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# Ingolstadt

*On the maelstrom into a challenged future*

– A master thesis investigating a resilient design approach for Ingolstadt





Fig.1. localisation Ingolstadt European context  
 Fig.2. locasiation Ingolstadt Regional scale

## INGOLSTADT

### - *On the maelstrom into a challenged future*

Humans have succeeded in changing the planet to meet the demands of a rapidly growing population. The population doubled between 1960 and 2000, and economic activity increased sixfold. The environmental changes to meet our growing needs have been so extensive that cultivated ecosystems now cover more than a quarter of Earth's land surface. Six times more water is stored in reservoirs than flows in natural streams.

However, the gains made by this transformation of the planet were not without cost. As the twenty-first century began, the prices became apparent. One of the most significant environmental threats is climate change. Nevertheless, it is only one of many challenges already taking a toll on people and the planet. (Walker & Salt, 2006)

The rapid and enormous global growth and economy-led mindset also left their marks on Ingolstadt. As Audi's headquarter, the economic pressure on the city was intense. It led to an aversion to and domination of nature and neglect of other societal needs. This planning made the town vulnerable to facing future challenges with climate change, such as an increase in heavy rain events and annual temperature raising.

The master's thesis examines on different scales how site-specific planning can address both social and environmental issues and create synergies between the city and its underlying structure.



Fig.3. Ingolstadt's city centre with empty shops



Fig.4. Ingolstadt during a flood 2013



# Methods

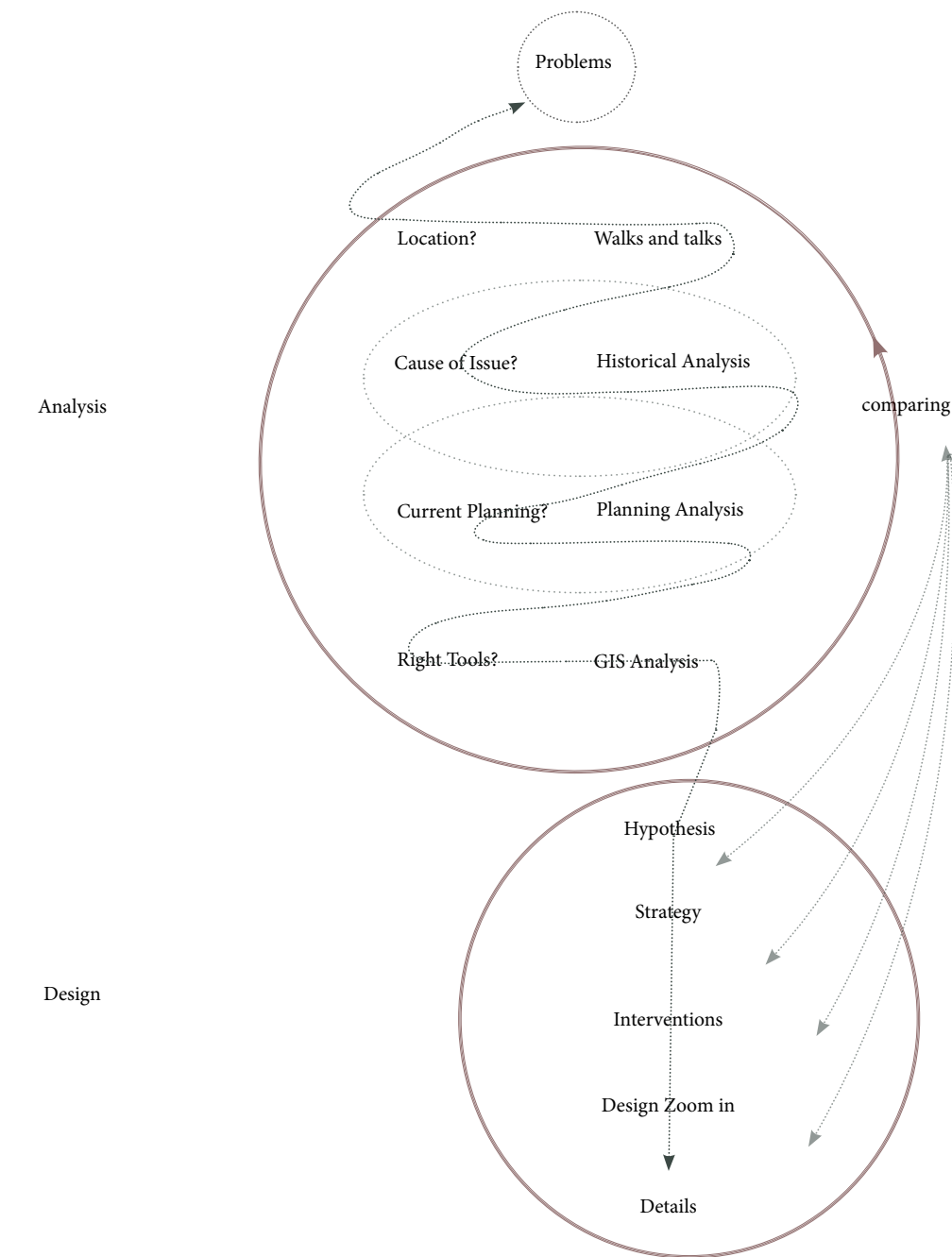


Fig.5. Diagram Process and Tools



# Analysis

*of history, physical and social enviroment and potential futures of Ingolstadt*

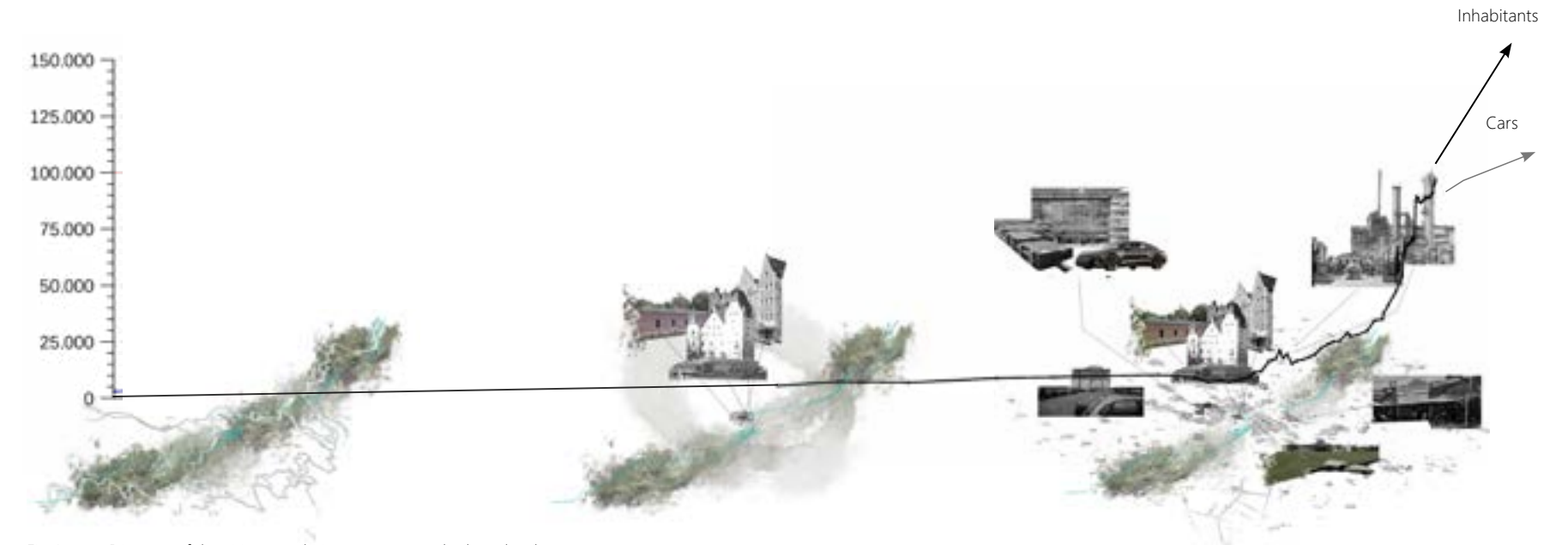


Fig.6. Diagram of the cities population structure and urban development

800 century

ON THE DANUBE  
TERRACES

Development due to/ with  
ecological circumstances of  
the Danube floodplains

1. features of former  
ecological dynamic  
landscape

13. century

THE RISE TO THE  
FORTRESS CITY

due to social/ political  
circumstances: military,  
university, trading

2. amplified features of  
the origin of the city

20. century

INGOLSTADT AS AN  
INDUSTRIAL CITY

After 1945 development  
due to social/ political/  
economical circumstance:  
Industry, car dependency

3. amplified features of  
industrial history of past 70  
years and present

## Challenges

- Build-up land
- ▤ Agriculture
- 'natural'



### CHALLENGES

The high amount of build up land, car infrastructure and agriculture leaves little space for nature.

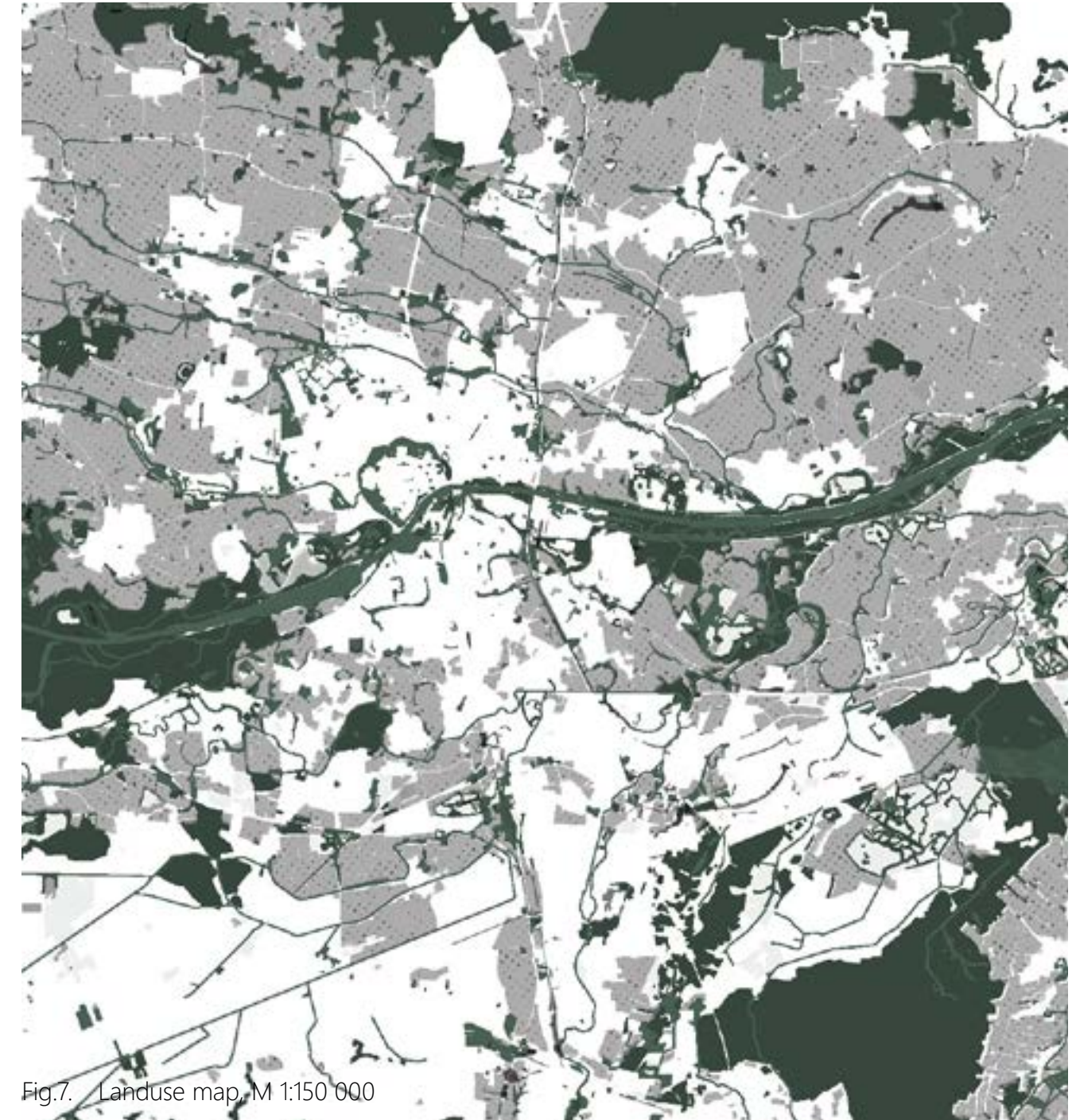


Fig.7. Landuse map, M 1:150 000





## CHALLENGES

Due to high amount of single family houses, industrial and commercial buildings and car dominated planning the city lacks valuable public spaces and identity.



Fig.8. A parking lot in the middle of the city



## CHALLENGES

The city center, as a former melting point, became less attractive due to less frequent use.



Fig.9. Empty shop in the city centre





## CHALLENGES

The traditional economic mindset is still firmly established and makes changes complicated.

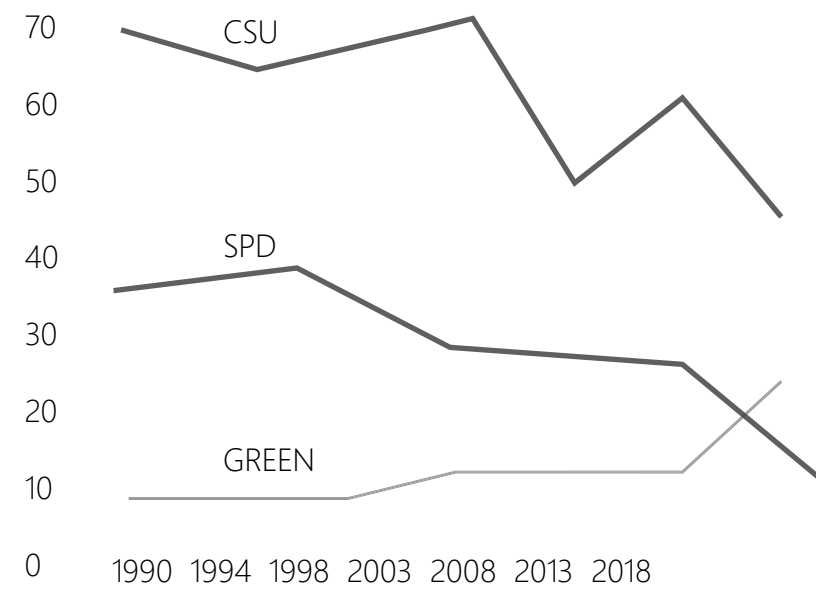


Fig.10. Diagram changing electoral votes in percent



## CHALLENGES

The lower lying areas are in risk of flooding, which will increase in the future, due to increasing frequency and intensity of annual precipitation.

At the moment, the area is protected by dams and barrages from flooding by the Danube. However, in the event of a dam break or flood, it will overflow its banks.



Fig.11. Map water flow and flooding HQ extreme , M 1:150 000





## CHALLENGES

Groundwater close to the surface on agricultural land can lead to pollution. Rainwater is lost from the water cycle if it is led into the sewer and can not be used in hot periods, which will increase.

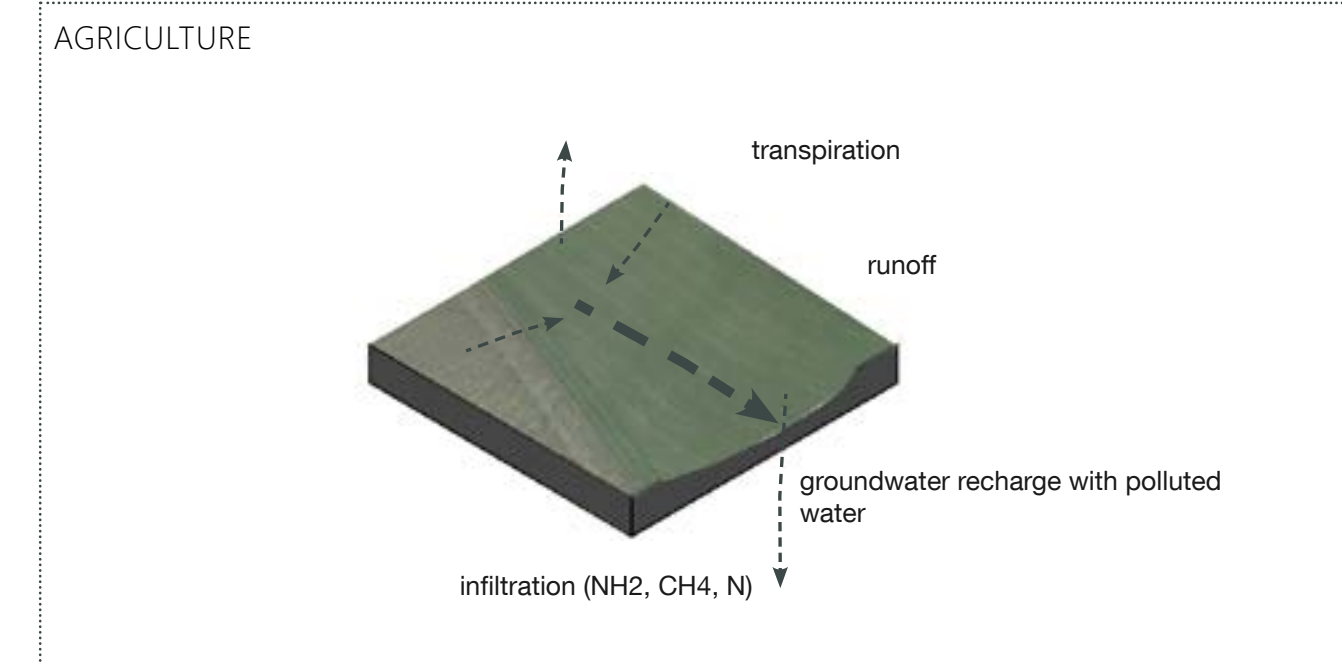
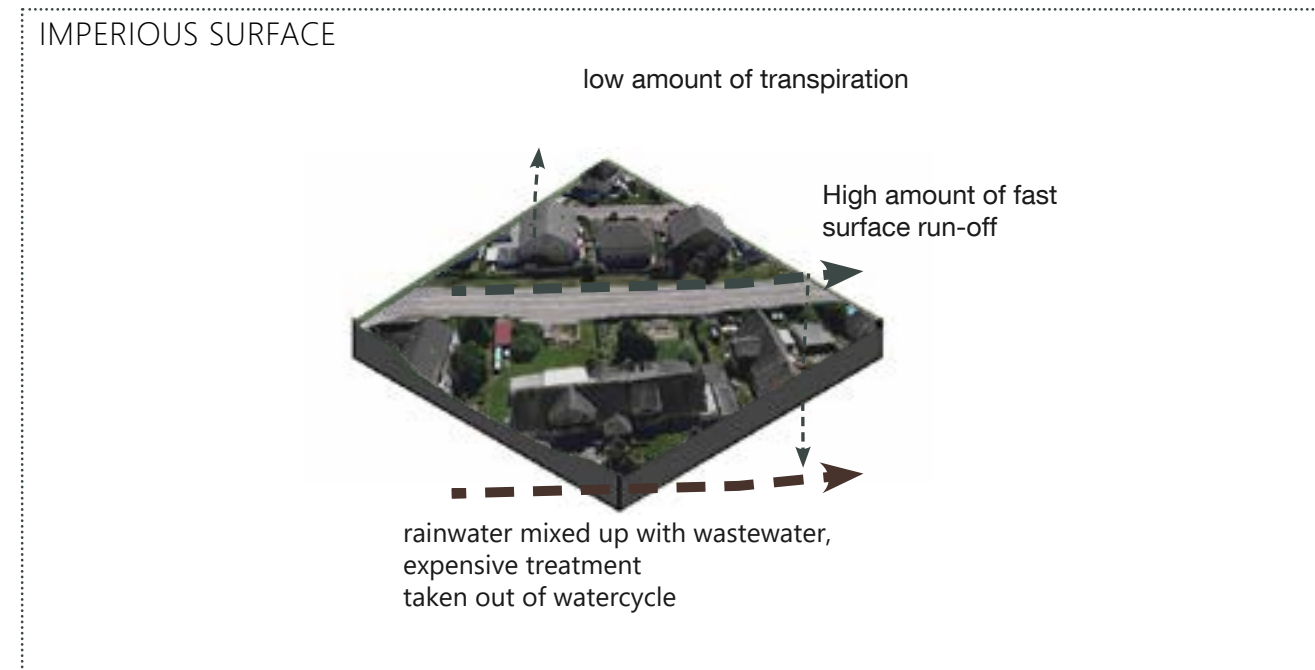
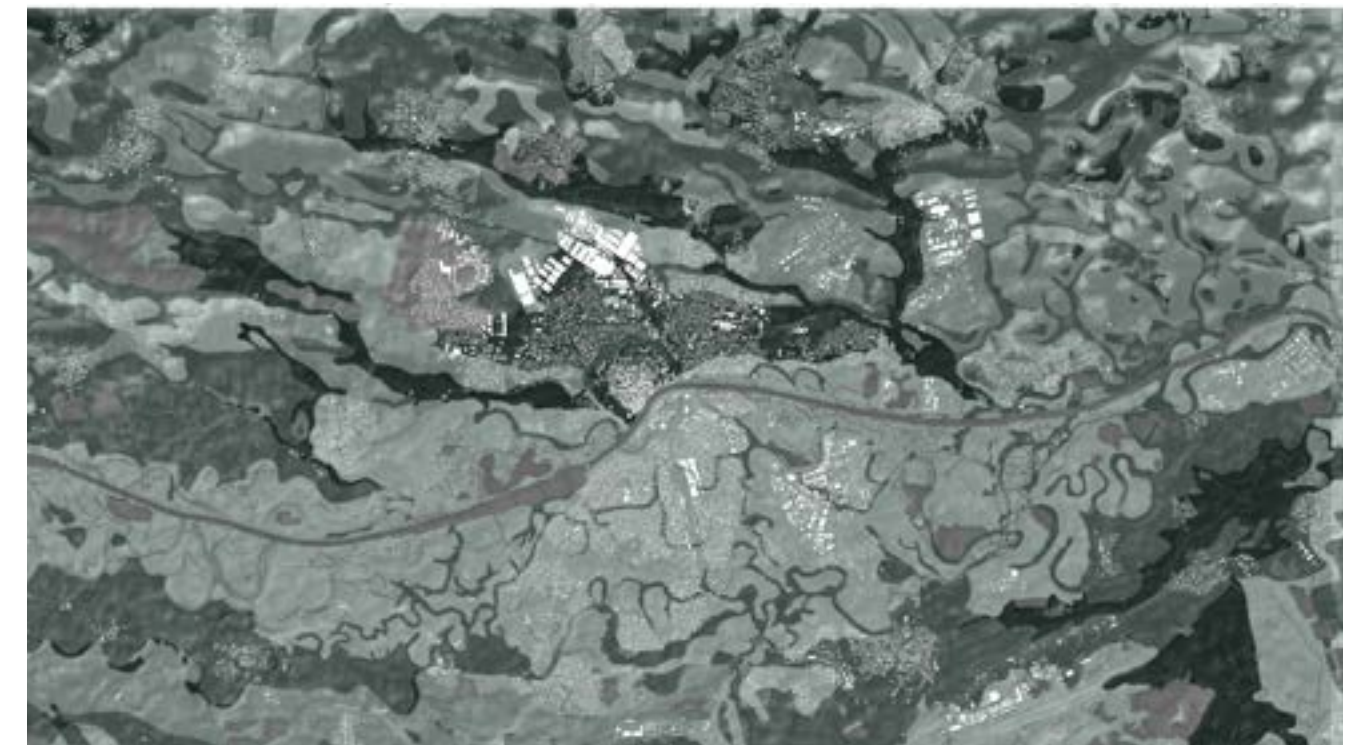


Fig.12. Diagram current waterflow

## Potentials

## POTENTIALS

Ecological and aesthetic values due to floodplain landscape



Increasing Waterretention capacity

Fig.13. Waterretentioncapability map of the soil, M 1:150 000





POTENTIALS

New initiatives for a more sustainable future planning with qualities of Danube, e.g The Donauloop, Donau Lust, New attraction in the city centre like Kammerspiele

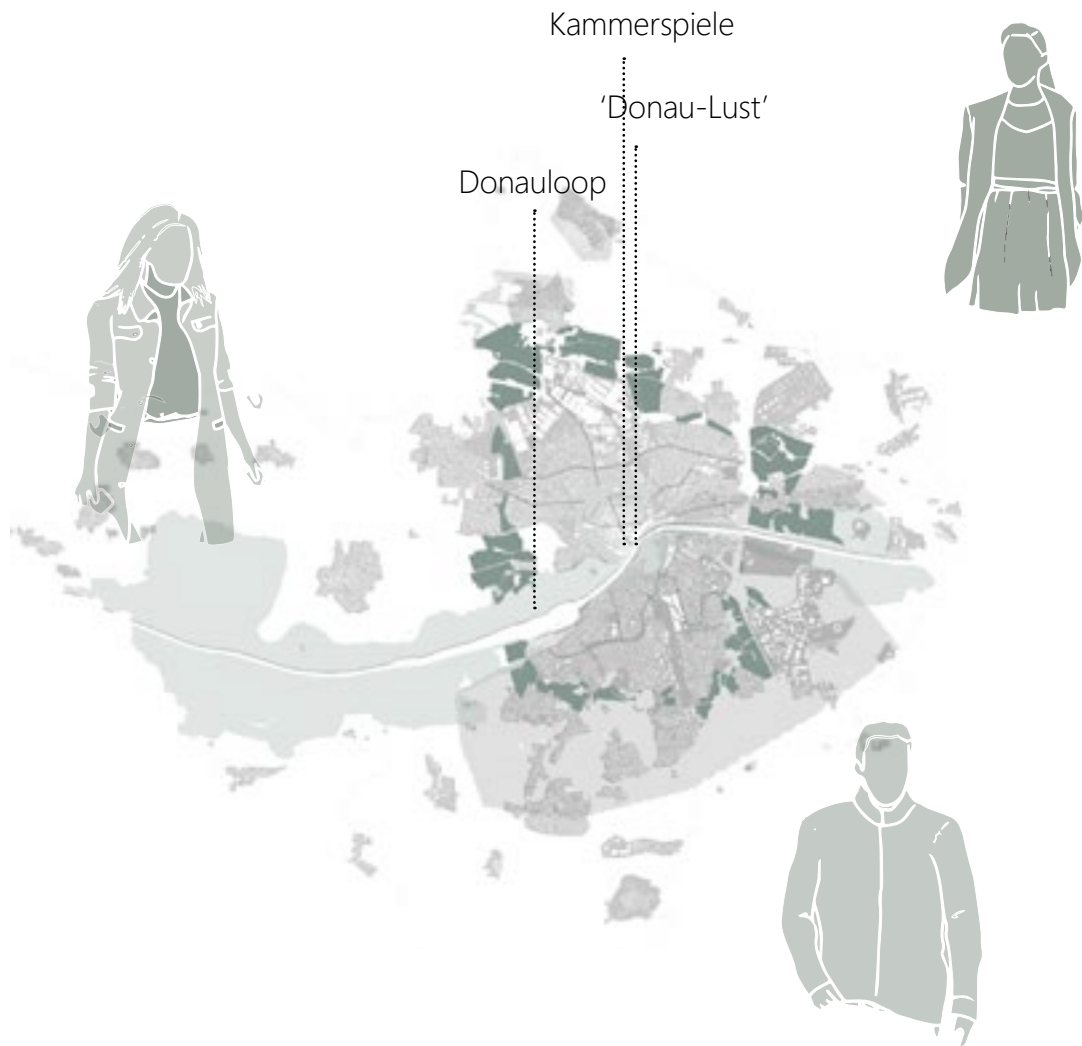


Fig.14. Diagram new initiatives



POTENTIALS

Changing mobility can provide more space for humans and ,nature'



Fig.15. Ideas about a changing mobility developed during the Audi Future Urban Awards

## SUMMARY



The goals of the design are an enhanced identification with the city and its environment, which can improve the acceptance and understanding for environment and create a wish for more environmental sensitive interventions.



The watercycle in the city should be improved and support the existing flood protection to make the city more resilient towards climate change and an unpredictable future.

an intervention only next to the Danube will not address the issues since they are anchored in the whole city

small scale interventions must be a part of a regional strategy to address the issues

current planning is missing out on potentials and fails to foster qualities of the landscape to better address social issues at once





## HYPOTHESIS

Only if we (re)integrate the genus loci into the city, inform of the underlying structure of the landscape, synergies between the built environment and human and non-human actors, can a resilient ecological and social environment facing the demands of future challenges be developed.

*Genus loci = Spirit of the place, The genius loci is not only composed of measurable factors, but also includes the atmosphere and aura of a place. The genius loci a construct in which knowledge, memory, perception and interpretation flow together as an interpretive achievement of the human mind.*

*(Wikipedia, 2004)*

## Design Proposal

## VISION & TOOLS

The Design is an alternative approach to the current planning of Ingolstadt. It takes a stand on the flooding protection strategy and the planned green belt (1). It sees the city and its surrounding as one and does not divide rather tries to integrate one into the other and create synergies.

The underlying structures underneath the city (2), which influence its hydrology will become again a spatial organizer in the urban landscape (3) and provide Ecosystemservices for human and benefits for non human actors. (4)

The Design gives back space to natural processes, admits we do not know / can not control everything (Ahern, 2006)

The spatial organizer in the landscapes acts as a multifunctional blue-green infrastructure, its functions in the city are given by it's hydraulic ability and the landuse today.

A catalog shows adequate uses for the areas and indicates which ecosystem services they can provide. The most suitable for water retention are further elaborated in their improvement of the watercycle over time, as they evolve in a natural dynamic. To show how valuable public spaces in the city can be created a case study is further elaborated.

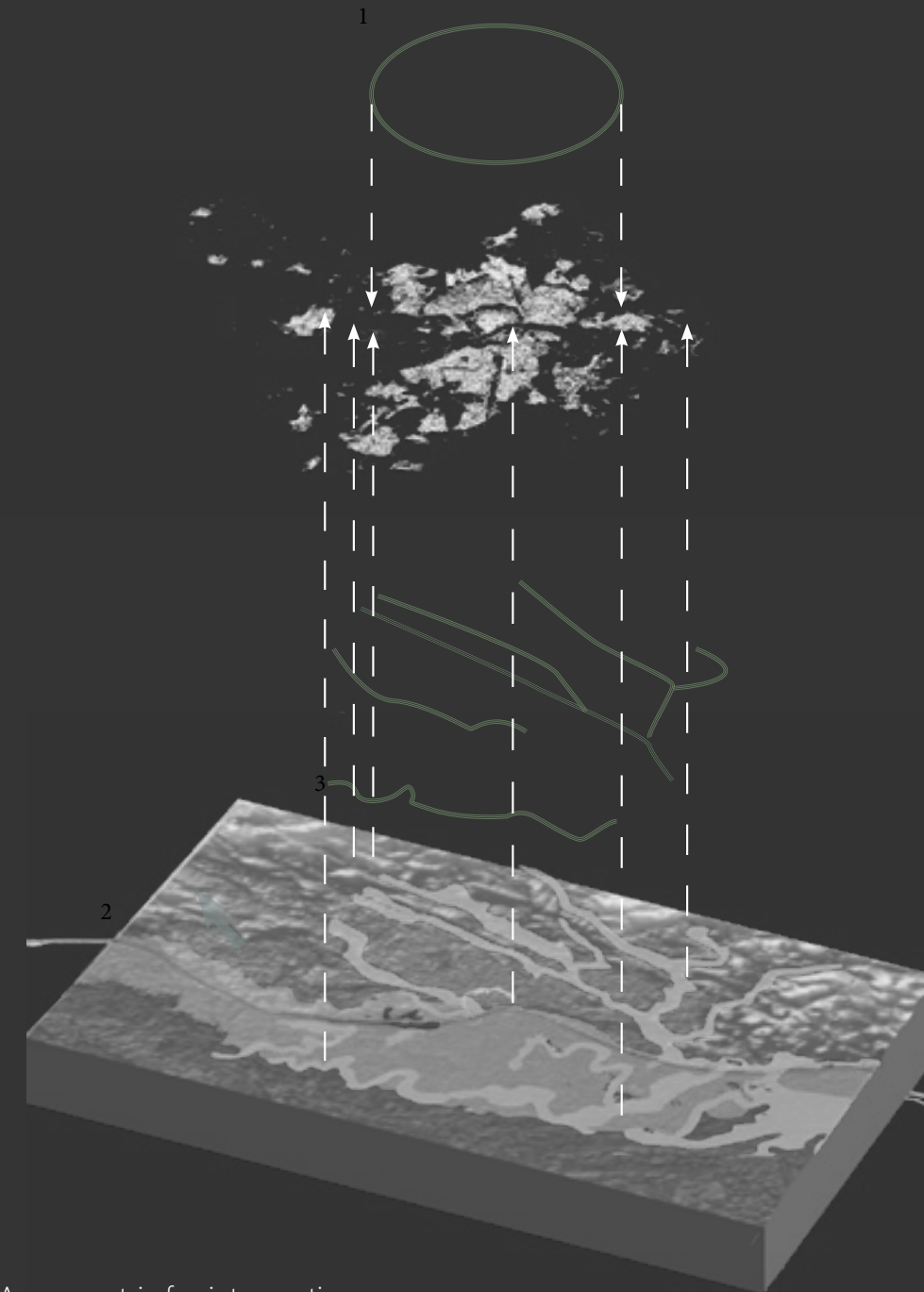
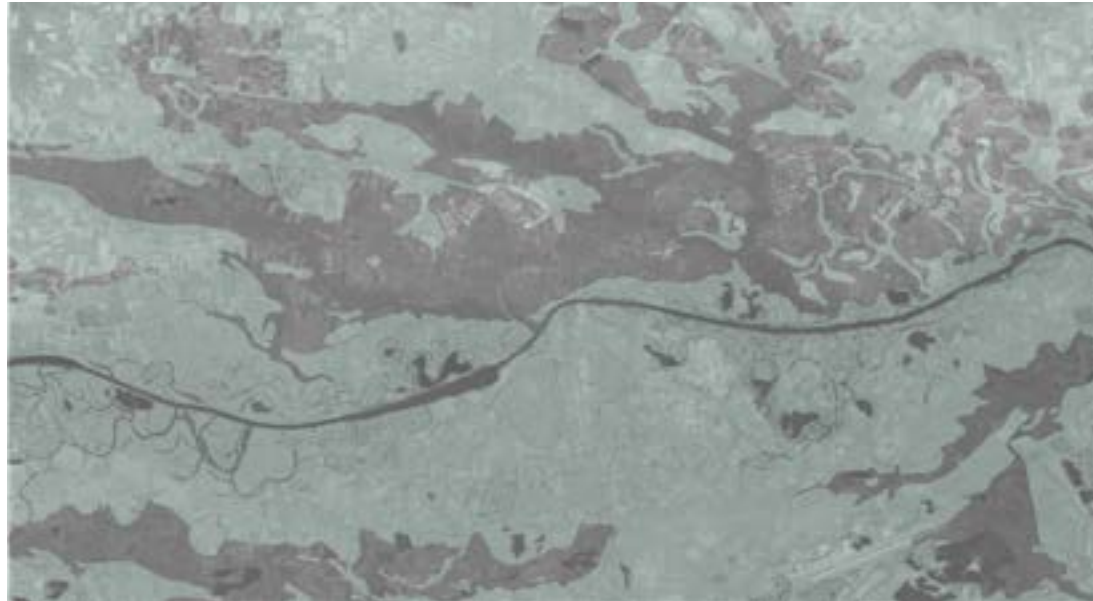


Fig.16. Axonometric for interventions



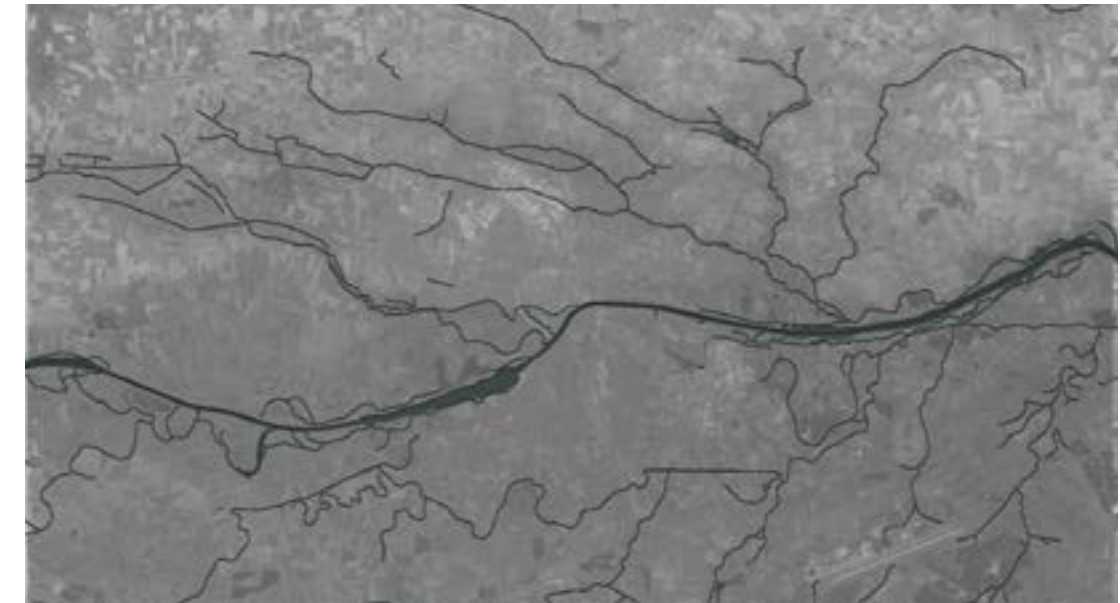
INFLTRATE  
SOIL WITH GOOD WATER RETENTION

The Strategic plan divides areas with soil for good water retention and waterways. In areas with soil with good retention interventions will be installed to improve infiltration and the quality of the infiltrated water. (On site control)



DELAY | TRANSPORT  
WATERWAYS

Interventions for the Waterways are supposed to retain and slow down the Transport of the water, improve its quality and give it more space. This can release some flooding stress on the downstream areas. (process control)



# STRATEGY

The specific uses for the spaces are given by the current land use. In contrast to the current approach with the green belt the water plan also suggests usage changes on the build-up land.

A catalogue suggests new different usages and shows the provided ecosystem services. In the areas with good retention soil a good usage for improved water retention could be a forest. Preferable next close to the Danube, creeks and surface close groundwater. In areas next to settlements more anthropogenic usages like a city park or sport field can be implemented.

The paved areas with soil with good water retention the paved area should be reduced as much as possible. With the changing mobility new areas used for cars, like parking lots or driving lanes, can be acquired over time.

Creeks running through agricultural fields should be slowly meandered and given more space around them, like this they can become an attractor in the green blue infrastructure.

Tunnelled creeks should be opened in the city to create lively public spaces around it.

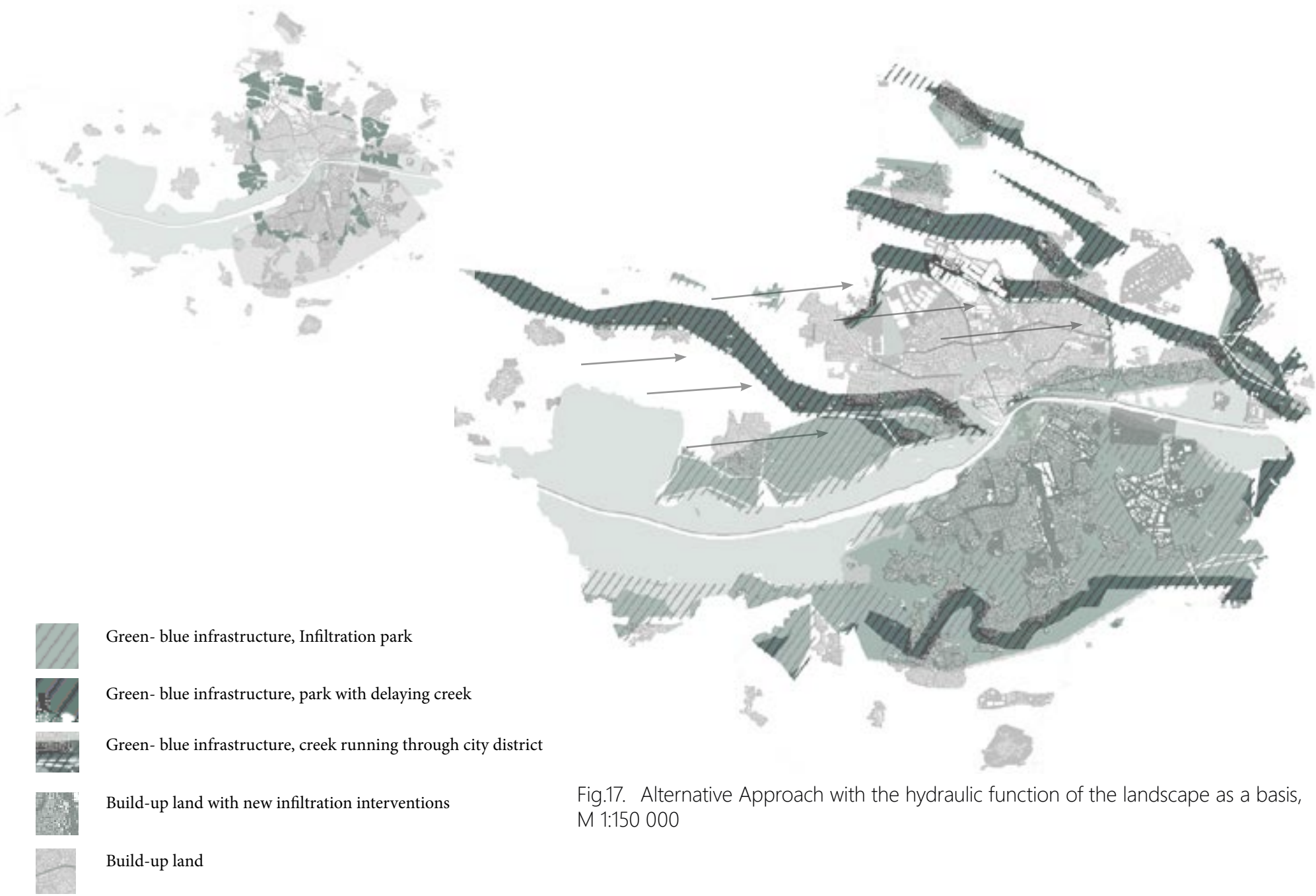


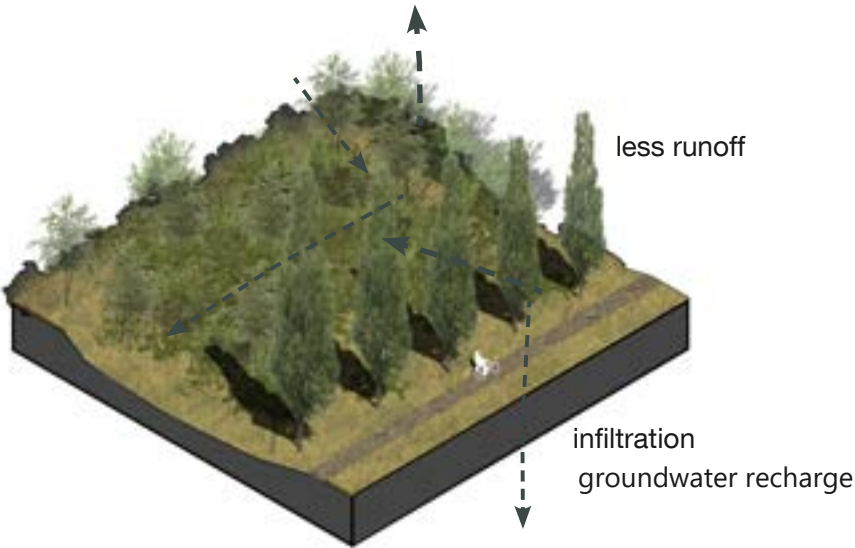
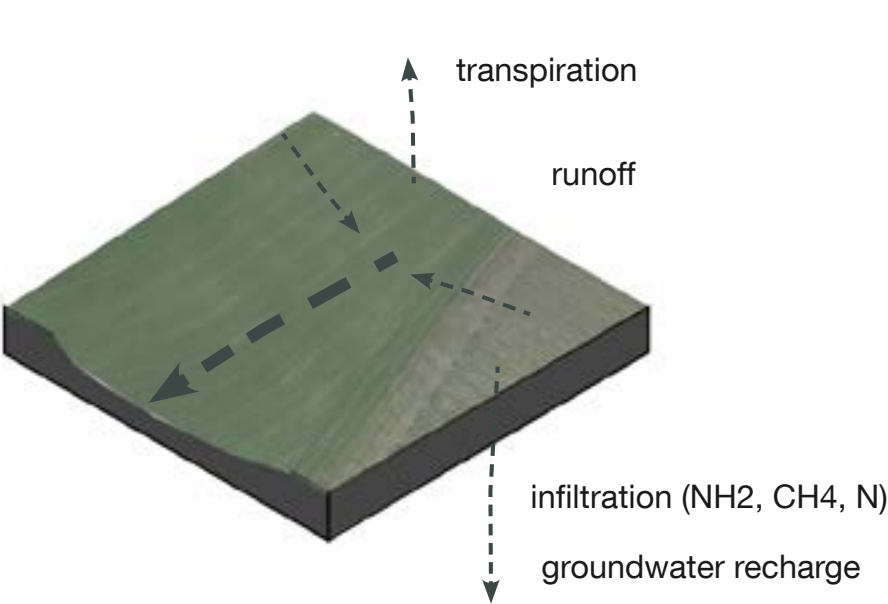
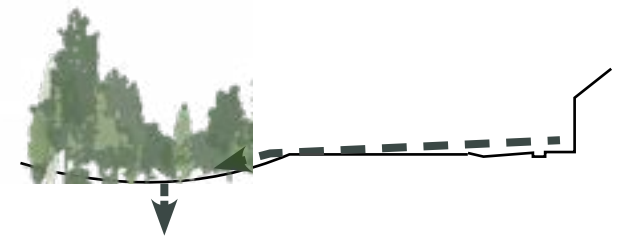
Fig.17. Alternative Approach with the hydraulic function of the landscape as a basis, M 1:150 000



CATALOG

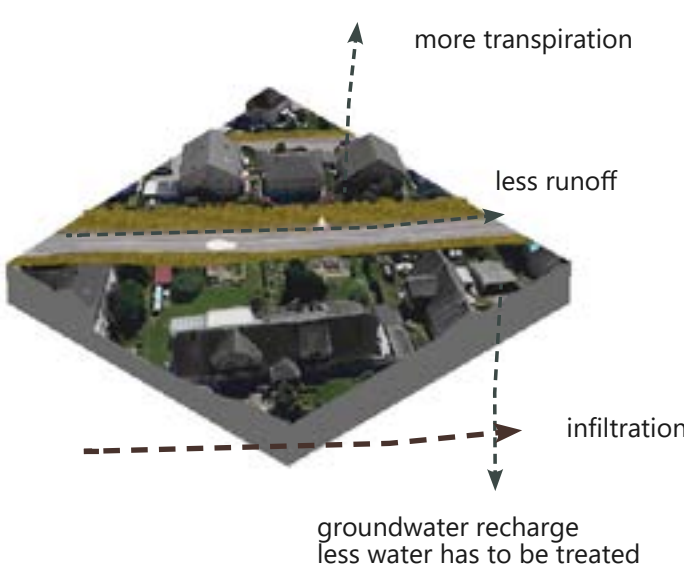
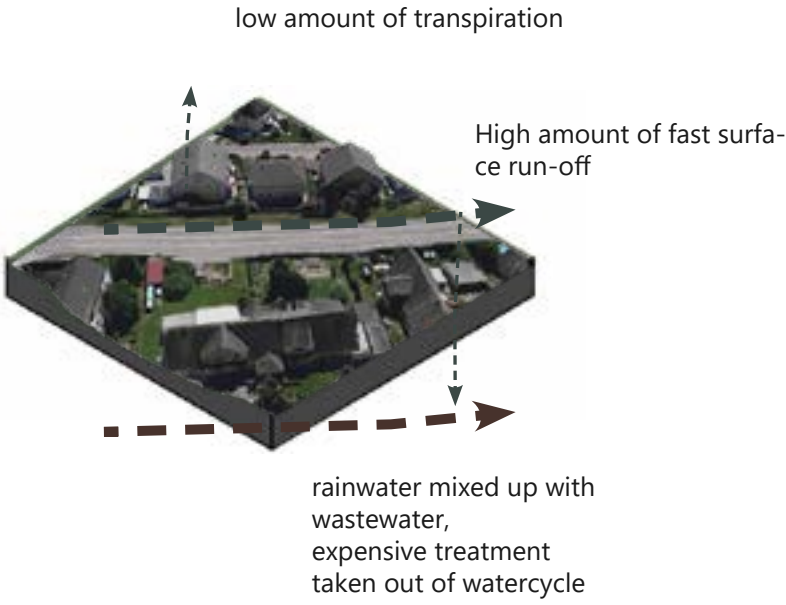
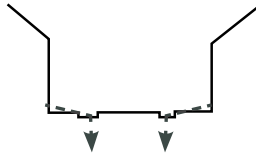
INFLTRATE  
SOIL WITH GOOD WATER RETENTION

Green- blue infrastructure, Infiltration park



INFLTRATE  
SOIL WITH GOOD WATER RETENTION

Build-up land with new infiltration interventions

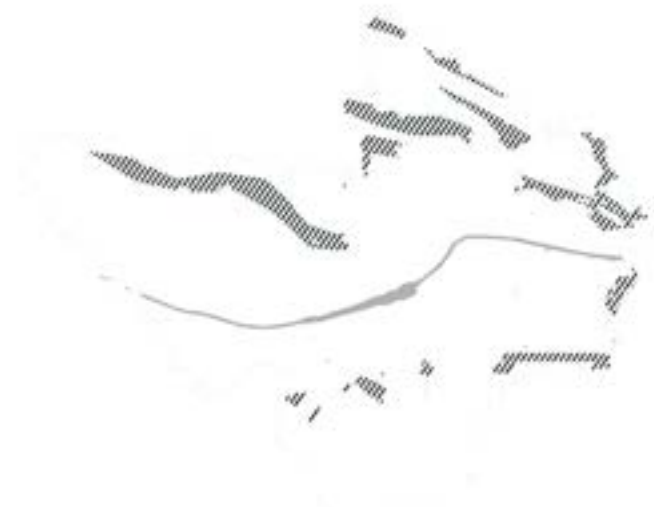


CATALOG

DELAY | TRANSPORT  
WATERWAYS



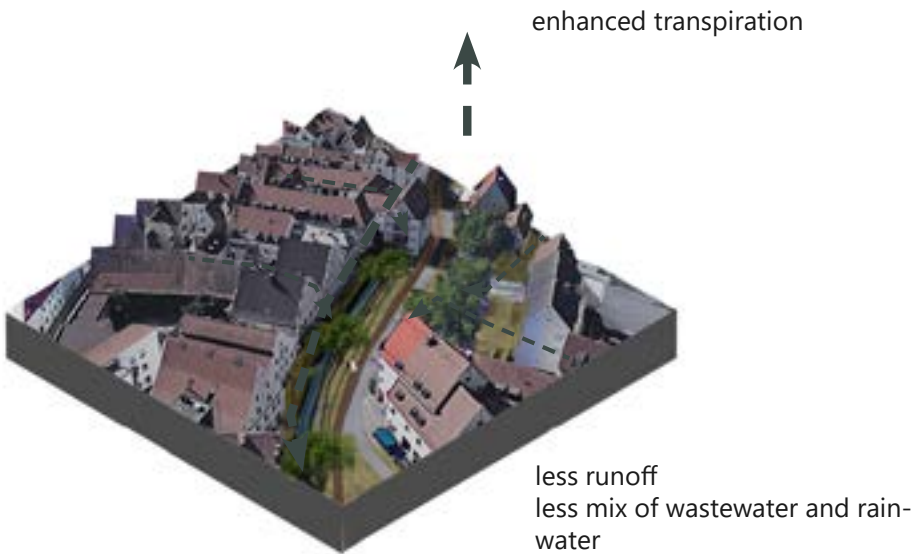
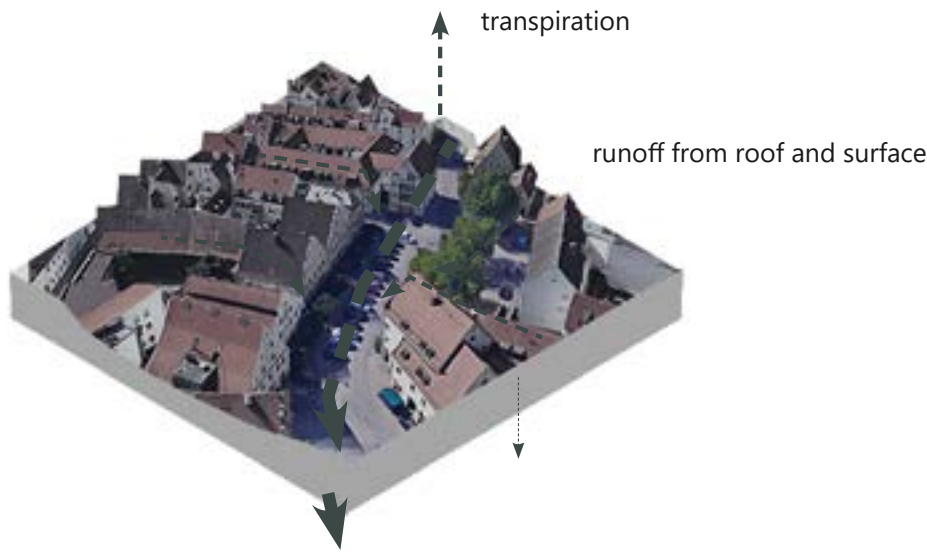
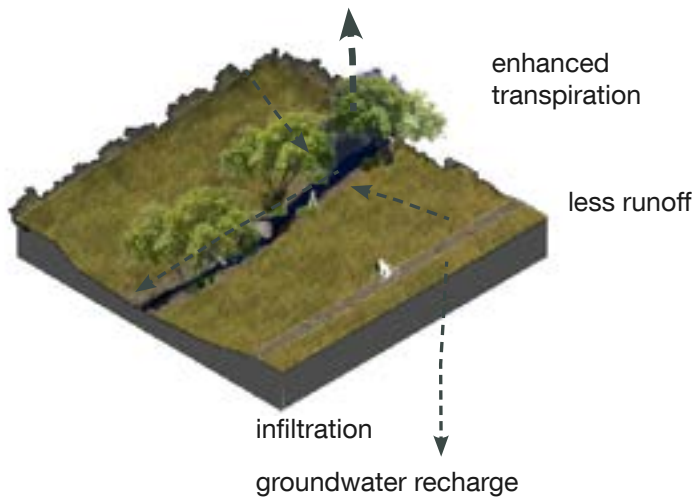
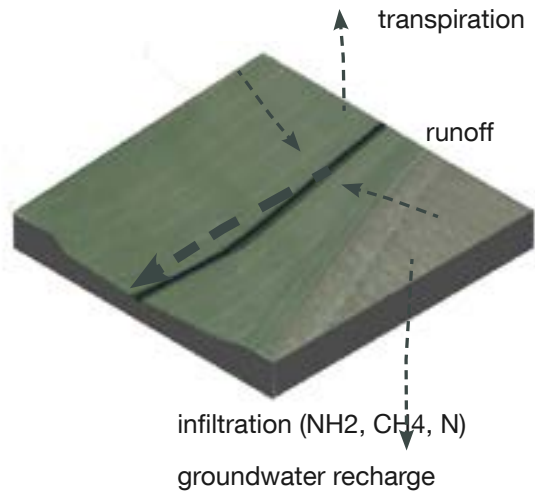
Green- blue infrastructure, park with delaying creek



DELAY | TRANSPORT  
WATERWAYS



Green- blue infrastructure, creek running through city district





## Zoom in Schutter



The Schutter was next to the Danube Ingolstadt's most important waterway. Before it got valued, it ran the city's mills. The city's millers and tanners built their prosperity on its foundation. The square at the foot of the castle, between the old town and the Danube is where the Schutter flowed into it. Today it is a parking lot, divided by a wide road and a wall from the river. To the other side the square is framed by the edge of the high terrace and the old city wall. This makes the square uninviting despite its localization and geological importance.

The vision for the Schutterplaza is to provide Ingolstadt with a large, public, dynamic and lively gathering place. It will thus become a key interchange area and space for special events and forum for all kind of activities; from temporary to everyday life activities.



Fig.18. Localisation Zoom in area



## INTERVENTIONS

### CARS

The Removing of cars will enable a new public space for Ingolstadt.

### SCHUTTER

By opening the Schutter Ingolstadt will be given back a characteristic feature. The stream will provide not only the plaza with a special atmosphere, it will link the whole city back to its fluvial and mideval history. Like the overall new infrastructure acts as a backbone for recreational development. It acts as a backbone for the the Plaza.

### LEVELS

The square needs to be leveled out to optimise accessibility and link the old town with the danube. Therefore soil gets removed at where Schutter and Danube meet and moved to the altitude between city and the new Schutterplatz.

### STREET LAYOUT

The street layout of Schloßblände needs to be upgraded to a shared space by reducing driving lane size for cars. This will calm the traffic, noise levels and improve the spaces recreational value.

### USAGES

Providing the space with infrastructure for new uses to invite more people and make it a lively space

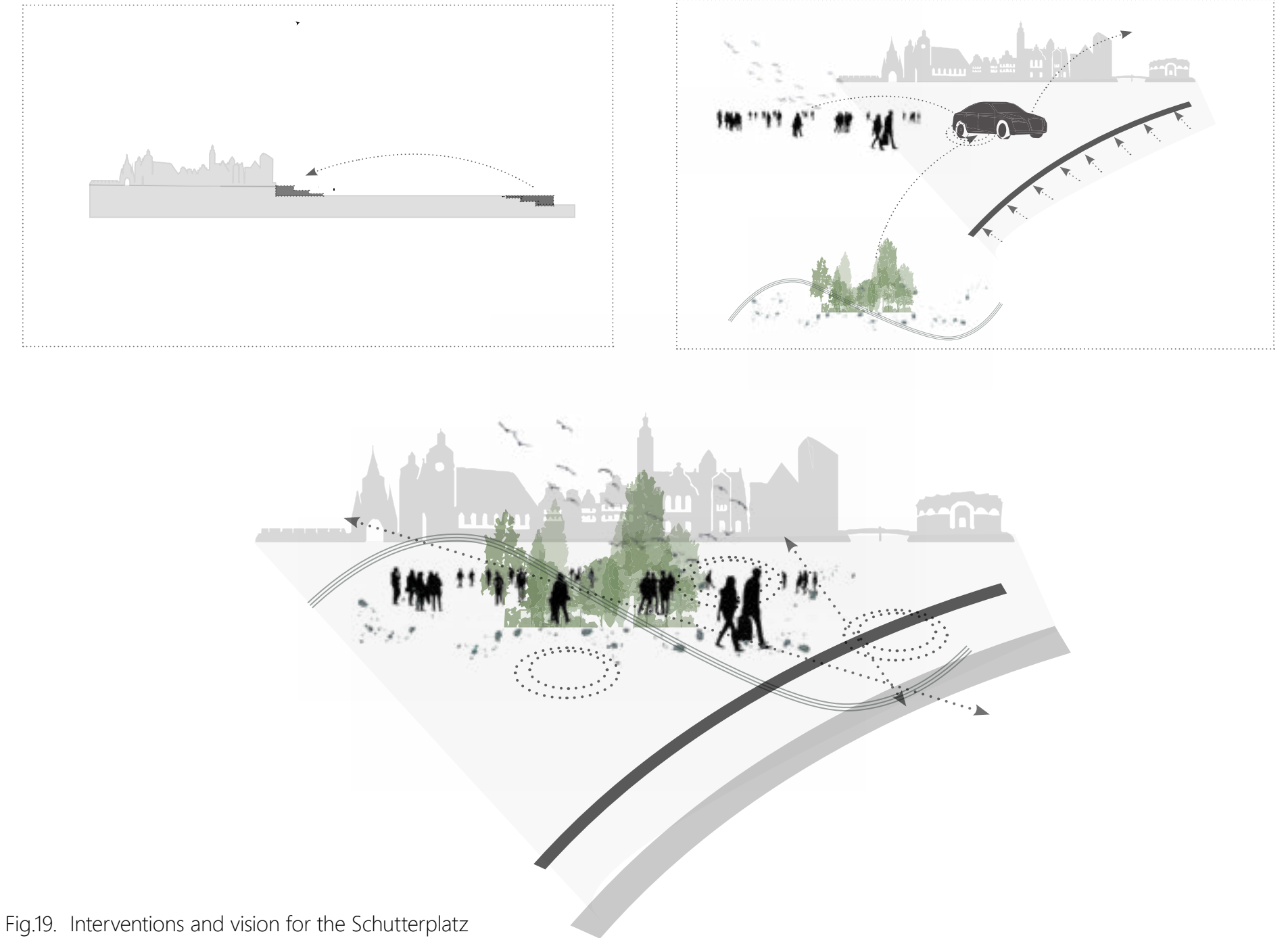


Fig.19. Interventions and vision for the Schutterplatz



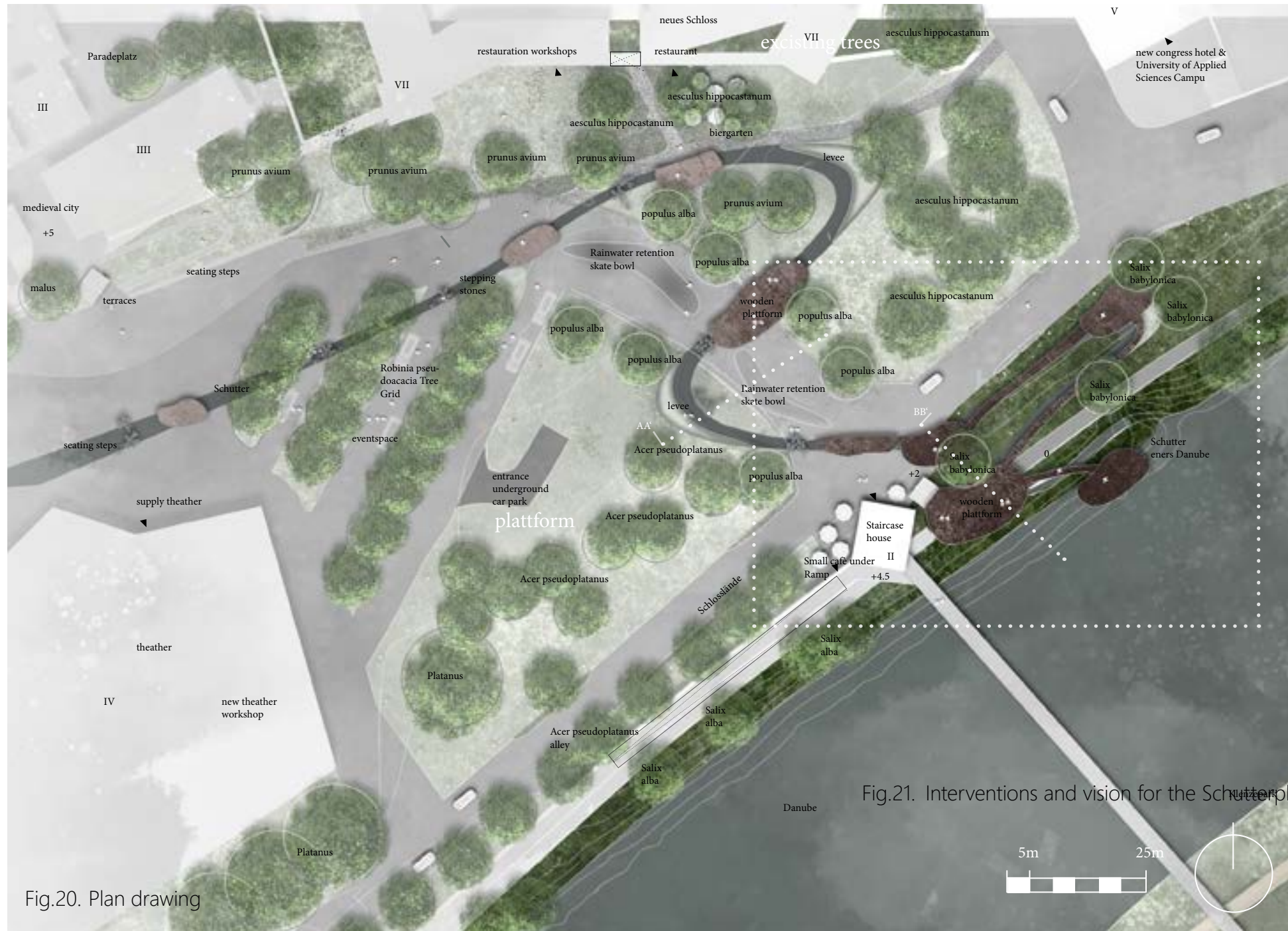


Fig.21. Interventions and vision for the Schutterplatz



## THE SCHUTTERPLATZ

Opening and remandering the streams will make them more accsesible for people. The increased heterogenity and structure in the landscape will make it more attractive and increase the quality of stay. However the water fluctuation in the water level will be a challenge.

The requirements for the use of the water arm are variable depending on the area it is running through. Especially in the city the stream must be chamfered so that the space is usable and easy to understand for all people, regardless of the water level.

The flowing lines of a meandering river have been an inspiration for the design language. Different heights and uses along the open up creek are inspired by the hydrogeomorphological elements of a natural stream.

Yet, it has to be clear, that the creek is not natural, it has been tamend anyhow for 500 hunderd years. A more natural design is aspired in the already today green spaces. Design tools have been developed to meet the various usage and aesthetic requirements.





The Design Tools are carried out, along the Schutter in the new Schutterplatz. Seating steps along the creek are used in the area where once the parking lot street ran. At some places the asphalt is broken up to allow for new vegetation to move in. More ‚natural‘ areas can be crossed by stepping stones out of the same material. The closer the Schutter moves towards the Danube, the more wood is used to utilize people's interaction with the water. It acts as bridge and as lounging place. While flowing towards the Danube, the creek flow changes into smaller curves. It runs in narrow meanders along the terraces down to the river.

The new terraces, that soften the height difference between city and river invite for a walk along the slope or to stay, sit and enjoy the very different atmospheres.

Concrete bowls in between the meandering shape of the creek attract for different uses like skateing, which can be observed from the levee on the other side.



Fig.22. Schutterplaza with Neues Schloss and reopen Schutter



Fig.23. Plandrawing

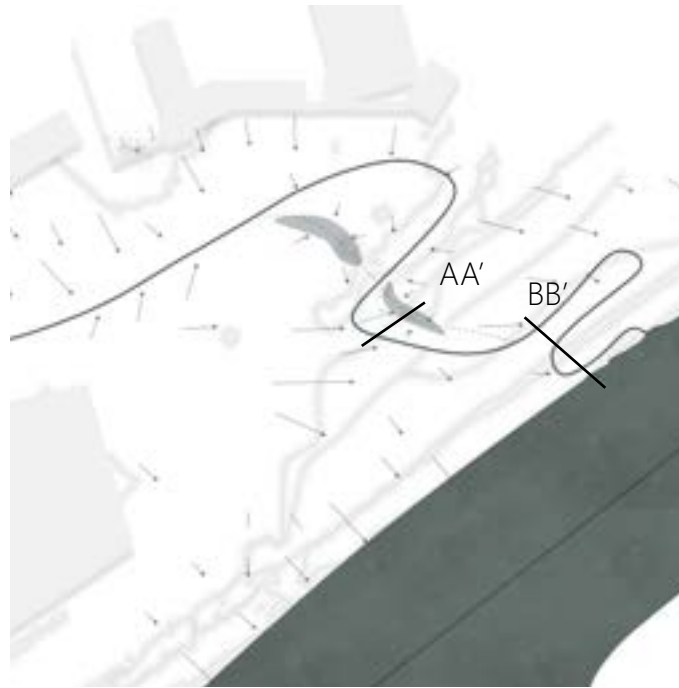
The street has been narrowed down and is on both sites incised by occasional breaking up of the asphalt with vegetation to slow down the traffic.

Installing a restaurant and a café on the borders of the plaza enlivens these and makes for a livable entrance into the space.

New plants are introduced along the former parking lot road and the terraces.







## THE WATERMOVEMENT

The Design Tools such as stepping stones, wooden platforms and seating steps are robust measurements for a heavy rain event. These smaller scale interventions, are supplemented by bowls next to the stream and retention basins along it. The plan shows, how the water can fill up these, in case of an extrem rain event.

The sections shows how the space can be used without a rain event and how water enters the concrete bowl in case of a high amount of water. The dotted area in the plan is where water is only moving in a extrem event. It can be released afterwards through a pipe.

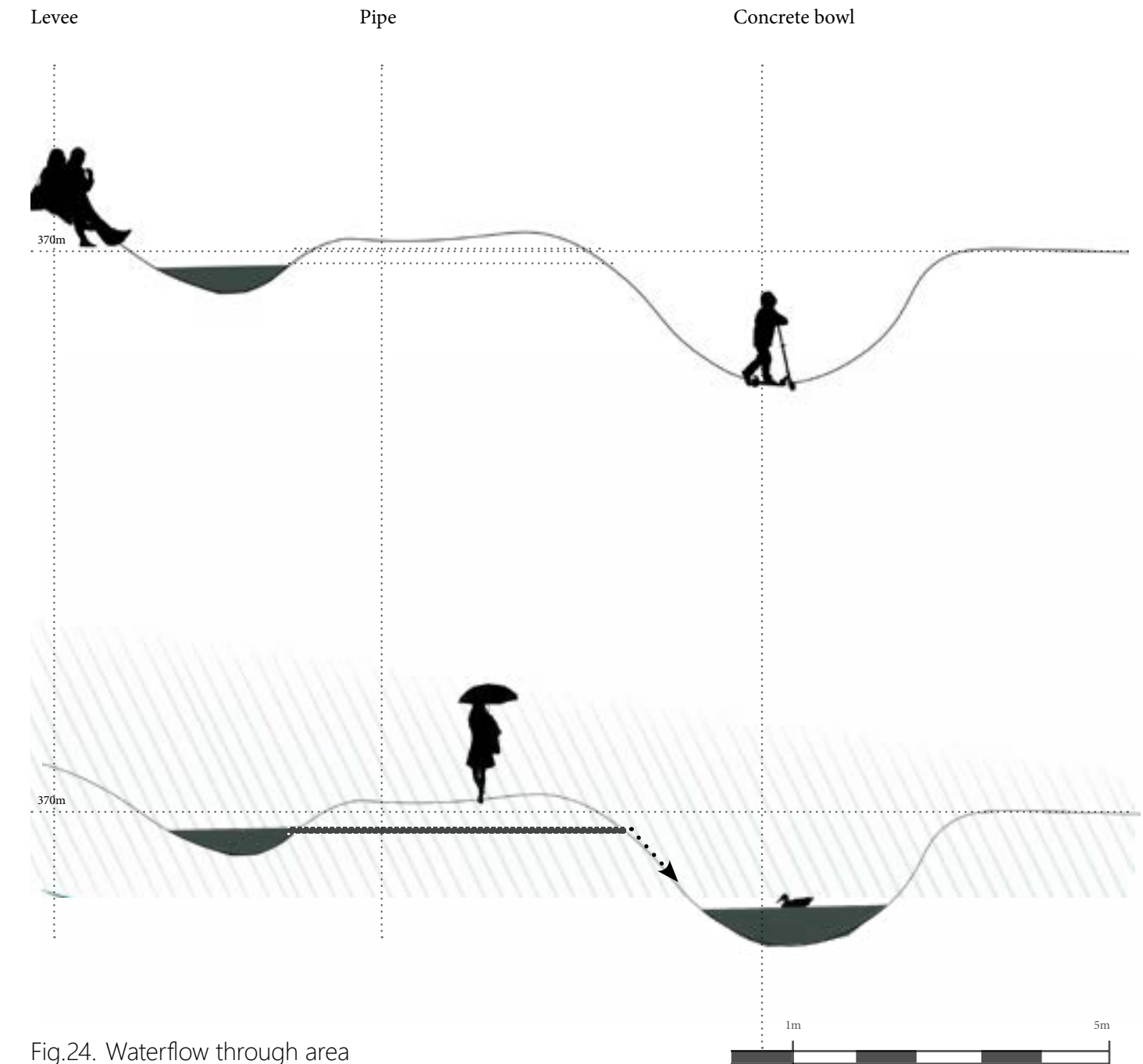


Fig.24. Waterflow through area  
Fig.25. Section AA': levee, Schutter and concrete bowl



After leaving the retention basins the water is led back into the creek. Along the terraces it the water can flow through wide and narrow areas Use for people even at high water levels is ensured by the wooden platforms. If lower ones are flooded the higher platforms get more interesting an offer a new experience with the water.



Fig.26. Section BB': Terraces at Danube banks



New measures and innovative solutions are needed to solve the challenges brought on by the climate and social environment changes.

The Analysis shows that the rapid growth and economic led mindset have directly impacted today's issues in Ingolstadt.

Green-blue Infrastructure projects are rising all around the world. We live in an unpredictable time, where we do not know which challenges we must face in the future. If we do not know what challenges we must prepare for, we cannot say their spatial extent or magnitude of disturbance. (Ahern, 2006) Furthermore, with a growing population, space will be limited. Thus areas need to provide multiple purposes (numerous ecosystem services)

In contrast to the green belt and other current planning initiatives, the water plan includes more spaces in the city. This forsters identity with and awareness of the region's distinct landscape type. Furthermore it enhances the water cycle by using the existing hydraulic qualities in the landscape.

Speaking about the flooding problem, Ingolstadt's water plan can only do a small part in contributing to prevention. The Danube puts significant flood pressure on the city. To further reduce the problem, upstream interventions must be introduced.



Fig.27. Model pictures



**With the Waterplan, Ingolstadt could become part of an international scene and present itself as an innovative city besides cars. Thus it can become an example of how to tangle contemporary problems and attract new attention and identity.**





Lea Jaud  
leajaud@web.de  
+4915787501381  
<https://www.linkedin.com/in/lea-jaud-8a49401b7/>