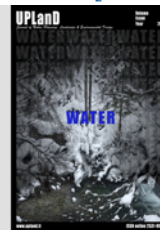


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## THE ROLE OF WATER MANAGEMENT IN EUROPEAN REGENERATION STRATEGIES. FROM PROBLEM TO OPPORTUNITY

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### HIGHLIGHTS

- Integrated approaches to urban regeneration
- Water management in Urban planning
- Resilience cities and green infrastructure
- Environmental problems and urban opportunities

### ABSTRACT

Among the research and experimentation paths about urban regeneration, the environmental issues have stimulated new ways of action, not only in terms of defence and preservation of the resources, but also in terms of proactive urban and territorial resilience strategies. These strategies merge an eco-landscape perspective, as well as morphological, functional and infrastructural ones in a complex, integrated and non-sectoral design dimension, toward a model of urban resilience that is considered a relevant operational reference, but also a significant collective value, on which to re-establish not only the forms of the urban landscape but also the sense of the collective use of spaces. In this context, the most advanced national policies in Germany and France, overcome the concept of ecological networks towards the concept of green infrastructure, a multifunctional network based on natural capital and ecosystem services. Green infrastructure is configured as a “resilient frame” for the prevention and mitigation of hydrogeological risks and adaptation to climate change, a structure for saving and recycling water resources, and a matrix of public spaces. This concept heads toward a holistic interpretation of water management issues. The case studies of the Ruhr Valley and the Seine Valley show emblematic water management strategies that face the complex challenges of environmental and socio-economic regeneration of some relevant European industrial urban areas giving important opportunities to drive territories beyond crisis and urban planning toward new operational references and collective values.

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## 1. URBAN REGENERATION STRATEGIES IN EUROPE. INTEGRATED APPROACHES TOWARDS RESILIENCE

In this phase of global crisis that undermines the sustainability of contemporary city and territories, research and experimentation in urban planning look towards new perspectives for the definition of theoretical and operational references aimed at putting in place integrated and multi-scalar strategies of urban and territorial regeneration (Gasparrini, 2016; Oliva & Ricci, 2017). These perspectives now highlight the increased awareness of rapid changes in environmental and socio-economic contexts and guide innovation of planning methods in order to overcome rigid disciplinary and administrative boundaries. To this end, it seems indispensable to anchor design references in space and time (Masbouni, 2012), through wide and forward-looking strategic visions and rules for sustainability (Poli & Ravagnan, 2017). This overall approach is indeed considered a key perspective to face contemporary urban pathologies and risks associated with natural cycles and to innovate socio-economic networks in the effective areas of their phenomenology and their forms of interaction.

In particular, urban planning finds significant areas of convergence with ecology and landscape, in a perspective of Resilience (Gasparrini et al., 2014). This principle fosters specific design inputs and lines of intervention (Ravagnan, 2018) to get out from the environmental, social and economic crisis:

- mitigation of environmental risks through the innovation of land use planning towards sustainable and “porous” city models;
- adaptation to climate change in urban transformations through the construction of landscape-oriented public spaces and the promotion of eco-friendly urban collective values and behaviours;
- promotion of green and circular economies through the re-appropriation and valorisation of common goods.

In this integrated framework, the most advanced urban regeneration strategies in European practices face these complex issues focusing on the construction of a green and blue infrastructure, overcoming the sectoral concept of ecological network in order to assess and maximize the economic and social implications and impacts, as well as

the morphological and aesthetic ones (Gasparrini, 2018; Poli & Ravagnan, 2017). These implications and impacts are specifically assessable in terms of ecosystem services (EU, 2013), to achieve a smart, sustainable and inclusive growth (Europe 2020 Strategy) based on the integration of morphological, cultural, environmental and socio-economic goals and actions. In particular, green infrastructure, according to the European definition (EU, 2013), constitutes “a network of natural and semi-natural areas planned at a strategic level with other environmental elements, designed and managed in such a way as to provide a broad spectrum of ecosystem services”. The Millennium Ecosystem Assessment (2005) defines specifically ecosystem services as “the benefits that people get from ecosystems”. These include Procurement services, such as drinking water; Regulation services, which act for example on climatic phenomena and on hydrogeological instability; Cultural Services, which provide recreational, aesthetic and spiritual benefits, strengthening identity collective values related to the environment; Support Services, such as soil regeneration (MA, 2005).

## 2. WATER MANAGEMENT IN URBAN PLANNING. NEW REFERENCES

Therefore, in the current European cultural and political framework, the principle of Resilience drives planning innovation by suggesting new references for proactive strategies to emerge from the actual phase of crisis. This principle focuses on the analysis and interpretation of the conditions of fragility, scarcity and pollution of environmental resources, as well on social issues of fragmentation and exclusion. This holistic perspective on contemporary processes enable to underline and interpret the ecological and social challenges as design inputs towards safe physical structures and cohesive communities based on environment protection, valorisation and regeneration (Poli & Ravagnan, 2017). To this end, these strategies favour integrated, multi-scalar and participatory lines of intervention, starting from the awareness that natural risks “intersect and overlap the many anthropic risks that are produced by the ways in which cities were built and their metabolism has been consolidating” (Gasparrini, 2018).

The lines of intervention concern in particular:

- the improvement of environmental safety

linked to the regulation of natural cycles, developing a cultural and technical sensitivity in urban planning and design related to the management of environmental networks (Gasparini, 2018);

- the conservation and reuse of natural resources, putting in place new building and urban planning rules and innovative technologies to support over the long term, at all levels of intervention, circular economies and profitable industrial ecologies;
- the protection of the quality of resources from pollution, to guarantee a higher *cadre de vie*, involving institutions, operators and citizens in a common project aimed at increasing the presence of nature in the city (Ravagnan, 2015), starting from the awareness of its economic, cultural, and aesthetic role.

In this framework, water represents an ultimate “vector of sustainability” (Masbouni, 2012), a sap for the re-naturalization and revitalization of territories in crisis towards green economies, but also a main topic of “social innovation” processes, fostering new forms of sweet and sustainable mo-

bility, and suggesting eco-friendly uses of recreational and inclusive public spaces.

The central importance of water management stands out in the most recent international references such as the Sustainable development goals - 6 Avoid wasting water, 13 Educate young people on climate change, 15 Plant a tree and help protect the environment- which are included, within urban issues, in some of the 12 objectives of the European Urban Agenda: sustainable land use; climate adaptation; circular economy.

These objectives are reflected in the design of green and blue infrastructure:

- as a grid for ecosystem quality and functionality (Giaino & al., 2018), a “resilient frame” for the prevention and mitigation of hydrogeological risks and adaptation to climate change,
- as a structure for saving and recycling water resources, in the context of new urban and industrial ecologies,
- as a matrix of public spaces for the enhancement of hydrographic networks and the promotion of environmental issues related to water.



**Figure 1:** The *Parc du peuple de l'herbe* in Carrières-sous-Poissy. Source: Photo by Chiara Ravagnan.

Therefore, water issue is a significant area of innovation for the reconfiguration of structural-strategic, regulatory and design aspects of planning, which is related to some specific contents. These stand out as common references, even if declined in an original way, in some European emblematic ongoing practices, which have been selected, funded and disseminated within national and European programmes.

In particular, within the structural-strategic approach of urban planning, the need for expansion and articulation of rainfall water captation and controlled flooding areas for hydrogeological purposes suggests opportunities for integration with the regeneration instances of degraded and abandoned areas within urban fabrics. In fact, the management of large surfaces of water enables the mitigation of flood risks in urban areas, but at the same time it allows the reconstitution of a natural environment and the implementation of the variety and the dynamism of urban landscape.

In this perspective, urban and territorial regeneration practices carried out along the Seine River have received national and international funding and awards, as the *ZAC Carrières-Centralité* in Carrières-sous-Poissy developed in the framework of the Seine City Park Project (Fig. 1), or the *ZAC Trapèze* in Boulogne-Billancourt (illustrated in the next paragraph). These practices have, in fact, been awarded with the label of Ecoquartier by the French Ministry of the Environment.

Within the regulatory approach of urban planning, the themes of water saving and reuse suggest the dissemination of water management rules through new innovative technologies for drainage, treatment and recycling of rainwater and wastewater (Sgobbo, 2018). Some territorial contexts, such as the Ruhr in Germany, have been implementing since a long time an environmental and territorial regeneration strategy. That strategy finds in the reclamation of waters the starting point for the construction of a green infrastructure, as highlighted in the case of the city of Essen (illustrated in the next paragraph). Other European cities, such as Vitoria-Gasteiz in Spain, Green Capital in 2012 (Poli & Uras, 2018) are significant best practices of this approach.

Within the participatory approach, urban planning references underline the priority of raising awareness of the population around water as a common good, in order to stimulate eco-friendly lifestyles, social innovation and site-specific creativity in the framework of the promotion of environment

as a universal and shared value (Poli & Ravagnan, 2016). On the one hand, this awareness must be fostered through top-down initiatives made possible by European Programs such as Life+ or European Green Capitals. On the other hand, some bottom-up initiatives highlight the arising role of local networks of territorial players. To this end, cases such as Essen bring out the opportunity to integrate quality criteria promoted at international level with place based approaches linked to a strong involvement of socio-economic actors and local communities in decision-making and management processes, that are the bearers of virtuous and ecologically oriented behaviours (Poli & Uras, 2018).

### 3. EMBLEMATIC CASES AND EXPERIMENTATION IN PROGRESS. FROM GREEN NETWORKS TO GREEN INFRASTRUCTURES

The cases of Essen and Boulogne-Billancourt are emblematic of the new approaches put in place in the European contexts in the area of urban and environmental regeneration interventions implemented in Europe's largest industrial conurbations.

In particular, the choice of deeply examining these case studies finds support in the priority-level, multifarious role played by water, understood as a structural grid, as a resource and as a common good, the thread that links plans, designs, and programmes bringing synergy to interventions of consolidation and reclamation, of re-naturalization, and of recycling – but also of socioeconomic revitalization and of shared re-appropriation of open spaces as collective spaces. Water thus constitutes the strategic component bringing design solutions capable of transforming sectoral problems into opportunities for multi-scalar, integrated and participatory regeneration.

The methodology of investigating and illustrating the cases thus aims at highlighting a convergence of strategies towards shared lines of intervention that articulate an effective integration between urban planning and environmental policies aimed at:

- improving the environmental safety connected with the regular operation of the water cycle, by means of systems for the catchment and collection of precipitation and flooding that

become linear and point-by-point elements in a network of green and blue spaces inner-vating and characterizing the urban landscape while pointing to “new ways to water”;

- saving and reusing the water resource, by implementing new construction and urban-planning rules and innovative technologies to support recycling systems for urban uses such as irrigation or street cleaning;
- protecting water quality, by means of new technological purification systems, but while also, at the origin, raising institutions’, operators’, and citizens’ awareness as to protecting and valorising water as a common good and as a primary support for life.

### 3.1 The Ruhr valley and the waterways of Essen

In the final decades of the twentieth century, environmental protection policy acquired an important position in the action of German governments, and was characterized by three guiding principles:

the principle of prevention, the principle of repairing pollution, and the principle of cooperation. The programmes and interventions implemented during these decades enabled public opinion to grow more aware of the importance of the environmental question, while at the same time giving impetus to the issuance of a significant body of laws, starting as early as 1974 (Galdini, 2017).

In this framework, Germany’s innovative environmental policy of ecological reconversion, promoted by the Government of the North Rhine-Westphalia Region in order to foster the structural process of deindustrialization of the Ruhr, achieved international renown with the ambitious IBA Emscher Park project.

On a regional scale, Emscher Park, through the essential operation of environmental reconversion of the river belt, is the structural axis of an inter-scalar, integrated planning strategy. This strategy configures a branched and complex ecological connective system that links together the rehabilitation of urban areas of the Ruhr Valley, the recovery of its historical industrial heritage, and the valorisation of its identity with the environmental



**Figure 2:** The Grüne Mitte Park in Essen. Source: iStock.com/TBE.

reclamation processes.

Essen is the emblem of this complex regeneration process. Winner, in 2017, of the prestigious European Green Capital prize, it is marked by its innovative projects for the recovery and requalification of the river belts, and by the reclamation and repurposing of urban voids and of large, abandoned industrial areas, combined with social policies aimed at achieving the city's high residential quality (Galdini, 2017; 2008).

Starting in the 1990s, following a major deindustrialization process, the municipal administration put in place an urban planning strategy summed up by the slogan "*Von Grau zu Grün*" ("from grey to green") (Kipar, 2017). This new strategy is founded upon green and blue infrastructure, configured as the occasion for recovering and reusing the drosscape, as an instrument to prevent and mitigate environmental risks, and, moreover, as the bearing structure for the new public city marked by ecological value (Kipar, 2017).

A fundamental role in *Grüne Politik* is played by water-related interventions: waterways have been the strategic components for reconceiving the historical and environmental identity of the city, in a complex and integrated dimension of planning (Mastrobuoni, 2018). In particular, the project for the ecological/environmental reconversion of the Emscher River and its tributaries, to be completed in 2020, appears emblematic.

The river was used until the late nineteenth century for the discharge of industrial and residential urban wastewater. Upon the definitive closure of the coalmines and the consequent diminishment of the subsidence phenomenon that has always been characteristic of the area, it was finally possible to build the underground wastewater treatment network and a rainwater recycling system.

Coordinating the multiplicity of individual works in this "multigenerational" project done over the long term required, in 2006, the drawing up of *Masterplan Emscher-Zukunft* – Masterplan for the future of the Emscher.

The Masterplan's search for design solutions innovative in comparison with traditional engineering works opened the possibility for a new way of planning the landscape and ecology of the river areas and of the Emscher cities, with the aim of giving the river "more room" in order to restore water quality and reduce flooding risk. In addition to creating new open and green spaces with high design quality, and new areas functional to the natural hydrological cycle, the plan then extends

well beyond the river banks, becoming the driver for a renewed urban development including residential areas, infrastructure works, and industrial and commercial settlements (Sommerhäuser & Paetzel, 2016).

The other river that symbolizes Essen's industrial development, the Ruhr, also used as a transport route for coal and for the discharge of industrial waste, was the subject of the "Management of the risks of pollution of the water cycle" research programme, which made the river water once again suitable for bathing, thanks to an early alert system that constantly monitors river water quality, thus reconciling water quality with the promotion of eco-friendly recreation functions. On an urban scale, the Masterplan developed by the architect Kipar systematizes and integrates multiple ongoing plans and projects, and the implementation of future projects, with the identification of 3 green "radii" and several watercourses as guidelines for the ecological regeneration process. This strategy takes tangible form in new types of green open spaces connected to watercourses, green areas, and existing parks (Fig. 2): green roofs, vertical gardens, urban forests, tree-lined avenues, temporary uses of urban spaces, and reconversion of abandoned industrial areas in new urban contexts, thanks to the introduction of new, ecologically-oriented functions that are connected and made usable by 150 km of bike paths (Kipar, 2017). These new types of green areas and spaces made usable by new recreational areas for sports and free time, enabling "about 250,000 persons living in Essen today to find direct access to bodies of water, through 'new ways to water'" (Kipar, 2018). In fact, in the context of the projects provided for by the Masterplan, the new ways to water (*Neue Wege Zum Wasser*) programme integrates the building of multi-functional green infrastructure – starting from the smart development of green spaces and parks – with a systematic set of interventions of ecological transformation and of integrated, sustainable rainwater and flood water management, thereby developing opportunities to overcome the economic crisis through new green economies.

### 3.2 *The Seine river valley and the Trame verte et bleue*

France is also a privileged context, because a consolidation process of environmental policies has

been successfully carried out for some years. This process has been strongly integrated with the specific French experience of planning and managing related to complex urban projects: urban projects structured on the networks of ecologically oriented public spaces, developed on an urban scale as well as on a metropolitan and inter-municipal scale.

In particular, following the Grenelle Laws of 2009 and 2010, the construction of the *Trame verte et bleue* has been extensively practiced. This design strategy is conceived within strategic and structural tools, at a large-scale level (such as the *Schéma de Cohérence écologique* at regional level), and implemented at all levels, by planning tool, partnership and cooperatives procedures, and national programs (such as *Ecoquartier*, *Ecocité*, *Nature en ville*) promoted by the Ministry of the Environment. This has led to the experimentation of new ecologically oriented urban and territorial models, based on sustainable and multi-scalar strategies aimed at empowering environmental safety and biodiversity, enhancing historical and contempo-

rary forms of landscape, fostering energy transition, strengthening rail transport, developing new eco-friendly lifestyles.

In this context, the Seine Valley, which crosses the Regions of the Ile de France and Upper and Lower Normandy, is an emblematic case of integration of urban and ecological-environmental issues related to the theme of water, within a broad strategic vision supported by innovative design solutions and an interdisciplinary focus on risk management (Poli & Ravagnan, 2017). The vision is conceived in the *Schéma stratégique pour l'Aménagement et le Développement de la Vallée de la Seine*, which sets out the challenges of territorial and environmental reorganization and economic and cultural development to 2030.

In this framework, the project Ile Seguin-rives de Seine, in Boulogne-Billancourt, which includes the *ZAC Trapèze*, is an emblematic case of Ecoquartier. The project, starting from the regeneration of one of the major industrial sites of the Ile de France, reaches the realization of a new sustainable urban structure based on the construction of a network



**Figure 3:** The *Parc de Billancourt* in Boulogne Billancourt. Source: Photo by Chiara Ravagnan.

of eco-friendly public spaces.

This frame enables to mend fabric fragmentation, limit private mobility and govern ecological balances in a resilient way, thanks to the integration of the settlement system with the green and blue networks (Poli & Ravagnan, 2017), which are the bearers of new urban landscape characterized by high levels of naturalness and biodiversity.

Indeed, the project starts from the goal of vivifying an innovative relationship between city and natural environment, based on an innovative management of water that counteracts pollution and waste, reducing the impacts of flooding risks caused by the river.

The vast green area of the “*Parc de Billancourt*” (7 hectares), connected to the river, assumes the structural-strategic role of a semi-natural transition area and flooding basin (consistent with the Plan for prevention of flood risk), as well as a large accessible and equipped park for citizens (Fig. 3). The Park is instrumentally organized to effectively manage the water cycle and to filter the rainwater of the whole neighborhood, store it and reuse it for irrigation purposes, through the permeability of the soil and the presence of a water collection basin. The rainwater collection basin is composed of a wetland area and a peat bog, next to sandy areas. Moreover, in case of flooding, it can turn into a containment basin, regulating the raising of water. The park is therefore a real “ecological niche”, characterized by high levels of naturalness and biodiversity, in which the sustainability of ecosystems is promoted, also through the choice of planting mainly native species (Ravagnan, 2015).

Furthermore, the articulation in differently characterized areas – natural, semi-natural, equipped for sport and leisure – makes it an element of dynamism and variety of the urban landscape.

In addition to the large park, even the green network formed by the linear green areas along the pedestrian paths through the open blocks of the fabrics, assumed as invariant of the settlement structure within the *Plan Local d’Urbanisme*, plays a key role in the water cycle.

White water and meteoric water are collected and reused for irrigation, both through collection systems on roofs, and through draining ditches and irrigation canals.

Through these design solutions, the project also pursues the reduction of consumption, primarily of potable water, and pollution. In fact, the excess water collected is treated before being discharged into the Seine river.

#### 4. WATER MANAGEMENT FROM PROBLEMS TO OPPORTUNITIES. INNOVATION PATHS AND OPEN ISSUES

These emblematic cases underline how “the issues of urban and territorial regeneration are strongly interweaving with the so-called urban safety planning” (Gasparrini, 2015).

In this direction, these cases highlight consolidated planning references, disseminated thanks to their identification as best practices and recognized through awards and funding programmes. However, they still leave some open questions and mark new paths of innovation just undertaken.

In particular, the issue of water management is considered as a main field of innovation of the regeneration strategies, as it tests the resilience of planning practices around the complex environmental, economic and social challenges that discipline is urgently called to face.

After decades of sectoral and constraining approaches water returns at the center of urban planning, not only through a physical reconfiguration of river contexts, blue networks, parks and green public spaces but also through an economic and social project, towards circular economies, sustainable uses, re-use of resources and processes of social innovation due to a greater awareness of the environment centrality.

In line with the consolidated references and new issues opened within these experiences, the topic of water management appears as the potential bearer of opportunities arising from the urban contemporary problems:

- valorization of urban landscape starting from the reclamation and the re-naturalization of urban soils, as an answer to the vulnerability of urban river contexts;
- re-activation of sustainable local economies, through the innovation of recycling systems for urban uses such as irrigation or street cleaning as an answer to the scarcity of natural resources;
- promotion of smart lifestyles and inclusive behaviors, through shared processes of re-appropriation of blue and green networks as a solution to pollution and abandonment of common goods.

These reflections confirm the importance of research and experimentation paths aimed at integrating, methodologically and operationally, assessments and rules related to ecosystem func-



tions and services in the fields of territorial planning and management. At the same time, participatory procedures are an important field of planning innovation in order to achieve sharing decisions on environmental

issues, for the promotion of a new development model that takes the opportunity of nature-based solutions to respond to environmental and socio-economic challenges, turning them into opportunities for innovation.

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