The transformation of South Bratislava as part of the waterscape of the Danube

FEI CHEN

Landscape Graduation Studio: Flowscapes

FLUX WATERSCAPES

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We may say that rivers have distinct personalities: forms and habits determined by their geologic settings, their flow regime—those seasonal and year to year patterns of floods and dry-season low flows—and their sediment load, that is, how much mud, sand, or gravel they transport. Rivers are naturally dynamic, changing in response to wet years and dry, the seasons, the odd landslide, and even the trees that fall in the channel. As Heraclitus said: “You cannot step in the same river twice, because the second time it is not the same river.” Rivers are part of a larger landscape, veins in a network that carries water, sediment, and wood, and through which fish migrate—most famously, salmon to their natal spawning grounds.

The river landscape also forms the collective memory of the surrounding residents. It forms the city shape and public daily life. The city and human also reform the river. As cities have urbanized, the smaller creeks have been buried in underground culverts and are largely forgotten. The floodplain was lost in the huge construction of city development. The river dynamic and ecological system was damaged. The flood faces the city directly and destroyed it.

How can we respond to this disharmonious relationship between the water and human? How can we adapting ourselves in this dynamic water landscape? It’s the passion for me to do this research design.
Figure 1.
The urban form of Wasserburg reflects the history of its growth on an accreting point bar. The construction of new buildings expended outwards in concentric bands as the channel migrated away from the city and the point bar grew.
Introduction

The Danube derives from the mountainous area of Black Forest in Germany and flows into Black Sea. It collects waters from the territories of eighteen nations and forms the international boundaries for eight of them. It’s the river that most effectively defines and integrates Europe (Wohl, 2011). However, due to the contemporary construction of river control, the Danube is a sick river now. The wandering channels straitjacketed into narrow navigational route, its floods captured by dozens of dams, and its water heavily polluted because of chemical agriculture and city development. The connection area of Upper Danube with Middle Danube between Vienna and Bratislava is a typical example for these problems. Especially, the flood-prone site of Bratislava which marks the start of the Middle Danube, is in danger of water problems because of geomorphology complexity of the meeting point of two mountains, the bottle neck area. The intense river rectifications of the old meander-belt spurred urban sprawl in the southern flood plains of the Danube and caused the central old city and southern biggest residential area of Bratislava in danger of floods. In order to mitigate these water problems caused by concrete construction of water control, we need a new water landscape spatial plan for Bratislava, which could turn the risks into opportunities for ecological sustainability, city development and public recreation.
The Danube is neither the largest nor the longest river in Europe, but it is the river that most effectively defines and integrates Europe. The Danube collects waters from the territories of eighteen nations and forms the international boundaries for eight of them. The gentle mountains of the Schwarzwald, Germany’s Black Forest, are credited with being the headwaters of the Danube. From the headwaters the river drops approximately 680 meters vertically to its mouth in the Black Sea.
Bratislava, Pressburg or Preßburg; Hungarian: Pozsony) is the capital of Slovakia and, with a population of about 420,000, the country's largest city. Bratislava is in southwestern Slovakia, occupying both banks of the Danube River and the left bank of the Morava River. Bordering Austria and Hungary, it is the only national capital that borders two independent countries.

Bratislava is the political, cultural, and economic centre of Slovakia. It is the seat of the Slovak president, the parliament, and the Slovak Executive. It is home to several universities, museums, theatres, galleries and other important cultural and educational institutions. Many of Slovakia's large businesses and financial institutions also have headquarters there.

The history of the city has been strongly influenced by people of different nations and religions, namely by Austrians, Czechs, Germans, Hungarians, Jews, Serbs and Slovaks (in alphabetical order, not significance). The city was the capital of the Kingdom of Hungary, a part of the larger Habsburg Monarchy territories, from 1536 to 1783 and has been home to many Slovak, Hungarian, and German historical figures.
Geology condition of Bratislava

Bratislava straddles the Danube River, which it had developed around and for centuries was the chief transportation route to other areas. The river passes through the city from the west to the south-east. The Middle Danube basin begins at Devin Gate in western Bratislava. Other rivers are the Morava River, which forms the north-western border of the city and enters the Danube at Devin, the Little Danube, and the Vydrica, which enters the Danube in the borough of Karlova Ves.

The Carpathian mountain range begins in city territory with the Little Carpathians (Malé Karpaty). The Záhorie and Danubian lowlands stretch into Bratislava. Therefore, Bratislava becomes the meeting point of the mountain massifs of the Carpathian arch and the last peaks of the Alps.

From Vienna basin, the Danube valley narrows as the river cuts through a spur of the Carpathian Mountains in a short gorge known as the Porta Hungarica before crossing the Slovakian border and passing through the city of Bratislava, home to approximately 450,000 people.

Because this two mountain which create a bottle neck shape squeeze the Danube River go through the south-east part of Bratislava. The city, Petržalka, that located on the south part faces a huge flood risks.
Over a period of almost three centuries, 11 Hungarian kings and 8 royal wives are crowned in Bratislava.

1809
The town is besieged by Napoleon’s troops.

1819
January 1 – Bratislava is occupied by the Czechoslovak Legions and becomes part of the new Czecho-Slovak Republic.

1948
February 25 – After a political coup, the Communist Party takes power in Czechoslovakia, all executive power in the town and across the country is assumed by communists.

1993
Bratislava becomes the capital of the independent Slovak Republic.

Bratislava developed slowly on the north bank of Danube. Lots of small village located on the higher area of the south bank of Danube.

Before 18 century
Developed on left bank of Danube

Harmony and uncontrolled

People settled and built a small village at right bank of Bratislava and enjoy the waterfront life there.

Between 18-19 century
Small Developing intervention on right bank of Danube

Less development and control

The right bank of Bratislava developed faster than any ages. The biggest socialist residential area was built by draining the alluvial fan of right bank of Danube. The floods risk becomes more serious at both bank and other water problems followed.

After 19 century
Huge development on right bank of Danube

Control and risks
Bratislava is developing on the banks of Danube for almost 2000 years. This particular river landscape also form the collective memory of Bratislava. However, at the same time, because of unlimited construction, especially on the right bank which was the floodplain of Danube river, the dynamic river landscape has lost.
Flood risk

The unlimited city construction, the lost of dynamic river landscape and together with the global climate changes give rise to higher possibility of more serious flood risks. Especially for the south part of Bratislava, the city of Petržalka, the whole city was in danger of flood risk problems.
The city of Petržalka

The construction of Petržalka in the 70s, under the socialist regimen, completely cancelled a part of Bratislava’s history, imposing a completely different urban character; Petržalka therefore still stands as a strong symbol for both the city and the citizens.

After 40 years of urban changes, transformations and despite the new millennium advent, it is straightforward how the utopist urban experiment of those years miserably failed in that district, as well as in many other European ones. Today the area is obsolete, connected to the rest of the city only through highways and full of massive and out of scale buildings, without reference points or public spaces able to offer a qualified living. Beyond the serious technological problems and weaknesses shown by the buildings, the area misses a lot of services for the inhabitants, as well as aggregation spaces; existing green areas are indeed designed only in the buildings’ courtyards and not at the district scale.

In the year of 1969, a huge residential area were built on the right bank of River Danube. It structured by separated community neighborhood which is introverted and public services centralized.
A quarter of Whole city’s residents live in Petržalka.

Petržalka, which houses 125,000 people, also still lacks centers, squares and infrastructure needed to make it a functioning community.
Problem Statement

In Bratislava, there are a lot of water problems occurring, such as urban development meets the problem of serious and frequent flooding risk; river channelization drains floodplain and river arms; dense forest area along the river leave insufficient space for flood water storage; drainage basin for city development and agriculture decreases groundwater level, reduces drinking water supplies, increases water pollution; poorly maintained and disconnected waterfront in Bratislava.
Right bank of River Danube
No central cultural services for whole city
No functional central public spaces
Low quality of right bank environment!
The right bank is endangered in flood risk!
Low accessibility from city to riverfront!
Due to the problems mentioned above, my research design is searching for a new water landscape vision of the right bank of Bratislava.

**Research Question:**

How to create a flexible and sustainable river landscape which gives a new spatial identity to the right bank of Danube River in Bratislava?

**Research Goal:**

For now, the city on the right bank of River Danube has emerging needs of a flexible, accessible and dynamic riverfront which can satisfy the public requirements and also can adapt to the water changes.

In the long run, the city on the right bank of River Danube needs big scale landscape and hydraulic Engineering for protecting the city from flood risks.
Methodology

A summary of the theory of nature process
The nature of landscape architecture as a discipline, and particularly landscape design as an important activity, can be characterized by the interplay of four principles of study and practice, understanding landscape as (I) three-dimensional construction, (II) history, (III) scale-continuum and (IV) process.

Especially, the last but most important character of landscape architecture is the thinking of Landscape as process: the landscape is regarded as a holistic and dynamic system of systems. In that respect landscape is an expression of the dynamic interaction between ecological, social and economic processes. The landscape is considered as a process rather than as a result. Natural and social processes constantly change the landscape, making the dynamics of the transformation a key issue in research and design. The design is like an open strategy, aimed at guiding developments, no blueprint design.

Projects play a role as an open-ended strategy, as in staging or setting up future conditions (e.g., manipulating processes of erosion and sedimentation by water or the development of project-based master plans). Operations focus on the interaction between landscape processes and typo-morphological aspects and facilitate aesthetic, functional, social and ecological relationships between natural and human systems. This principle of study and practice elaborates on models for understanding the landscape as system (e.g. layers-approach) and concepts like sustainable urban metabolism and urban ecology (Nijhuis, 2010).

Nature processes as Values
Once it has been accepted that the place is a sum of natural processes and that these processes constitute social values, inferences can be drawn regarding utilization to ensure optimum use and enhancement of social values. This is its intrinsic suitability. For example, flat land with good surface and soil drainage is intrinsically the most suitable land for intensive recreation, while areas of diverse topography represent a higher value for passive recreation. The social values represented by the natural processes more often than not are inherently suitable for a multiplicity of human uses. Flat well-drained land is as suitable for intensive recreation as it is for commercial...
industrial development. Areas of diversity and high scenic interest have a high social value for conservation and passive recreation, at the same time being highly desirable locations for residential development. These apparent conflicts can be resolved in a number of ways. Because of their scarcity and vulnerability, certain resources may represent such high value for conservation that other uses should be excluded. Multiple uses of some areas may be permitted if it is assured that intrinsic values are not compromised. Yet in other cases where two uses are coequally suitable, it remains with society to make the choice (Mchage, 1969).

Water processes

Considering the character of the right bank of Bratislava, the processes related to the river landscape are vital forces to form the existing landscape. As an alluvial fan of Danube River, the sediments from the upper Danube stay at this area. This water landscape of Bratislava is an excellent research subject for such process orientation design.

Water and processes can never be regarded as separate. Observations over a longer period reveal that the entire river space exists in a constantly advancing, continuous process of change. The constant shifting of the river’s course that can shape entire landscapes creates a complex, continually changing system – although the processes cover timescales that we cannot directly comprehend. The present course of a river is, seen in this light, no more than a snapshot in time of this ongoing process. Therefore, what kinds of processes and their driving forces related to water and river landscape? Water and river landscape are highly complex systems within which interconnected processes occur simultaneously: physical, chemical and biological processes exert reciprocal influences.

For the design of landscape architecture, the spatially operating physical processes are more important. They are predominant for the shaping of river spaces. Essentially, it distinguishes between two types of dynamics, each with two sub-processes. The first is the temporary flow fluctuations which have two sub-processes: vertical water level fluctuation and lateral spread of the water. The second is morphodynamic processes that have two sub-processes: sedimentation shift within the river and self-dynamic river channel development (Prominski et al., 2012).
**Water process: temporary flow fluctuations**

Sub-process 1: vertical water level fluctuations

The discharge and resultant level of a river changes almost daily, although mostly it is only extreme high or low water events that are noticed. The water level in the river and during floods in the flood plain is in direct correlation to discharge from the catchment area. According to the space available and the roughness of the riverbed, the banks and the river foreland, a certain discharge rate causes a corresponding water level. This relationship can be described for single points along the watercourse as the ratio between water level and discharge. High water events are generally expressed in mys - the discharge volume and not the water level.

Sub-process 2: lateral spread of the water

High water is especially conspicuous through flooding; minor rises in discharge levels can usually be contained within the river channel, but with larger high water events the river overflows its banks and covers the adjacent flood plain. This has a corrective effect: in flooding the foreland, which generally has a higher roughness, the water’s energy is dissipated and its height and speed reduced. Flooding is limited, when the river is not shaped by human measures, to the valley borders. Flood protection measures such as dikes cause an artificial limitation on the spread of the water and thus the flood area.

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**Water process: morphodynamic processes**

Sub-process 1: Sedimentation shift within the river

The slower flow on the inner curve of a river leads to the deposit of sediment; a slip-off slope is created. On the outside curve, the cut bank, the fast cylindrical flowing current erodes the bank and deepens the bed. This means that the cross section of the river bends is asymmetric; the bank on the inner bend is flat, and on the outer cut bank there is a deeper channel (pool); the secondary flow cuts a channel in the riverbed that, when the water is low, carries most of the discharge and is thus called the low water channel. As a result of centrifugal forces created by the flow vortexes, the low water channel sinuously meanders from one side of the riverbed to the other, always on the outside edge of the outer bends. In straight sections of a river the riverbed is flat which is where ripples or a ford can form through sediment accretion (Pic. 1). The state of the riverbed is constantly changing as a result of these dynamic processes. Through this alternating process of erosion and sedimentation the river as a system is self-regulating, and the longitudinal section of the riverbed varies around a relatively stable mean.

Sub-process 2: Self-dynamic river channel development

The meandering of a river is a self-reinforcing process, as the water flows faster on the cut bank on the outside of the bend and causes further erosion. The bank is literally ‘eaten away’ and steep edges are created. As the bank crumbles, the bend that thereby emerges shifts inexorably, both towards the edge of the valley and downstream. On the inside bend of the river - the slip-off slope where the flow rate is lower - sediment settles, and the course of the whole river channel shifts (Pic. 2). The meander becomes larger and rounder, almost circular, and when the circle is nearly closed the river may break through, the loop is cut off, and the whole process begins again.
The waterscapes design principles including flow fluctuations and morphodynamic processes

Each river forms the surrounding landscape in diverse ways, and conversely the surrounding environment exerts influence on the shape of the river through many factors. The land forming power of water arises from the close interplay of topography, geology, climatic conditions and the above mentioned erosive and accumulative activity of the current. Every river changes over various timescales and to various spatial extents; water landscapes are thus expressions of complex spatiotemporal processes.

In order to adapt this complex system, human has created different kinds of water spaces. Due to the great amount of ways of designing the water landscape, it is better to use the mixed methods research approaches by John W. Creswell and case study research method by Robert K. Yin to get a grip on it and to find the clues and principles for us to deal with the water landscape design of Bratislava.

Space A
‘Embankment Walls and Promenades’, the banks are very steep and there is hardly any flood area available. For this reason fluctuations in watercourse conditions are mainly vertical and morphodynamic processes are consequently excluded.

Space B
‘Dikes and Flood Walls’, large vertical elements limit the flood area at some distance from the normal watercourse. Both horizontal and vertical fluctuations in the watercourse conditions take place, whereby the borders of this Process Space only permit very small-scale morphodynamic processes.

Space C
‘Flood Areas’, comprises spaces near the watercourse that are regularly submerged under its horizontal expansion and in which spatial design has to work with these processes.

Space D
‘Riverbeds and Currents’, when the river is not sealed in places, reversible aggradation and erosion processes can happen along the riverbed, with consequences for the form of the riverbed and also the banks.

Space E
‘Dynamic River Landscapes’, is shaped by processes that are to be found in natural watercourses. By including the flood areas in the erosion and aggradation processes, the river can shift its entire course.
Space A
Embankment Walls and Promenades

Space B
Dikes and Flood Walls

Space C
Flood Areas

Space D
Riverbeds and Currents

Space E
Dynamic River Landscapes
Design Concept

The processes orientated design principle of landscape architecture will guide my research design and provide basement for the theory and methodology. The dynamic processes of water landscape are the focus of my research design. By means of combining different water landscape programs and strategies, the research design will reflect on those design possibilities and show the potential of utilization at the location of Bratislava.

My design concept is based on this water process. By creating dynamic water landscape, the aim is to create a flexible and sustainable waterscapes which can give a new identity for the south part of Bratislava.

The title of my research design is FLUX WATERSCAPES- The transformation of Bratislava as part of the waterscape of Danube. Flux means a continuous change. Flux waterscapes can adapting to the changes of water flow and social needs.

It can create a flexible water landscape basement which can adapting to water changes and recall the collective memory. Then adding dynamic programs to waterfront of Bratislava that can satisfy the public requirements.
Extending the space

Tolerating

Evading

Adapting

Above the water

Flexible waterscapes

Channel migration

Channel dynamic

Creating new channels

Grading the channel

Varying the river bed

Social needs
Regional analysis and plan framework

From regional scale, in order to mitigate the floods problem, this area needs hydraulic engineering construction. The design combines the two kinds of river bypass system to solve this problem.

From local scale, in order to improve the quality of living environment and enhance the connection between the human and water landscape, the design uses the existing water landscape and creates new water landscape to facilitate the accessibility to the waterfront and increase the public recreational use of the waterfront area.
How to mitigate flood risks of Bratislava?

How to improve low quality of living environment?

Reference: New Envision of the city center of Christchurch

Reference: Delta work 2.0, by RAAAF/Reitveld-Architecture

BLUE river bypass

GREEN river bypass

Waterfront transformation and improvement
The main Danube river bank transformation

The waterfront transformation becomes a start point for the whole regional water landscape development. It can get public attention to the potential of this fantastic water landscape. And it’s also can be a flood warning place.

Decreasing the seasonal overmuch water discharge risks of each banks;
Increasing the connection between city center and new city;
Improving the recreational function of right bank of Danube River;
Flood risks warning.

Inside new city waterscape improvement

Based on this waterfront transformation, it provides potential to improve the quality of the connected south inner city old creek green field. The old creek go through the whole south city and can be created as city central public spaces to enhance the city social daily life. Decreasing the bad influence of the massive and out of human scale buildings.

Improving quality of the environmental liveability of south city;
Connecting the existing old creek to the blue bypass;
Increasing the accessibility from the inside city to the waterfront of Danube River;
Improving the recreational function existing water channel;
Rainfall collection and underground water supplement.

City surburbs blue river bypass construction

First, starts to built the blue river bypass that can handle the floods in 30 years. The blue bypass landscape also changes when the water level changes. Besides this, it also can fulfill the social recreational needs of surrounding residents. It provide a wildness and high ecological green field. It also can let the water quickly pass by without damage the city.

30-50 years floods mitigation;
Constructing the bypass water channel;
Providing surburbs waterscapes adventure activities opportunities.

City surburbs Green river bypass construction

The construction of Green river bypass is to give extra safety of the city. It can handle the flood in 100 years. The Green river bypass can still keep the agriculture function of the existing land. When the floods comes, it will fill with extra water discharge that the blue river cannot handling. So in normal time, the green river bypass field can use as grazing and grass production. The surrounding residents can take a trip to this fantastic meadow landscape. When the water level becomes higher, this field will fill with water.

30-100 years extra safety flood risks protections;
Constructing the entrance of green river bypass;
Agricultural production (Grazing and grass production);
Rainfall collection and underground water supplement.
The main Danube river bank transformation

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Decreasing the seasonal overmuch water discharge risks of each banks;
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Improving quality of the environmental liveability of south city;
Connecting the existing old creek to the blue bypass;
Increasing the accessibility from the inside city to the waterfront of Danube River;
Improving the recreational function existing water channel;
Rainfall collection and underground water supplement.
In order to mitigate the flood problems, the suburb agriculture land provide potential to build river bypass. By tracing the old existing creeks and lower land of this area, it provide potential to build River bypass. Beside this, the bypass design needs to protect the heritage that found in this area, give them new perspective in the new water landscape.

Based on this, the regional design introduce two river bypass system in these area to solve the huge flood problems. The blue river bypass and green river bypass.
City surburbs blue river bypass construc-

First, starts to built the blue river bypass that can handle the floods in 30 years. The blue bypass landscape also changes when the water level changes. Besides this, it also can fulfill the social recreational needs of surrounding residents. It provide a wildness and high ecological green field. It also can let the water quickly pass by without damage the city.

30-50 years floods mitigation;
Constructing the bypass water channel;
Providing surburbs waterscapes adventure activities opportunities.
Blue Bypass
Existing Forest

Blue river bypass water discharge changes
City surburbs Green river bypass construction

The construction of Green river bypass is to give extra safety of the city. It can handle the flood in 100 years. The Green river bypass can still keep the agriculture function of the existing land. When the floods comes, it will fill with extra water discharge that the blue river cannot handling. So in normal time, the green river bypass field can use as grazing and grass production. The surrounding residents can take a trip to this fantastic meadow landscape. When the water level becomes higher, this field will fill with water.

30-100 years extra safety flood risks protections;
Constructing the entrance of green river bypass;
Agricultural production (Grazing and grass production);
Rainfall collection and underground water supplement.
Regional ecological potential

In the long term, the transformation of this water landscape of whole region will increase the dynamic of ecological potential. It will reconnect the broken nature corridor between the Vienna to the Gyor. The new water landscape provides possibility for the endangered species to live.
Art field park

Considering the utilization of the new water landscape, the Danube museum in Bratislava gives a possible way. The landscape is also an art project. The combination between this natural art and artificial art could provide a new way for people to rethink about the surrounding water landscape. The landscape will change and grow in the future, the artificial art project also changed in this background, because of the light and reflection.
Design of Art field park

Service Center  Waterfront Villa  Art Project  Gallery
Presenting landscape as Art

The new water system changed the original agriculture land into more dynamic landscape. This dynamic landscape can be experienced by the public because of the fantastic seasonal changes.

The landscape is constantly changing and growing. People could feel those changes and cherish this landscape resulted by this new water system. Besides this, the new landscape also becomes a landscape basement for the manmade art project and buildings. Because of the landscape changes, those art works also change with them. The growing grass will cover part of the project. The tree will put their shadows on the building. The art project with mirror facade will reflect the color of landscape.

Besides this, the landscape also provides a dynamic living environment for the animals. Various kinds of plants can survive in this new ecology system. It becomes a good suburb recreational area for the people living in Bratisalva.
Considering the existing situation and problems of the water landscape of south Bratislava, I put forward my regional plan framework. The whole regional plan includes four parts. The Danube riverfront transformation, the inner city old creek improvement, the city suburb green and blue river bypass construction. The whole plan is to deal with the problem of low quality and inflexible water landscape of this area, the flood risks and inaccessible waterfront.

To realize this project, I introduce to transform this water landscape step by step in a time schedule. This schedule is based on the degree of urgent public needs, the construction time, commercial issues, political land owner problems countries’ boundary area. Then the whole project could finish in this time. And it provide more options and potential to realize this project.
1. Main Danube river bank transformation
   - Decreasing the seasonal overmuch water discharge risks of each bank;
   - Increasing the connection between city center and new city;
   - Improving the recreational function of right bank of Danube River;
   - Flood risks warning.

2. Inside new city waterscape improvement
   - Improving quality of the environmental liveability of south city;
   - Connecting the existing old creek to the blue bypass;
   - Increasing the accessibility from the inside city to the waterfront of Danube River;
   - Improving the recreational function existing water channel;
   - Rainfall collection and underground water supplement.

3B. City surburbs blue river bypass construction
   - 30-50 years floods mitigation;
   - Constructing the entrance of Blue river bypass
   - 30-100 years extra safety flood risks protections;
   - Constructing middle and lower part of green river bypass;
   - Providing surburbs waterscapes adventure activities opportunities.

3G. City surburbs green river bypass construction
   - 30-100 years extra safety flood risks protections;
   - Constructing middle and lower part of green river bypass;
   - Agricultural production (Grazing and grass production);
   - Rainfall collection and underground water supplement.
Elaboration in waterfront design framework

As the heart of Bratislava, the right bank of Danube River in Bratislava has urgent needs for transformation and improvement now. The situation of the waterfront is non-functional and in low quality. It is also unadaptable to the seasonal water discharge changes. With a great view and public utilization potential, the riverfront becomes an important conjunction and connection part for the two bank cities. Therefore, I would like to do an elaboration design for this area as a showcase for regional plan. It’s also a start point to let people notice and pay attention to this dynamic waterfront potential and recall the collective memory of old riverfront of Danube River.
The city on the right bank of River Danube has an urgent need of a flexible, accessible and dynamic riverfront which can satisfy the public requirements and also can adapt to the water changes.
The south bratislava is an alluvial plain formed by Danube river. The shape of river bank was meandering before. Until 19 century, in order to increase the potential of navigation, the river banks has reformed as straight. The bank raised higher and higher than the river, it caused the lost of dynamic ecological potential and also unadaptable to the seasonal water changes. However, the old Right meandering river bank is an old water landscape identity of Danube River in Bratislava. It forms part of the collective memory of Bratislava. This meandering river shape also gives more dynamic ecological potential.
The existing situation of this area is in low quality and non-functioning green field. It’s like a boundary between the south and north city. However, this waterfront area faces a fantastic view the old and new city center of Bratislava. So how can we design this waterfront to turn this boundary land into a flexible, accessible and dynamic riverfront that can satisfy the urgent social recreational requirements and also can adapt to the water changes? Based on my design concept, firstly, creating a flexible and dynamic waterfront landscape base. Secondly, preserving existing valuable program and introduce new necessary and attractive program to satisfy social needs. Thirdly, improving and strengthening the accessibility from right and left bank to the waterfront.
Creating a flexible water landscape basement which can adapting to water changes and recall the collective memory.
Landscape basement design

Firstly, it's to create landscape base. When we look at the historical map of Bratislava, we found that The south bratislava is an alluvial plain formed by Danube river. The shape of river bank was meandering. Right meandering river bank is an old water landscape identity of Danube River in Bratislava. It forms part of the collective memory of this area. Besides this, the meandering river bank creates dynamic water landscape that has high ecological value. Therefore, based on the elevation of waterfront, I trace the flood line of this area. Extending and reshaping the existing dike, the design recreates a new waterfront bank. It also recalls the history of dynamic waterfront. The new landscape changes the existing single water flow direction, providing more active water flow and water level.

The new water flow and water level also provide a dynamic water landscape that has ecological potential for various kinds of plants and animals. Some endangered species could have chance to be protected and surviving in this area. Beyond that, this new riverfront can be experience by surrounding residents. People can cycling or walking through this area to do a water adventure. At winter time, the shallow water channel of the waterfront area will freeze. It can be used for people to do skating. This riverfront can also adapt to seasonal water level changes. At the same time, it also creates a new water landscape of this area. The higher water level speed the plants upgrading. Increasing the amount of different kinds of species.
Elevation map

New dike

New water flow system

Elevation map for the new waterfront
LANDSCAPE / PLANTS & ECOLOGICAL POTENTIAL

Existing forest
Floodplain Forest
Shrub & Meadow
Wetland & Swamp

Fagus sylvatica
Salix alba
Salix alba
Typha shuttleworthii
Salix fragilis
Sambucus nigra
Carex pendula

Sorbus terminalis
Ulmus laevis
Swida sanguinea

Tilia cordata
Populus x canescens
Alnus glutinosa

Stratiotes aloides
Nuphar lutea

white stork
Corncrakes
balod’s ruffe

balod’s ruffe

Existing forest
Wetland & Swamp
Flood plain
Forest/shrub/meadow

LANDSCAPE / PLANTS & ECOLOGICAL POTENTIAL
Creating a flexible water landscape basement which can adapting to water changes and recall the collective memory. Then adding dynamic programs to waterfront of Bratislava that can satisfy the public requirements.
Program

After reform the waterfront, then it’s to add necessary and attractive programs in this area to satisfy the public requirements.

When we look at the existing programs of this waterfront, the old forest park, the stadium needs to be preserved in future design. In additions, some temporary programs also can be kept in this area. It has great potential to enrich the spatial dynamic of waterfront.

The waterfront also can be an attractive promenade places for the whole city. It enjoys a high value of surrounding fantastic view. It includes the old castle and city center, new modern waterfront buildings, the old steel bridge and the new Apollo bridge. Those view potential make this waterfront as a unique public space in the whole city.

Therefore, according to the existing potential of this area, I introduce some new programs. Such as a open theater, a waterfront promenade, a beach and so on. Especially, the waterfront theater will become the central public gathering space of this waterfront.
PROGRAM / EXISTING PROGRAMS
PROGRAM / WATERFRONT VIEW POTENTIAL

Right bank waterfront
Beach
Music Festival
View point for New year’s firework
Therefore, according to the existing potential of this area, I introduce some new programs. Such as an open theater, a waterfront promenade, a beach and so on. Especially, the waterfront theater will become the central public gathering space of this waterfront.
Design Concept

When we go inner to the south city, the motorway and the massive unattractive wilderness area stop people to go to the waterfront. But some the surrounding shopping center and office area, which provide potential of gathering people.

The construction of the post-socialist ugly neighborhood completely erased the history of the area, which is used to be a small town. In addition, the south city also has a shortage of small retail store. So the design extends the existing west shopping mall to the east with a small retail streets to recall the history of small town, it also satisfy the public needs for small retail stores in this area. It become a new attraction for inner city residents to go across the motorway.

PROGRAM / CITY CENTRALIZED POINT
Creating a flexible water landscape basement which can adapt to water changes and recall the collective memory.

Then adding dynamic programs to the waterfront of Bratislava that can satisfy the public requirements.
After designing the landscape base and program, it needs route system to guide people going through this area.

Considering the existing traffic system of car, cycling and pedestrian routes, I found that the car traffic is at outside of waterfront, the slow traffic become a strong connection to the waterfront. Especially the unused old steel bridge. It becomes an important pedestrian route for people to go to right and left bank.

Beyond this, the right end points of the bridge is the conjunct area of the old city center and new modern right bank waterfront. It has high population density. It's a meeting points of people on the right bank.

So those city centralized points of this area has high potential for creating new connection between the waterfront and the inner city.

By extending this axis to the inner side of south city, it can connect with an old creek green field. The central main axis can form a main entrance between the north and south city.

By tracing the buried part of the old creek and extending existing green field to the waterfront, it recalls the historical landscape of this area.

This main axis also connects with the new retail stores street. then provide potentials for people to go across the west to the east of this area. Most importantly, the main axis is connected with the old bridge that form a new connection route between the south and north city.
Main axis to waterfront of Danube River

The main axis starts from the inner old creek waterfront. Then lower the motorway and extending the green field to the waterfront area with pedestrian route, cycling route, and meadow. Then the main axis form the main street of retail stores, where provides coffee, resterants, folks craft stores and open market. Lower the route which before, enhancing the possibility to cross from west to east area. The main axis will elevate to connect with the old steel bridge. The elevated route also considers the water levels in order to keep the axis always open even floods comes. The main axis linked with old bridge and reuse the outside of bridge for pedestrian and inner side for cycling.

Therefore, being a new connecting route, this main axis is absolutely wonderful solutions for this area. It provides the right and left bank with clearly and directly connection. Most importantly, it connects with existing old steel bridge then forms a comprehensive main routing system.
Creating a flexible water landscape basement which can adapt to water changes and recall the collective memory.

Then adding dynamic programs to waterfront of Bratislava that can satisfy the public requirements.

To sum up, the new landscape base, together with necessary and attractive programs, adding new routes system to strengthen the accessibility to the waterfront and connecting those with existing traffic system. They together reform the riverfront of right bank.

This is my riverfront design plan, which is a flexible, dynamic and sustainable waterfront that can satisfy urgent public needs and adapt to water changes. It strengthens the accessibility to the waterfront. Enhancing the relationship between the human and river.
Considering the new waterfront landscape, the new important waterfront program and the connection parts between the main axis and the steel bridge, the central conjunct point becomes an important and complicated gathering space. So I would like to go deeper to show the detail design of this area.
Open theater

Dock

Public flow system

Public flow system of Main axis

Waterfront square
Design Concept of main entrance axis of water-

The main axis forms the entrance of this waterfront area. It forms a new pedestrian flow by elevating the walking flow to the bridge and lowering the walking flow to the waterfront square. It clearly guiding people going to the different destination. Besides this, the elevated pedestrian route also provide potential to enjoy the fantastic view of the waterfront. The view to the east waterfront is the wetlands with different species and wildness water landscape. The view to the west the new waterfront open theater and the long-range perspective of the old castle, Apollo bridge and city center.
Above the main axis

Walking down to the waterfront

Above the old bridge
DETAIL DESIGN / ACCESSIBILITY-VIEW POTENTIAL

Concrete pavement
Elevated wooden route

Lythrum salicaria  Molinia caerulea  Typha shuttleworthii  Carex pendula  Salix fragilis  Salix alba  Ulmus laevis  Populus x canescens
DETAIL DESIGN / ACCESSIBILITY-VIEW POTENTIAL

Elevated wooden route
Concrete steps
Waterfront view to the main axis
Considering of the view potential and existing program, the open theater is located on the west side of main axis. The waterfront also has a dock, which gives extra accessibility for people to go on this waterfront. Based on the main axis connection and some other route connection, the open theater is completely accessible for public.

The open theater will function as a unique city public gathering space with different possibility and fantastic views. Such as a outdoor concert, a folk dancing show, food festival, film festival. In the winter time, the open theater could fill with water, the when the water freezing. It can be used as a skating field.

From June to September, the theater becomes the main places for the largest cultural festival of Slovakia with music and shows. When the new year’s comes, the theater becomes the perfect place to enjoy the new Year’s fireworks.
Different water levels

- Winter 1793: 400cm
- Summer 2295: 508cm
- Q.MIN: 1000, 292CM
- Q3: 3500, 563CM
- Q5: 7000, 788CM
- Q10: 7800, 830CM
- Q20: 8700, 874CM
Concert or native folk dancing show

Skating in Winner

Music festival

New year's firework
Construction Details

- **Lythrum salicaria**
- **Molinia caerulea**
- **Typha shuttleworthii**
- **Carex pendula**

- **Salix fragilis**
- **Salix alba**
- **Ulmus laevis**
- **Populus x canescens**

- Wooden steps on grass
- Glass surface pavilion

- Building ground as subsoil or substructure
- Frost protection layer 0/45
- Concrete foundation C20/25
- Ballast base course, 0/45 cm
- Mortar bed
- Clay liner

- Rounded steel 80 × 80 × 5
- Concrete edge wall 20/80 cm
- Concrete foundation finished part
- Building ground as subsoil or substructure
- Frost protection layer 0/45
- Concrete foundation C20/25
- Drainage pipe
- Topsoil ≥ 100 cm

- 30 cm × 30 cm × 8 cm, concrete tiles
- Mortar bed
- Ballast base course, 0/45 cm

- Squared timbers 80 × 120 or 80 × 80 mm
- T-steel 50 × 50 × 6 mm
- Mortar bed
- Edge stone, 8/25/100 cm
- Topsoil = 25 cm

- Drainage pipe
- Concrete foundation C20/25
- Frost protection layer 0/45
- Concrete foundation finished part
- 20/30 mm steel RHS bent to shape
- 40/30 mm iroko strips, pressure impregnated

- 80 cm × 80 cm × 8 cm, concrete tiles
- Mortar bed
- Ballast base course, 0/45 cm

- Posts, flat-rolled steel 80/10 mm, ferric oxide DB 703
- Shortened sheet pile wall
- Concrete foundation C20/15

- 20 cm ballast base course 0/45
- Two-by-four, 9/9 cm, larch
- Roofing felt

- Drainage pipe
- Plastic liner with protective fleece, water proof
- Clay liner

- Clinker/brick laid as edge course, 100 cm × 100 cm × 20 cm
- Mortar bed
- Concrete foundation C20/25
- Ballast base course, 0/45 cm
- Frost protection layer 0/45

- Fragile plant species: Salix fragilis, Populus x canescens, Carex pendula, Salix alba, Molinia caerulea, Ulmus laevis, Typha shuttleworthii, Lythrum salicaria, Carex pendula, Salix alba.
DETAIL DESIGN / BIRD’S EYE PERSPECTIVE OF WATERFRONT
Reflection

The reflection is the last part of my graduate research design. The aim of this part is to provide the reflection and evaluation throughout the framework of the project, which help to rethinking the whole research and design process of the project, giving critical review on its methodology and expected relevance. In addition, the reflection part also points to the general thinking of the relationship between the theme of the studio and the subject chosen in the project, the relationship between the methodical line of studio’s academic approach and the project’s methodology line, the relationship between the process of research and design, and the relationship between the project and wider social context.
The relationship between the theme of the studio and the subject

The graduation studio of Flowscapes aims to explore infrastructure as a type of landscape and landscape as a type of infrastructure. Through focusing on landscape architectonic design of transportation-, green- and water infrastructures the studio aims to develop innovative spatial armatures that guide urban and rural development and represent their civic and cultural significance. With the respect to this theme, this individual project shows its concern on the landscape infrastructure, especially the water infrastructure which consists of what is planned, designed and constructed to manage water and riparian zones. The studio is framed around the Rhine-Danube corridor, integrating and defining Europe between the North Sea and Black Sea. Therefore, this graduate research design is focusing on the water landscape on the right bank of Danube River in Bratislava. The theme of my project is included in the topic of studio. The aim is to integrate new programs into the ‘genius of place’ and time, and with regard to landscape processes, the continuation of spatial quality and cultural identity of landscape.

The relationship between the method of studio and the method of individual

The research and design methods of Flowscapes studio emphasize on landscape architectonic design explorations of multi-layered understanding of landscape: landscape as spatio-visual structure; landscape as palimpsest; landscape as scale-continuum; landscape as ecologic, economic and social process. Those four perspectives on landscape which together characterize the work of landscape architectures. Based on this condition of the studio’s theme, the individual research and design are connecting and guiding by the methodology which is the based on the most important character of landscape, the thinking of landscape as process. Then considering the character of the right bank of Bratislava, the water process becomes the main system that guides the research design. Essentially, it distinguished between two types of dynamics: the temporary flow fluctuations and morphodynamic processes. However, the water process also influences the surrounding social processes. River reserves the memory of city and can recall the collective cultural memory from the water landscape. The water process asked to work through process, changes and scales. The flexible character of water process also provides potentials for social safety, protecting natural essences, and also recreational possibilities.
### Schedule of waterscape transformation of Bratislava

#### Main Danube river bank transformation
- Decreasing the seasonal overmuch water discharge risks of each banks;
- Increasing the connection between city center and new city;
- Improving the recreational function of right bank of Danube River;
- Flood risks warning.

#### Inside new city waterscape improvement
- Improving quality of the environmental liveability of south city;
- Connecting the existing old creek to the blue bypass;
- Increasing the accessibility from the inside city to the waterfront of Danube River;
- Improving the recreational function existing water channel;
- Rainfall collection and underground water supplement.

#### City surburbs blue river bypass construction
- 30-50 years floods mitigation;
- Constructing the entrance of Blue river bypass;
- Providing surburbs waterscapes adventure activities opportunities.

#### City surburbs green river bypass construction
- 30-100 years extra safty flood risks protections;
- Constructing middle and lower part of green river bypass;
- Agricultural production (Grazing and grass production);
- Rainfall collection and underground water supplement.
The relationship between research and design

Based on the waterscapes and surrounding city issues, I put forward my research question which is how to create a flexible and sustainable river landscape which gives a new spatial identity to the right bank of Danube River in Bratislava? The goal is to create a flexible water landscape that can satisfy the urgent public needs of recreation, rebuilt the connection form the city to the riverfront. In the long run, the design could transform the south Bratislava as part of the waterscape of the Danube that can protecting the city from flood risks and recall the collective memory of waterfront city.

The design framework is based on the question and aims, by using water process of Danube River as a dynamic natural and cultural icon, then creating a flexible and sustainable water landscape that can satisfy social needs and adapt to water changes. The whole design process starts with the analysis of different natural and social aspects, then integrating them by water landscape. The whole design process formed by different scales. In local scale, the design creates a new waterfront area for the whole city which strength the connection between both riversides. Then connecting the waterfront to the inside city by an old creek linear park. It increases the possibility of the waterfront to different water levels and creates new programs for social recreational function. In regional scale, the research design create two flood river bypass on the city suburb which that can mitigate the flood problems and also recall the erased old waterfront collective memory of the south socialist city. However, the money always is an issue. The whole plan is a huge landscape and civil engineering construction. It needs cooperation of different parts of government and companies. The design is just a start and elaboration answer for this urgent water problem in Bratislava. It helps to get attention from the public and related government.

The relationship between the project and wider context

From wider context, the whole research design transforms the south Bratislava as part of Danube River landscape. It provides a new spatial identity for the right bank of Danube River. Based on this new water landscape, it gives new spatial essences for Bratislava, the capital city of Slovakia and the city in twin city region with Vienna. In addition, the design has created a dynamic water landscape for ecological advantages.