

## **Rhodanian Neighborhoods in Transition: Towards an Integrative Strategy Facilitating Decision-Making for New Sustainable Fluvio-Neighborhoods**

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*ABSTRACT: In the changing history of city-river relationships, cities are today questioning strategies for “reconciliation”. Thus, rather degraded sites like riverside brownfields represent an important potential for the creation of new sustainable fluvio-neighborhoods. This research project focuses on the Rhône, and aims at developing an integrative strategy facilitating decision-making for rhodanian neighborhoods in transition. This paper presents the methodology of the research, which is composed of three work packages: 1-a research by design approach, 2-a decision-making support, and 3- interactions with stakeholders. Thanks to the “research by design” approach, several project-based visions developed on 4 selected study sites along the Rhône form the material for the elaboration of the decision-making support. The latter consists of two separate but correlated elements: a sustainability profiler, and an analysis framework for the new city-river balances. It is enriched by inputs from different stakeholders.*

*KEYWORDS: Rhône, Sustainable neighborhoods, Research by design, City-river balances, Integrative strategy*

### **1. INTRODUCTION**

Over the centuries, cities have developed changing relationships with their waters. After a clear sidelining of rivers in cities, today is an opportune time to question the potential for “reconciliation” of these relationships. In fact, current inward densification objectives of urban areas combined with flood protection strategies are generating a wide field of exploration for the future evolution of urban riverbanks. In this perspective, rather degraded sites like riverside brownfields represent a significant potential for the creation of new sustainable fluvio-neighborhoods.

This research project focuses on the Rhône, an emblematic territory for the reconquest of urban riverbanks. The current shape of the Rhône is the result of a long series of developments, exploitations, and appropriations over time [1]. It shows a discontinuous density between its metropolitan centers and the intermediate regions, more neglected [2]. In light of the climatic emergency, this territory lives a decisive time in its evolution, where the matter of planning strategies on fluvial sites intensifies. In this context, many landscape, urban, and architectural issues are questioning the project approach to be adopted for the development of fluvial neighborhoods. The regeneration process of these sites goes hand in hand with the accentuation of their specific city-river dynamics, the ambition of the research is thus to develop sharp knowledge in the understanding of the issues related to the neighborhoods in transition along the Rhône.

Focusing on this challenge, the ongoing research presented in this paper aims at developing an *integrative strategy* facilitating decision-making for sustainable fluvio-neighborhoods. The paper gives an overview of this objective through the description of the methodological research approach as well as its expected general and specific outputs.

### **2. RESEARCH METHODOLOGY**

The development of the *integrative strategy* focuses on the emerging issues raised by fluvio-neighborhoods in transition. In this sense, the proposed *integrative strategy* is expected to enrich the perception of these sites by offering guidance to the stakeholders involved in this type of projects, contributing thus to the decision-making process.

The methodological work packages taken for the development of the *integrative strategy* are: 1- The research by design approach, through the development of project-based visions and the definition of the components of the city-river balances; 2- The conception of a decision-making support, through the establishment of sustainability profiles and the implementation of an analysis framework; 3- The interactive exchanges with the involved stakeholders, through a series of interviews with various experts and working sessions on the study sites.

These three work packages are not only strongly interconnected but become also the parts of the *integrative strategy*.

#### **2.1 Research by design**

The development of project-based visions and the definition of the components of the city-river balances constitute the “research by design” approach. The projectual process becomes a concrete research tool that lies between theoretical and operational issues. Thanks to the knowledge emerging at the same time from developing design projects and studying current practices as well as the state of the art, the approach constitutes a powerful tool for architectural research [3].

### 2.1.1 Project-based visions

The relationships to the river are not uniform depending on cities [2], and several parameters must be taken into account when looking at fluvial sites : the establishment (position to the river, distance to the urban center) ; the physical environment (size of the site, density, urban morphology, building typologies); usage (type and rate of activity, number of users, cultural elements); the city-river interaction (type and nature of the link with the river, public and green spaces, ecosystems, risks). With that in mind, 4 distinct study sites are selected along the Rhône (Fig. 1): Sion and Geneva in Switzerland, respectively Givors and Avignon in France. Each site is located in a different Rhône hydraulic regime (excluding the Delta), and is expected to become a new urban polarity.



Figure 1: Rhône basin, 4 study sites and hydraulic regimes of the river

The 4 study sites present similar characteristics. They all show a strong link to the Rhône, through genuine landscape qualities, as well as the presence of a major mobility infrastructure in the direct vicinity: a motorway bridge in Sion and Givors, a railway bridge in Geneva, and a major touristic road in Avignon. In addition, the high potential of the riverbanks allows to imagine new uses and resilient developments. (Fig. 2). Moreover, the study sites are destined to be regenerated into mixed-use neighborhoods, with a flagship program that is adapted to the specificities

and needs of each location. Sion focuses on the theme of education with a new campus, Geneva deals with the creative economy with cultural activities, Givors lends itself to the establishment of a research center in the field of energy, and Avignon will house a cultural center dedicated to the performing arts.

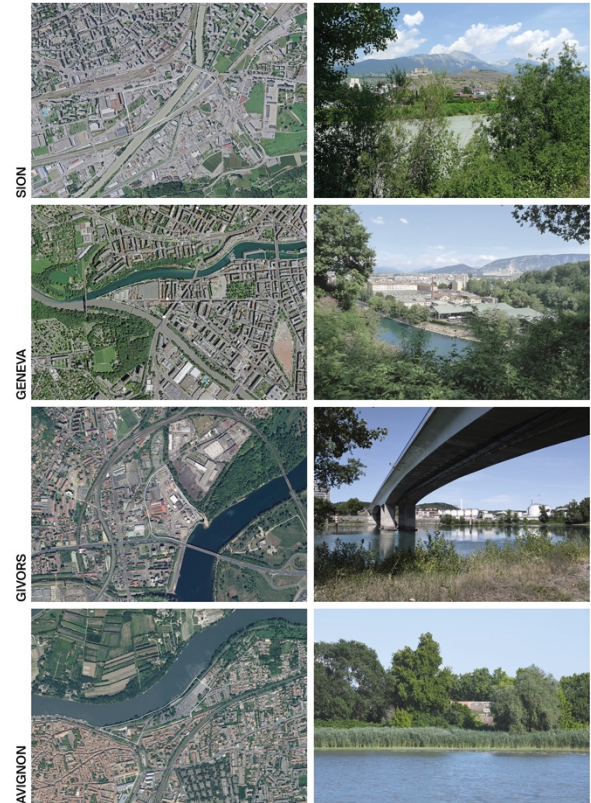


Figure 2: Current situations (orthophotos) and river landscape views of the 4 study sites

The research project is then combined with an annual architectural studio intended to undergraduate students. For each of the 4 selected sites, between 8 and 10 projects are developed. Students work taking an iterative approach on multiple scales: from the urban project to the construction detail. In groups, they analyze, explore, and experiment with sustainable architectural strategies. A total of about 40 projects is expected. At the end of each studio, a variety of projects presenting the best qualities in terms of interactions between the site and the river are selected and deepened during intensive workshops to generate project-based visions. They become the “raw material” for the progressing and testing of the decision-making support.

On each of the 4 rhodanian study sites, 3 project variants are developed in addition to the current situation, for a total of 12 visions per site. 3 prospective attitudes categorize the project-based visions: “Weave”, “Orient” and “Deploy” relate to the specific contribution of the new neighborhood to the spatial relationships between the actual urban fabric of the city and the landscape area of the river.

Weave: the prospective attitude weaves sequenced links with the river's landscape space. It translates into an urban form and an urban structure that are part of a logic of extension of the existing built fabric of the city (Fig. 3).



Figure 3: Site plans of "Weave" for the 4 study sites (from top to bottom: Sion, Geneva, Givors, Avignon)

Orient: the prospective attitude orients and opens up the built fabric of the existing city towards the river. It results in an urban form that alternates between concentrated built spaces and unbuilt public spaces (Fig. 4).



Figure 4: Site plans of "Orient" for the 4 study sites (from top to bottom: Sion, Geneva, Givors, Avignon)

Deploy: the prospective attitude deploys a river frontage that is permeable to the built fabric of the existing city. It translates into a large-scale urban form that enters in dialogue with the larger landscape while offering a vast public space at the water's edge (Fig. 5).



Figure 5: Site plans of "Deploy" for the 4 study sites (from top to bottom: Sion, Geneva, Givors, Avignon)

The three prospective attitudes not only give rise to several urban morphologies but also generate diverse public spaces in connection to the river. In the perspective of a convivial city open to transformation [4], the potential of sustainable rhodian neighborhoods is therefore particularly rich and qualitative.

### 2.1.2 Components of the city-river balances

At the neighborhood level, the concept of new city-river balances involves a transition from current practices to resilient practices [5]. Through a review of the literature and the analysis of a large series of current practices, the various elements constituting the city-river relationship are specified [6].

The first step is to understand the rhodian territory as a set of resources and fragilities linked to the river. These "Rhodian Intensities" are broken down into six points: Urbanization and flood risk; Energy and transport; Agriculture, ecosystem and landscape; Tourism, leisure and recreation; Governance and management; Heritage and culture of the river.

The balances components are then derived into new city-river balances, understood as resilient urban attitudes in the framework of the ecological transition: Positizing the risk; Energy transition; Environmental dynamics; River public spaces; Co-construction; River Culture.

These components are the basis on which the various dimensions of the analysis framework are developed, in order to feed the decision-making support (Fig. 6).

### 2.2 Decision-making support

Multi-criteria evaluative approaches, as a means of establishing a common project goal, are at the heart of an informed decision-making process and an overall quality approach [7]. At the neighborhood scale, there is a strong need for "tailor-made" evaluative methods [8] structured around environmental, socio-cultural, and economic sustainability indicators. To complete this requirement, indicators related to the city-river dynamics are also needed. As mentioned above, fluvial sites present similar issues in terms of planning but different particularities. Hence, the decision-making support is conceived to compare prospective visions independently by sites.

The elaboration of the method includes: The determination of a list of indicators (quantitative and qualitative) to be evaluated in order to tend towards a multidimensional representation of the issues characterizing sustainable fluvial neighborhoods; The establishment of the evaluation framework, i.e. the definition of "measurable" values to indicate the degree of satisfaction with respect to each indicator considered; The testing and optimization of the method, applying it to project-based visions as well as

to the current situation; The elaboration of the graphic representation of the comparative evaluation results, in order to communicate with various audiences.

For more precision and adaptability, the proposed decision-making support consists of two separate but correlated elements: a tool for establishing sustainability profiles, and an analysis framework for the new city-river balances (Fig. 6).

### 2.2.1 Sustainability profiler

The sustainability profiler is based on the NEBIUS methodology (Neighborhood-scale Evaluation to Benchmark the Integration of Urban Sustainability) [9–11], which facilitates the evaluation of key aspects of sustainable neighborhoods. This tool, at the same time precise and straightforward, addresses equally the standard three sustainability pillars (environmental, sociocultural and economic) adapted to the built environment [12]. In addition, its robustness also allows for specific adaptations without losing consistency.

The criteria leading to the sustainability profiles for each project-based vision are as follows: Density and Diversity; Energy performance, Lifestyles, Ecology and Mobility, Economic efficiency.

### 2.2.2 Analysis framework

The analysis framework relies on the concepts of nature-based solutions and resilient city.

According to IUCN, nature-based solutions are “actions to protect, sustainably manage, and restore natural and modified ecosystems that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits” [13]. Given that urban environments have an important role to play in sustainability transitions [15] in the face of climate change phenomena, resilient cities aim at transforming vulnerability into dynamic adaptation [14]. Therefore the planning of nature-based solutions in cities involves several principles [16] in order to guarantee “inclusivity, livability and resilience” [17].

In this context, the analysis framework for new city-river balances intend to address the challenges specifically related to the rhodanian urban communities. Indeed, the need for place-specific scenarios and their assessment in terms of potential impact [18] seems particularly adapted to the neighborhood scale.

The analysis framework for the new city-river balances is structured by 6 components, each one declined in 3 dimensions referring as much to spatial scales (Region, City, Neighborhood) as to specific inputs (Consistency, Contribution, Quality). The “Balances Components” (described in chapter 2.1.2) therefore lead to 18 dimensions: Risk management, Risk culture, Porosity – Circularity, Networks, Energy

autonomy – Active river, Nature in the city, Fertile meshings – River resources, River urban life, River public spaces – Regional masterplan, Negotiated urbanism, Co-construction – Material and cultural heritage, Usages, Living with the river.

This system of quantitative and qualitative dimensions allows a multi-criteria comparison of city-river balances scenarios through sustainable fluvio-neighborhoods.

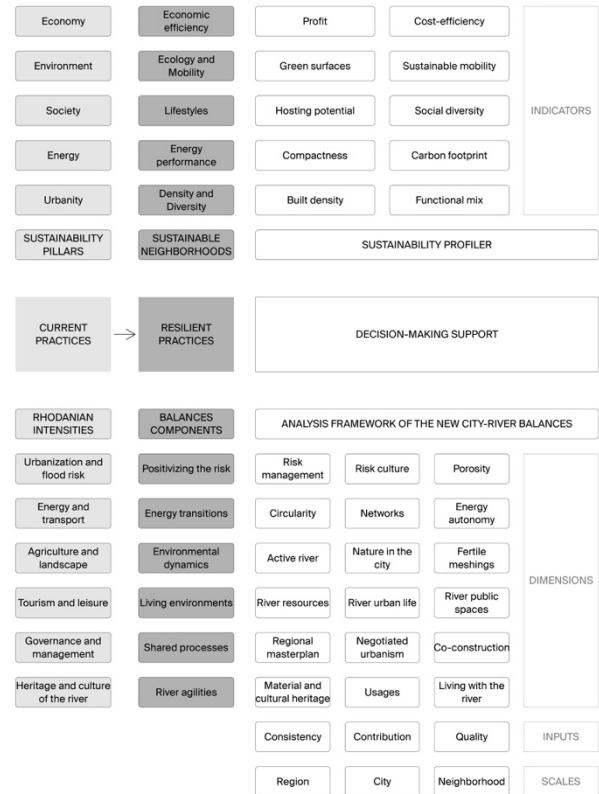


Figure 6: Decision-making support

### 2.3 Interactions with stakeholders

In order to guarantee the multidisciplinary approach inherent to the concept of sustainability [19], stakeholders active in urban river territories and coming from a variety of professional backgrounds (architects, urban planners, hydrologists, engineers, geographers, sociologists, politicians, economists, representatives of the study sites, etc.) are intensively solicited throughout the research project. Building on the strong links between the assessment device and the process leading to it [20], stakeholders involvement is inseparable from the decision-making support tool.

First, targeted interviews intend to determine the elements that can define city-river dynamics. It allows increasing the understanding of the territory under development, the issues related to the city-river relationship as well as the related principles of sustainability.

Second, on-site working sessions are organized to enrich the research activity on the Rhône territory and

to promote the exchange of knowledge. They aim particularly at: Establishing an interdisciplinary dialogue; Linking the different stakeholders of the Rhône urban area; Bring out the specificities of each Rhône study site; Defining sustainable city-river dynamics; Confronting the project-based visions with the perception of the concerned stakeholders; Testing and optimizing the decision-making support.

### 3. RESEARCH EXPECTED OUTPUTS

Beyond the development of theoretical knowledge on the nature of the "Rhodanie Urbaine", this research project is expected to provide an *integrative strategy* for fluvio-neighborhoods in transition. This *integrative strategy* will accompany decision-makers in the planning of new sustainable fluvio-neighborhoods by offering not only an unprecedented decision-making support but also guidance to elaborate project-based visions for specific sites along the Rhône and to implement long-term interactions with stakeholders.

In terms of communication and dissemination, the research project is presented in detail on a dedicated website [21].

### 4. CONCLUSION

This work questions the challenges raised by the management and steering of the evolution of fluvial sites engaged within the context of sustainability transitions. Throughout a multidimensional research project along the Rhône as a vector of multiple urban uses, an *integrative strategy* of decision-making support for sustainable fluvio-neighborhoods is developed.

Thanks to the notion of integrated design, which aims to exploring unprecedented links between the methodological rigor of research and the inventiveness potential of the project, the "research by design" approach constitutes a real knowledge tool for architectural and urban issues. The project-based visions facilitate the exploration of the different existing and potential city-river dynamics generating the future rhodanian neighborhoods.

The research is currently progressing with the deepening and evaluation of the project-based visions in Givors and Avignon, which will be followed by the on-site working sessions with stakeholders.

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