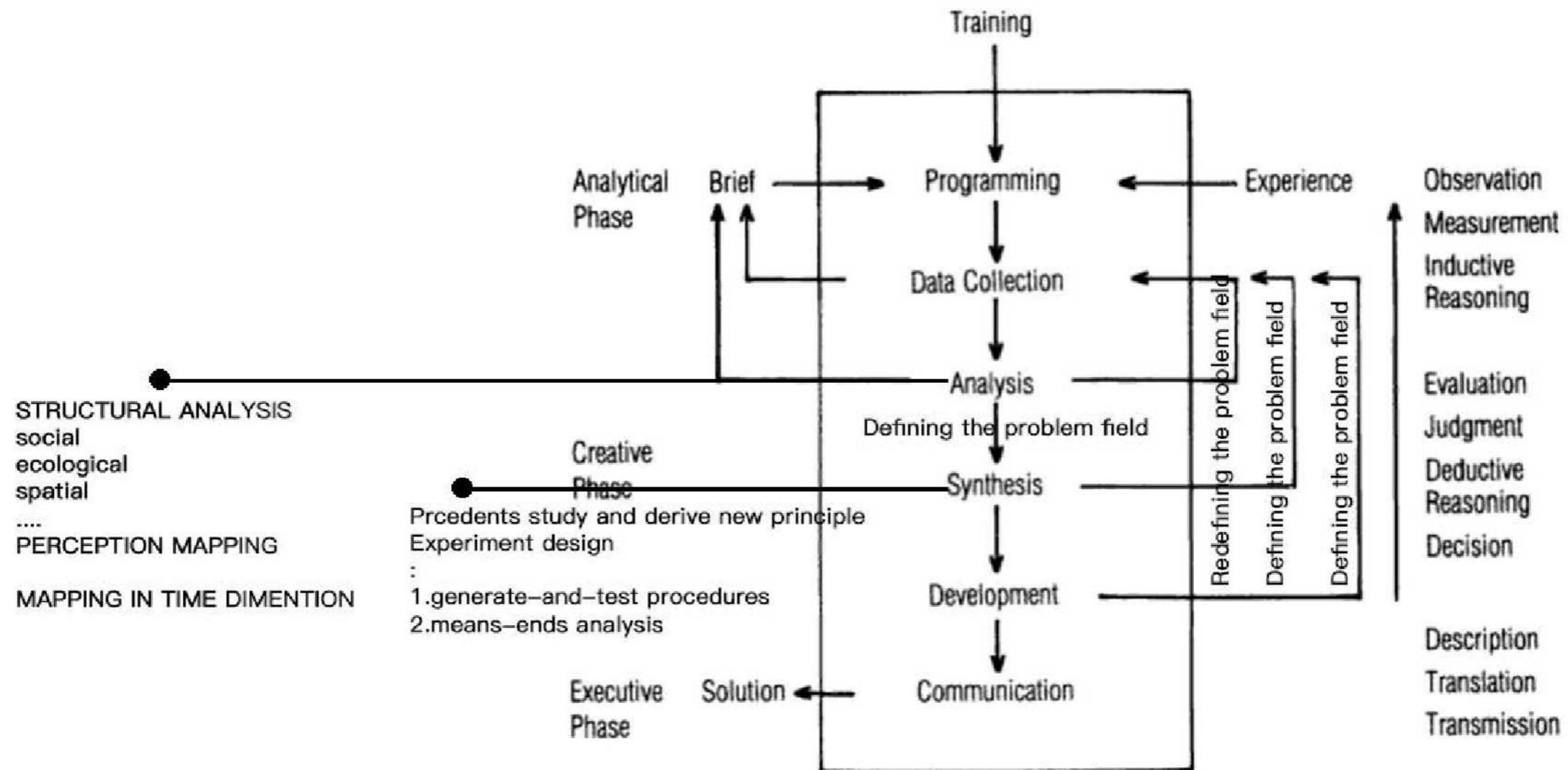
For "fragmentary" problems which is ill-defined,it will develops the toolbox for defining and solve the fragmentary problems .It will show possible elements and structure of the fragmentary problem field.It mainly consists of four types of fragmentation.



#### Scheme development phase

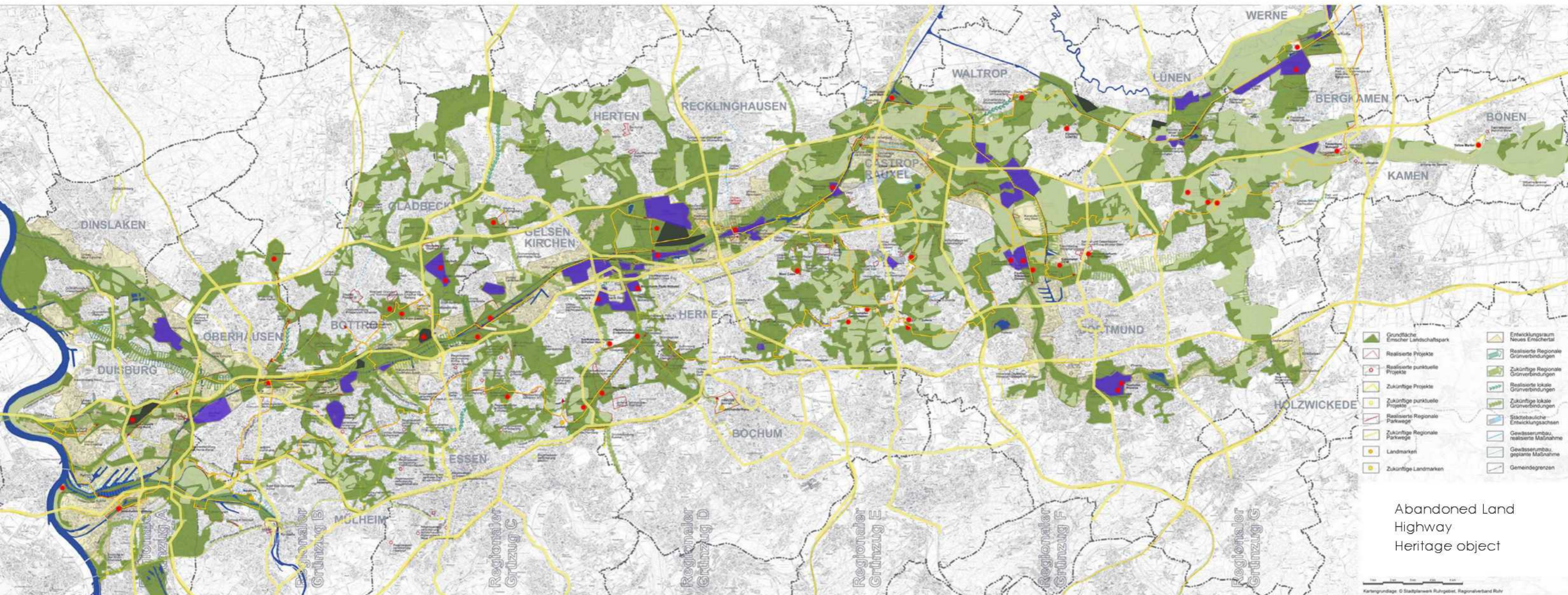
In the part of creative phase,inductive reasoning,deductive reasoning, and design experiments will be used.In the step of inductive reasoning,it will study several precedents about the "integration" of natural and human habitats .It will derive the spatial design principles for "space of flows" and "space of place".

This elaborated "integrating" procedure includes the step of defining ill-defined problems and defining well-defined problems. The demands for development is ill-defined, and "connects" the fragmentary landscape infrastructure is a well-defined problem. (Figure 11)



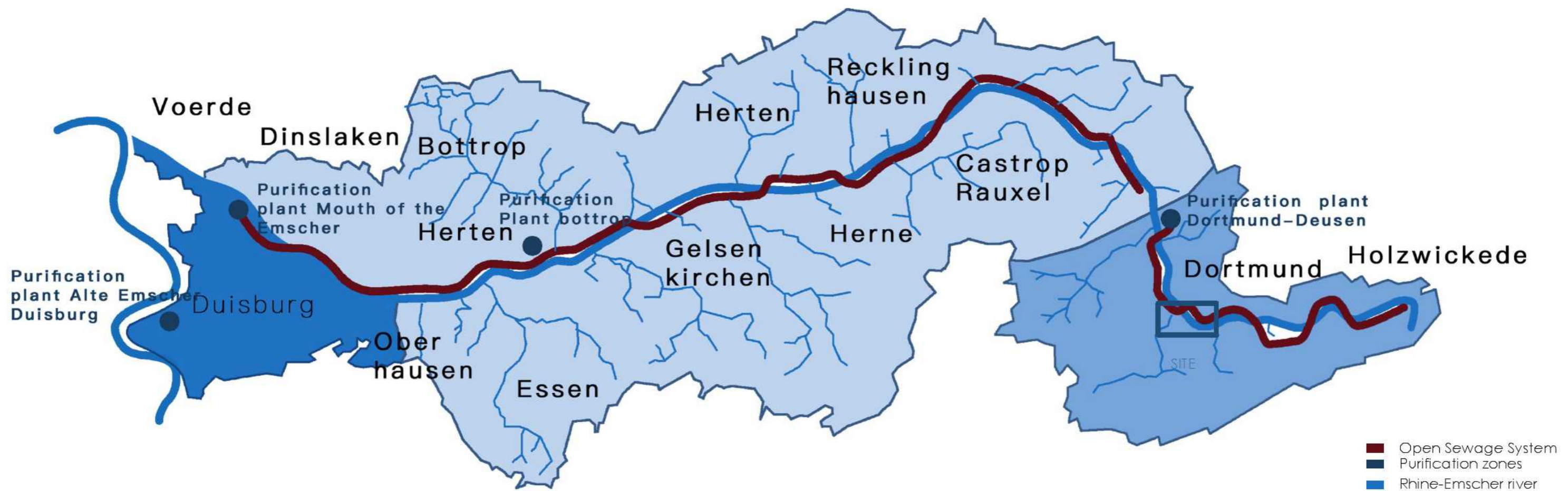
### III DIAGNOSIS





### Spatial analysis of Emscher

In current phase, EMSCHER PARK is considered as the backbone for development. However, this backbone is not well connected, it is consisted of many fragmentary spaces (abandoned land, open space woodland etc.) and it is scared by highway and river.



Watersystem of Emscher

Emscher river is polluted and the polluted water will flow to the Rhine river, there are three purification basins in the Emscher. The site has a high potential ability to purify the water and it should be connected and serve the main Emscher river.



The introduction of the site

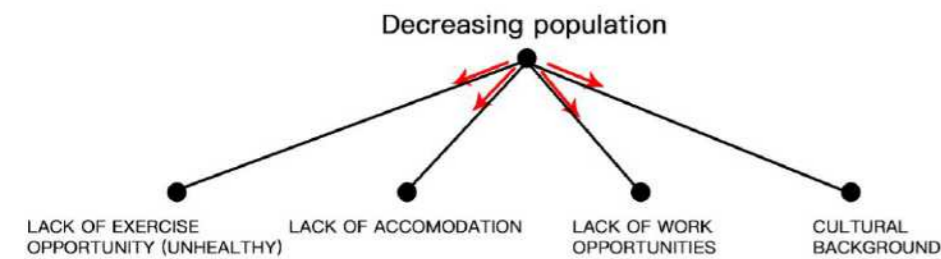
The site is a abandoned industrial land,which is polluted in the age of industrialization.It separates the existing greenstructure.This abandoned land is in Dortmund,it has the potential to recover the shrinking Dortmund.



Two approaches for exploring the ill-defined problem field

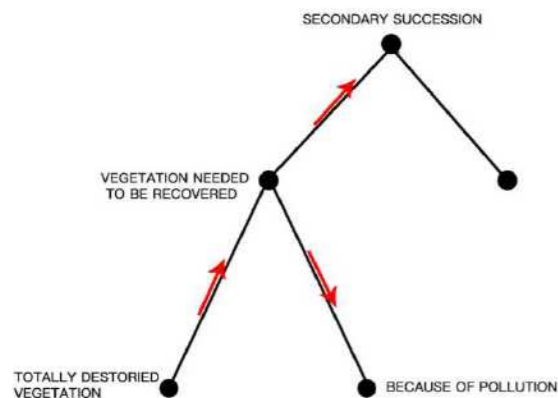
Regarding to the features of ill-defined problem. This problem planning activity consists of repetitive problem definition and redefinition actions. There are two ways for exploring the problem space. firstly the top-down or hierarchical decomposition variety, the solver's attention is directed downward through the lattice structure, creating what tend to be broader subdivisions of the problem at first and gradually moving into more numerous detailed subproblems. (Rowe, 1998)

For example, it can start from a generic phenomenon like decreasing population and divide it to several sub-problem like the lack of work opportunities, accommodations, opportunities for exercising, and etc. When considering lack of opportunities for exercising, it is the problem which can be solved by being more accessible, continual and, attractive .

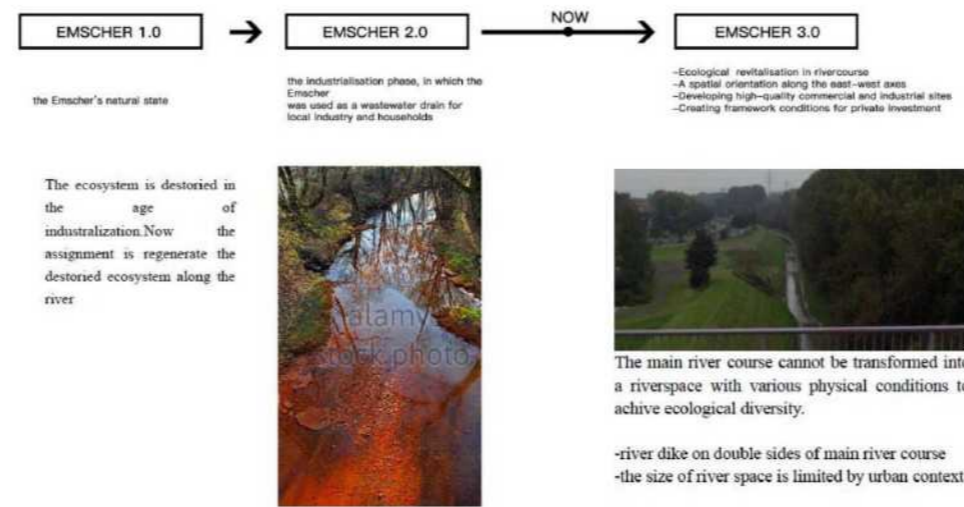


or sometimes the process of discovering a problem's structure may also be initiated by 'smaller ideas.' (Rowe, 1998)

During the field trip in Emscher, I found all vegetation is destroyed, and through the literature study, I know that the European union and German government are trying to recover the ecology of Emscher and treat the pollution caused by industrialization. In this studying process I know both a higher level problem (vegetation needed to be recovered) and the other problem in the same level (Pollution). Finally lead to the defining of the whole process which is secondary succession. The whole bottom-up-problem-field-planning process is illustrated in the drawing below.

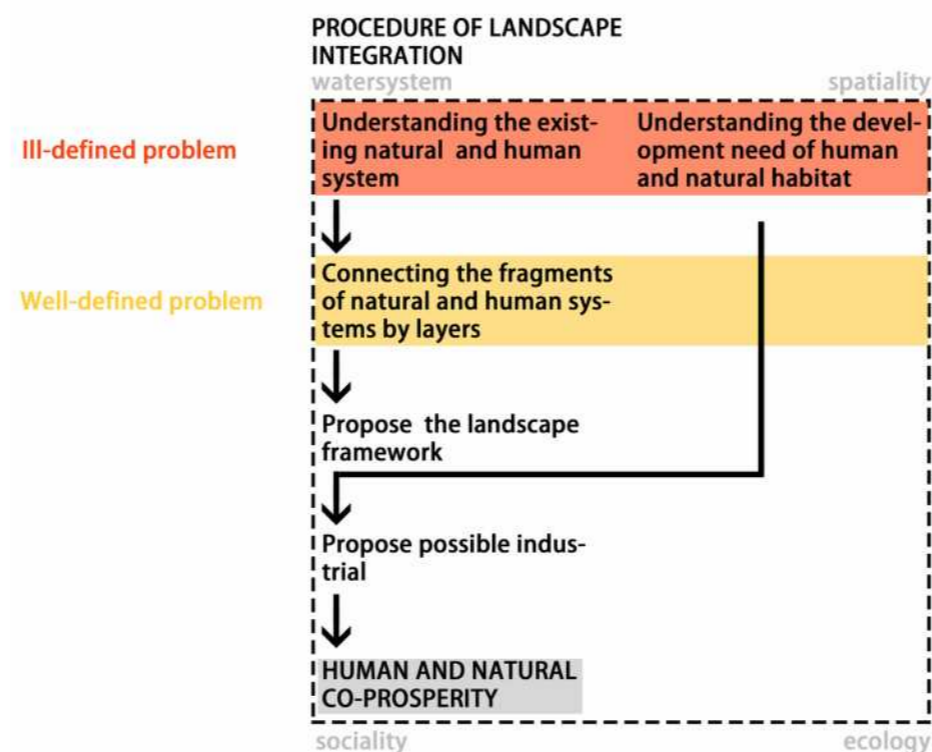


The natural process of Ruhr area  
The ecosystem is destroyed in the age of industrialization. Now the assignment is to regenerate the destroyed ecosystem of Emscher river. landscape (greenstructure) should be considered as the backbone for both natural and economics development. It integrates all human habitats (industrial site) and natural habitat which need development.



1.2 The study on the fragmentation (define the well-defined problem)

In this part it will introduce the method to define and solve the fragmentary problems which are well-defined problems.

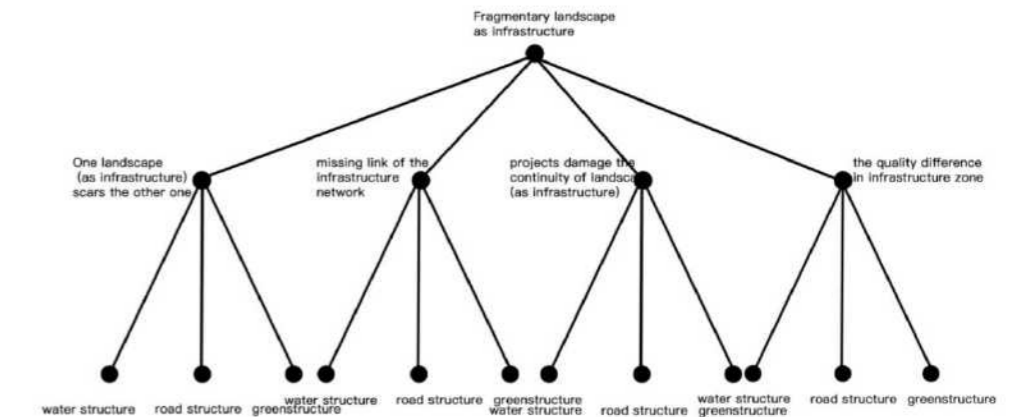


understanding the structure of the well-defined problem space

A problem space can be defined as an abstract domain containing elements that represent knowledge states, some of containing elements that represent knowledge states, some of which are solution states to the problem at hand. (Rowe, 1998)

In considering a simple case where two courses of action are applied in sequence to represent an approach toward a solution to a problem, the structure of the resulting problem space can be displayed as shown in the drawing. There are always two or more available courses of action reaches a solution.

The problem space is consisted of four types of fragmentation. In each type of fragmentation, it includes social, ecological, economics, cultural, and water elements. This illustration of the problem space serves as the diagnostics tool for defining the fragmentary problems of infrastructures (and its zone). According to different problem, it will lead to different solutions.

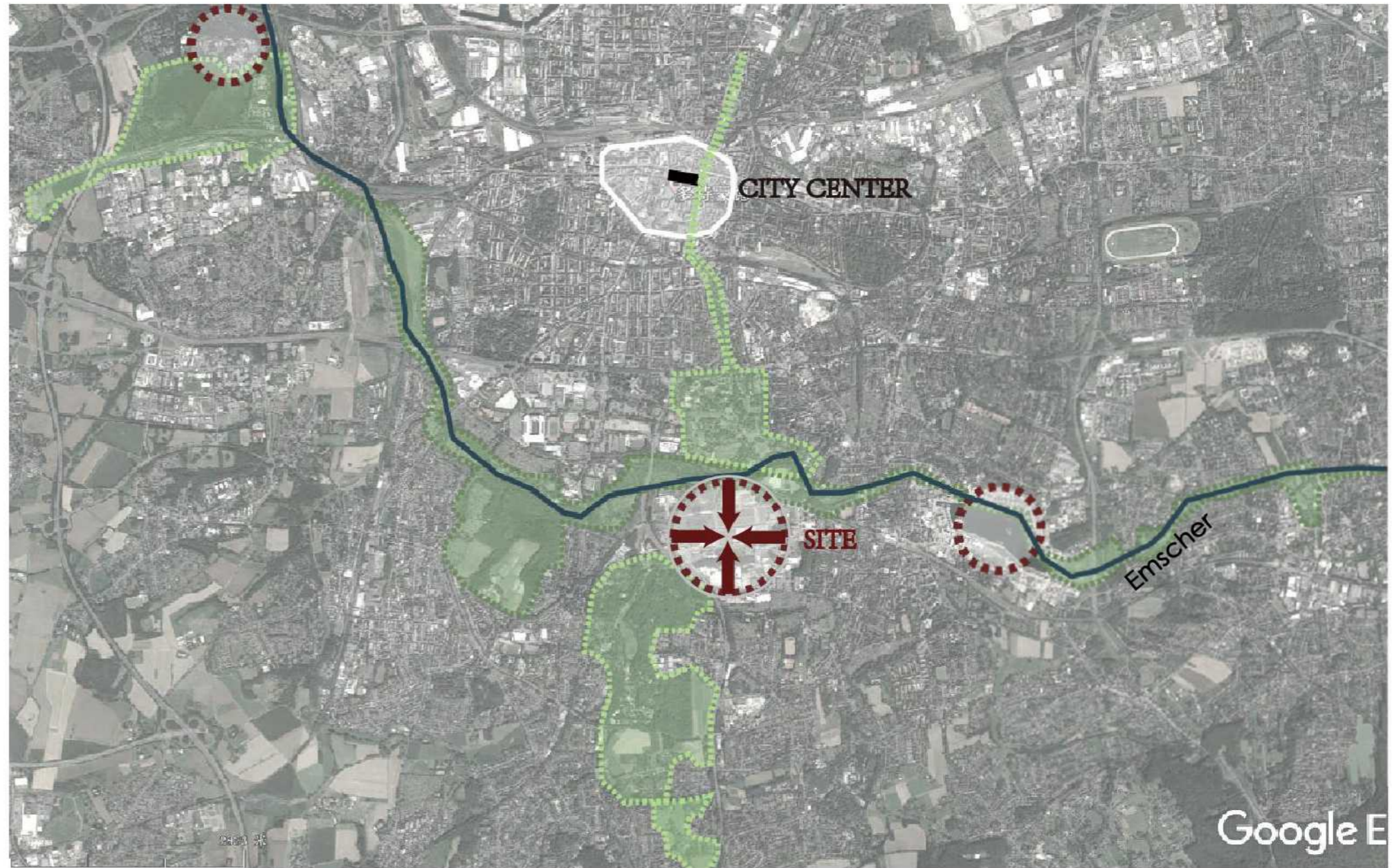


The subproblems in each categories are linked with each other and they have a common or similar ingredient, for example the fragmentary water structure will affect ecology as well. When designers go in halfway of design process they may find a new problem, and this is positive. The solution to those fragmentary problems can be a ecological bridge built on the highway, connect the segregated structure and etc. The design process, from data collection to solution development, is a cyclical process instead of one way thinking.

## OVERALL DIAGNOSIS IN REGIONAL SCALE

### Current situation

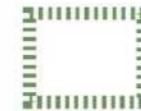
The site is a abandoned industrial land, which is polluted in the age of industrialization. The site is a spatial island. It separates the existing greenstructure. One is from the city center to rural park, and the other one is Emscher structure. The Emscher greenstructure is consisted of fragments in low or high ecological quality. The site causes fragmentation to those habitats



GREENSTRUCTURE  
WITH BETTER  
ECOLOGY



POLLUTED WATER



GREENSTRUCTURE



SITE

ISOLATED SITE

Map decomposing as an instrument to understand the fragments problems in layers

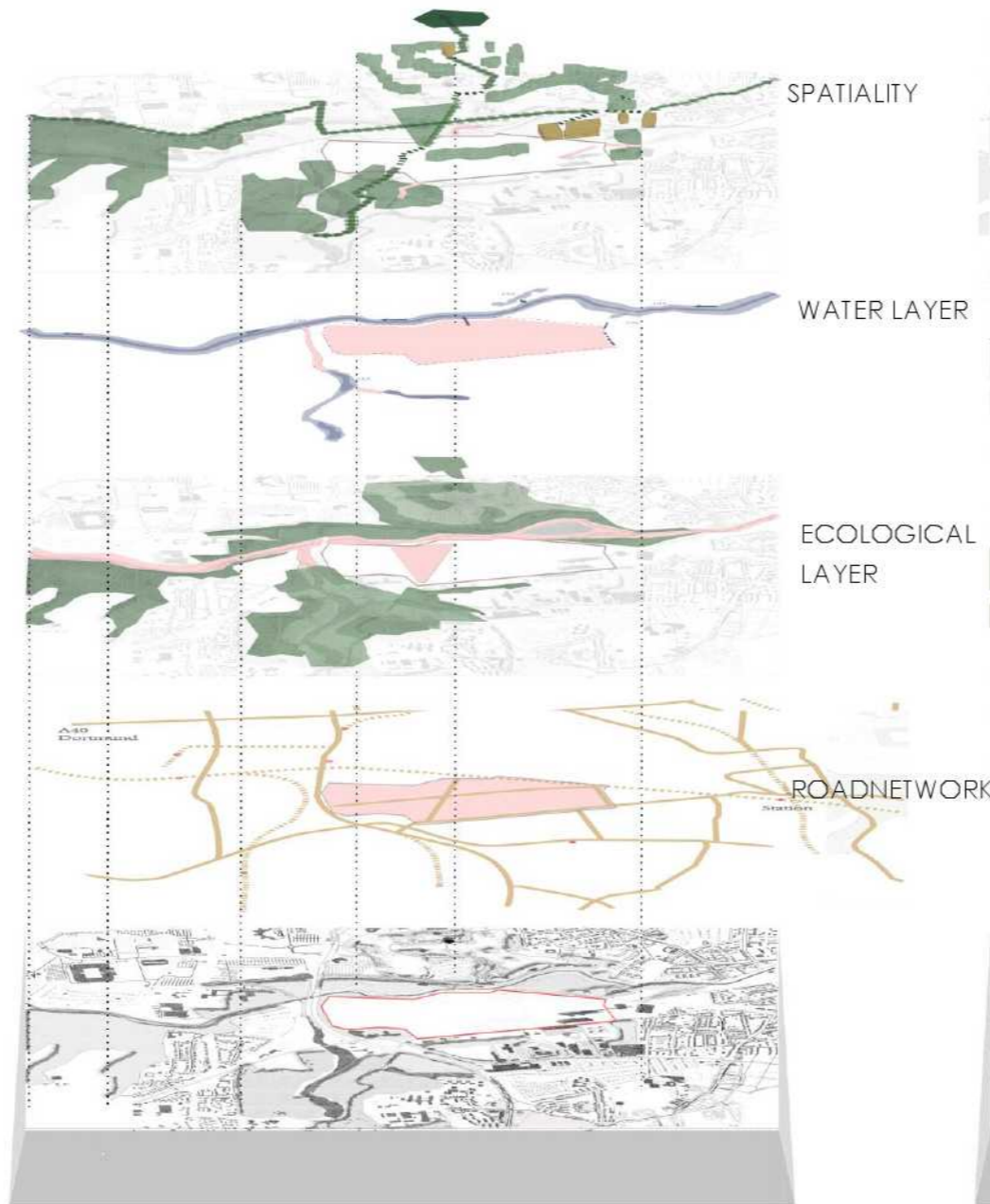
The one goal of the project is solving the fragments problem of different layers in multiply scales.  
The development could be facilitated by integration(connection)

Layer decomposing:current situation

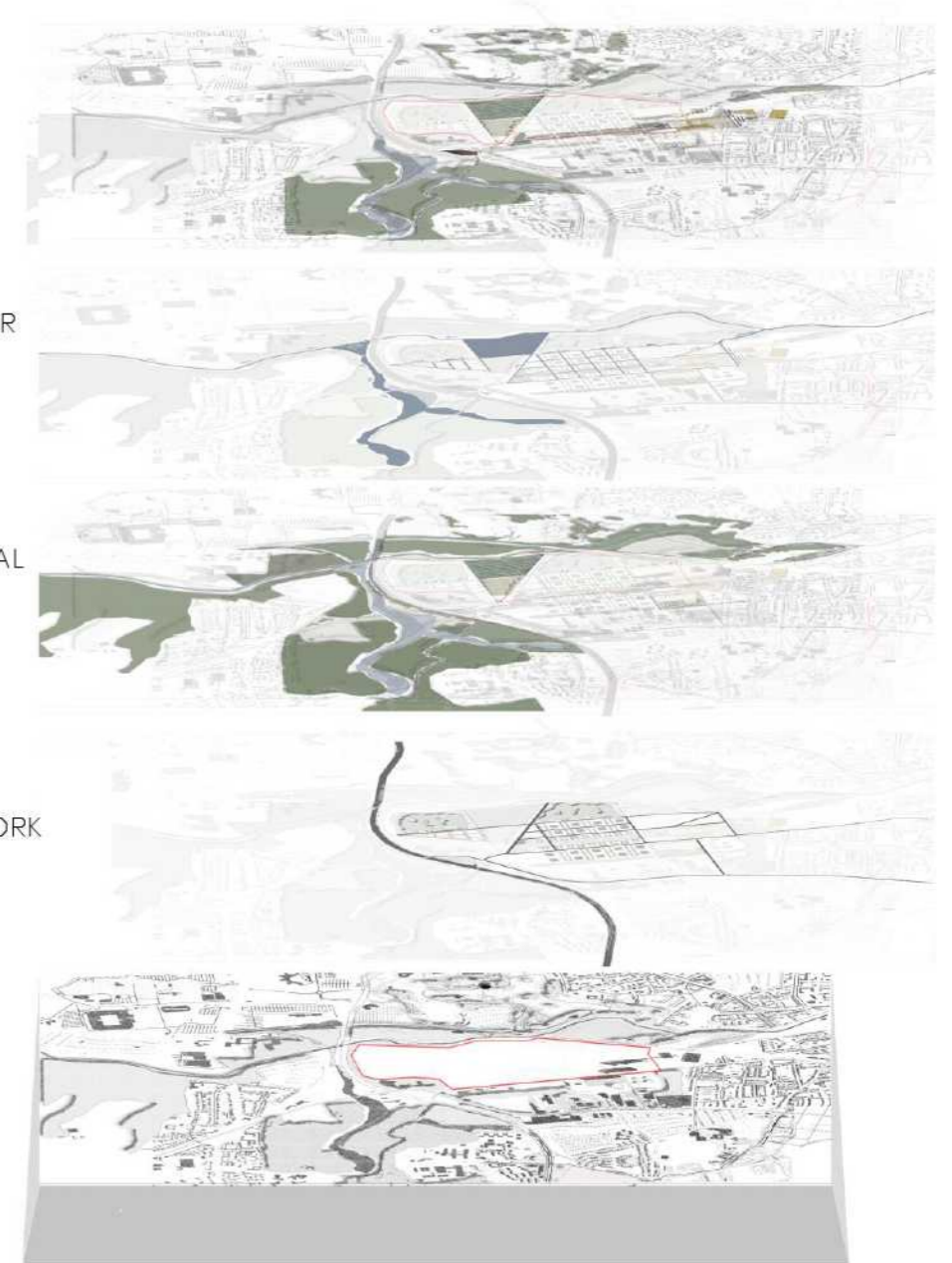
The decomposing layers diagram shows the fragmentation in the spatial layer,water layer ,ecological layer and road layer.In the following part the integration(or connection) will be implemented layer by layer.

The interdisciplinary maps could illustrate a lot of different elements and the interactions between elements. It would be very hard and confusing to read everything in one layer of a map. So decomposing the map into different layers is a clear approach to make the map readable.

### CURRENT SITUATION



### INTERVENTION

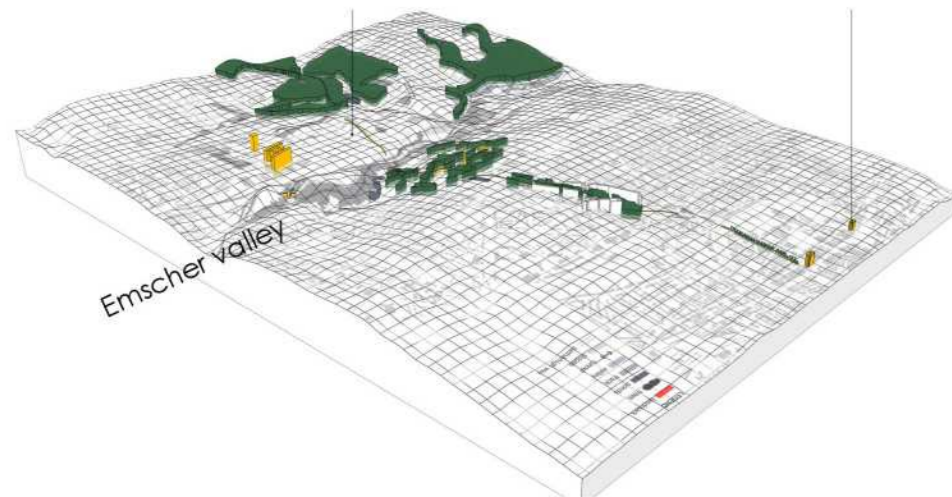
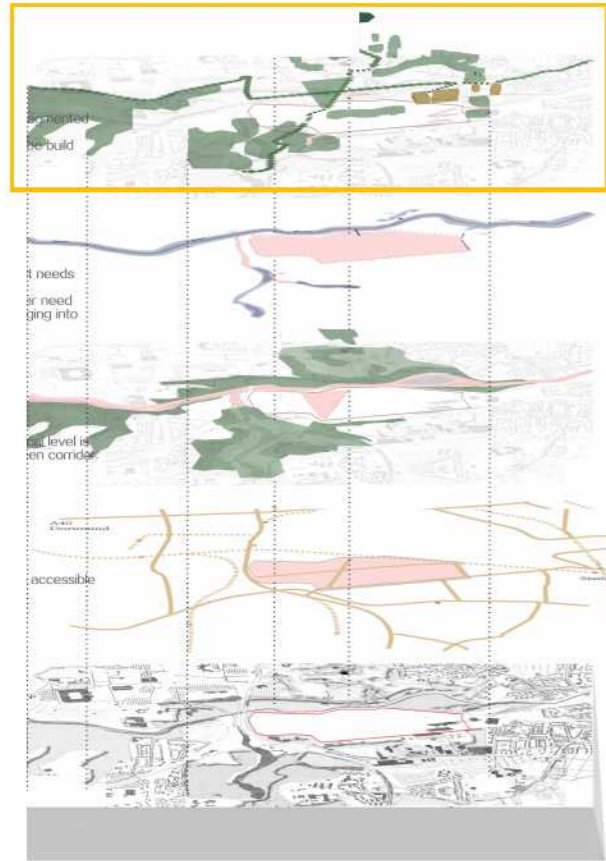


Missing link s or possible intervention

The Spatial study on the green structure

The greenstructure from city center to rural park should present a continuous story,different parts should be highly related with other parts.For example the site is part of the Emscher valley experiencing route.

The study shows the spatial layer in the decomposing layers study,The followings drawing is detailed illustration of this layer



**TREE AVENUE**  
A combination of urban context and green structure.The loose tree canopy as up surface and the facade of building as left and right side surface,which form a walking space together.

**Enclosed space**  
Both in visual and physical aspects,the space in this phase is super enclosed by big cluster of trees and continuous facade.

**LANDSCAPE THEATER**  
The park located on the slop.The gap between small clusters of trees force people to look out in certain direction.Those small clusters also define an relative enclosed space in which different functions are facilitated.

**SPATIAL ISLAND**  
The height difference and trees as barrier result a spatial island.And the scale of the island overwhelm the human scale,which facilitate the assignment of a new spatial division

**FLOODING PLAIN**  
Flooding plain is the only open space in Rombergpark,which in a relative low height level.

### Valuable visual elements

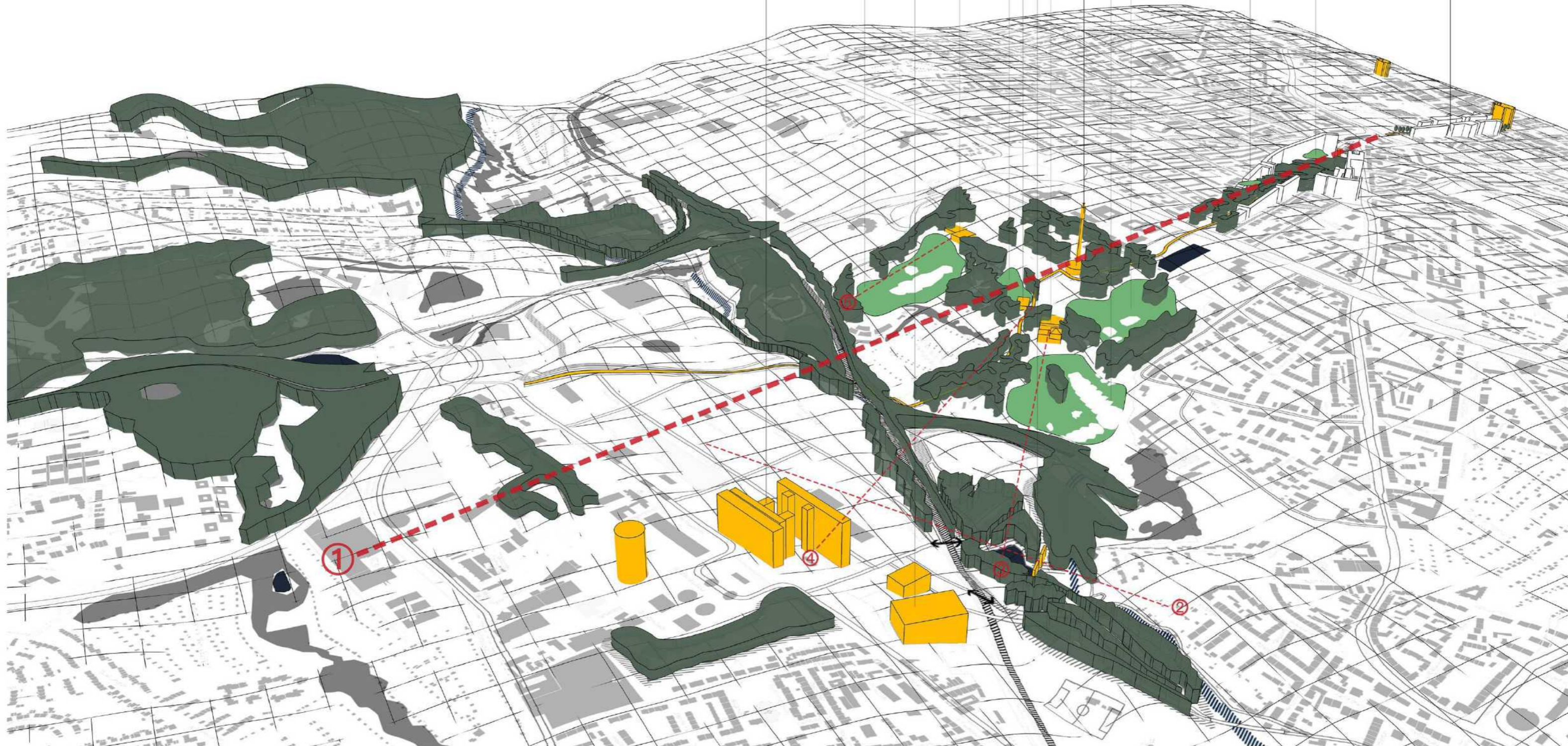
The diagram shows Valuable visual elements in the Valley geometry which will influence on the main design decision. For example, those visual elements will decide the main direction of people's movement (road network) in the site.

### FACTORY SKYWALK

### SKY TOWER

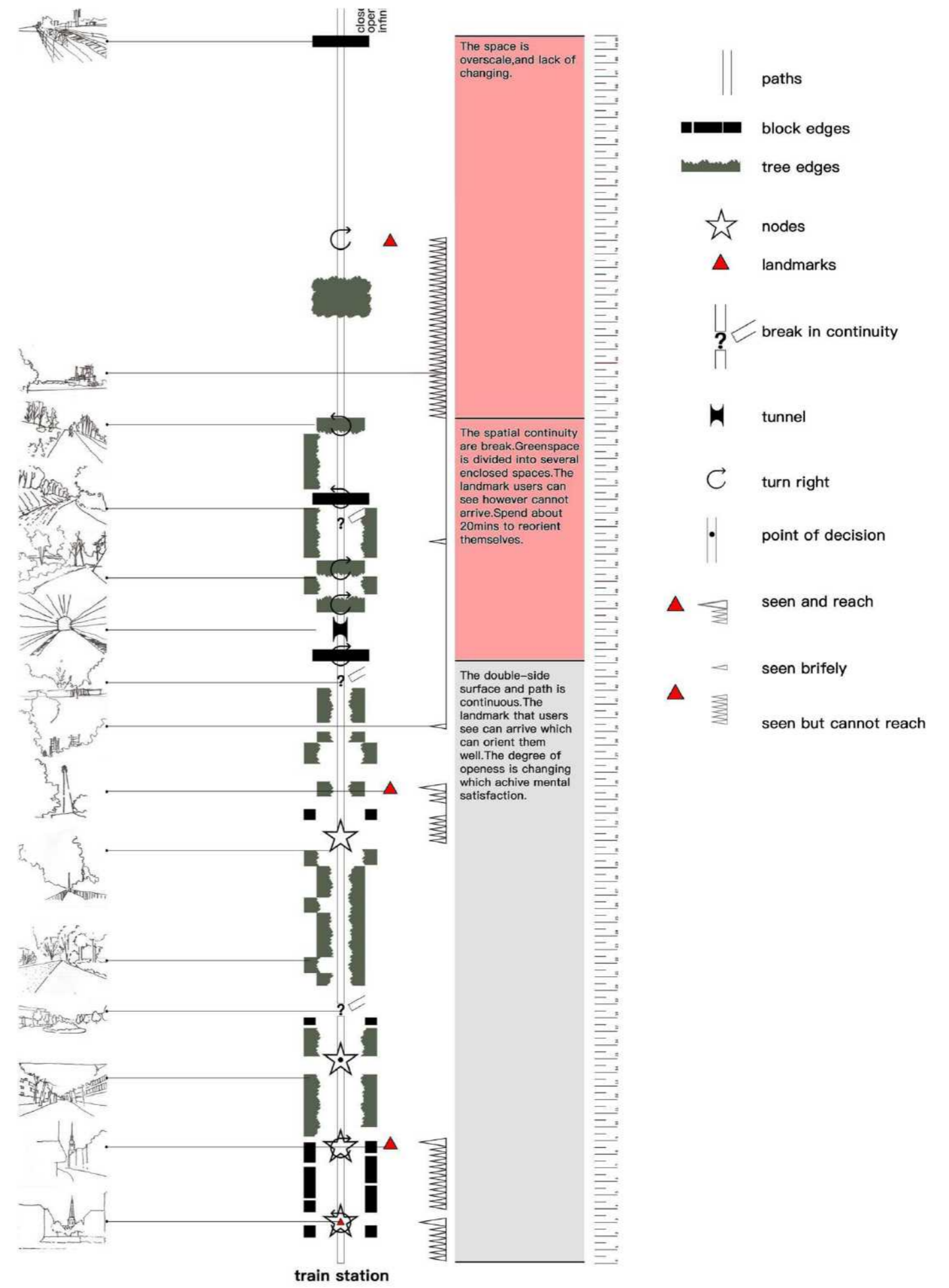
### COMMERCIAL STREET

meadow entrance hall garden garden cafe restaurant historical bridge meadow garden playground playground



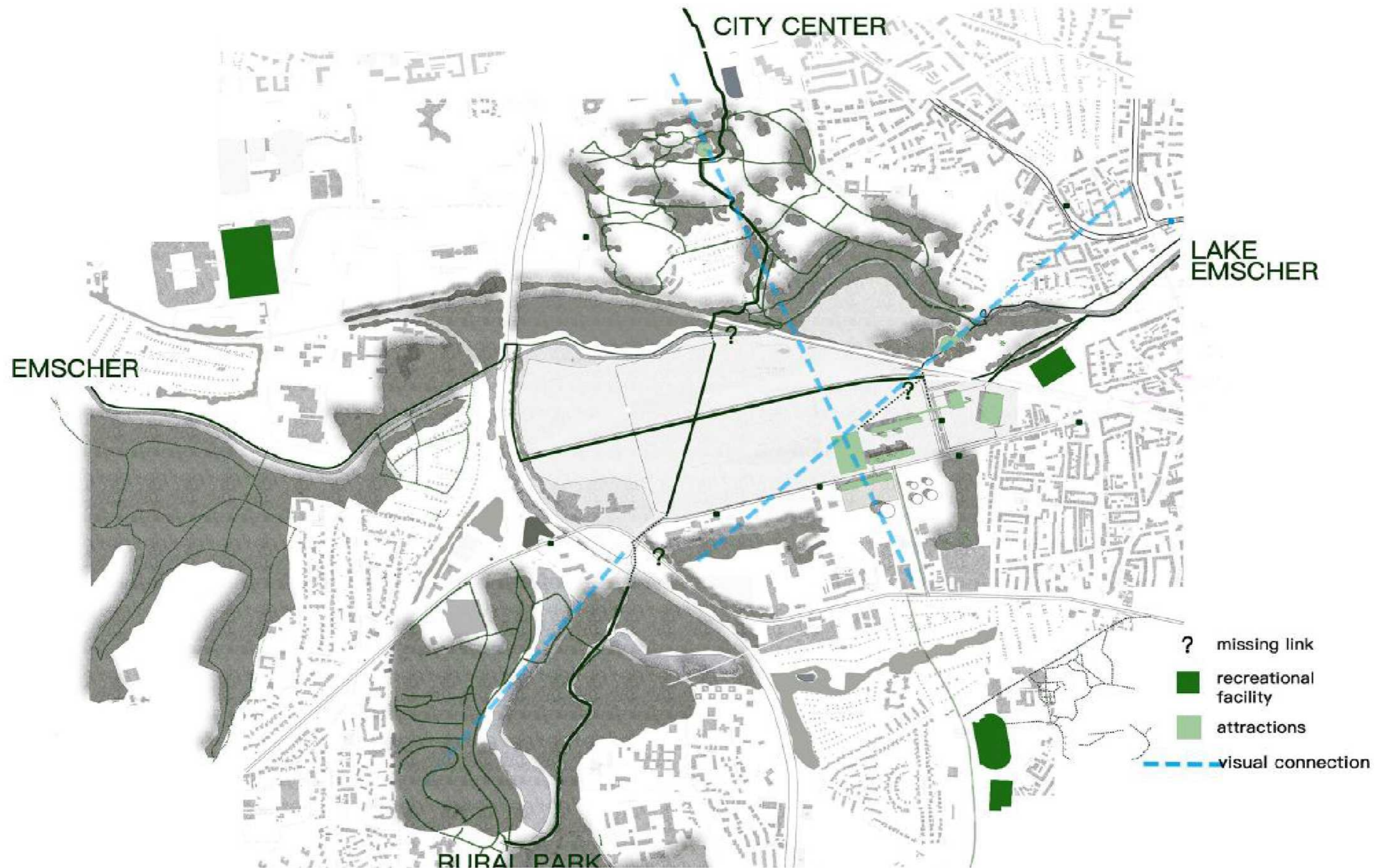
Perception study of the greenspace

The diagram shows the perception study of the greenstructure. The greenstructure is a coherent story line, it should be continual in perception level. However, the conclusion is that people are hard to orient themselves and see the continuity in some part.



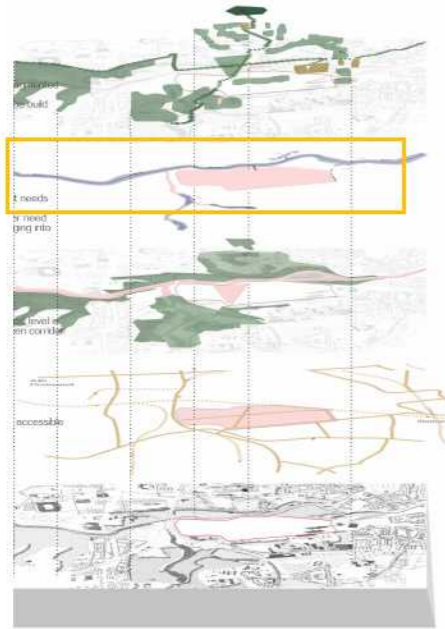
The conclusions of the spatial study

For the previous analysis, this diagram shows the conclusion of the fragmentation and visual potentials. They will be considered as important arguments in the whole design process.



The Study on the watersystem

The study shows the water layer in the decomposing layers study, The followings drawing is detailed illustration of this layer



Problematic

1. A link between Emscher river and high level habitat is missing. Those high level habitat have the potential to relieve the pollution caused by the old industrial site.

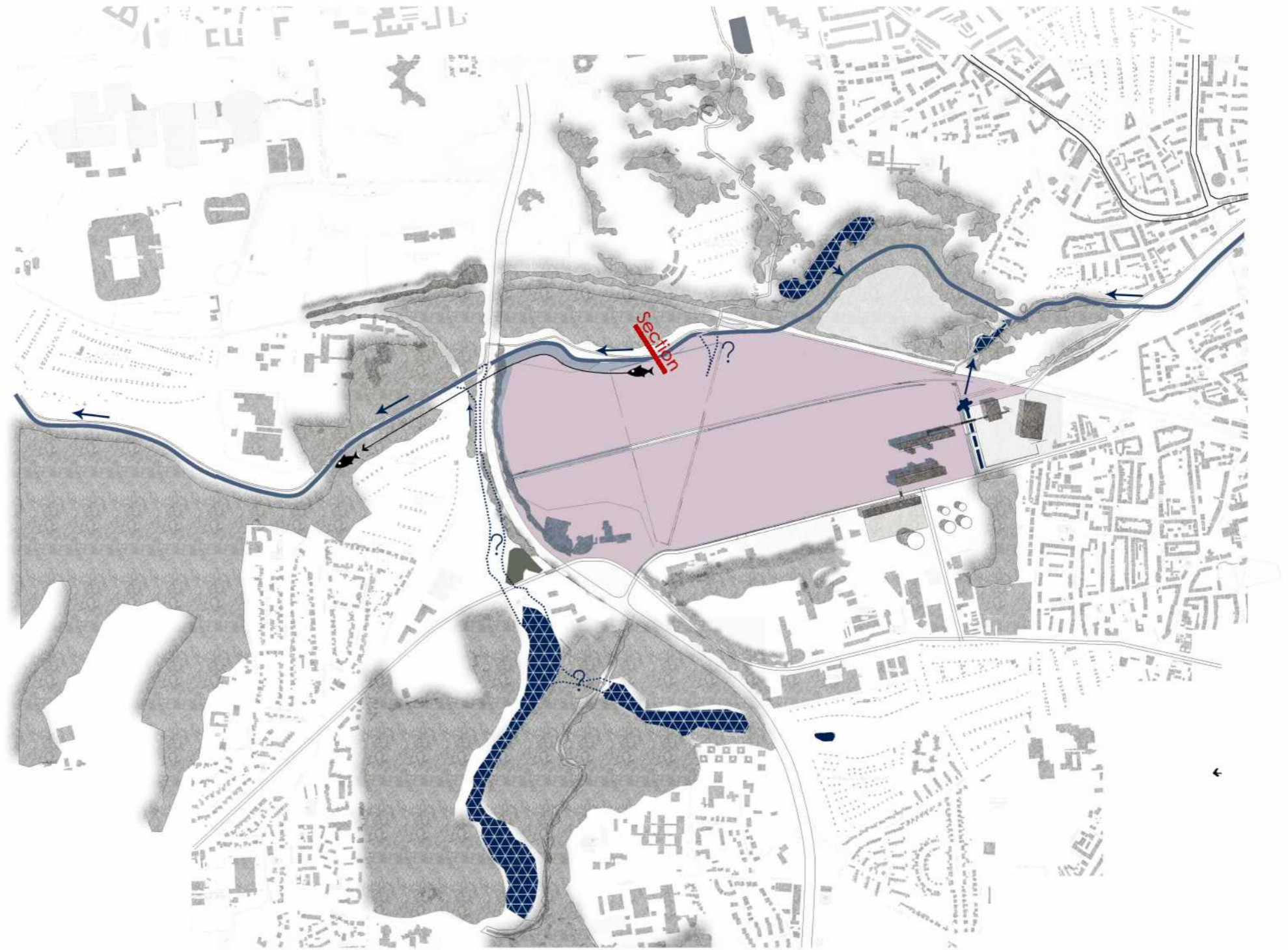
Emscher lacks surface water and groundwater resources in the branch of Emscher river. The industrial water supply relies completely on importing from neighbor basin, and people are hard to touch the water

The mix water source in sewage system: Waste water and urban storm water, natural source

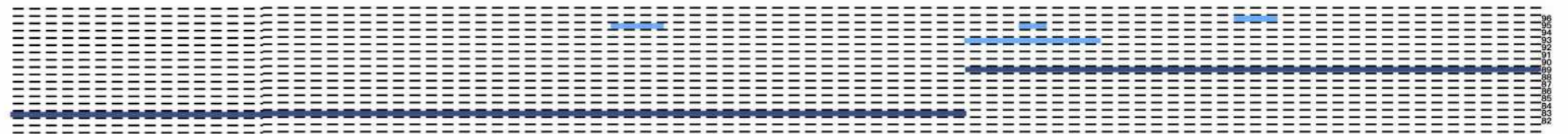
The purification ability of nature is not enough

5. Mining subsidence

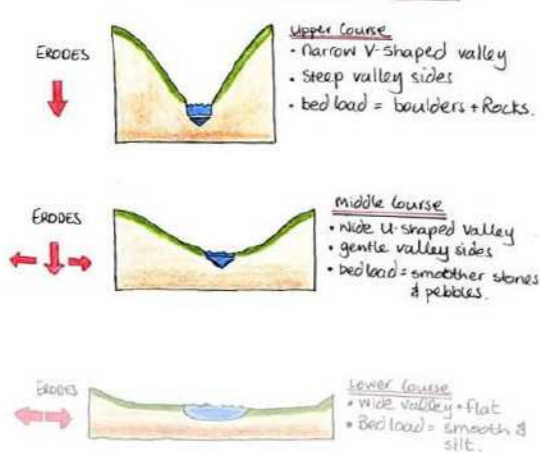
6. most section of the Emscher is the first one and the second one. There is a limitation for the river space



WATER HEIGHT



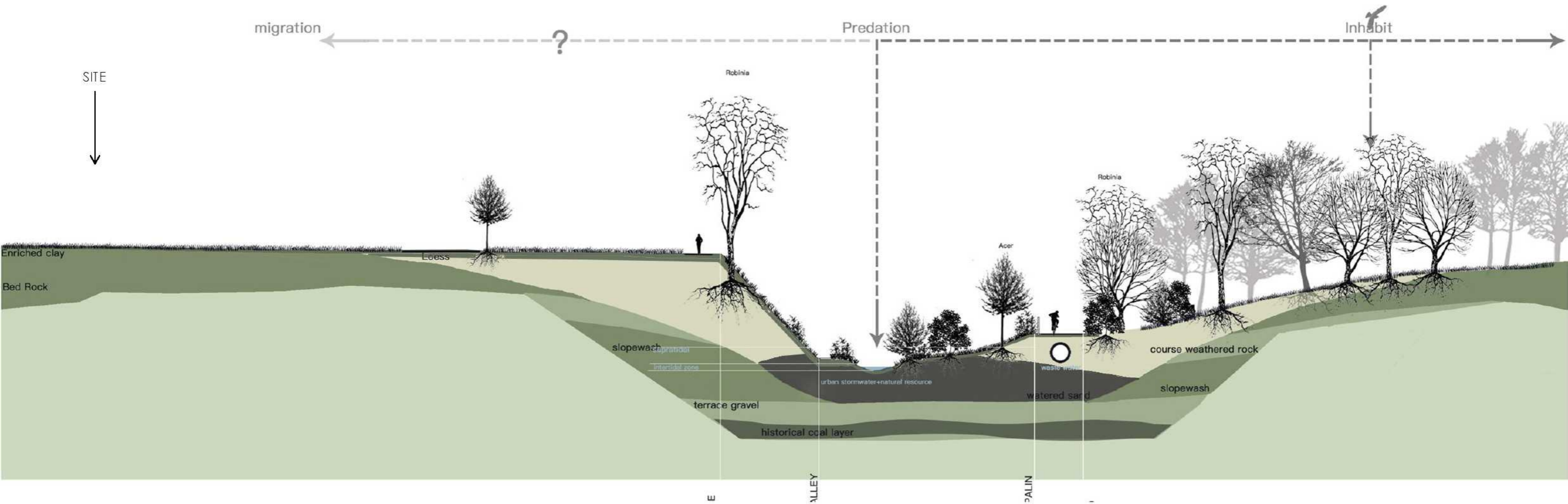
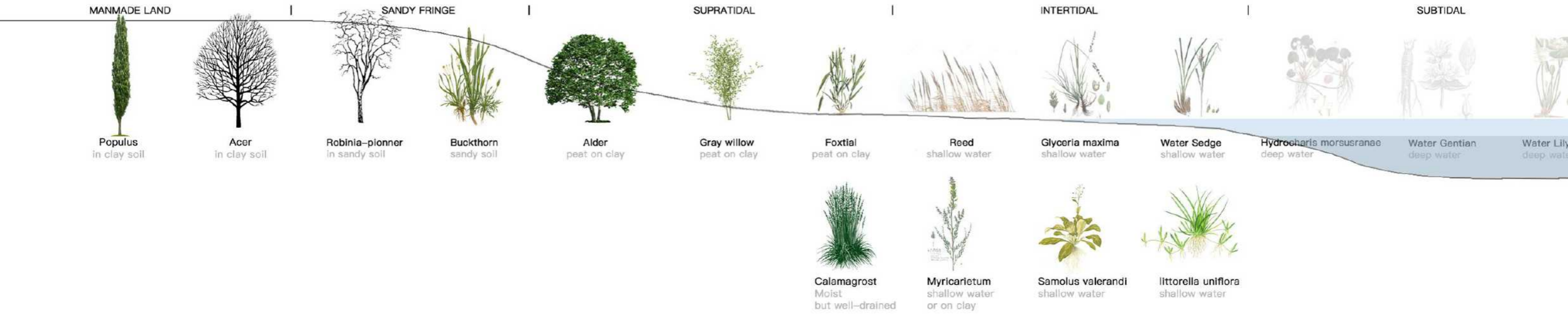
RIVER VALLEY CROSS-SECTION



- Water polluted by industrial soil
- water storage basin
- missing link
- fish immigration
- discharge point of rainwater in polluted field
- water flow
- emscher river with bad ecology situation

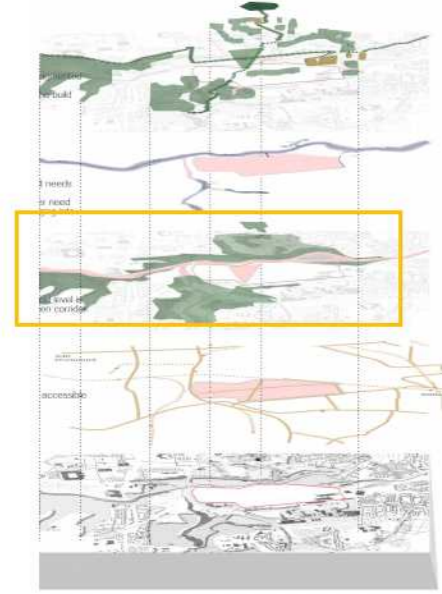
The section of Emscher valley

The water level in Emscher is low, People are hard to have interaction with the water. The intertidal zone is very limited. This causes the vegetation layer is missing. This cause the low recovery speed of Emscher river.



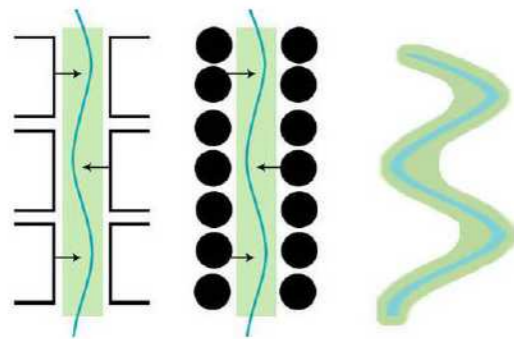
The Study on the ecology system

The study shows the ecological layer in the decomposing layers study, The followings drawing is detailed illustration of this layer

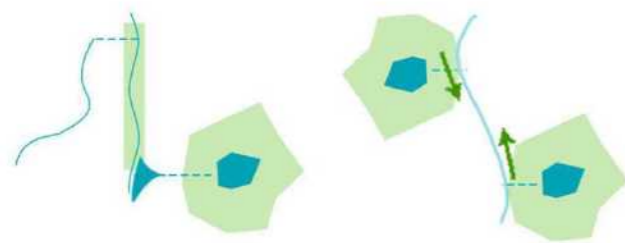


Problematic

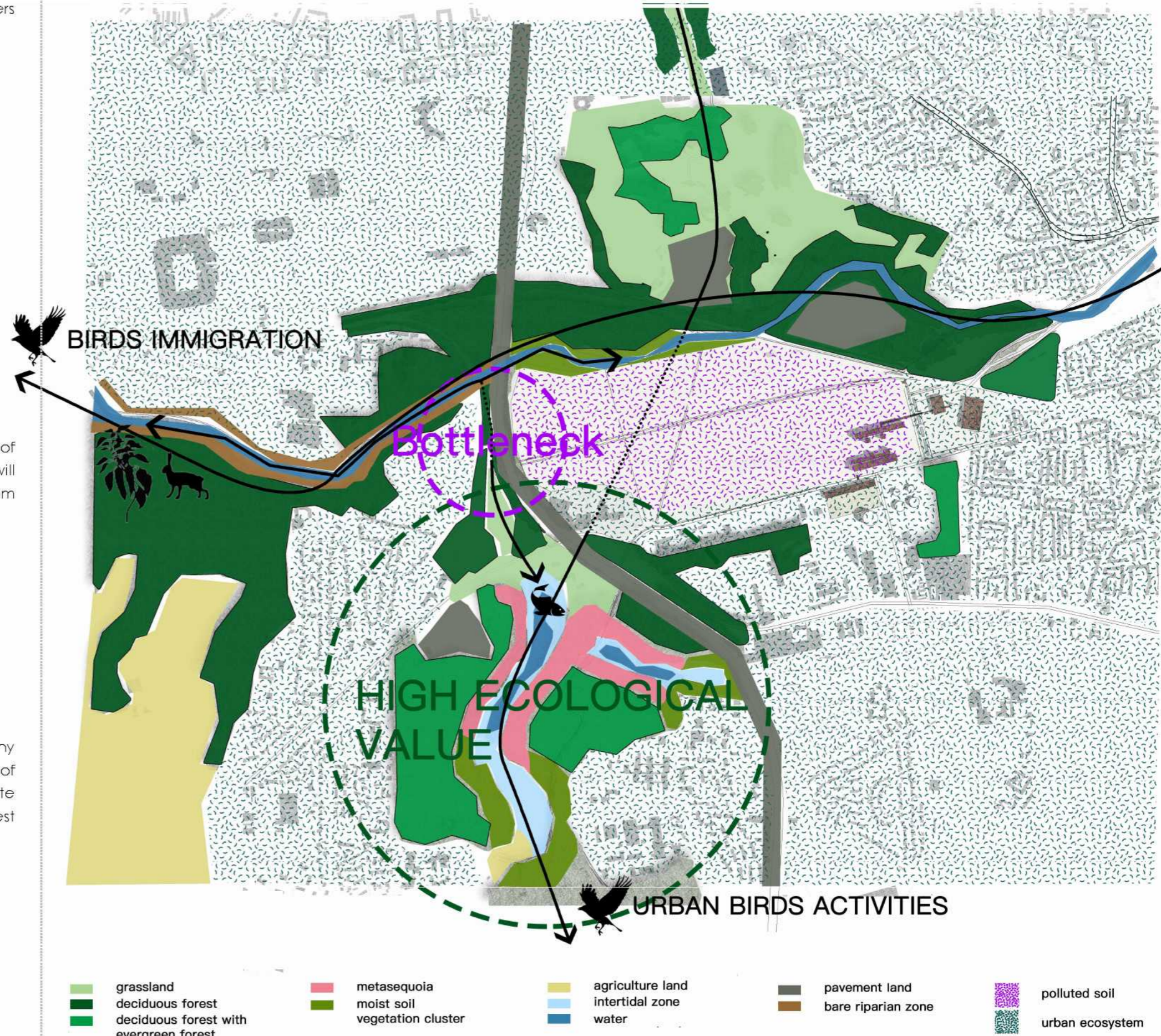
The size of ecological patch is limited because of the squeeze of urban context and other land. The size of ecological patch will determine its ecological level. The Emscher river lacks of enough room for evolving into a higher level habitat.



It should connect the supplementary habitats to the Emscher as many as possible. The flora and fauna colonization will improve the quality of Emscher river. Those supplementary habitats could create extensive, damp habitats in which animals will find spaces to feed, rest and reproduce.



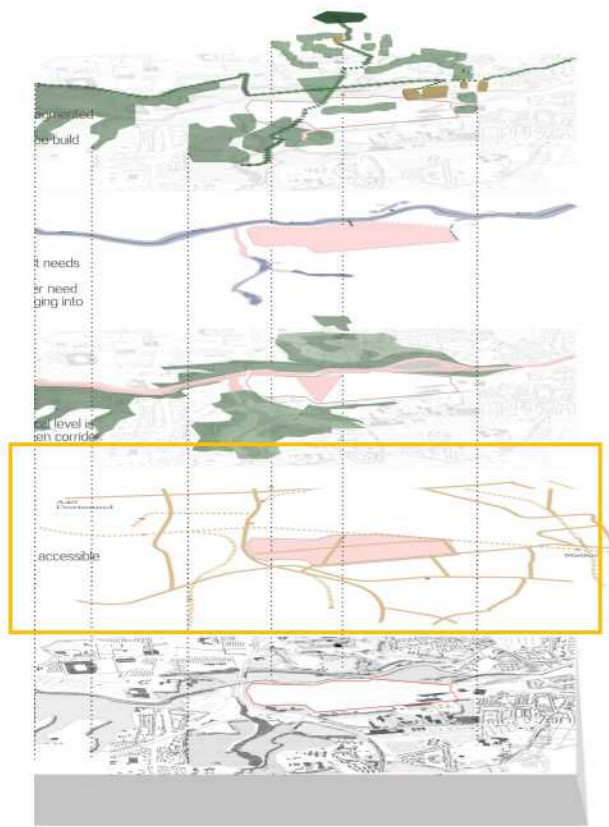
However The important ecological connection is missing near the site. The immigration route is not connected.



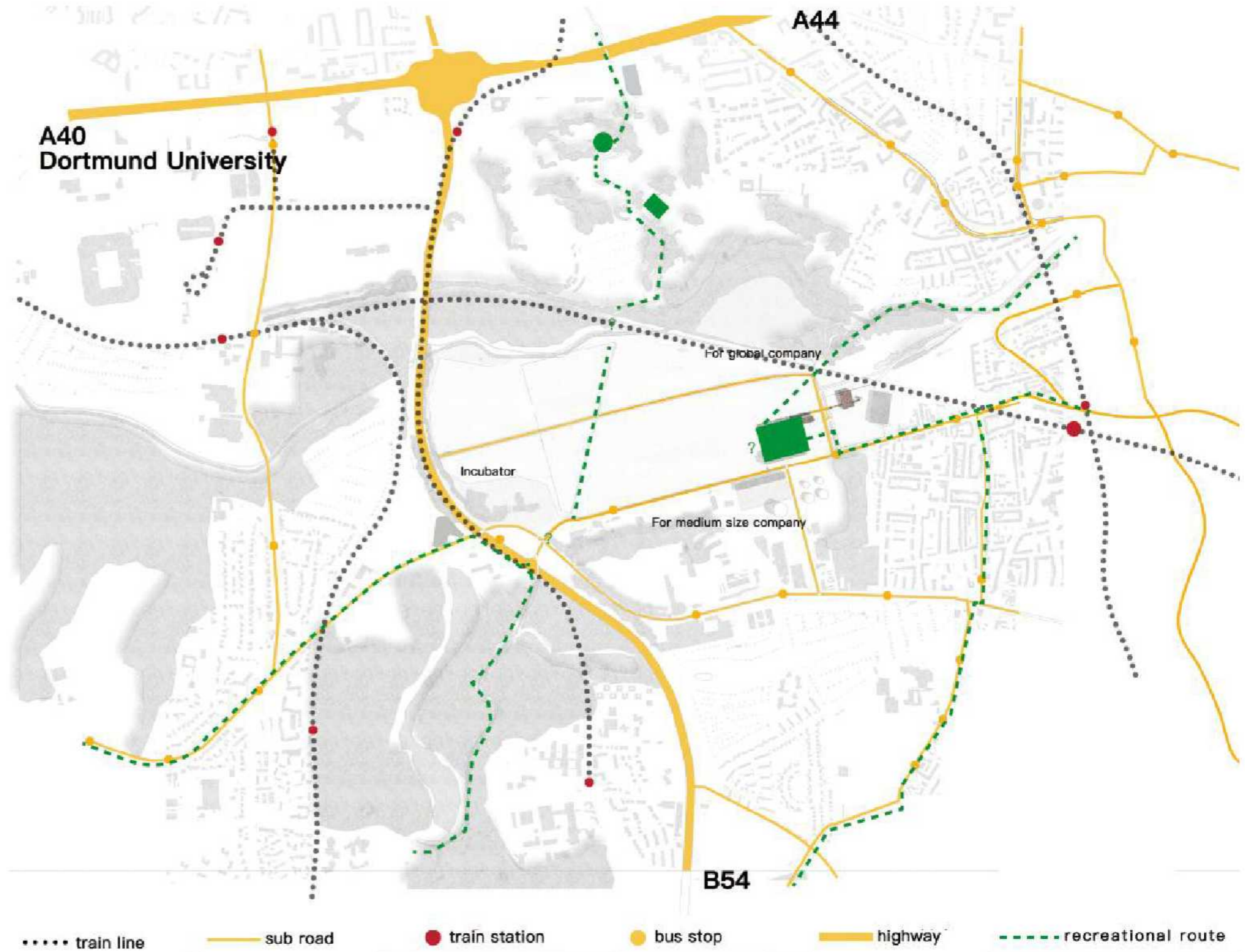
- grassland
- deciduous forest
- deciduous forest with evergreen forest
- metasequoia
- moist soil
- vegetation cluster
- agriculture land
- intertidal zone
- water
- pavement land
- bare riparian zone
- polluted soil
- urban ecosystem

## The Study on the road infrastructure

The study shows the road layer in the decomposing layers study, The following drawing is detailed illustration of this layer



The site is located besides a international highway. It is partly connected with public transportation and the slow traffic system. However, a complete road network inner the site is still missing and it should be well integrated with the larger traffic system so that it could provide opportunities for economics development.



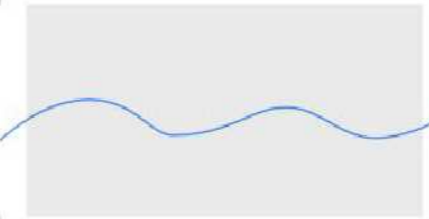
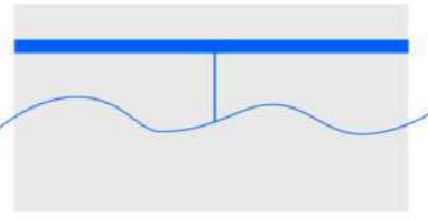
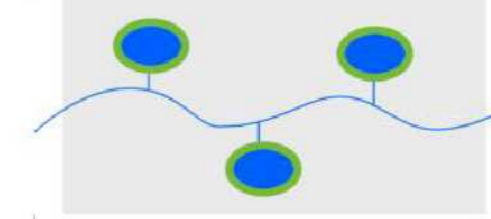
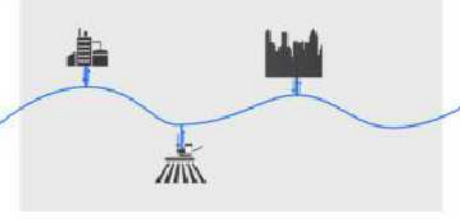

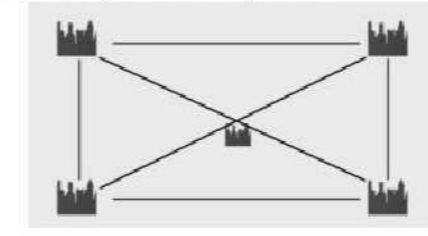
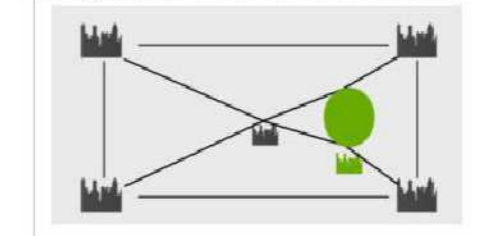
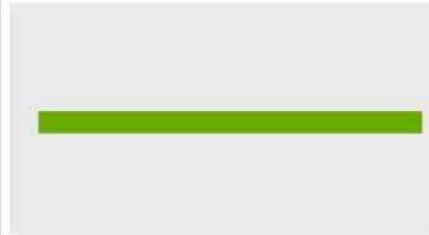

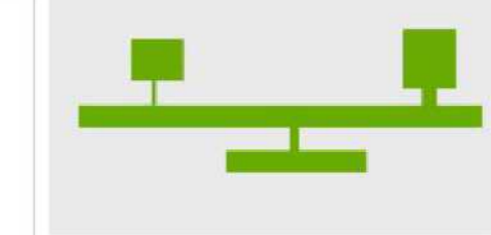
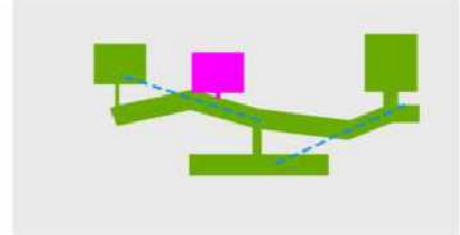
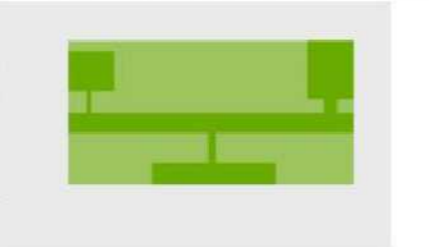
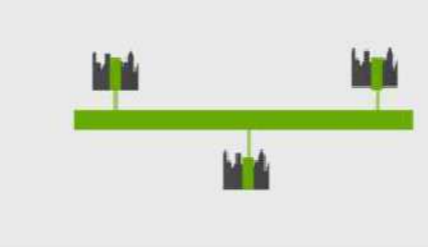
## IV DESIGN APPLICATION

## 1.1 PRINCIPLES

Principles for connecting the fragments.

According to the existing precedents, Some principles about the landscape integration are derived.

Those principles can serve as a toolbox and be applied in other projects. For example, the Emscher river need ecological recovery, then the principle of “integrate with natural water basins” can be applied. (see the yellow mark)

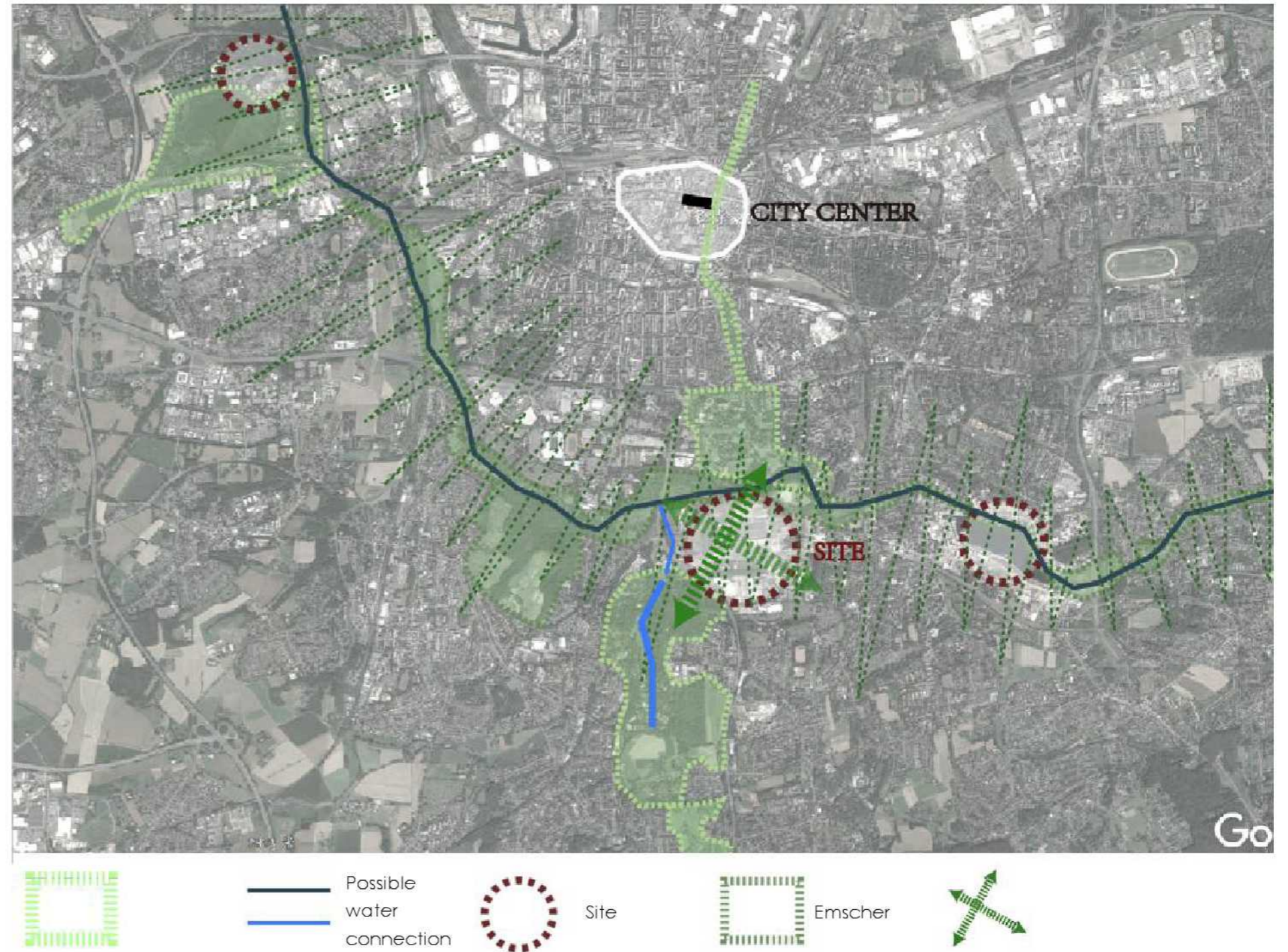
waterflows				
integration with other water system	original	integrate it with a bigger and higher watersystem	integrate with natural water basins	integrate with agriculture land, urban or factory
				
	normal water flow, water level and water quality	water level will be heighter. a faster water flow, which may cause a better water quality or more sediment in the water. a higher flooding risk. better ecology condition	collect more water, higher water level, lower flooding risk, better ecology condition, better water quality.	less water, lower water quality, worse ecology condition
transportation flows	original	higher degree of integration	integrate with natural resources	
				
		economics development, and share the urban resources	sustainable economics development, a stronger flow because of recreational purpose, better view of road, new nature-based industrial is developed along the network	
ecological and recreational flow	original	integrate with other greenstructure	integrate with other habitats	integrate with other habitats and playgrounds share the visual resources
				
		palm shape green structure can catch more creatures	better ecology, a stronger creatures flow	better ecology, build a spatial sequences for recreation, a stronger recreational flow
	integrate with other habitats and result a wider green corridor	integrate with urban greenstructure		
				
	better ecology, a stronger creatures flow	stronger recreational flow nature based happiness, better urban ecology, better economics		

## 1.2.APPLICATION OF PRINCIPLES

### Overall Scheme

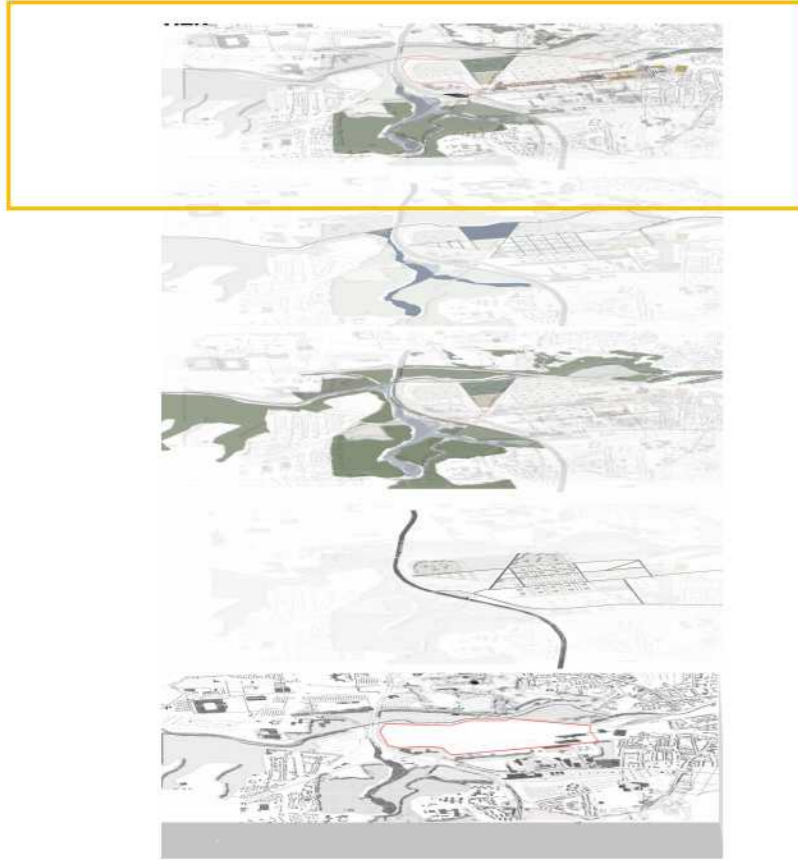
The project will transform those fragments into a continuous green backbone and contribute to more intensive flows in the backbone. Those separated habitats and fragmented water system will be connected and thus facilitate human and nature development.

Based on the previous decomposing map.The landscape integration will be implanted layer by layer



## Intervention on the green structure

The diagram shows the intervention on spatial layer in the decomposing layers study, The following drawing is detailed illustration of the intervention.



The spatial fragments of greenstructure will be connected. The triangle is a landscape theater which looks at the bottom of the valley and the rising mountain.

The triangle is also a bearing structure for the bridge. It separates the working area with recreational space.

There are several pocket park will be arranged along the recreational route.

There are visualization of spatial layer in the video and elaboration design part.

## PRINCIPLES

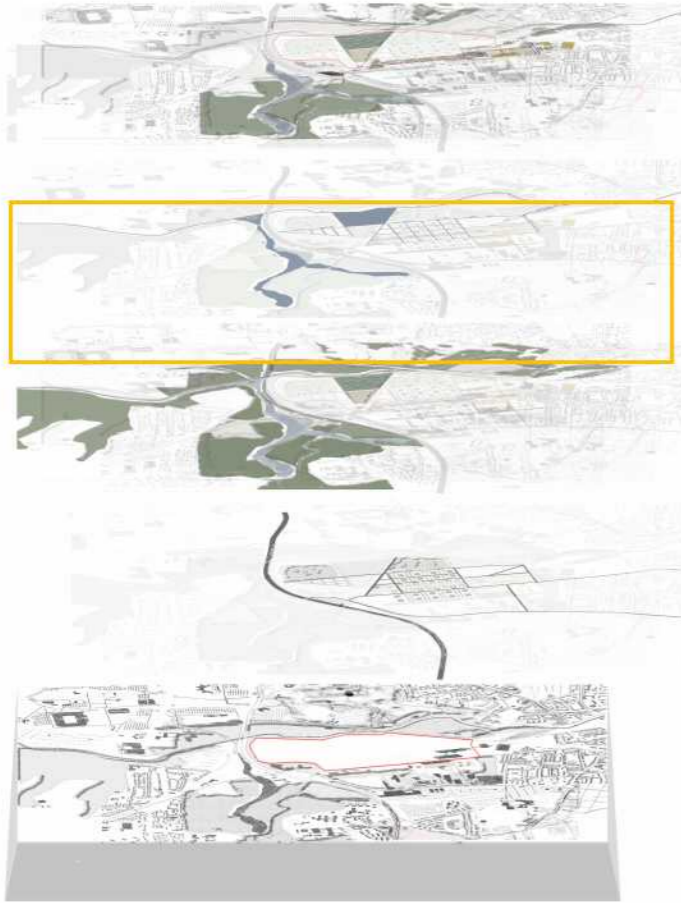


## APPLICATION



## Intervention on the watersystem

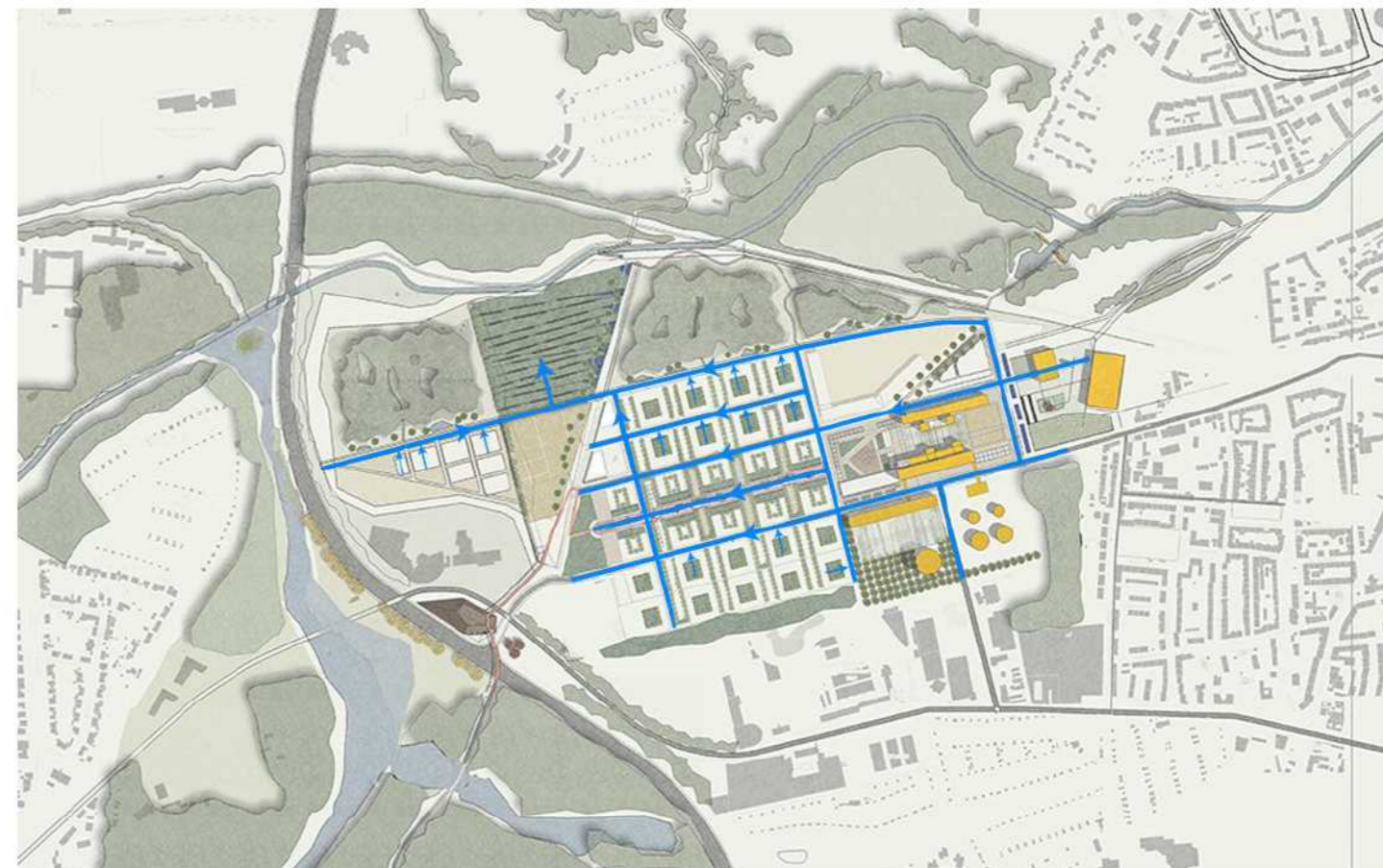
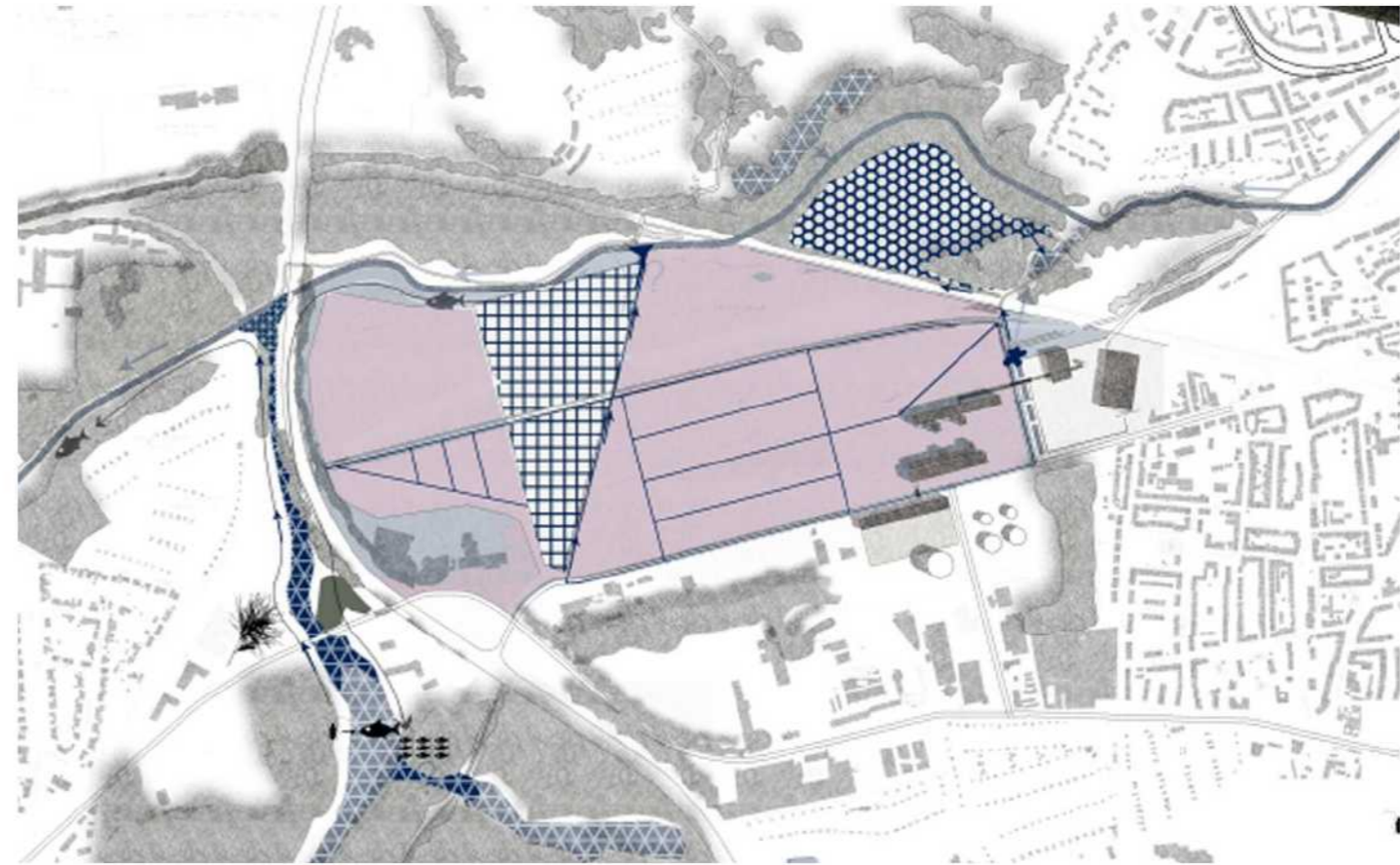
The diagram shows the intervention on water layer in the decomposing layers study, The followings drawing is detailed illustration of the intervention.



The Emscher river will be connected with a larger water structure and thus improve the water quality. The Emscher will have a better water resilience. More water will be collected in the main course. The fish have more supplementary habitats when they immigrates now.

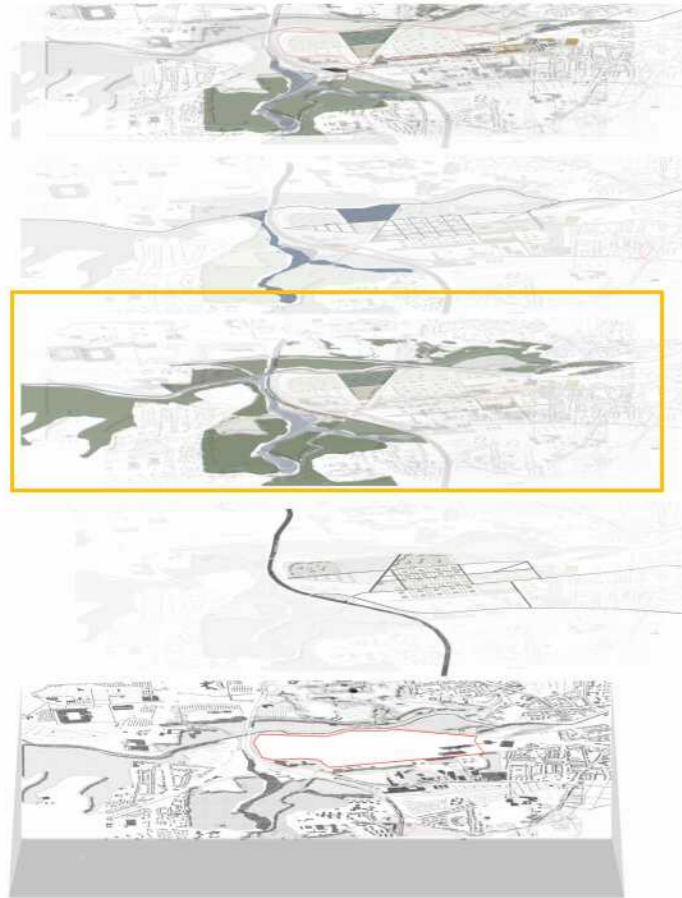
All the rainwater in the site will be first collected in two purification place and then be discharged into the Emscher river.

## PRINCIPI FS



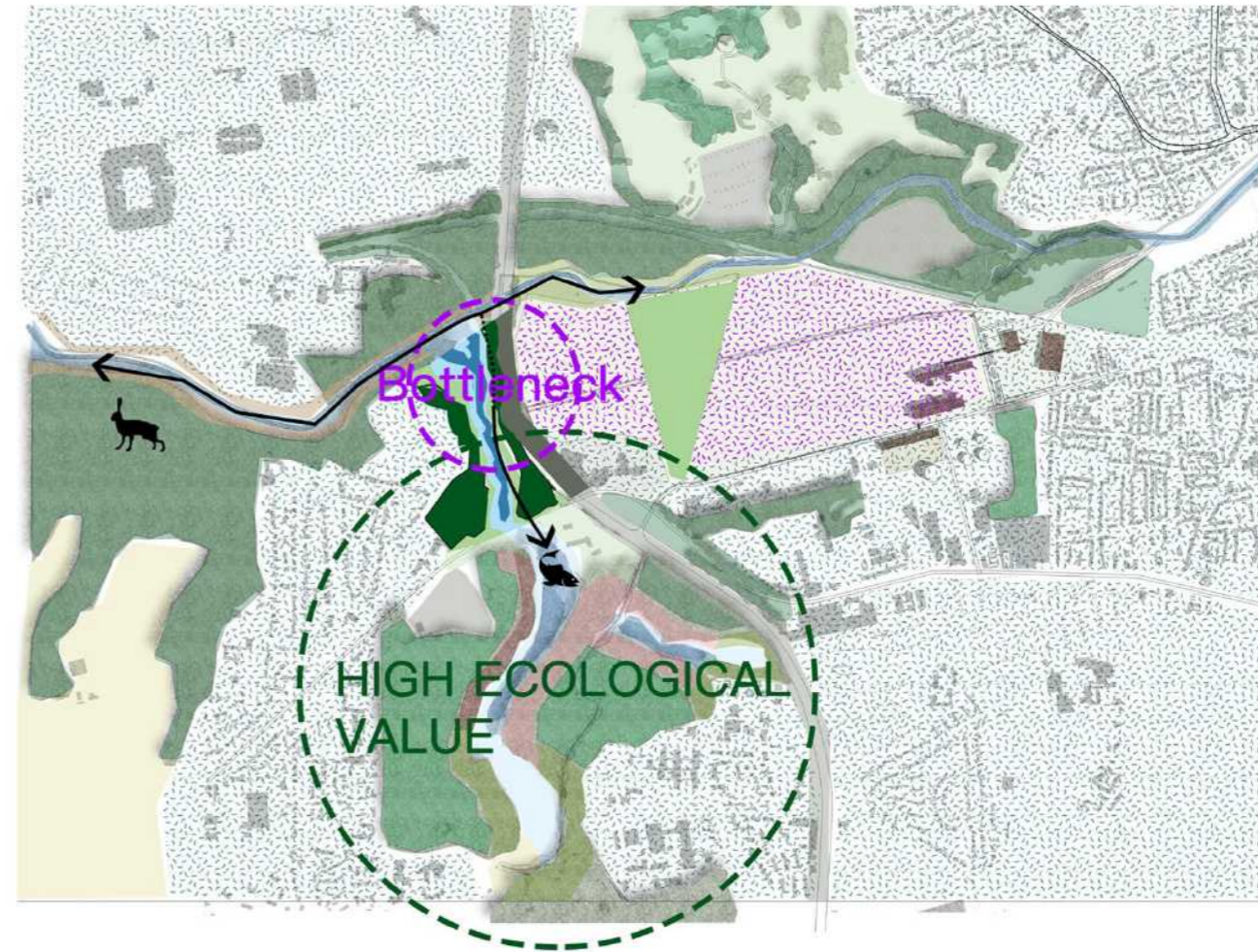
## Intervention on the ecology structure

The diagram shows the intervention on ecological layer in the decomposing layers study, The following drawing is detailed illustration of the intervention.



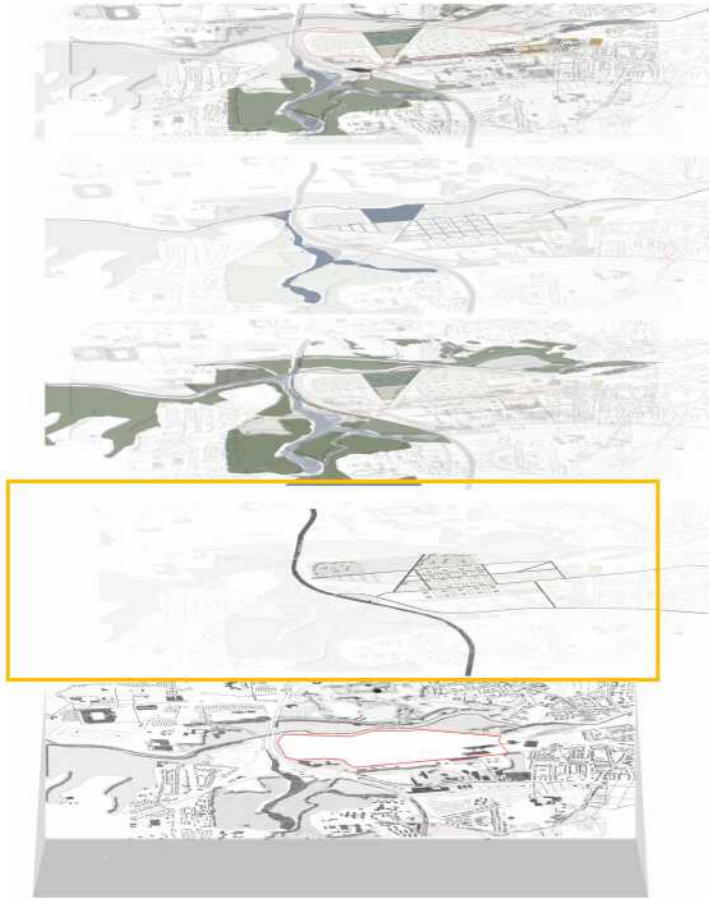
The Emscher river course will be connected with more natural habitats, and thus the ecology of the Emscher will recover faster. The vegetation in the high-level habitat could immigrate to the main river course, which is beneficial.

At the intersection of the river branch, a wetland will be made.

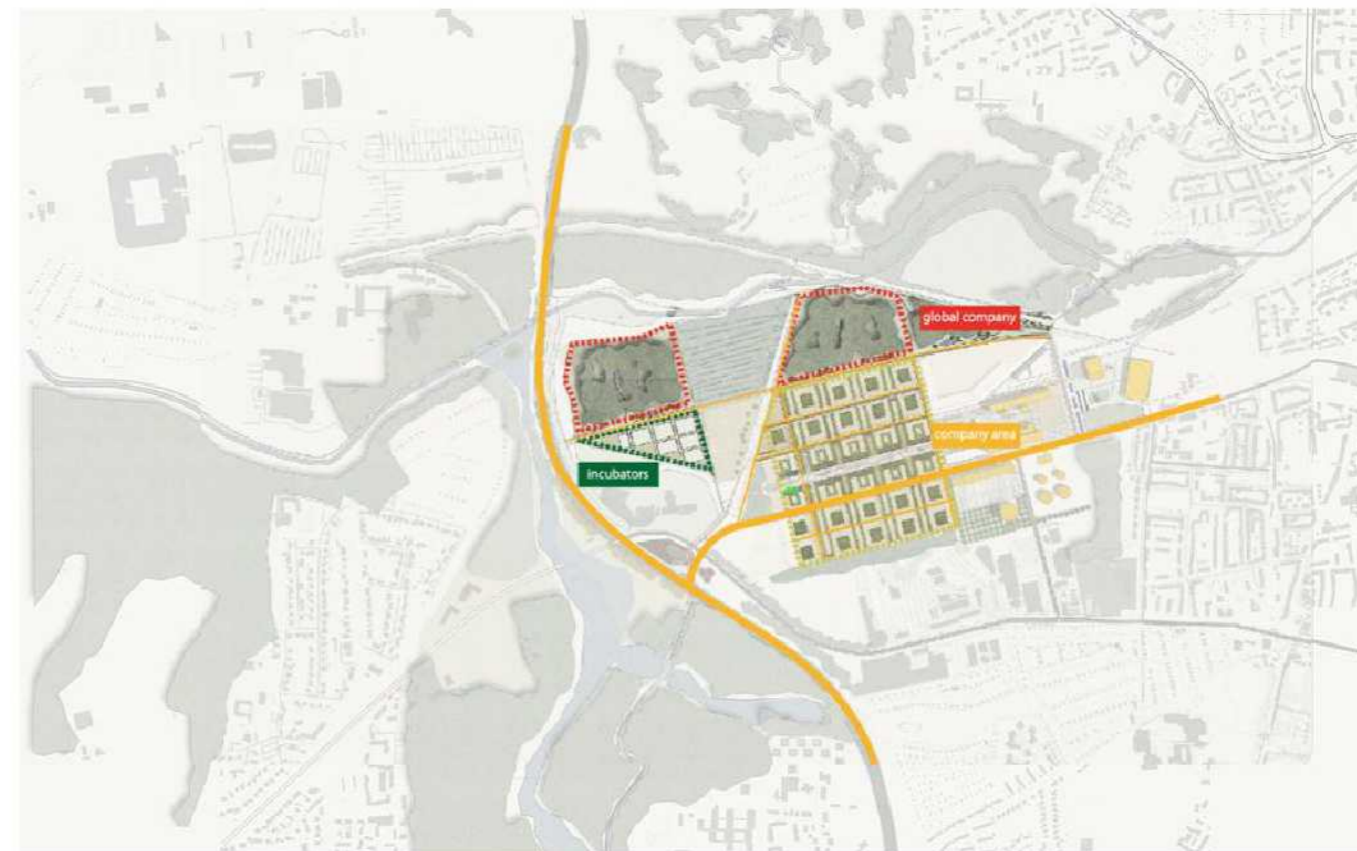
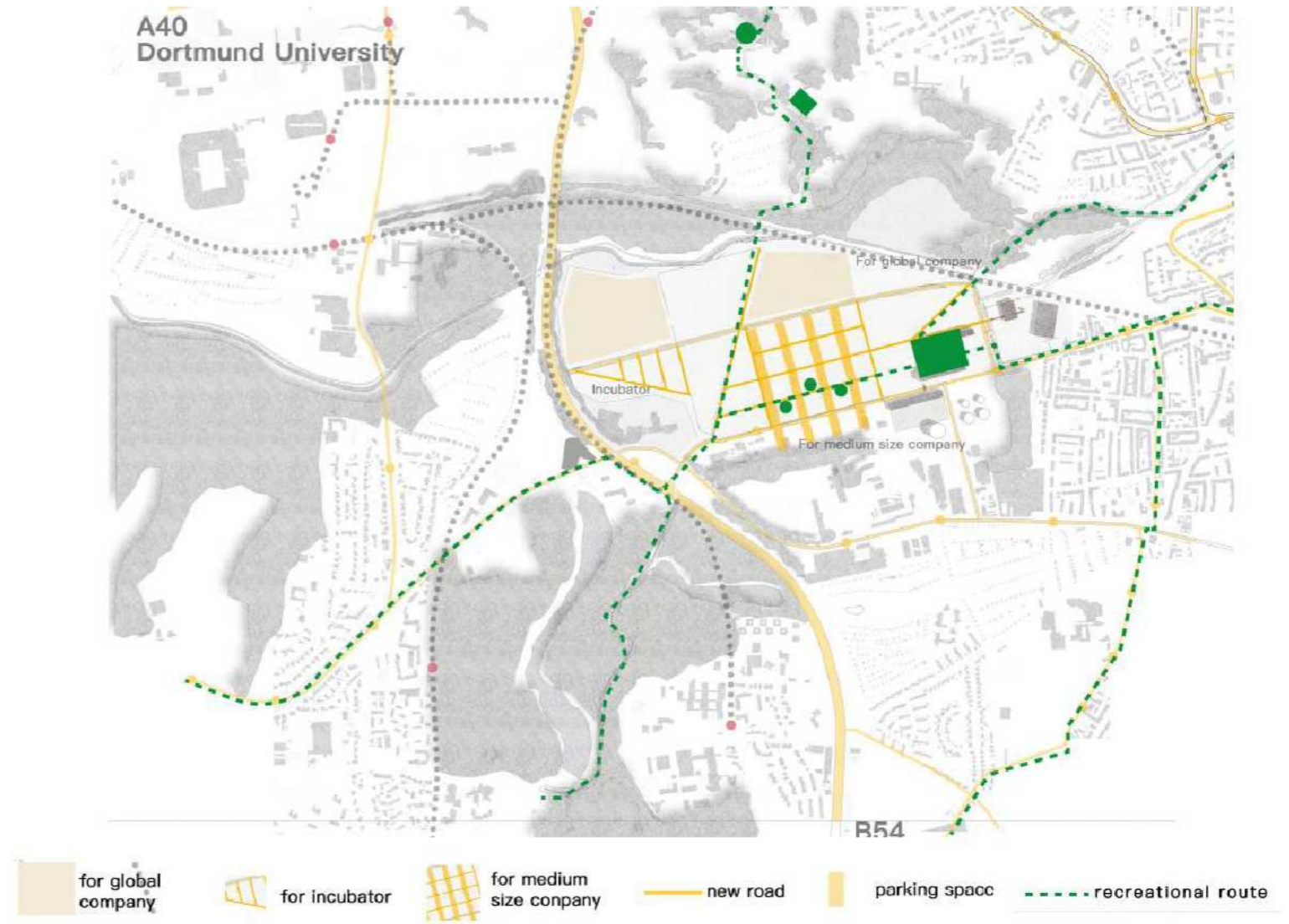


### Intervention on the ecology structure

The diagram shows the intervention on road layer in the decomposing layers study, The following drawing is detailed illustration of the intervention.



Besides the connections with the slow traffic system, the highway and public transportation traffic systems, three types of grids will be facilitated for different programs and investment.



## Implementation and phasing

The project will be developed in several phases:

### First Phase: Main Structure and connection

In the first phase, the main connection of large green structure and watersystem will be made because those connection will contribute to a better environment in the whole Emscher. The environment is the base for every possible development and industrial. Now the Ruhr municipality is working on recovering the Emscher. In the aspects of financing, it is easy to get first-step finance by doing this because both European Union and Germany have the fund for recovering the Emscher.

Second Phase: Fill the abandoned land with trees and build road network

The second step is creating the local framework for the future investment. The trees should be planted inner the abandoned land. The road infrastructure should be built to attract the investors. The main goal of this step is to provide the attractive environment for the future development.

Third Phase: The market itself will give the answer

The amount of future investment is largely decided by the quality of the landscape framework. In the framework approach, this project will show high resilience to the unpredictable development in the future. The future investors could decide how to use the trees inner the site. Those trees could be used for the company garden or just be moved. The part without investment can just serve as a recreational space for the local residence.

Current situation



1st: Main structure and connection



2nd: Fill in trees



3rd: The market will give the answer



Current situation



1st: Main structure and connection



2nd: Fill in trees





NORTH



## 2. ELABORATION DESIGN

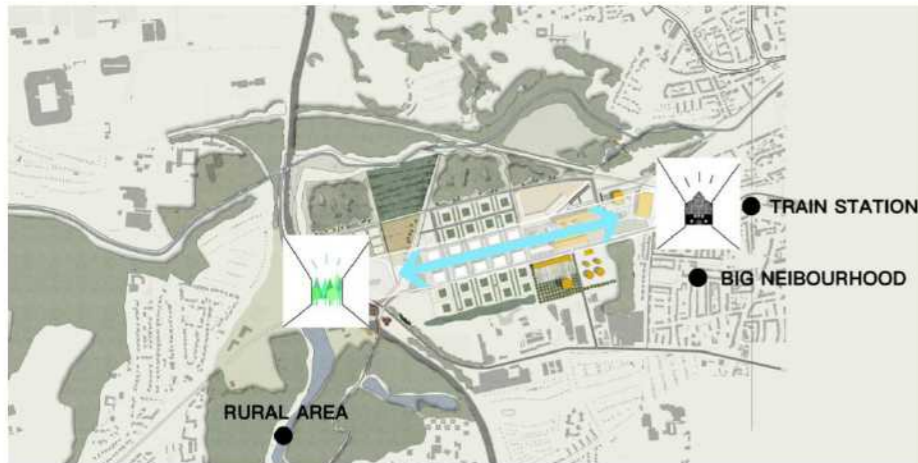
The task of the Elaboration design



There are three potential flows, the task is designing on the room for those connection and flows. Those main flows connect city center, neighborhood, rural park and fragments in different layers. The new recreational industrial is based on those flows.

### 2.1.1 Linear park design

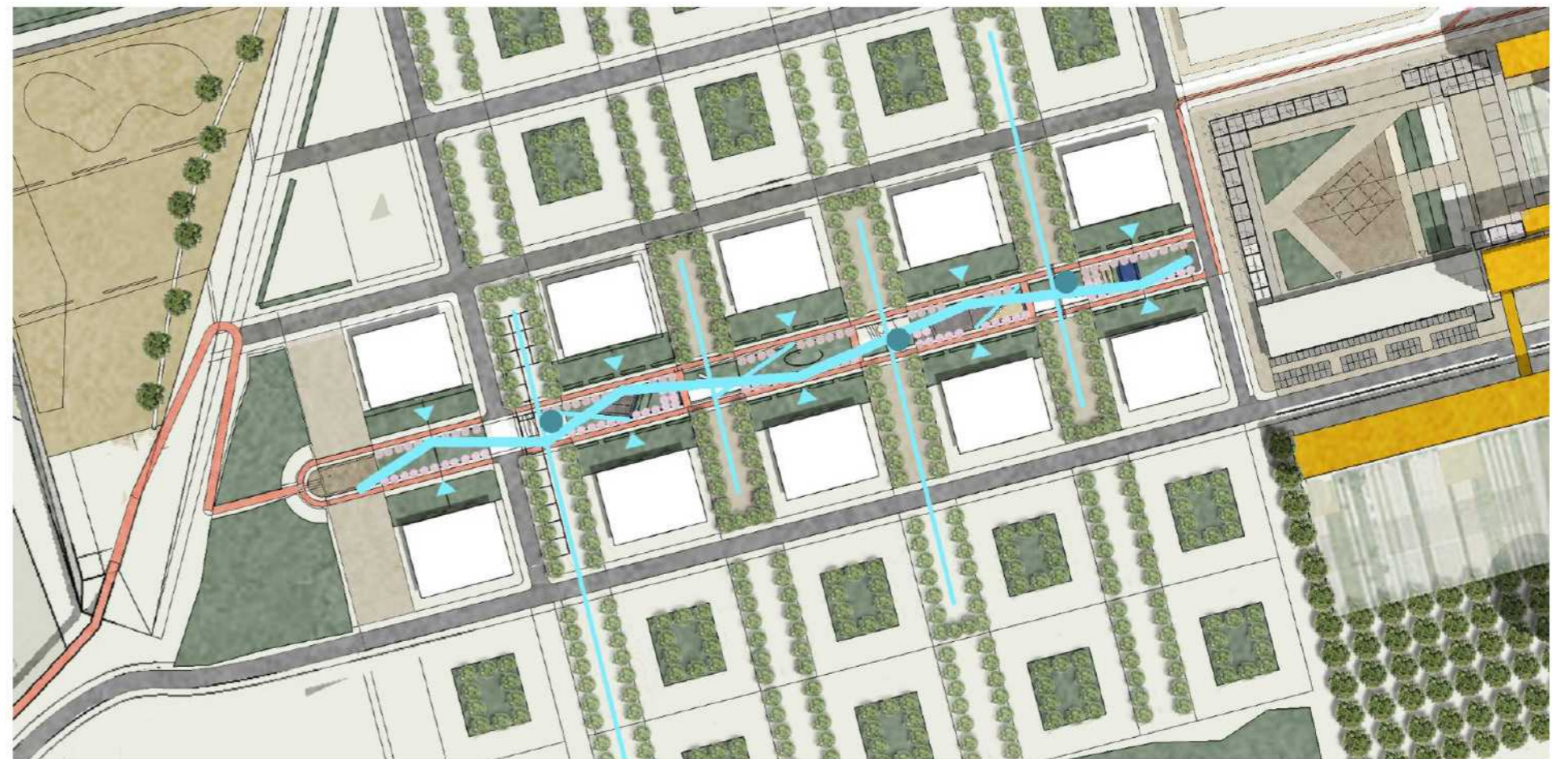
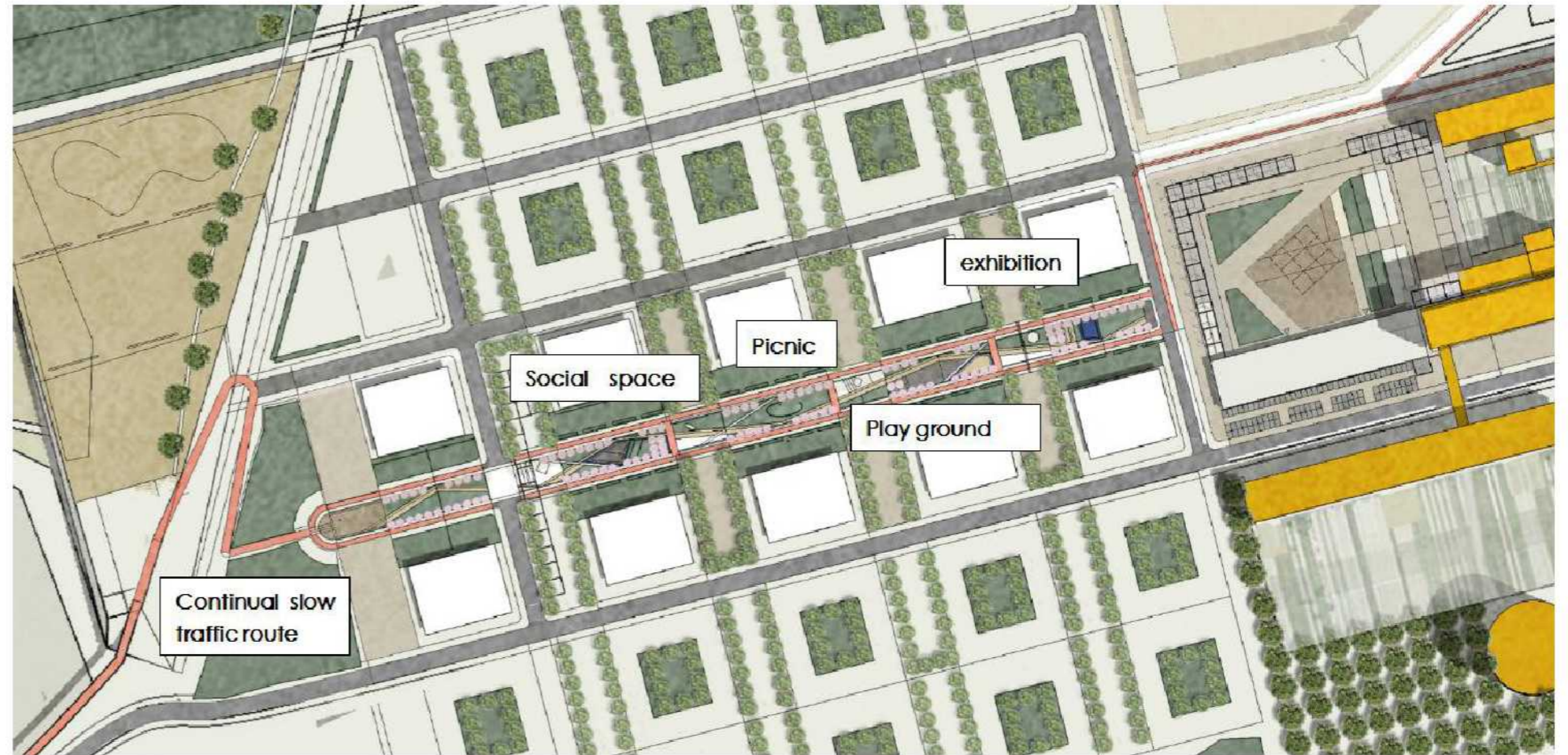
The linear park is the gate to the Emscher greenstructure.



The linear park is a transition area between rural and neighborhood. Thus, it will have different pictures and feelings when users walk towards different sides.

### Spatial concept

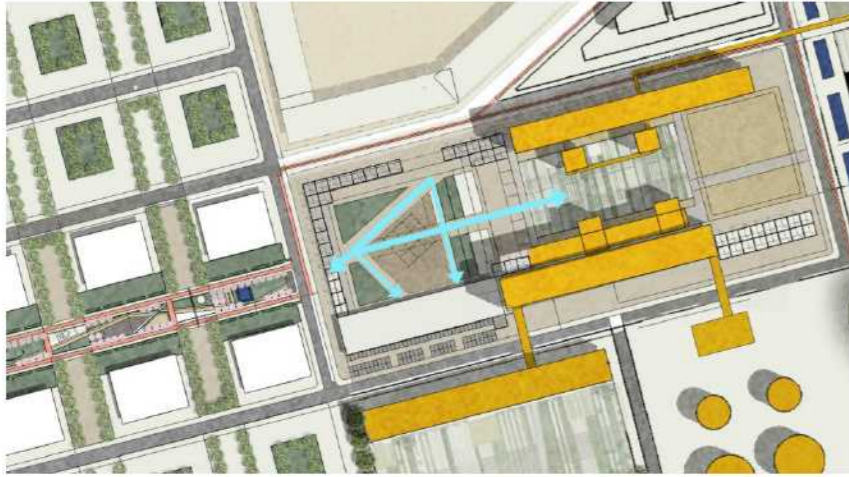
The main path is decided by the entrance of the building. The shared space is a relative public area and it will be used for exhibition. The four exhibition spaces make up a continuous story line about high-tech industrial. The linear cherry trees are planted on the double sides. Group trees inner the park provide a place for stay. Such movement and group trees provide diverse visual engagement with the heritage object.





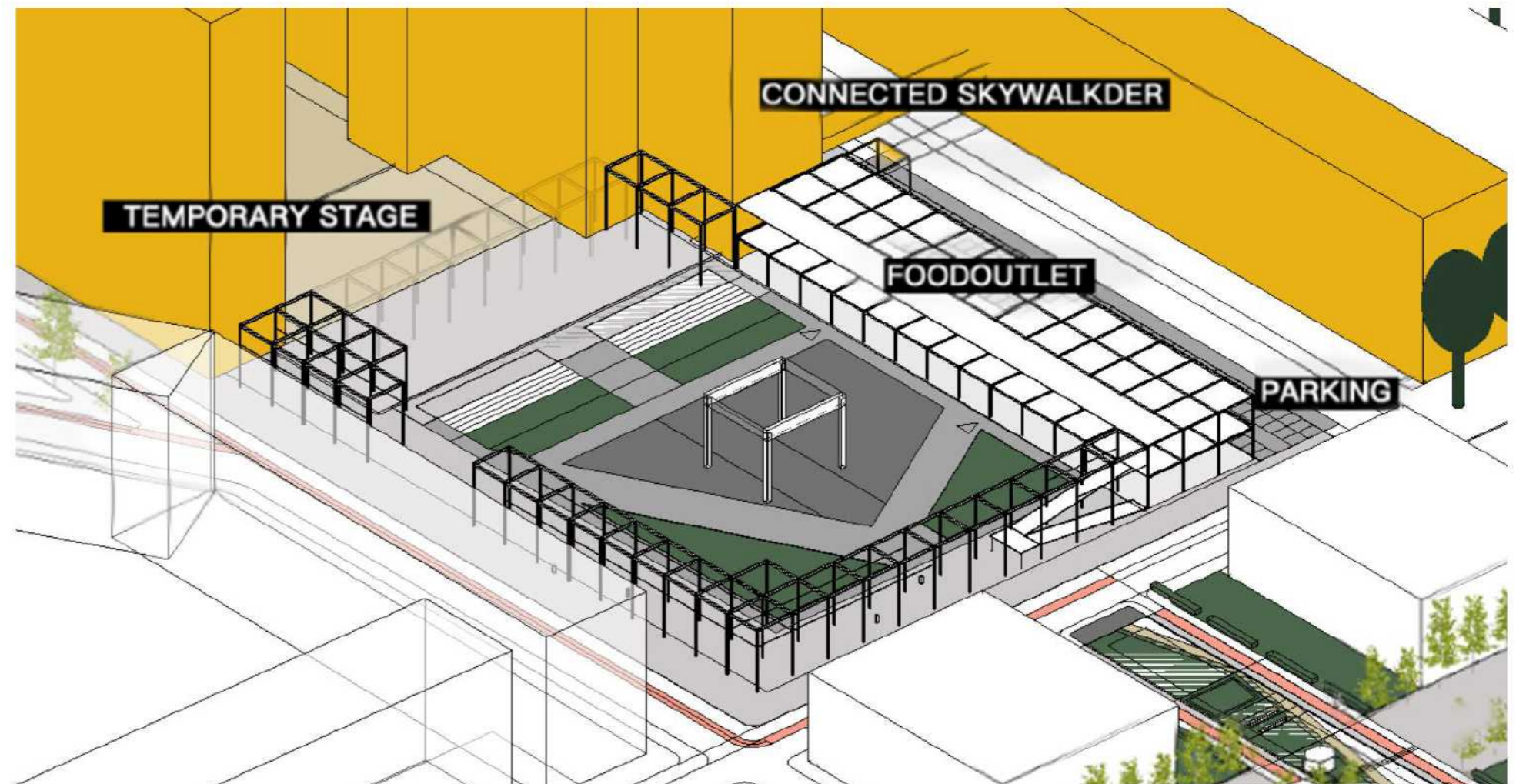
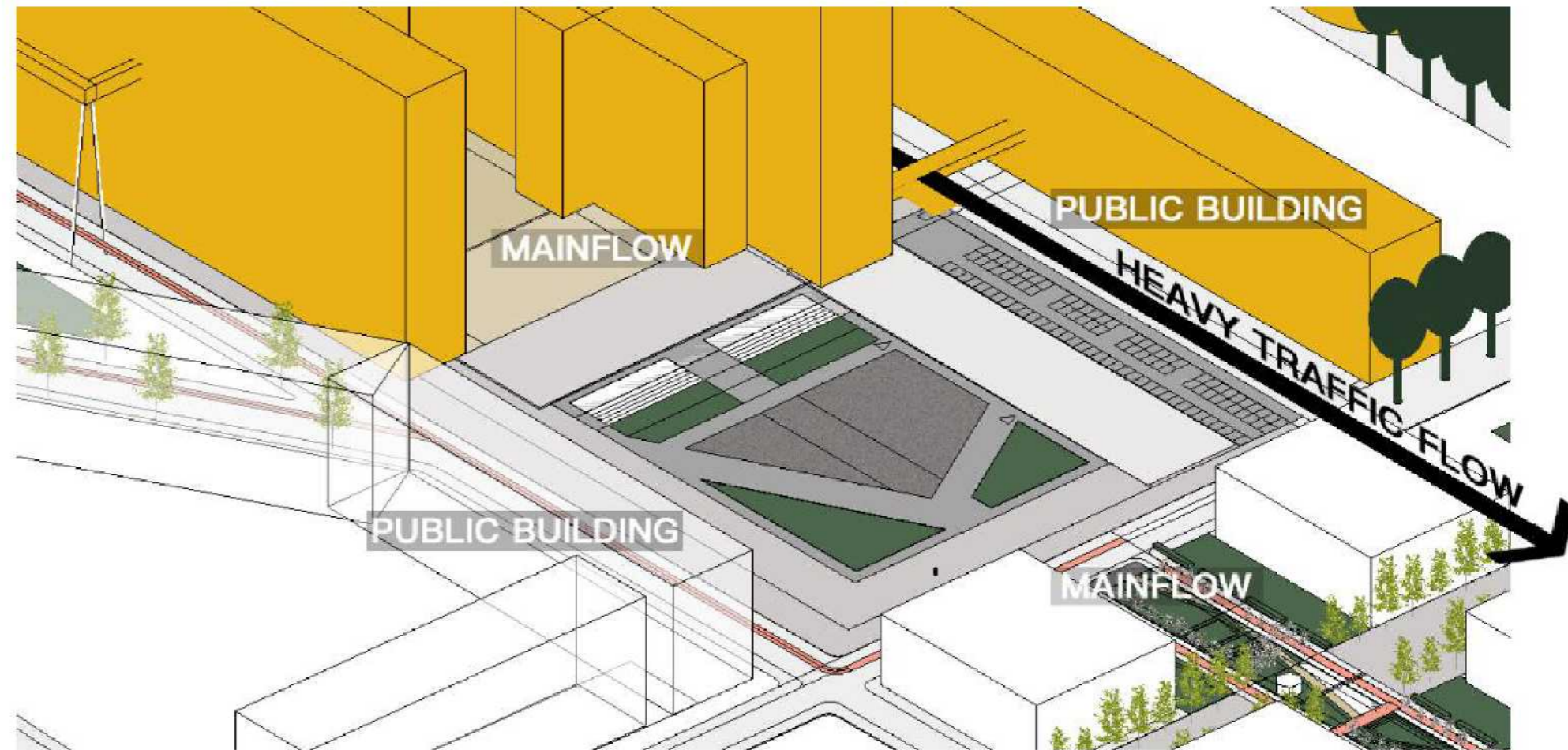
## 2.1.2 Public space design

Here is the central public space of the industrial park. Main flows decide the basic pattern of the square

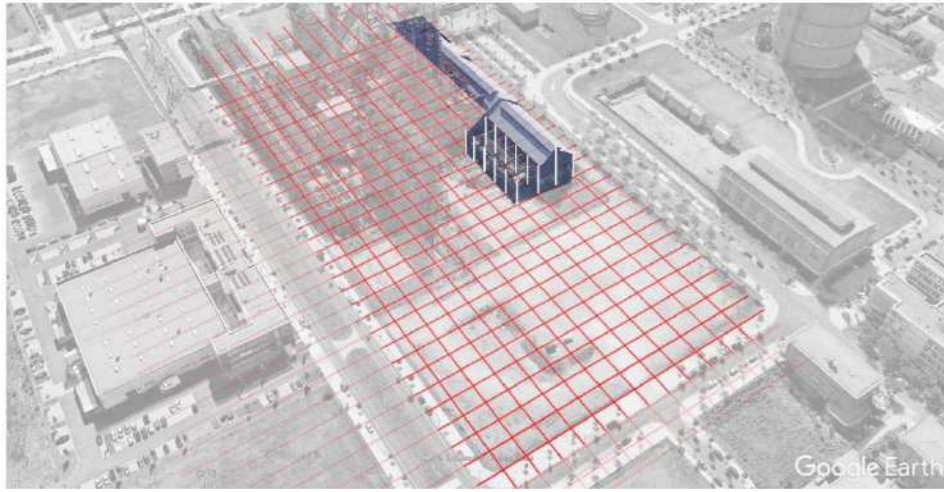


The square is surrounded by public buildings and heritage buildings. It has the potential to be a central space, and it can be a stopping point of heavy traffic and human flows.

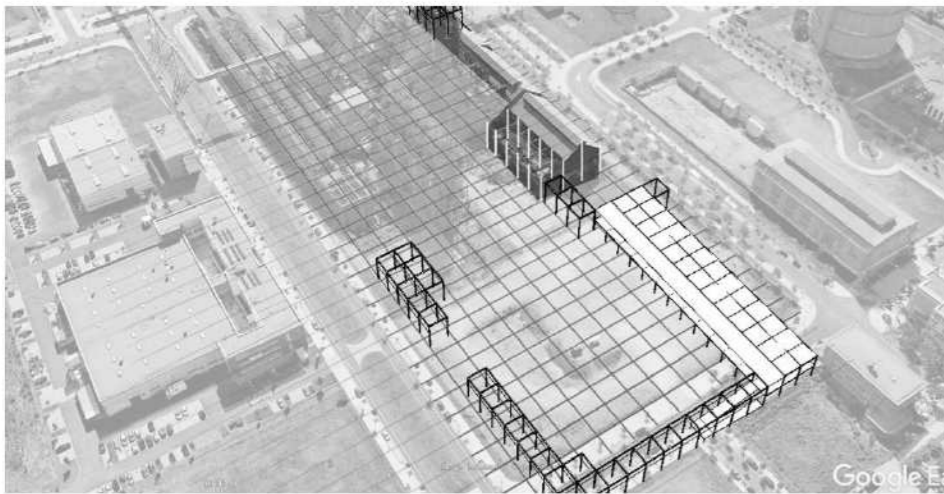
The left metal construction will be used for building a corridor on the existing grid. The corridor provides an intermediate layer between over-scaled buildings and human-scale space. It's also the interface between space of flows and space of stopping. Corridors make a half-enclosed space and the feeling of being a place. The food outlets are connected with public buildings by a skywalk. The temporary stage can be used for film, performance, and high-tech shows. The construction in the center divides the over-scaled space into four spaces.



The grid of heritage building



The new built construction will based on the existing grid of heritage building



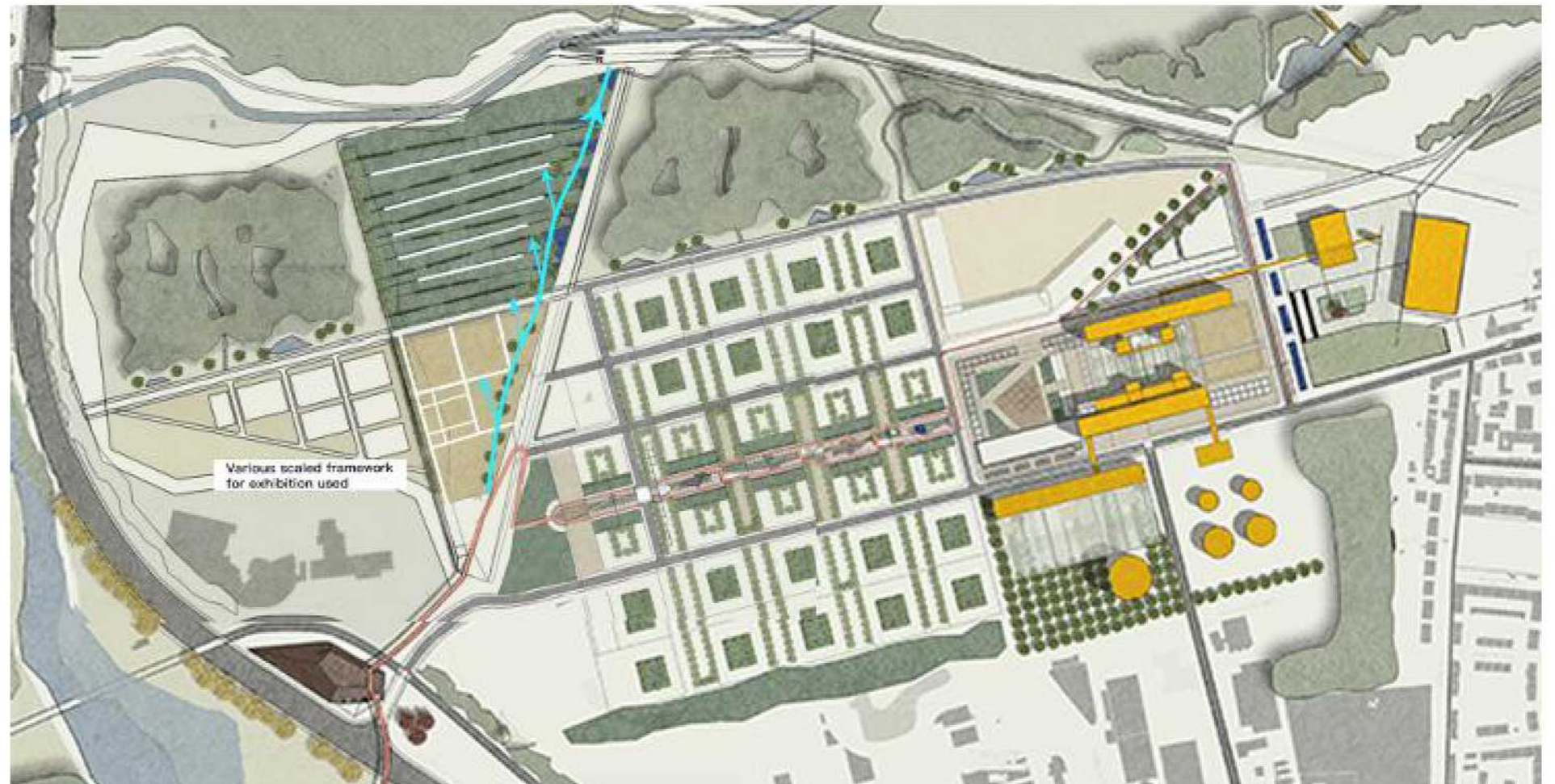
## 2.2 Wedge design

The soil is still polluted in the site. To solve this problem, the rain water will be collected and discharged into the bio terrace. The water flow will create diverse physical condition for vegetation growth on the wedge

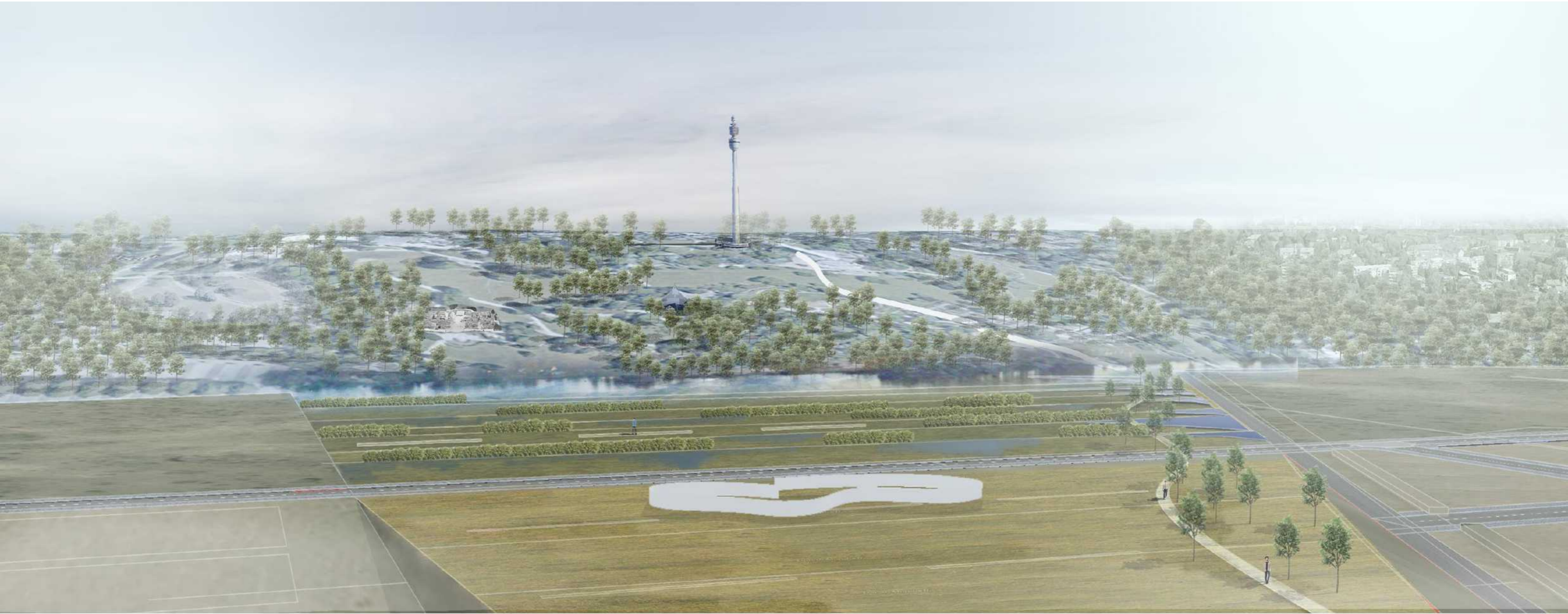


## Spatial quality of the wedge

The wedge is the only open space in the industrial park. It is a landscape theater which looks at the bottom of the valley. When people move forward, the linear space moves back (white line), those linear space are caused by natural forces. In the southern part, small path provides the various-scaled framework for temporary exhibition.



Bird eyes view From the wedge to Emscher valley



## Water quantity calculation

Half of the rainwater can be purified by the wedge and the coal field.  
The intertidal zone is enlarged, and people can touch the water now  
Connection point design



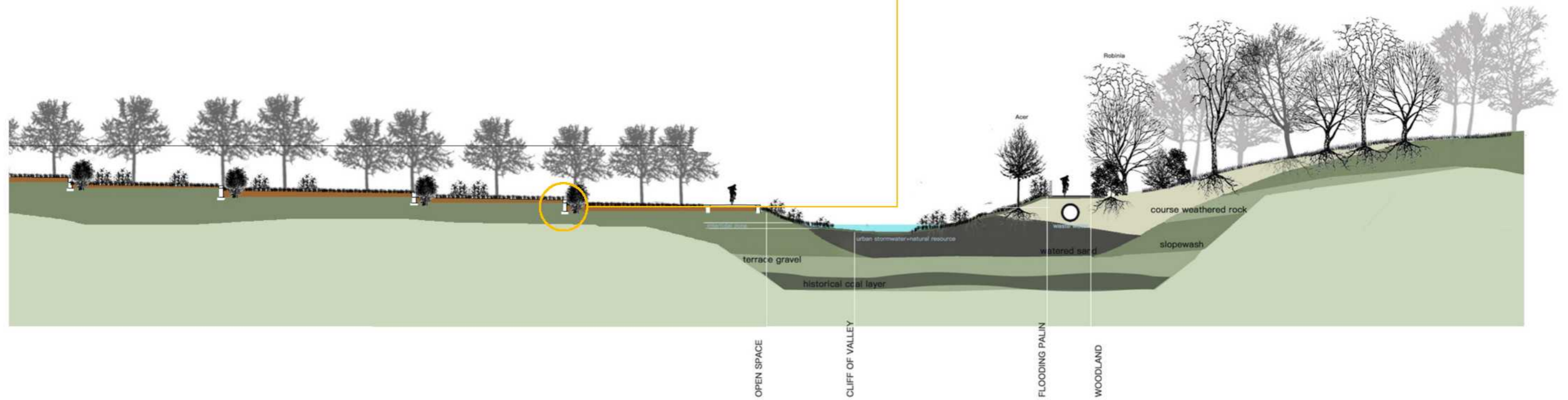
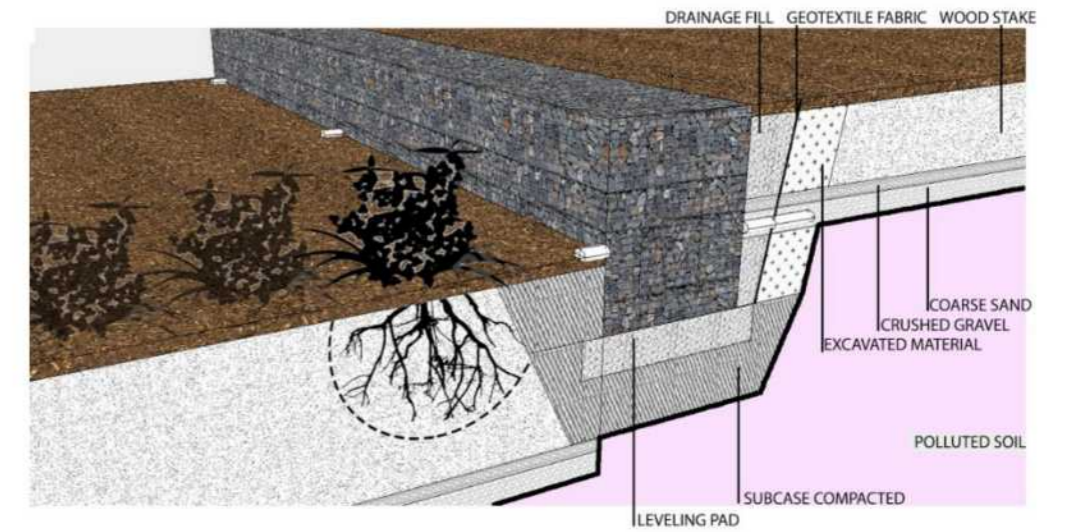
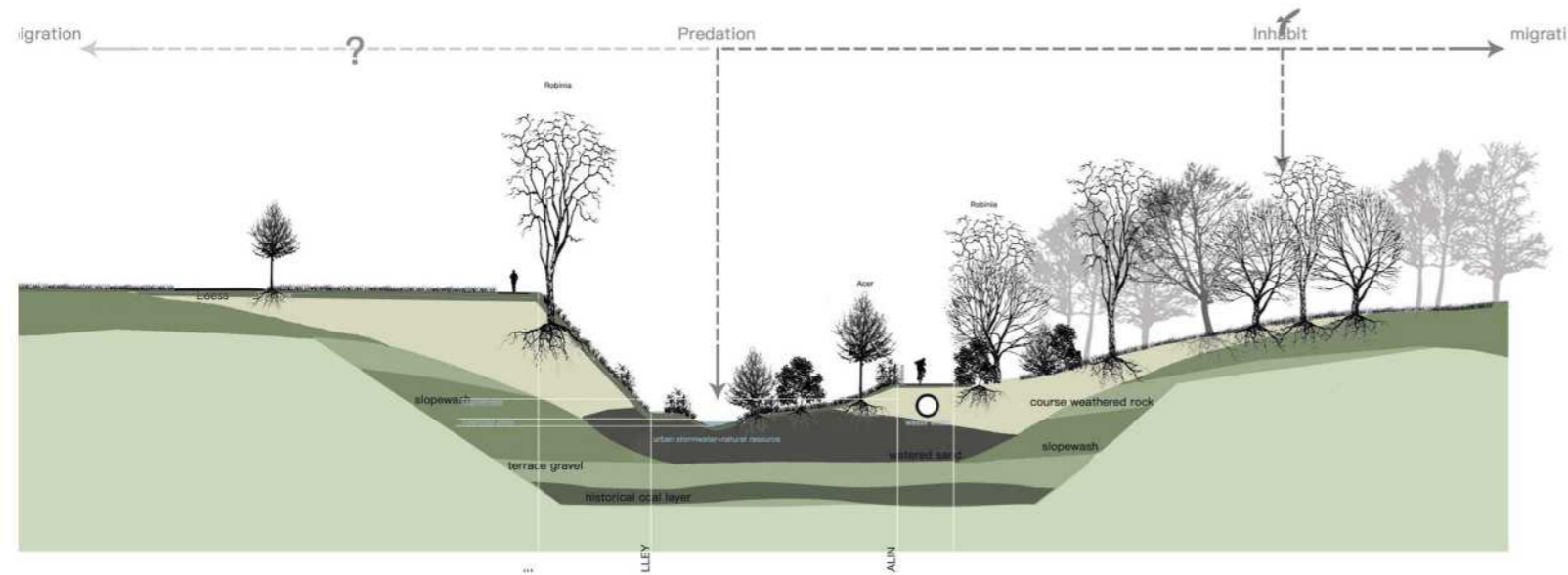
## Design on the ecology bottle neck

At the intersection of two river a wetland will be made. A fish ladder is built to deal with the height difference.



Retaining wall of the water Cascade

A technical layer is added to decrease the water penetration because the water is still polluted in the site. The underground pipe will lead the water to the next terrace and purify it again. The layer will also limit the root of vegetation, which means only low trees can grow in this visual corridor

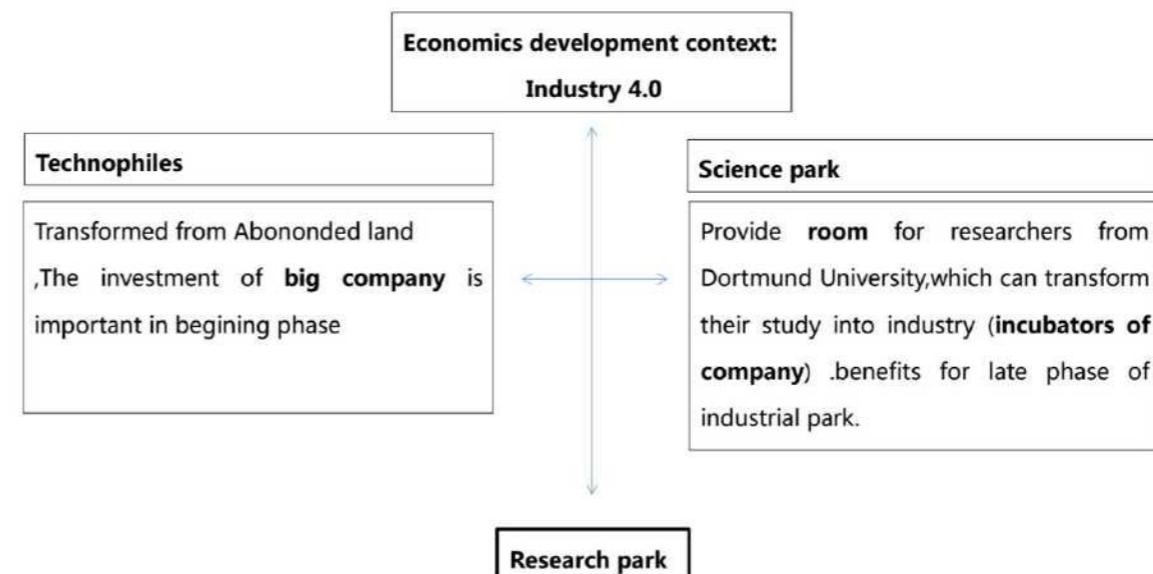
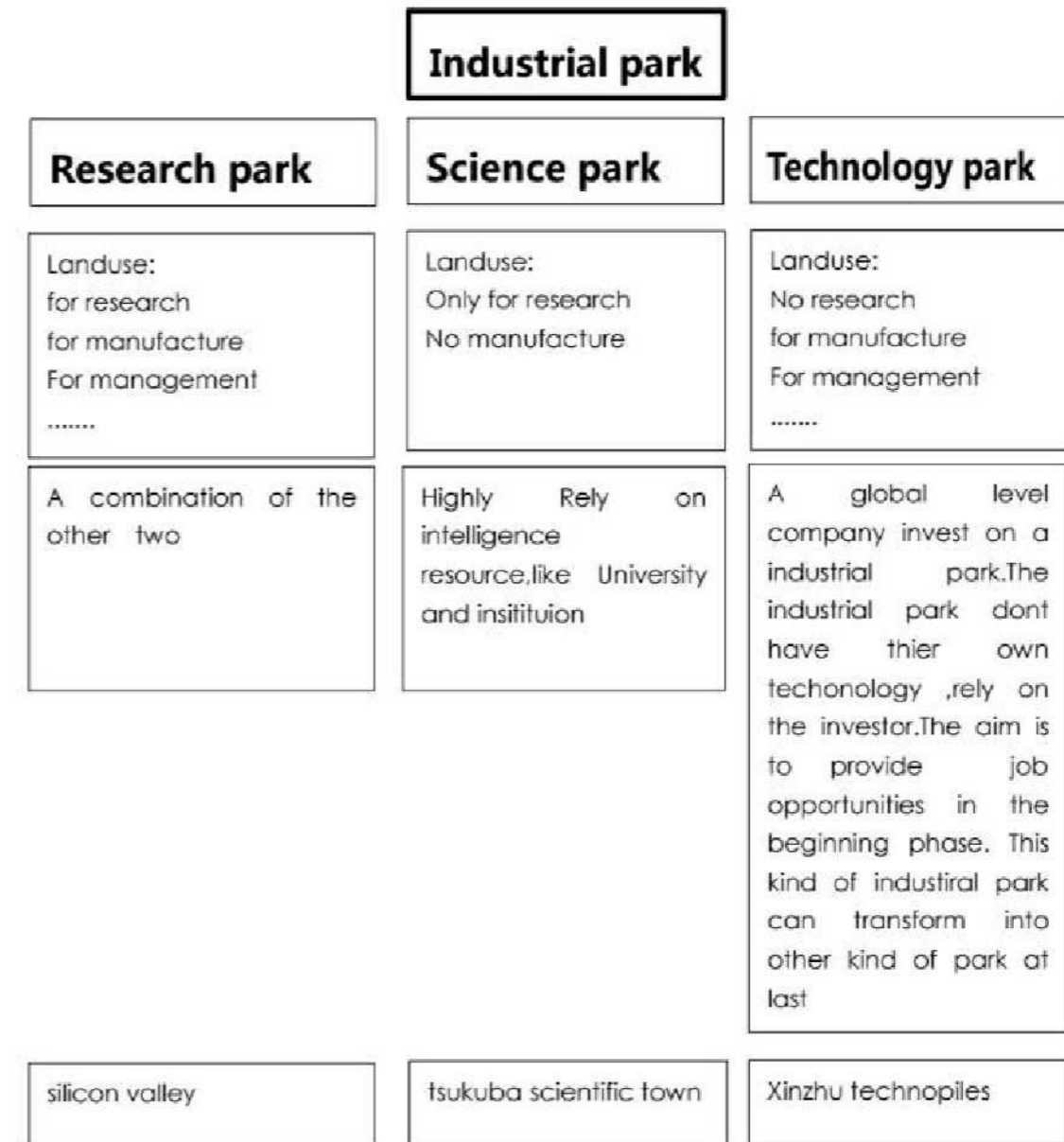


### 2.3 Possible programs

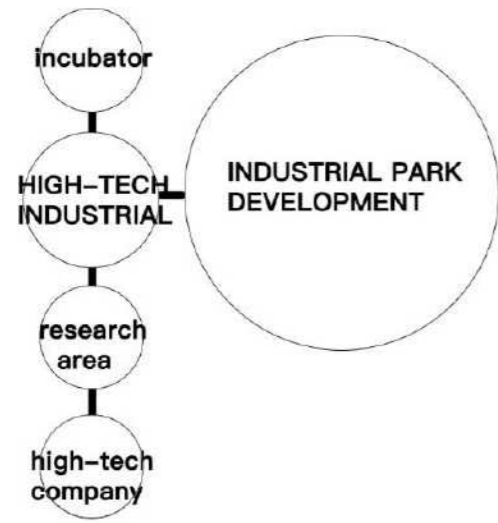
Dortmund is a shrinking city. In order to recover Dortmund economics, the abandoned land could be transformed into an industrial park which can provide more work opportunities.

What kind of industrial park is suitable for Dortmund? It has literature studies in order to decide the inventory of land use and the scale of framework of industrial park.

According to the policy of Dortmund and the advance of industrial 4.0, it has the conclusion that the research park is suitable for Dortmund.



The typical industrial chain



In order to provide more work opportunities to Dortmund, a industrial park can be developed in the site. The typical German industrial park is based on the high tech industrial. The industrial chain will includes incubator, research institution and high tech company.

Future industrial

**RECREATIONAL INDUSTRIAL**

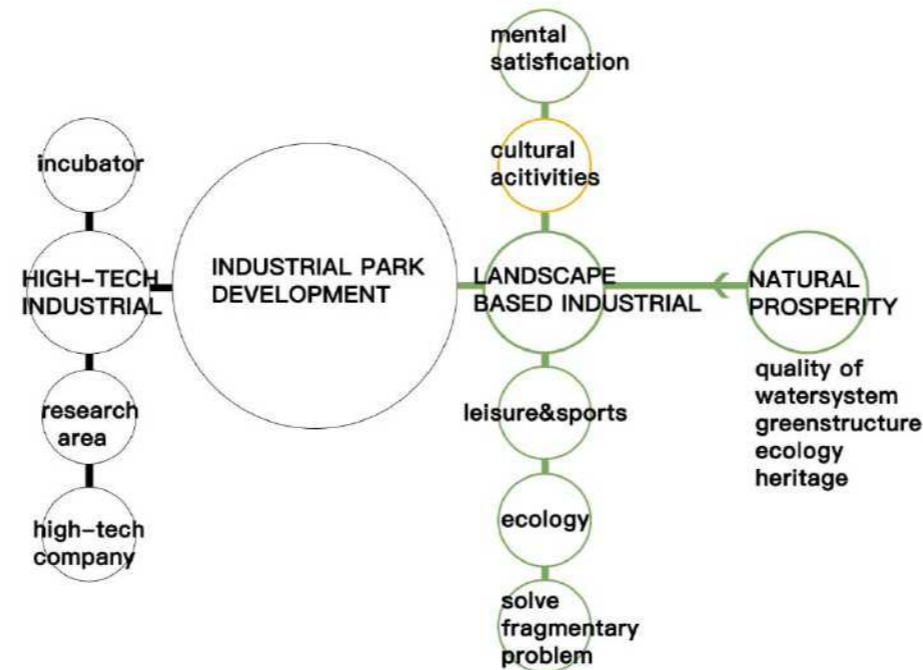


It is said that recreational industrial will occupy more percentage in the future . Many rich in German have moved out from the city and seek for a better environment to live.

Upgraded Industrial chain

Based on the recreational and natural flow , more recreational industrial can be developed. The industrial chain will be upgraded. It will contribute to the economics growth and better working environment.

Improved industrial chain



There are some recreational programs could be developed along the recreational route. For example, high rope course. The cool tower will be developed as the diving center, and liner park will provide the space for high tech show.



## 2.3 Related principles

### Transition area

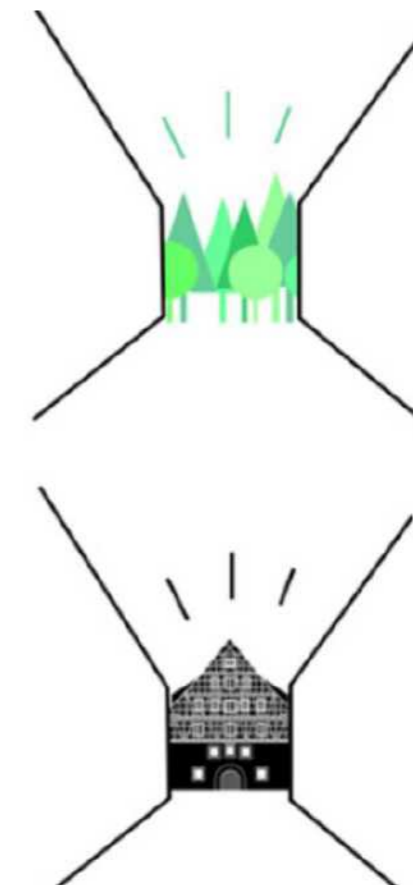
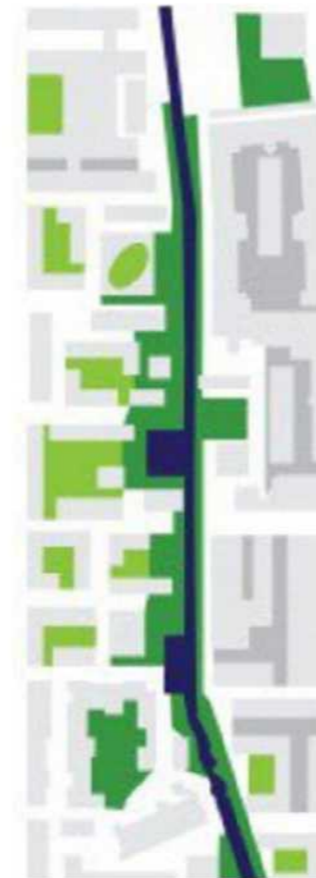
A transition lane has different pictures and feeling when users walk towards to different sides

### Public space in the industrial site

The idea of the public space in Duisburg landscape park is that a public space in human scale is necessary in an over scaled spatial island. That's the reason why a human scaled space need to be made in the experimental site.



Here is another project from which I can derive the principles. This project is a public space which is transformed from industrial heritage. The square is over-scaled, but those three industrial objects divide the over scaled space and create three smaller space which is in human scale. The result of the scale study will be applied to create the suitable size of the space for users and different activities.



The wedge in the industrial site



The Germany designer have created a slope which is 6 meters high. The double sides of that slope are defined by two higher terraces. The scale is similar with this wedge in the experimental site. There are vertical paths divide the big wedge.

The industrial park

It researches on the typical programs in the research park and the scale of different of possible road frameworks

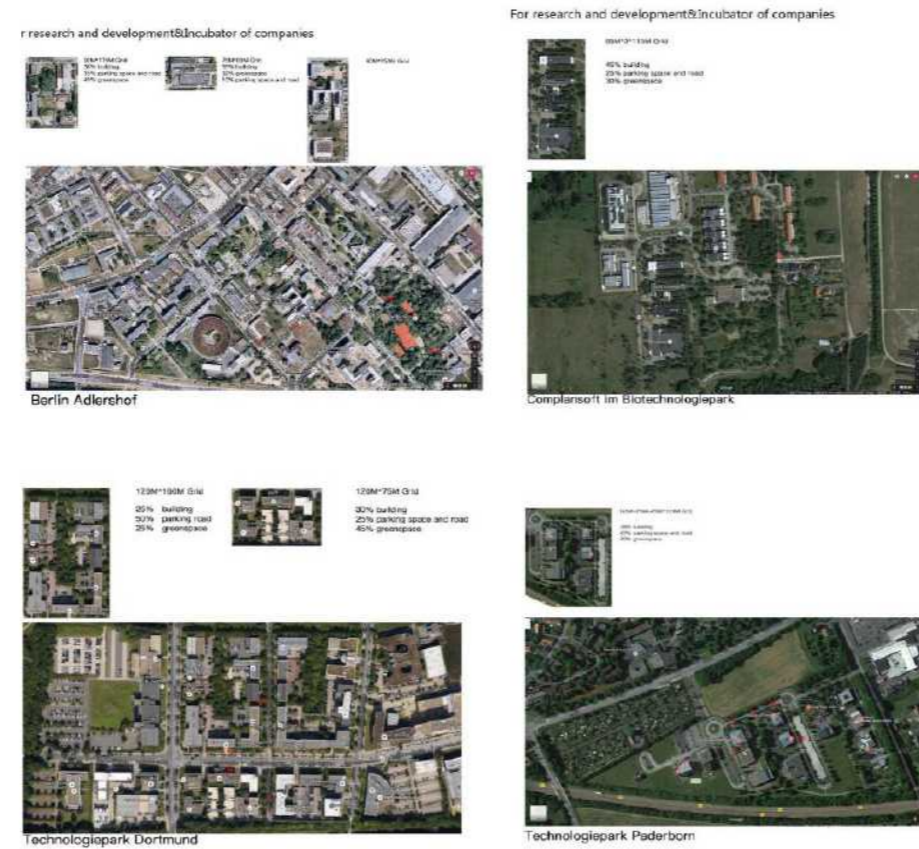
The inventory of landuse and position

1. Management and services. (contact with urban context and symbolic landmark)
2. Marketing and propagation. (central part of the industrial park)
3. Greenspace. Three scale of infrastructure grid
4. For research and development.
5. For big company investment.
6. Company incubator.

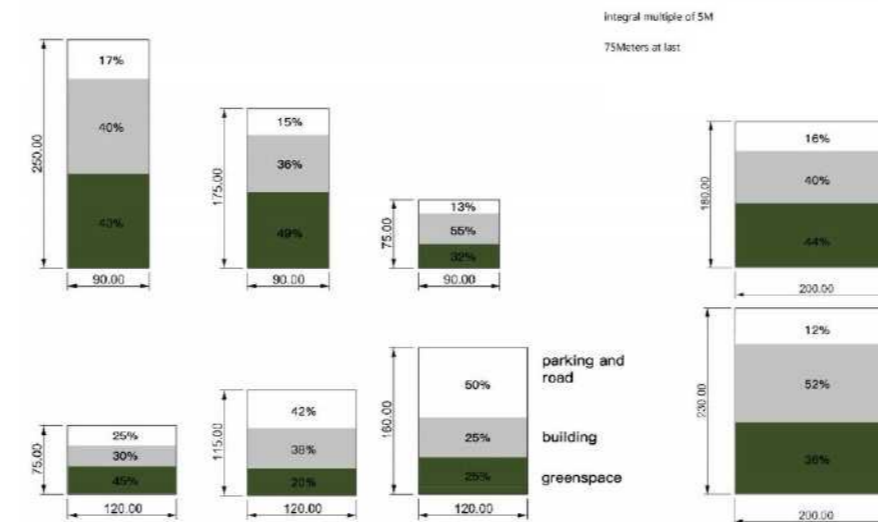


The road unit

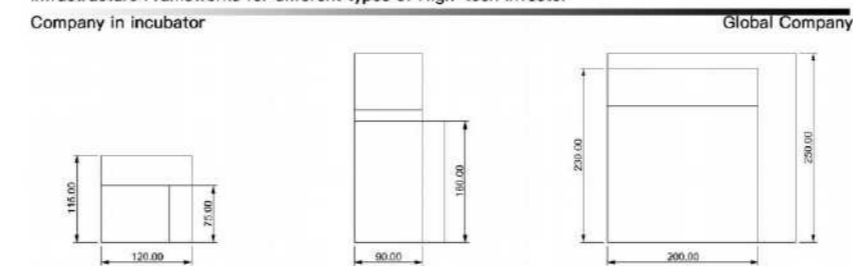
The scale study on the existing framework of industrial park. There are three types of road framework which will be facilitated in the industrial park. They are for global company, normal company and incubators.



Typology study for High-tech institution ensemble



Infrastructure Frameworks for different types of High-tech investor



## V DISCUSSION & CONCLUSION

# 1. CONCLUSION

## Reflection

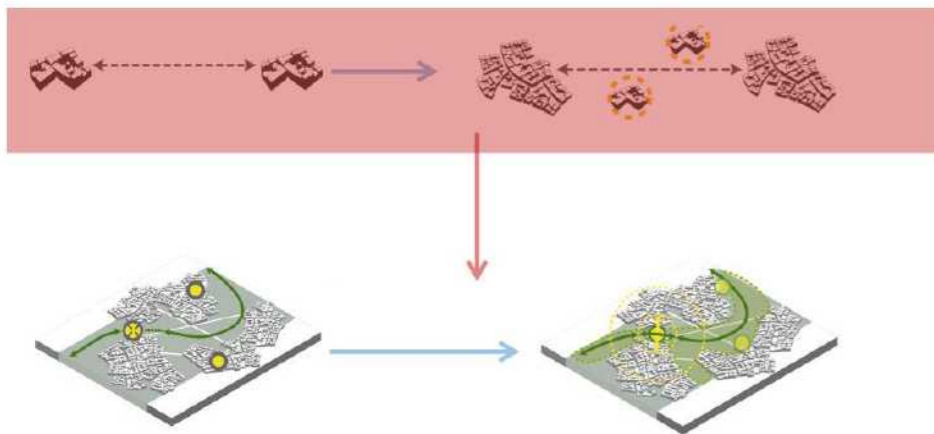
### Question 1:

Typical integration uses only road infrastructure to guide the urban expansion, and only achieve human prosperity. It ignores the profits that landscape could bring and the integrity of natural layer.



### Answer 1:

The design experiment demonstrates how landscape infrastructures can be used to guide the development of the site. The road network is more focusing on the traffic flows. However, using landscape as infrastructure, it can accommodate more types of flows. It uses landscape to create room for potential nature and human flows. It also gives insights on developing new types of economics in a over-developed region. Using landscape to integrate is caring more about the natural layer, instead of just human. During the research process, the "connecting" toolbox is developed which aims at solving the fragmentary problems.

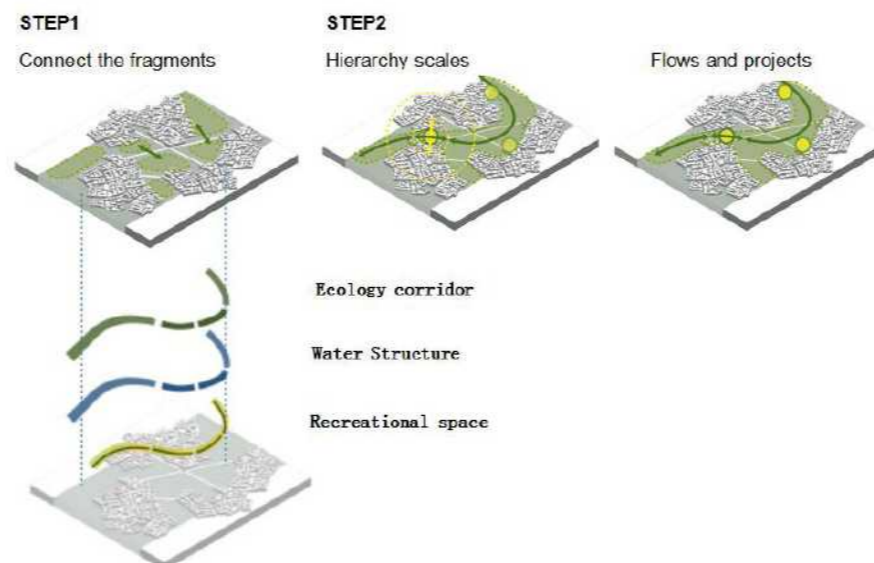


### Question 2:

The existing pilot project, for example Duisburg landscape park, is isolated as a spatial island, it isn't connected to a larger greenstructure and even cause a further fragmentation.

### Answer 2:

This implementation procedure gives answer to this question and it gives step-by-step guide to realize the Emscher proposal so that it can establish a more integral spatial configuration by addressing ecology, water and recreation in regional and local context.



It suggests that the future projects based on the Emscher proposal should be contextualizing locally and regionally and it should also help to complete the larger Emscher structure, instead of being an isolated ones.



## Toolbox

During the design process a toolbox is developed for solve the fragmentary problems in different layers.

waterflow	integrate it with a linear and slope ecosystem	integrate it with a linear and slope ecosystem	integrate with natural water bodies	integrate with agriculture landscape or factory
	normal water flow, water level and water quality	water level will be higher, a faster water flow, which may cause a better water quality or more problems in the water, a higher flooding risk, better ecology condition	collect more water, higher water level, lower flooding risk, better ecology condition, better water quality	less water, lower water quality, worse ecology condition
transportation flow	integrate with natural resources	integrate with natural resources	integrate with natural resources	integrate with natural resources
	economic development, and shape the urban structure	economic development, a stronger flow because of environmental purpose, better view of road, new urban form, substantial to developed along the network	economic development, a stronger flow because of environmental purpose, better view of road, new urban form, substantial to developed along the network	economic development, a stronger flow because of environmental purpose, better view of road, new urban form, substantial to developed along the network
ecological and recreational flow	integrate with other habitats and programs more the visual resource	integrate with other habitats and programs more the visual resource	integrate with other habitats and programs more the visual resource	integrate with other habitats and programs more the visual resource
	integrate with other habitats and result a wider green corridor	integrate with other habitats and result a wider green corridor	better ecology, a stronger structure flow, recreation, a stronger recreational flow	better ecology, build a spatial structure, recreation, a stronger recreational flow
	better ecology, a stronger structure flow	stronger recreational flow, better urban ecology, better economy		

## 2. OUTLOOK

### Future research

1. 'Landscape integration' is a spatial planning method which can achieve human and nature co-prosperity. However, natural interests sometimes go against with the human interests.

In the design process, I make balance according to my own professional experience. Actually it should have a quantitative way to measure the social value, economics value and nature value. For example, in 'design with nature', the author decided to plan a highway. He gives values to all engineer factors (slope gradient, the intensity of soil), and to natural factors (forest value, visual value, recreational value). At last, he gives a weighting to each of those factors and makes calculation to plan the route with highest interests.

2. In the study of typical "integration", it relates the GNP with the degree of "integration" in a statistic way.

However, this study have not worked in a statistic way. In my future research, it can have such studies in landscape layer. For example, it can relates the ecological value with the size and the degree of "integration" of greenspace. As a result, it can develop the most beneficial strategy to use human value and natural value when those two conflict.

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