Weaving landscapes: Bringing the river back to the city

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Conceptual framework

The nature of the project
Vistula river in Warsaw

Growing city - Human activities - Valuable landscape
Years of neglect

Socio-cultural issues
Years of neglect

Hydrological issues

Narrowing of the water channel

Decreasing spacial presence of the channel in the city landscape

Increasing water velocity

Lowering of the river bed
Years of neglect

Ecological issues

Destruction of natural habitats and disappearance of local species
Current developments

City’s urge to reverse the diminishment of the river areas in the city
Project site
Czerniakowski Headline as a space for sport and recreation
Czerniakowski Headline
Views of the site
Lost natural character of the site

Changing characteristics of the site through 20th century
Unexploited potential of the site

Lack of infrastructure
Water level changes on the site

Yearly characteristics of average and emergency level changes

- 6.5 m Emergency state
- 6.0 m Alarm state
- 2.4 m Average state
Design Concept

Widening of the river channel as a way to solve hydrological and ecological issues

1. Breaking groynes on the eastern side of the current channel.
2. Introducing new east bank line
3. Creating island detached from the main land.

Intervention scenario developed at Warsaw University of Life Sciences
Design Concept
Benefits of the intervention scenario

1. Widening channel cross section by 20 to 50m
2. Slowing down water current
3. Creating protected habitats for endangered species with controlled human access

Achieved improvements

1. Reduced flooding risk
2. Natural environment protection
3. Encouraging land and water recreation
4. Rising importance of the river in urban landscape
5. Increasing stability of the river
Design Concept

Widening of the river channel as a way to solve hydrological and ecological issues of the channel

1. Decentralized program
2. Program distribution on the site
3. Analyzing water flow on the site
4. Defining water flow channels of the site
5. Circulation dependant on water level changes
Design Concept

The idea of weaving landscapes

WATER
ARCHITECTURE  indoor / outdoor
GREENERY
Functional program
Re-establishment of socio-cultural relationship between the citizens and the river

WATER POOLS PROGRAM

WETLAND NETWORKS

WATER INLET
PRIMARY TREATMENT
SECONDARY TREATMENT
TREATED WATER COLLECTOR

RAINFALL COLLECTORS

LOW RAINWATER COLLECTOR
MEDIUM RAINWATER COLLECTOR
LOW RAINWATER COLLECTOR

RECREATION POOLS

LARGE POOL 200m²
SAUNA POOL 75m²
SMALL POOL 50m²

BUILDING PROGRAM

EDUCATIONAL SPACES

AUDITORIUM 350m²

PERMANENT EXHIBITION SPACE 350m²

TEMPORARY EXHIBITION SPACE 350m²

EVENT SPACE 250m²

EVENT SPACE TERRACE 150m²

HIGH DECK 75m²
MEDIUM DECK 75m²
LOW DECK 75m²

RECREATION SPACES

BISTRO PUBLIC AREA 250m²
BISTRO SERVICE AREA 150m²
BISTRO TERRACE 100m²

SUN BATHING TERRACE 100m²
WATER TRAM PLATFORM 1 100m²
WATER TRAM PLATFORM 2 100m²
WATER TRAM PLATFORM 3 100m²
WATER TRAM PLATFORM 4 100m²

SUPPORTING FUNCTIONS

ENTRANCE HALL 200m²
BUILDING SERVICE AREA
Relationships between water pools and architectural elements

**Mapping desired connectivity patterns**
Distribution of water pools and architectural elements

*Kangaroo particle-based modeling*
Creation of water pools

Branching system
Creation of water pools
Testing different branching patterns
Creation of water pools

Evaluation of the results

<table>
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<th></th>
<th>Option 1</th>
<th>Option 2</th>
<th>Option 3</th>
<th>Option 4</th>
<th>Option 5</th>
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<td>0m / 3m SECTIONS</td>
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<td>646 550</td>
<td>644 680</td>
<td>633 545</td>
<td>633 970</td>
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<td>10% of the lowest values</td>
<td>21 12</td>
<td>3</td>
<td>26</td>
<td>18</td>
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Creation of water pools

Choosen result
Form finding of architectural elements

**Concept**

1. Initial starting points of the geometry and the seeds for the first iteration of CFD simulation. The area of the seed is 1/5 of the desired surface area of the function.

2. Results of the first iteration of the CFD simulation performed on the 'functional seeds'.

3. Translation of the graphical results into lines with the height informed by the saturation of the image in a given point on the grid.

4. Extraction of the regions affected by the introduction of the seeds where the velocity decreases.

5. Drawing the curves on extracted forms according to a specified desired area of particular section for each function.

6. Chosen section curves for the next iteration of the CFD simulations.
Initial seeds

Definition of initial seeds
Form finding of architectural elements

Computational Fluid Dynamics (CFD) simulations

1 meter 2 meters 3 meters 4 meters
5 meter 6 meters 7 meters 8 meters
Geometrical interpretation of simulation results

Principles
Geometrical interpretation of simulation results

Overview of results on different levels and with different thresholds of water velocity

- 0 meter S
- 0 meter A
- 1 meter S
- 1 meter A
- 2 meter S
- 2 meter M
- 2 meter A
- 3 meter S
- 3 meter M
- 3 meter A
- 5 meter S
- 5 meter M
- 5 meter A
- 7 meter S
- 7 meter M
- 7 meter A
Defining outlines of architectural spaces

Principles
Outlines of architectural elements

Initial spatial configuration
Understanding characteristics of water level changes

Occurrence patterns and duration of specific water level states

Permanent conditions
82.3% of the time water level stays below 4m

Temporary conditions
17.7% of the time water level stays above 4m

Monthly water level values

Water level values in years 2002 - 2003

The highest water level values are observed during spring and summer months. The lowest values occur during winter months. Average monthly value differs between 1.54 and 3.41 meters. Every month the value below 1.5 m was observed, what underlines the dynamic character of water level changes. Due to the duration of occurrence, the condition where water level is above 4m will be treated as temporary in the design process.

Duration of occurrence of each water level height

Adjusting the results to architectural requirements

Refining shapes and vertical location of spaces
Adjustment of vertical locations

Defining vertical circulation
Overview of process steps

Water - Architecture - Greenery
Final configuration

Masterplan

Total site area - 22 604m²

Percentage area of elements at average water level:
Indoor space: 23,7 %
Outdoor terraces: 9,6 %
Greenery: 30,6 %
Water: 36,1 %
Added top greenery area (without connectors): 13,7 %
Water pools

Functionality

RC - rainwater collector
W1 - Wetland 1st treatment pool
W2 - Wetland 2nd treatment pool
W3 - Wetland 3rd treatment pool
Architectural elements

Functional scheme

Bathhouse
1220 m²

Bistro
651 m²

Exhibitions
1169 m²

Entrance complex
294 m²

Event space & Auditorium

Office space
613 m²

L pool
M pool
S pool
W1 inlet

RC
W2
W3
W1
W2
W1
W2
S pool
S pool
collector
Architectural elements

Circulation patterns

Bathhouse 1220 m²
Bistro 651 m²
Exhibitions 1169 m²
Entrance complex 294 m²
Event space & Auditorium
Office space 613 m²
Differentiation of spatial qualities

Bistro

Kitchen and facilities

Public space
Differentiation of spatial qualities

Bathhouse

entrance space

changing & showers M

technical area

saunas & pools

changing & showers F
Differentiation of spatial qualities

Exhibitions
Differentiation of spatial qualities

Entrance complex - Event Space - Auditorium
Continous Greenery

Ground and top greenery and the connection links
Architectural enclosure

Objectives diagram

Greenery  Building Walls  Terraces  Windows
Design of architectural enclosure

Selection of the fragment
Fragment topography
Defining continuous topography containing all the elements
The roof

Defining the outline of roof surfaces
Vertical elements

Indoor space enclosures and greenery connectors
Vertical elements

Principles of wall creation
Vertical elements

Principles of wall creation

Structural support

Installation space
**Vertical elements**

*Functionality of the walls*

**Opennings**

**Furniture**
Vertical elements

Greenery connectors
Definition of the walls

Roof curve offset out
Definition of green connectors

1. Greenery areas to connect
2. Defining curves for the script
3. Structural connection
4. Greenery pots
Oppenings

Roof windows and wall windows

Roof windows resulted naturally in the process due to height differences of roofing surfaces.

Wall windows have a differentiated height related to the elevation of the floor defining curve.

Both window types are composed of glass curved in xy direction, following the direction of the walls (or roofs). Roof surfaces are straight in z axis.
Design

2 m sections
Plans
1:200
Sections
1:200

A - A section

B - B section
Views from the path

View from the roof pathway
Views from the path

*View from the terrace to the bathhouse entrance*
Reaction to water level changes

Average water level (2.5 meters)
Reaction to water level changes

High water level (4 meters)
Reaction to water level changes

Alarming water level (6 meters)
Reaction to water level changes

Average water level (2.5 meters)
Reaction to water level changes

High water level (4 meters)
Reaction to water level changes

Alarming water level (6 meters)
Zoom in into interiors

Low plan 1:100
Materiality

Concept

STRUCTURE AND INSULATION
Structural lightweight concrete

ADDITIONAL CLADDING
Lightweight cellular concrete

INTERIOR
Different aggregate concretes of differentiated patterns and roughness

MATERIAL CHANGES OVER TIME
Materiality

Facade cross cut 1:20

1. structural lightweight concrete roof slab 50cm
   waterproofing layer
   concrete layer; thickness to falls 5 - 10 cm
   plastic sealing layer
   gravel drainage layer
   5 x 10 cm bearers
   timber decking 3 cm

2. structural lightweight concrete roof slab 50cm
   waterproofing layer
   gravel drainage layer 20cm
   extensive planting layer 130 cm
   vegetation

3. waterproofing layer
   structural lightweight concrete
   floor slab 45cm
   plastic sealing layer
   aggregate polished concrete flooring
Materiality

Additional cladding detail

- High water level 4m
- Flood level 6m

- Waterproofing layer
- Prefabricated lightweight cellular concrete block - 7cm
- Screw fixing
- Prefabricated lightweight cellular concrete block - 20cm
Materiality

*Indoor - outdoor greenery pot detail*

- **Soil planting layer 20cm**
- **Gravel drainage layer 5cm**
- **Drainage outlet to the lower pot**
- **Waterproofing layer**
- **Steel curtain keeping water out in days of engine moving the curtain**
- **Filtering barrier allowing pass of moisture but keeping dirt away**
Exhibition space

View of the wetland plants exhibition space
Geometrical continuity

Bathhouse horizontal sections studies
Geometrical continuity

*Bathhouse vertical sections studies*
Geometrical continuity

Bathhouse vertical sections studies
Geometrical continuity

Bathhouse
Bathhouse

Plan 1:50
Bathhouse

b - b section 1:50
Bathhouse

c - c section 1:50
Bathhouse

View of the indoor pools area
Bathhouse

View from the swimming pool