

Methodology of aesthetic evaluation of rivers in urban context

Prof. Jorge Batista e Silva, Prof. Maria Graça Saraiva, Isabel Loupa Ramos, Fátima Bernardo

1. Introduction

Landscape aesthetic appreciation and evaluation is actually an important concern in relevant interdisciplinary fields of research, crossing disciplines so diverse such as geography, planning, landscape architecture, architecture, psychology, and philosophy among others and a raising issue in sustainable development, planning and resource management (Berleant, 1997).

Aesthetic values can be assessed through different approaches and motivations, namely from expert or professional point of view, from the social sciences framework like environmental psychology (Kaplan and Kaplan, 1989) or through phenomenological approaches, more concerned with the intangible, sensorial and emotional aspects of landscape appreciation.

Several policy documents encourage the inclusion of assessment procedures in the planning process. Also, the Landscape European Convention states the need for integration of landscape into regional and town planning policies. Water is also a key natural resource concerning sustainability - the presence and crossing of rivers in cities, water quality, flood vulnerability, accessibility, increased aesthetic and landscape value, and contribution to urban attractiveness, identity, among others (Silva and al., 2003a). Water quality improvement is one of the more demanding due to the obligations of the Water Framework Directive (EC, 2000). This task, together with an increasing environmental concern on the rehabilitation and restoration of fluvial ecosystems, are responsible for an emergent trend on river rehabilitation and restoration programmes, all around the world (Boon and al., 2000 ; FISRWG, 1998 ; Saraiva, 1999 ; Ureña, 1999). The specific cases of urban rivers is highly demanding, due to its complexity in terms of uses, density, population, institutional framework, degree of pollution, public involvement, among others. On the other hand, urban riverfront areas can show an enormous potential for recovery and rehabilitation, bringing together programmes of urban regeneration with environmental, socioeconomic and aesthetic improvement (Petts and al., 2002 ; Riley, 1998).

This project has an overall objective to provide a comprehensive framework to facilitate urban watercourse rehabilitation that takes into account the regional variations in modification and use of rivers across Europe. Within the European research project URBEM (Urban River Basin Enhancement Methods) (www.urbem.net), the authors developed a methodology for the evaluation of the aesthetic performance of an urban river, considering its potential for the urban river rehabilitation.

2. The Methodology

The overall aim was to develop and integrate in a decision support system a methodology of aesthetic evaluation of rivers in urban context, allowing better understanding about different dimensions and characteristics that can be improved in a river rehabilitation scheme, compare performances and analyze their scores based on reference values. The methodology includes both expert assessments and public surveys and is inspired on Multi Criteria Decision Analysis procedures (Belton, 2002). The methodology follows three main steps described below:

- ☐ Exploring
- ☐ Structuring
- ☐ Modelling

2.1. Exploring

This first important step leads to the generation of ideas that are considered relevant to the evaluation of aesthetic quality of an urban river. It can be conducted through an expert panel using a “post-it” technique (Eden, 1989). During a case-study application 15 experts, from different and institutional background, were brought together for a session where they have been exposed to the question: “What can influence the aesthetical quality of a watercourse in cities?”. A large number of concepts and ideas have been posted, through an interactive process of generating knowledge and enlarging the field of common understanding about aesthetics.

2.2. Structuring

The analysis of these concepts and their relationships, emerged from the expert panel, lead to a cognitive map that can be modelled with the help of Decision Explorer software¹. The complex network of concepts obtained will be then structured and organized considering their relevancy to the aesthetical evaluation process of urban watercourses. A set of fundamental viewpoints and elementary viewpoints can be obtained through a hierarchic representation.

2.3. Modelling

The modelling stage is based on a designing process that leads to the evaluation and comparison of performances of alternatives, the urban watercourses that are supposed to be evaluated, assigned to the selected viewpoints and leading to the establishment of a profile of aesthetic performances.

3. A three dimensional approach

¹ is a software developed by Banxia Software Ld^a (www.banxia.com)

The research has revealed, mainly in the *exploring* and *structuring* stages, three main types of evaluative dimensions or viewpoints – viewpoints related with the *River*, with the *City* and with the *People*. This three dimensional approach has strong similarities with the three Worlds of Habermas (*in* Mingers, 2001: 290).

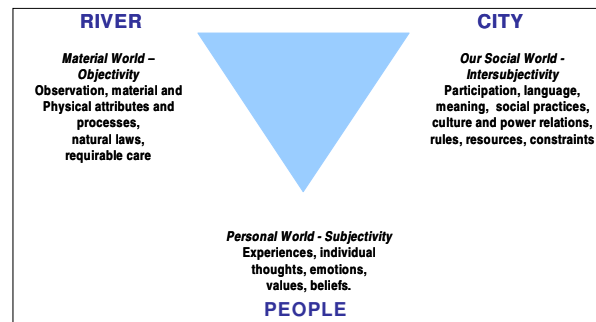


Fig.1– River-City-People framework

In this context the River can perform the material and “natural” world, the City can be viewed as the Social and “humanized” world and the People can perform the place of subjectivity, of individual emotions and perceptions (Fig.1). Within a first case study (Jardas stream within the city of Cacém in the Metropolitan Area of Lisbon) a refined set of viewpoints was established. In the following sections, the fundamental viewpoints used in each dimension are briefly described.

3.1. Natural features – the River

The main natural features of rivers that influence its aesthetics were aggregated into 4 viewpoints:

- ❑ River typology;
- ❑ River morphology;
- ❑ Biological components;
- ❑ Natural and technological hazards.

The spatial framework of eco-regions, as presented in the WFD (2000), has been used to frame the viewpoint “**River typology**”. Each river is strongly related with the territory that generates runoff and sediment transport, which is conducted by the water movement that reaches the fluvial system. The aesthetic appearance of an urban watercourse is also influenced by the basin size, the stream order where it is located, the river width and the morphology of the valley. In most situations river typology can not be changed by man.

The River is a natural dynamic system with a specific behaviour pattern, influenced by geology, geomorphology and climate. Thus “**River morphology**” reflects a balance of forces and processes that operate through it and upon it and

influences the aesthetic appearance - the balance between a “natural” morphology and a “man-made” one, like channelization, sinuosity, increasing view depth, mystery, focal points and other aesthetic attributes.

“**Biological components**” are associated with the biological features of the river system - the degree of naturalism, diversity/uniformity, variety of species, vegetation stages and contrast with land uses.

“**Natural hazards**” on the river corridor are mostly associated with floods and massif soil erosion processes, both in form of bank erosion or landslides. The associated risk depends on the natural characteristics, geological structure and hydrological regimen. Nevertheless the risk might be increased, or even induced, by human behaviours. The perception of risk and feelings of insecurity may influence aesthetical appreciation of rivers.

3.2. Urban environment – the City

Within the structuring process five fundamental viewpoints were identified as being the main issues that envelope a wide variety of elementary aspects that can describe and influence the aesthetic value of city-river landscape.

- ☐ Urban space quality
- ☐ Cultural heritage
- ☐ Activities on riverfront
- ☐ Accessibility
- ☐ Pollution

The “**Urban Space Quality**” can be related with *Visual Permeability* of built space, *Landmarks* or reference points physically perceptible on the landscape (Kevin Lynch: 1960), the *Quality of Built Space* in the river-corridor (quality of construction and maintenance, healthy conditions and the presence of basic infrastructures). The *Public Utility* given to both river watersides, expressed by the balance between public open areas in good condition and private open areas, can reveal the equity of access to the aesthetic values. It was also considered that low *Intensity of Construction* on the river margins would have better consequences in the aesthetical performance of the river.

“**Cultural Heritage**” (CH) of city-river landscape regards its public interest – the amount of collective memories, its social representation and level of attractiveness – which influences aesthetical performance.

It is also important to consider the “**Human Activities in the Riverfront**” – an intense human contact with the river increases the potential of interaction between people and the river. Diversity of uses and distinctiveness enriches the urban landscape and influences indirectly aesthetics.

Many towns and cities owe their existence to water, developing around a port or being located at a major crossing point. “**Accessibility**” is an indirect factor that

makes more or less possible the people enjoyment of aesthetic values of urban waterfront. In most urban watercourses, bridges are in fact the common way to cross the water, having two fundamental functions: Linking function and Contact zones (Manning, 1997). Also, the way in which people access the river has great importance. *Looking from the river to the city*, which highlights the traditional transportation function or *navigability* (the movement of people and goods by water transport has aesthetical significance) and *Looking from the city to the river* that highlights the use and abuse of private cars and the amount of parking surfaces. A well-balanced improvement of aesthetical value should promote more sustainable transport solutions - Public Transport Systems and Soft Modes. If the river is also considered an important focus and generator of events, we must mention the problem of valleys that have become a corridor for major urban roads or railways. Manning (1997:79) mentions this as the *disruption effect* that may be devastating. “**Pollution**” has also aesthetical consequences in water colour, odour, littering.

3.3. Human perception – the People

From the expert panel session a set on concepts emerged which are connected with the people-river relationship. These concepts were aggregated into three fundamental viewpoints:

- ☐ public perception of river landscape,
- ☐ place identity
- ☐ restorative capacity.

The viewpoint “**public perception**” is related to the process of extracting meaning from complex stimuli encountered in river landscapes, which depends from physical elements in the scene, their spatial arrangement, personal, cultural and training factors. On a public perception assessment there is a lack of objectivity, nevertheless it gives important information about people’s preferences and their behaviour in the landscape through the identification of cognitions, feelings and behaviours of its users. Literature on public perception of riverine areas in urban context identifies several dimensions: biophysical features; dimensions related with the urban surroundings of the river; dimensions that reveals people’s relationship with space as individual (e.g.: relax, attachment).

“**Place identity**” refers commonly to “*those dimensions of the self that define the individual’s personal identity in relation to the physical environment by means of a complex pattern of conscious and unconscious ideas, beliefs, preferences, feelings, values, goals, and behavioural tendencies and skills relevant to this environment*” (Proshansky, 1978:155) which plays an important role in the positive or negative perception of environmental problems and changes.

In relation to the “**restorative capacity**”, empirical research strongly suggests that viewing natural scenes may have a *restorative effect*, contributing, for instance, to reduce stress and promote positive moods and feelings (Ulrich and al., 1991). So, natural spaces in urban areas, and notably those with presence of water, can promote a positive view of the place stimulating the involuntary attention that requires little efforts. In the context of this research, it was used the Kaplan and Kaplan’ conceptualisation (1989, 1995) that considers four interrelated characteristics of restorative experiences: *being away*, *fascination*, *extent*, and *compatibility*. Understanding the restorative environment can be useful in environmental design, planning, and policy (Kaplan and Kaplan, 1989; Ulrich and al., 1991) and the measurement of restorative qualities of person-environment transactions can help in applying such understandings (Hartig and al. 1996).

The assessment of *People World* has been done using questionnaires, based on the concepts previously presented, and adjusted to local characteristics of the river, to the specific urban context, and to the social background present in the case studies. The integration of information on public perception in aesthetic evaluation is relevant in setting guidelines for river rehabilitation processes, because it informs about potential users expectations and desires towards the future of these landscapes. In this way the rehabilitation process may contribute to increase the users’ attachment and identity with the place and promote environmental conservation behaviour.

4. The profile of aesthetical performance

A multicriteria approach was used to model and making operational the evaluation process. The partial performances following each elementary viewpoint have been measured through a set of chosen indicators and descriptors. The resulting measurement scales have been standardized to a cardinal common scale of performance, using simple linear functions, varying from 0 (the worst plausible level) to 100 (the best plausible level). Fig. 2 shows the profile of aesthetic performance obtained for Jardas stream, the exploratory case study used within the project, showing the all set of criteria performance (Silva and al., 2003b).

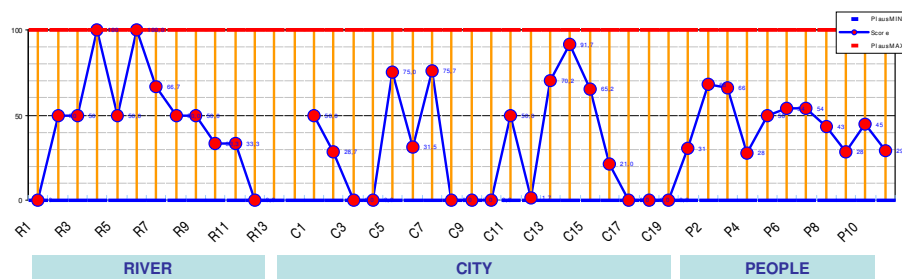


Fig. 2 - Profile of aesthetical performance for Jardas Stream

This profile can be a useful manner of showing more objectively the aesthetical performance of an urban watercourse, expressing the local plausible achievements and allowing comparability between criteria and between *worlds*. The profile is bounded which is useful to perceive the meaning of partial performances and supporting the selection of criteria where the best improvements on aesthetics can be made in a rehabilitation scheme. The profile does not express the preference system of decision makers (weights were not used). However, value functions and weights can be introduced to include value judgments from decision makers or other actors, in the decision making process.

5. Discussion

The methodology presented can be viewed as a *multimethodology*, using the arguments referred by Mingers (2001:289), because it deals effectively with the full richness of the real world, especially with aesthetical aspects, which are inevitably multidimensional. Combining different methods and approaches may well yield better results. This means reinforcing interdisciplinarity and using several approaches, from expert evaluation procedures to other involving public surveys and enquiries, that can include several “publics”, such as residents and users of city riverfronts, decision makers, planners, etc.

The approach described shows some advantages, as following:

- revealing the diversity of characteristics of each urban watercourse. Some could be more related with social and cultural context, other with a more “natural” landscape or even a specific geographic context;
- allowing perceiving and better understanding the different dimensions that can be improved in a river rehabilitation process and compare performances between rivers in different contexts.

We believe that this procedure can help to establish conclusions and comparisons about profiles of aesthetical characteristics of urban watercourses, helping also in defining priorities in urban rehabilitation processes and policies, taking into account landscape aesthetic values, which try to include not only expert procedures, but also some inputs from public surveys and human values assessment.

6. References

- BELTON, V. ; Stewart, T. J. (2002) Multiple Criteria Decision Analysis. Kluwer Academic Publishers, Dordrecht.
- BERLEANT, A. (1997) Living in the Landscape. Towards an Aesthetic of the Environment. University Press of Kansas.
- BOON, P.J., Davies, B.R., Petts, G.E. (Eds.) (2000) Global perspectives on river conservation: science, policy and practice. Wiley, Chichester.

- DREISEITL et al. (2001) *Waterscapes. Planning, Building and designing with water*. Birkhauser-Verlag Publishers, Basel.
- EC 2000. Water Framework Directive (2000/60/EC), Official Journal (OJ L 327), 22 December, European Commission.
- Eden, C., SIMPSON, P. (1989) Using Cognitive Mapping for Strategic Options Development and Analysis (SODA), in *Rational Analysis for a Problematic World*, Edited by J. Rosenhead, John Wiley & Sons Ltd^a.
- FISRWG (1998) Stream corridor restoration. Principles, processes and practices. Federal Interagency Stream Restoration Working Group http://www.usda.gov/stream_restoration.
- HARTIG, T., Korpela, K.M., Evans, G.W., & Gärling, T. (1996) Validation of a measure of perceived environmental restorativeness (Göteborg Psychological Reports, 26:7). Göteborg, Sweden: Department of Psychology, Göteborg University.
- HOUGH, M. (1998). *Naturaleza y Ciudad. Planificación Urbana y Processos Ecológicos*. Editorial Gustavo Gili, Barcelona.
- KAPLAN, S. & Kaplan, R. (1989). *The Experience of Nature: A Psychological Perspective*. New York: Cambridge University Press.
- KAPLAN, S. (1995) The restorative benefits of nature: Toward an Integrative Framework. *Journal of Environmental Psychology*, 15, 169-182.
- LYNCH, Kevin (1960) *The Image of the City*, Cambridge: M.I.T. Press.
- MANNING, O. D. (1997) "Design Imperatives for River Landscapes", in *Landscape Research*, 22,1: 67-94.
- MINGERS, J. (2001), "Multimethodology – mixing and matching methods" in Rosenhead, J. et al, „*Rational Analysis for a Problematic World Revisited*”, 2001, John Wiley & Sons, Ltd.
- PETTS, G, Heathcote, J., Martin, D. (Eds) (2002) *Urban Rivers. Our Inheritance and Future*. IWA Publishing, London.
- PROSHANSKY, H.M. (1978) The city and self-identity. *Environment and Behavior*, 10, 147-169.
- RILEY, A.L. (1998) *Restoring streams in cities. A guide for planners, policymakers and citizens*. Island Press, Washington, D.C.
- SARAIVA, M.G.A.N. (1999) *O Rio como Paisagem. (The River as a Landscape)* *Textos Universitários de Ciências Sociais e Humanas, Fundação Calouste Gulbenkian e Fundação para a Ciência e Tecnologia*, Lisboa.
- SILVA, J., Saraiva, G., Ramos, I.L., Bernardo, F., Monteiro, F. Câmara, C. (2003a) Classification of the aesthetic value of the selected urban rivers. *Methodology. Project Deliverable 4-2, URBEM Project, CESUR, IST, Lisbon*.
- SILVA, J., Saraiva, G., Ramos, I.L., Bernardo, F., Monteiro, F. Câmara, C. (2003b) Classification of the aesthetic value of Jardas stream. Application of the methodology to the study area-.. *Project Deliverable 4-3, URBEM Project, CESUR, IST, Lisbon*.
- ULRICH, R.S.; Simons, R.F.; Losito, B.D.; Fiorito, E.; Miles, M.A.; Zelson, M. 1991. Stress Recovery during exposure to natural and urban environments. *Journal of Environmental Psychology*, 11, 201-230.

UREÑA, J.M. (Ed.) (1999) River design and environmental protection in Europe. Project cofinanced by the Socrates-Erasmus program, European Commission, Universidad de Cantabria.

WHITE, R.R. (2001) Sustainable development in urban areas: an overview. In : Devuyst, D., Hens L., De Lannoy, W., (Eds.), How green is the city? Sustainability assessment and the management of urban environments. Columbia University Press, New York, pp. 47-62.

7. Contact details

Title/Name: Prof. Jorge Batista e Silva

Organisation: CESUR – Centre of Urban and Regional Systems

Address: IST - Technical University of Lisbon, Av. Rovisco Pais, 1049-001 Lisbon, Portugal

Email: jbsilva@cesur.civil.ist.utl.pt

Phone: 00351.21.8418309

Web: <http://cesur.civil.ist.utl.pt/~jbsilva/>