Urban River Basin Enhancement Methods

Identification of parameters to be monitored for aesthetic assessment

Project Deliverable 4-1

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1. Introduction

This deliverable presents the way we looked to aesthetic evaluation of watercourses. In a first step the team begun the structuration stage with the help of an *experts panel* that gave us a wide perspective of what can influence the aesthetic value of urban watercourses. The obtained framework acted, in a second step, as a reference guide to the choice of parameters that were needed to the aesthetic assessment.

The third step was the study of river-city relationship and their reciprocal influence. A set of parameters to get a basic characterization of river and city was proposed and should be improved in the future.

2. Basic attributes for the River - City - Man characterization

The Three Worlds of Habermas[1] can inspire the River-City-Man framework (Figure 1**) and their relationships. In fact, the City – the main complex expression of society – has influenced Watercourses through time and now, we think that city should become positevely influenced by rivers and watercourses, answering to individual and social believes of sustainability.**

To understand those three types of relationships between watercourses, city - social structure and man – individual values, we need to have a basic characterization in those three worlds as much concise as possible.

The following list of parameters is, above all, indicative and should make possible to compare different urban/societal conditions in witch watercourse reahbilitation occurred or will take place.

[1] Cited by John Mingers, "Multimethodology – mixing and matching methods",in Rosenhead, J. et al, *Rational Analysis for a Problematic World Revisidted", 2001, Jonh Wiley & Sons, Ltd.*

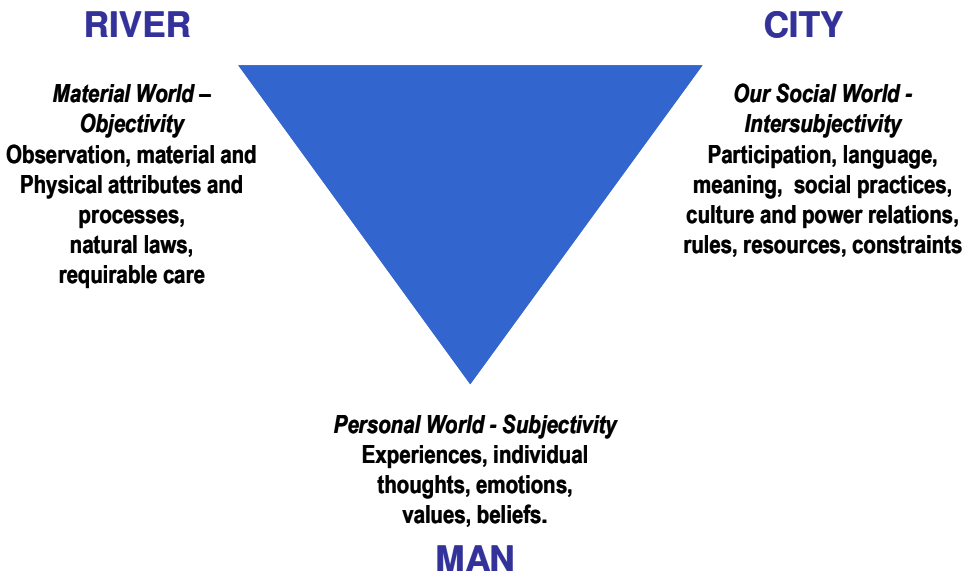

Figure 1 – River-City-Man characterization

RIVER

- Catchments area
- Hydrological regime (patterns and quantity of rainfall)
- Pollution sources (diffuse and point)
- Chemical and biological water quality (BoD, nitrates, phosphates, pH)
- Length, width and shape of the river inside city limit
- Average slope of both hillsides in river-corridor (RC)*
- Profile (side view) of the valley (along RC)

* (RC): river-corridor, a "buffer-zone" with 500m wide

CITY

- Population
- City limit: used and planned urban area
- Sustainable Land use
- Quality of Life
- Housing and Household structure
- Environment
- Income, disparities and poverty
- Crime
- Economic activity
- Health

Suggested indicators:

A basic characterization of the city is needed to better perceive the conditions offered by the city to the actual utilization of the river/watercourses or to plan potential actions of its reabilitation. The following information sources:

- "Urban Audit – assessing the quality of life of Europe's Cities"
- "Towards a Local Sustainability Profile – European Common Indicators"

can give us an adequate guide of fundamental urban indicators. However, It will be dificult to have all data available to all case studies. With indicative purpose, the following list describes an essential subset of urban indicators, which can be improved and supported by cartographic information:

Nr. of inhabitants per Hectare of "Urbanized / developed land" area
Demographic dependency Index
Activity rate (active population [15-65] / Total population)
Artificial areas:
- Central areas delimitation (CBD´s);
- Total Urbanized/ developed area;
- Derelict/ Contaminated areas (brownfield);
- Area of new developments allowed;
- Protected areas (areas of vegetation and landscape under specific protection);
- Green structure of the city (public and private);
- Total Area occupied by significant cultural heritage;
- Total Area occupied by Social infrastructures;
- Gross dwellings density;

Unemployment rate
Life expectancy at birth
GDP per capita at city level (if available) or at regional level
Average income per capita
Population employed by activity sectors
Total nr of recorded crimes per 1000 population per year
Number of tourist overnight stays in registered accommodation per year
Level of education (% of resident population who have completed tertiary education leading or not to first university degree or equivalent)
Energy use (electricity consumption per capita)
Climate (Nr of days of rain per month; average number of hours of sunshine per day)
Environment (CO_2 emissions per capita; annual consumption of water per inhabitant; tonnes of solid waste collected per capita per annum)
Annual expenditure of the municipal authority per resident

MAN

- Civic involvement and public participation will
- Risk groups presence
- Citizen satisfaction with the local community
- Levels of education and training

3. Margins typology

The natural/ artificial dialetics (Figure 3) cannot be discussed independentely from urban structure and its different levels of use intensity. It is normal to found at innercity areas a great level of artificialization and a more natural environment in urban peripheries or outside the city perimeter. It is our conviction that the place/location of the river in the structure of the city determines a more or less tendency (or need) to acquire a certain level of artificialization that influences several aspects, namely its aesthetical value. This also means that we must understand the urban model or structure that is taking place in each city, their main centralities and bigger concentration of tertiary activities.

A typology of watercourse margins, with six classes as presented in Figure 2, should be validated and illustrated in the future.

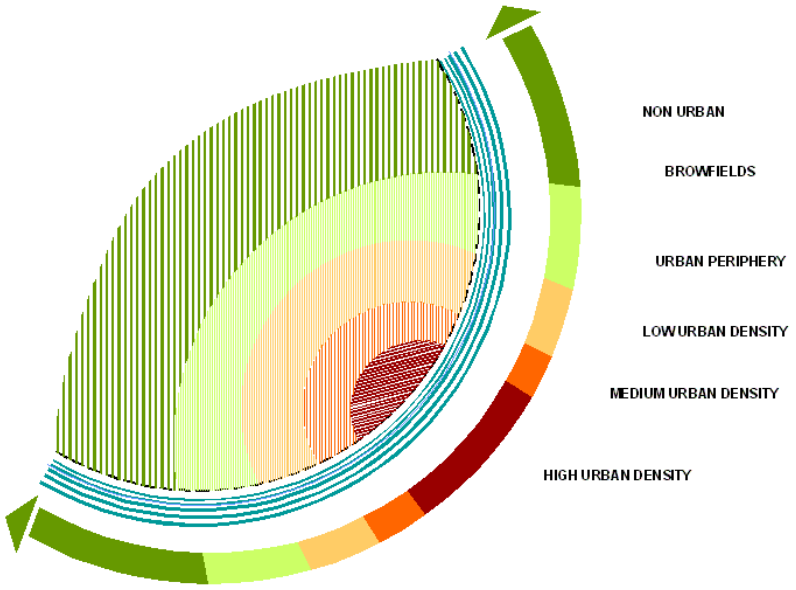

Figure 2 – Reference urban model

4. List of viewpoints and parameters

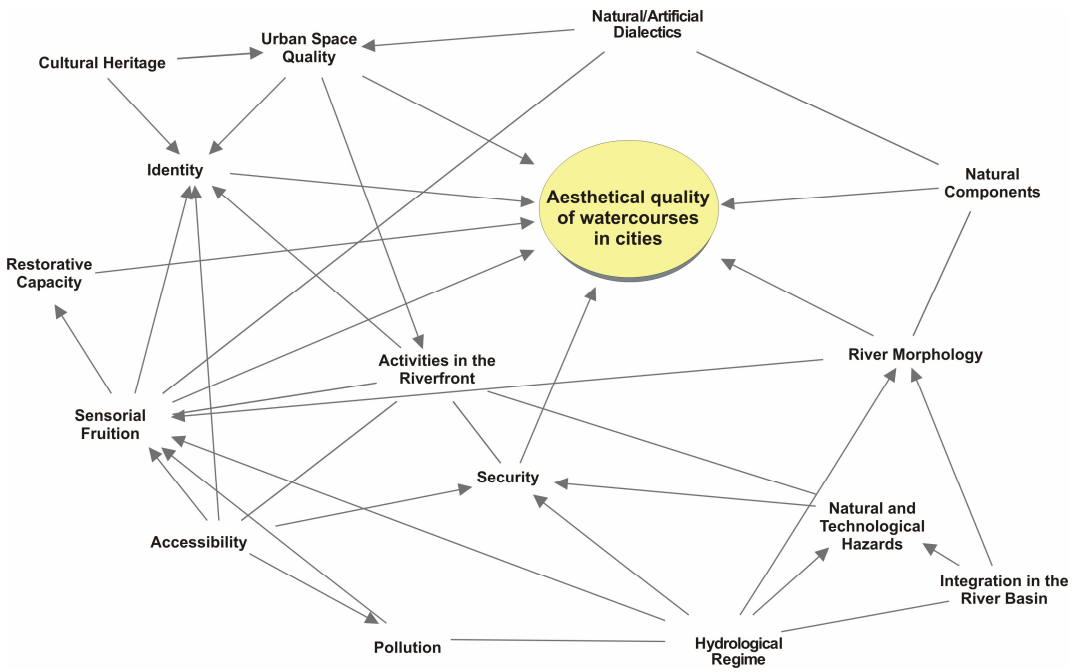

Figure 3 – Structure of viewpoints (minimal network)

The majority of the following parameters are related with river-corridor, i.e., the river or watercourse and the adjacent areas, in both sides, that are directly influenced by it. We considered that a 500 m width, in each side, was appropriate to assess river-city relationship.

We think that in most cases (if not always) we'll need a spatial or geographical perspective of City and Watercourse, i.e., we'll need cartographic information and remote sensing data.

This is a preliminary list of parameters. The team will try further to establish a measurement unit, scale or model for each parameter.

Domains	Viewpoint	Parameter
River Attributes	River Morphology	River width (riverbed width)
		Sinuosity
		Morphological diversity
		Presence of vertical and horizontal irregularities
		Bank shape
		Valley morphology
		Respect of natural dynamics / change of natural dynamics
	Integration on the river basin / catchments	Stream order (Strahler)
		Size of the basin/catchments
		Degree of impervious land in the basin
	Natural and technological hazards	Bank erosion or landslide
		Flood vulnerability
	Pollution	Visible dumping and littering on margins
		Floating dumping and littering on water
		Visible pollution on water
		Turbidity, water colour
Natural Components	Spatial distribution	Height of trees
		Riparian gallery area - overstory density - understory density
		Width of riparian gallery
		Species distribution on the river section
		Presence of ornamental bark and steams
		Stage of tree development
	Biodiversity	Ecological status of RC
		Presence and type of fauna (birds, fishes, etc.)
		Presence and type of flora (trees, shrubs, grass, etc.)
		Riverside vegetation - natural species; - planted species;
		State of conservation of vegetable species on the RC
		Presence of exotic species (invasive species)
		Presence of species autochthones
	Temporal diversity	Type of tree and shrub species (deciduous, coniferous, evergreen)
		Age of trees (stand age)
		Colour of flowers, fragrances and flowering season
		Colour of foliage (autumn variation)

Domains	Viewpoint	Parameter
Urban Space	Urban Space Quality	Visual permeability of the city morphology in the river-corridor (RC) allowing visual contact with the river/watercourse Availability of local (RC) public open areas and services Quantitative balance between public open areas and private (non-public) areas (%) in RC Quality of existent public open areas in RC Quality of the built space in river-corridor - conservation state - level of infrastructures - level of salubrity - height of buildings - age of buildings - distance between buildings façade and river margins - land uses (housing, services, commerce, industries, parks, …) - daily traffic along the river-corridor - length of walking ways with visual perspectives over the river.
	Cultural Heritage	Areas or punctual elements which value had been classified or recognized: - value as public interest (local, regional, central) - type (natural, archaeological, cultural, industrial, architectonic, hydraulic,…) - State of physical conservation - Size (how monumental it is?) - Originality
	Accessibility	***From the river to the city…*** Distribution of anchorage places, docks, floating pier, etc, Total daily traffic of boats in the river ***From the city to the river …*** Access in public transport: connectivity from the river-corridor to the city Access in private car : irrigation in terms of road network and parking offered Access in soft modes – foot and bike: length of the ways offered inside river-corridor ***Crossing the river …*** Quantity of walking bridges allowing visual relationship with water Daily traffic by passenger-boats or ferries that cross the river

Domains	Viewpoint	Parameter
Activities in the Riverfront	Economic activities	Presence of commercial units
		Presence of services
		Frequency of occasional commercial events (e.g.fairs)
		Presence industrial units
	Traditional activities	Employment witin the RC
		Existence of facilities
		Occasional events
		Frequency of occasional events
	Housing	Inhabitants within the RC
		Households in the RC
		Share of built areas within the corridor occupied by residential buildings
		Share of city inhabitants in the river corridor
	Recreational use	Presence of recreational facilities
	Culture	Frequency of cultural events
Emotional and Sensorial Aspects	Smell	
	Sound	
	Visual aspects	Visual basin
	Environmental preferences	Coherence/Harmony
		Legibility
		Mystery
	Environmental restorative components	Complexity
		Novelty
		Escape
		Extent
		Fascination
	Identity	Compatibility
		Distinctiveness
		Continuity
		Self-esteem
		Self-efficacy