

# **ACTIVATING PUBLIC SPACE**

## **An Approach for Climate Change Mitigation**

Alessandra **Battisti**  
Daniele **Santucci**  
(Eds.)

**First Edition**

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# Re-Cool Trento

## Designing Blue and Green Flows for a Hot City

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Sara Favargiotti

### **Abstract**

The challenges facing communities and cities today are climate change, the vulnerability of territories, the availability of limited resources (primary, material, territorial, economic), the loss of the collective sense of community, cultural degrowth, inequality and social inclusion. In response to these challenges, many planners, designers and planners are rethinking cities, through new paradigms and models guided by strategies of adaptation to change. Today we often find ourselves having to repair the many mistakes made sometimes unconsciously and sometimes driven by models and conditions that are no longer valid. In this context, it is even more urgent to stop and ask ourselves who the future belongs to, what is the temporal dimension of the future and the respective effects in designing it.

The contamination of disciplinary boundaries between landscape, architecture, urbanism, ecology, and futures studies (a recent branch of social sciences) has forced to expand and redefine the practice of designers and their field of operations. Following this, the contribution will briefly focus on the expansion in approaches and definitions of relevant themes such as uncertainties, resilience, urban adaptation, blue and green infrastructure, climate change that have undergone during the last decade and the consequent emergence of new design methodologies. It will do so through sharing knowledge, data, perspectives, and design experiences among the fields of urban, landscape and ecological design, as well as environmental and social studies.

### **Keywords**

Blue and Green Infrastructure, Landscape Reserve, Urban Adaptation.

## Introduction

Walking along the river Tevere in Roma, between Ponte Sisto and Ponte Mazzini, original murals will suddenly appear. It is an artistic interventions with a double signature: the first, in 2005, by Kristin Jones titled “She Wolves”, that “had originally envisioned the potential for a major site-specific intervention [...]”; and the latter in 2016 by William Kentridge, “Triumphs and Laments”. This installation represents our histories: the ancestors of the Roman Empire but also the fragility of our world. It also wants to be the society more aware of the impacts that every human action can have on the planet. The illustration of the frieze emerged from subtraction: they are obtained eliminating the biological patina of silt and pollution that has been slowly but progressively accumulated on the travertine of the walls. The prevision states that - in a time of three or four year - the pollution will come back by “naturally” covering the illustration, with the lost of the entire installation but more critically, the increase of the environmental contamination. The installation push our responsibility as citizens and researchers to face and urgently question on the most urgent and pressing environmental problems: the violent fire in Australia, the big floods in Liguria or in Toscana, the reduction of ice in the Alps, the extreme dry season in Sicily, urban heat island, the wind storm like Viaia, the CO2 emission alert, are increasingly pressing environmental issues that, with the expanding urban configurations and the changes in technology, economy and lifestyle, have significantly shaped our life environment. All these trends call for a new ecological dimension for a more sustainable and sustained world.

The contribution insists on three main concepts to address the social, environmental and urban challenges that communities and territories transformation have to be faced.

UNCERTAINTIES. The main threats that affect cities and communities are climate change, environmental degradation, globalization, security, migration, automation, crisis and poverty that are all characterized by non-linear, unpredictable, and unstable dynamics. The growth of “immaterial” inequalities affects the physical spaces of urban



environments as well as the community dynamics. Uncertain growth is connected to the use of the space and the production of culture. Innovative anticipatory, forecasting and monitoring methods will be needed in order to address potentialities of such spaces. Therefore, which policy recommendation and urban strategies can help to address these global issues and to drive a more equal, sustainable and resilient development?

**RESILIENCE.** Resilience is the capacity of an ecosystem to recover from perturbations. Interpreting this concept for urban environment, urban resilience refers on the one hand to the adaptation capacity of physical spaces to the ongoing (unpredictable) changes; on the other hand it refers to the capability of communities to change accordingly to nonlinear dynamics or shocks by designing innovative social, economic and environmental responses that allow them to withstand the stresses of environment, economy and history in the long term. How urban resilience could activate processes and drive governances for the urban and social regeneration?

**ADAPTATION.** Adaptation strategies in urban environment aim at to reduce the waste of spaces and resources, as well as preserve natural and human assets, limit the costs for reconstruction, stimulate economic growth, and enhance a more sustainable and secure wellbeing. Cities need to be guided from one unstable condition to another, and citizens are the main actors to contribute to this change. How a city (or parts of a city) and communities could adapt to the unstable, unpredictable, uncertain socio-political-economic flows?

### **Fragile landscapes, resilient communities**

Italy is a fragile territory. From 2010 to 2017, 126 Italian Municipalities have been damaged, 242 severe weather phenomena happened, and 56 States of emergency have been declared. All these caused damages and costs to the territories and to the communities: to land and soil, public and private heritage, production and economic, since rebuilding after such events is much more expensive than preventing them, but above all direct impacts direct and indirect impacts on the health of inhabitants. From 2010 to 2016

over 145.000 have been died due to floods and over 40.000 have been evacuated. From 2013 to 2016 damages caused by landslides and floods amounted to 7.6 billion euros. In 2017, 738 million euro (about 10%) has been invested by the national government to respond and prevent risk. The fragility of the territories has been influenced by human actions and impacts. Most of the population lives in cities and the numbers will grow. An increase in urban density and land consumption, have led to a reduction in green spaces and water, nature reserves and biodiversity (source WWF). Since 1970 the Italian population growth of 28% with a growth of the construction as 166% that highlight how we have built much more than the real demands. This trend has happened all over Italy, also in the Province of Trentino where since 1960 the growth of the population is 20% population with a development of the built-up land as 190% and consequent reduction of agricultural land and natural ecosystems. According to the 2019 ISPRA Report, “the soil continues to be consumed even in protected areas that are subject to water hazard and landslide and seismic hazards. Soil consumption - not necessarily abusive - is also growing in protected areas (+108 hectares in the last year), in restricted areas for landscape protection (+1074 hectares), in areas with medium hydraulic hazard (+673 hectares) and landslide hazard (+350 hectares) and in areas with seismic hazard (+1803 hectares).” In this dense and consumed territory, the hydrogeological risk area in Italy is widespread: 88% of the Italian municipalities and 7 million inhabitants are considered areas with a high hydrogeological risk. In Trentino Alto-Adige 80% of the municipalities are located in an area of high hydrogeological criticality (Source: CRESME elaboration on ISTAT and Ministry of Environment data). In addition, the precipitation trend has varied in the last decades: the rain patters show unpredictable weather phenomena of great intensity that last for a very short time. Short but vey intense rainfall, with unexpected floods and windstorms, followed by the increase of temperature in the urban areas more than in the rural areas (urban heat island). The conjunction of this phenomenon with the increase of urbanization and soil consumption and the consequence of the reduction of non-permeable areas, have

brought to a more vulnerable and fragile lands but more urgently it entails a strong risk to citizen wellbeing.

### **Global challenges, local solutions: blue and green flow to adapt cities to climate change**

The Sustainable Development Goals (SDG) are a set of 17 objectives adopted by the UN Member States in 2015 as part of the 2030 Agenda for Sustainable Development which set out a 15-year plan to achieve the Goals. They include 169 targets whose aim is to address a wide range of issues related to economic and social development, such as poverty, hunger, health, education, climate change, gender equality, water, sanitation, energy, urbanization, environment and social equality. Cities and community's adaptation to climate change is outlined as one of the most emergent and urgent challenges in the near future. In that sense, the city can be considered as resilient systems by getting the inhabitants more aware of its vulnerabilities and becoming adaptive to extreme wheatear phenomena.

Why resilience is so important and widespread concepts at the moment?

Resilience is the capacity of an ecosystem to recover from perturbations. Urban resilience is referred to the definition of ecosystem resilience, intending the capacity of complex systems to react to stress phenomena by adapting to change, not so much to return to their initial state, but to achieve a new balance (but aiming at restoring functionality). All the dynamics above mentioned bring to a shift in urban design a planning, where the landscape and its "renaissance" is at the center of the design discourse and ecological approach for more livable cities. Above all, the reality of climate change for administrators and practitioners as well as citizens bring to a renewed sensitiveness underneath the conceptual approach of a performative design. Cities need to adapt to absorb and resist the unpredictable and unexpected events. Communities need be resilient by knowing their vulnerabilities and transform the dramatic event into of opportunities to become adaptive to these phenomena.

Climate related vulnerabilities refer to two phenomena: extreme events - which are increasing with climate change - and microclimatic phenomena - phenomena that depend

on local climatic conditions. Their combination leads to vulnerabilities, for humans, for the natural and urban environment, and for services. The mapping of local climate zones highlights how the microclimate changes within the city, both longitudinally and transversely. On this base, the climate risk is calculated from the combination of three factors: natural hazard, vulnerability, and exposure. In the urban context they are represented by temperature, presence of vulnerable population (including children and senior), urban density.

Urban climatology is the field that allows to define the positive and negative elements for the climate in space and it is our goal to study the tools it offers to propose solutions for the city that also improve the quality of urban space. Two are the approaches to address climate-related risks: mitigation (acting directly on CO<sub>2</sub> reduction to reduce climate change) and adaptation (accepting that certain changes happen and will happen and acting on space to make it safer and more adaptable to future changes). If mitigation is more related to political actions, adaptation is local and can be implemented with large but also small actions.

Using nature-based solutions is one of the most efficient and cost-effective ways to adapt cities and territories to climate change. The green infrastructure approach is the most cost-effective because it enables the achievement of a range of ecosystem services that improve ecology, society and the economy. The process adopted is multi-scalar, from the scale of the city by defining guidelines, going down to the scale of the neighborhood, which in turn helped to better define the interventions at the urban scale. But the process could also be extended to the strategic and metropolitan scales.

Blue and Green Infrastructure (BGI) becomes a fundamental tool for the adaptation of cities in order to achieve resilience and sustainability, quality, health and environmental safety objectives. Indeed, according to the EEA (European Environment Agency), the concept of green and blue infrastructure is based on the principle that the protection and enhancement of natural processes can be integrated into spatial planning and development. The fundamental character of green and blue infrastructure is multifunctionality

(i.e. the ability of a single area to perform multiple functions and provide numerous ecological benefits: food, material, clean water and air, climate regulation, flood prevention, pollination and recreation). This characteristic is complemented by two others: connectivity and multi-scalarity. The first refers to the relationship between different characteristics of the urban landscape; this definition does not consider the size, composition or shape of the environment, but only the existing networks and matrices. Multi-scalarity allows green and blue infrastructures to be effective at any scale of intervention, without binding the provision of ecosystem services to it.

The project of a multi-functional landscape, advocating ecological potential and socio-economic opportunities, started as early as the 19th century. The resilient urban landscape projects by US landscape architect Frederick Law Olmsted offer innovative urban and infrastructural quality solutions based on local needs such as the continuous flooding of the Charles River in Boston. This is the Emerald Necklace project in Boston that creates a system of parks as a green and blue infrastructural network capable of producing multiple benefits for residents and visitors. This example, like many others, makes us understand how green and blue infrastructure should not be considered as separate elements from the built environment but vice versa as an integral and complementary part of the natural-anthropogenic urban system. Urban blue and green infrastructure can be defined as “the elements of biodiversity and organized systems that can be traced back to the Natural Capital, of any urban area, valuable or degraded, including individual technological devices that leverage biodiversity integrated into the built environment, such as green roofs and vegetated walls, permeable pavements, rain gardens and other rainwater collection and management systems, designed to promote environmental protection, economic viability, well-being, equity and social inclusion through the provision of ecosystem services”(Andreucci, 2017). These are not, therefore, natural accessory elements of purely aesthetic value, the so-called “beautification”, which often leads to the negative and widespread consideration of considering the inclusion of the natural element within the urban project as a luxury,

i.e. the first item of expenditure to be eliminated in case of budget cuts. On the contrary, the multiple benefits provided by green and blue infrastructures touch different areas, providing services not only from an ecological but also economic and social point of view. The aim, therefore, is to maintain and improve the provision of services for society: this makes their implementation in the most densely populated urbanized areas particularly important.

Blue and green infrastructure in the design and redevelopment of more or less densely populated urban areas is an opportunity to improve the quality of life in urban and peri-urban areas. Thanks to their ability to respond to multiple needs through the systematization of individual interventions, these elements make it possible to address the climate challenge at different integrated scales. The strategies and devices used must be flexible enough to be able to be deployed in different contexts, evolving over time in line with the urban structure. Planning, in fact, is a process that considers different dimensions (spatial, environmental, social, economic), where the choices of individuals involve effects not only within blocks and buildings, but also on collective spaces up to the climate in the surrounding area. To develop effective adaptation strategies and actions, it is therefore necessary to consider all scales of intervention (Rovers et al., 2014).

Italy in 2014 approved the Strategy to adapt to the effects of the changing climate. A strategy whose main objective is to develop a national vision on how to deal with the impacts of climate change through a framework aimed at: describe the vulnerability of the territory; improve current knowledge on climate change and its impacts; promote participation and raise awareness of all actors, through a broad process of communication and dialogue, in order to integrate adaptation into sectorial policies; raising awareness through information; identify the best options for adaptation actions. The city must make plans because the problem is not only environmental but also economic, since repairing the damage is more expensive than intervening preventively. Interesting examples of an adaptation plans, strategies, city guidelines can be proposed by Bologna BLUAP, Milan 2030 Parigi, or Barcellona. Specifically, the review of the urban

plan in Milan, Milano2030, has been adopted in March 2019. Milan's resilience challenge is to address flooding, air pollution, and climate change, while increasing affordable housing access (Source <https://www.100resilientcities.org/cities/milan/>). One of the most innovative approaches in the plan structure is a resilient-based plan on the following goals: performance rules for new buildings, to minimize energy consumption, re-naturalize and maximize the permeable surface area in the city, to reduce the carbon footprint of new buildings that in the regeneration of the building stock; and urban forestation on private area, with high investments on green maintenance and management, as well as environmental regeneration. Other 298 Italian municipalities have included the topic of climate adaptation in their local buildings' regulations. The territorial plan of Houston greenways proposed a "path" offer a matrix of multiple ecosystems that intertwine and connect harmoniously. In a stretch of about 1.5 km you could meet at least seven different ecological conditions: from forest, to meadows, to riparian areas. At the neighborhood scale, interesting examples are the water squares in Rotterdam. With low rainfall, the water squares would perform as a simple "organized collector" of rainwater, which before being reused, would be stored in hidden storage basins; in case of particularly heavy rainfall, instead, the water squares would be transformed into a real rainwater settling basin, which would then be introduced into the sewer system gradually, to avoid overloading problems.

### **A pro-active contamination**

The landscape design approach is a valuable resource for regenerating, restoring and renewing urban, peri-urban and rural areas, often obsolete or abandoned. Land recovery and transformation processes find an opportunity in urban agriculture to improve the quality of life in cities, interpreting the abandoned areas as reserves capable to manage climate, ecological and social complexities. This process becomes an opportunity to reconnect society with its landscape identity and geographical characteristics (urban, rural, regional, territorial), make initiatives economically sustainable and scalable, build a comprehensive and flexible framework to

guide cities to implement projects adapted to multifunctional use on different scales. For this, a change of perspective is necessary, based on values such as social integration, climate adaptation, enhancement of environmental and ecosystem services (protecting against erosion, facilitating pollination, supporting tourism and biodiversity) in a perspective of sustainable development and circular economy for urban regeneration.

In response to global challenges, cities around the world are adapting, innovating through nature-based strategies for sustainable development. The growing sensitivity to contemporary emergencies such as food scarcity, climate change, land consumption, together with emerging trends such as ICTs, alternative economic development models, bring back the community's interest in the land by finding in agriculture a test-bed to drive innovative production systems. Here green and blue infrastructure presents itself as a field of investigation on which to apply the concept of urban resilience and climate adaptation to contribute to integrated sustainable production to temperature mitigation and improvement of city comfort.

The approach of adaptation is not only proposed to solve the environmental problems, but also to make the city more adaptable to future changes that are unknown and to improve its urban quality. Indeed, adaptation drives to a paradigm shift: to think not only to solve the environmental problem but to make the city more adaptable to future changes that are not yet known in order to improve urban qualities. It is a different approach to the traditional engineering practice that relies exclusively on centralized hydraulic systems to capture and convey rainwater away as quickly as possible, where instead the natural material becomes a design element. It is a change of approaches both in practice as well as in theory: a multidisciplinary approach where landscape and architecture, urban design and planning, engineering and agronomy, are co-creating and collaborating in the discourse on adaptation to reduce the ongoing effects of anthropogenic climate change.

A pro-active contamination is required due to the contemporary socio-cultural-economic-ecological conditions and the uncertainties perspectives of multiple possible futures,



through the sharing of knowledge and experiences between scholars. The concept of as landscape as cultural common drive territories and cities through a sustainable development in a mutual exchange between research, planning and design to foreseen crucial (critical) changes. Within this framework, some recommendation can support the education, the dissemination and the sharing of emerging attitudes. The contamination and the proactive exchanges of disciplinary boundaries between landscape and architecture, art, urbanism, ecology, but also engineer, technology, and science in a broad sense, has forced to expand and redefine its own terms and field of operations, in order to tackle the critical environmental and social needs. A cross-disciplinary education by integrating architecture, urban design, landscape architecture, engineering in ways that blend the knowledge of construction engineering with knowledge of architectural and urban planning tools, with a balanced learning with practice and theory. An iterative process offers to the students the methodological framework to develop assessments of landscape, infrastructure and urban space thought the different scales, with specific focus in the Alpine context, in order to design the renovation or remodeling of existing buildings and territories.

Indeed, to respond to the complexity of the territory, territorial development policies must pursue collective values with territorial qualities integrating: agricultural production and technological production; territorial and social connectivity; environmental awareness and tourist attraction; natural and cultural diversity; collective spaces, parks and therapeutic green areas; territorial governance, common goods, participation and training. This is how green and blue infrastructures constitute a multifunctional strategy to help develop a more sustainable urban management process, in which the expansion of cities is curbed by exploiting and upgrading the existing building heritage. Moreover, when thought of in a systemic way, they are a key building block to connect and improve the ecological value of the landscape.

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The book - *Activating Public Space* - deals with the regeneration of the public realm from different points of view, with the main purpose of optimizing its social, functional, technological and energetic requirements.

Under this premise, the text aims at identifying intervention strategies that, in addition to satisfying the basic needs for fruitive, aesthetic and safety qualities, address the environmental compatibility for an outdoor comfort upgrade. For this purpose, the authors' group analyses different scales ranging from the global climate macroscale analysis, the mesoscale for the urban analysis and ultimately to the microscale for the local and pedestrian comfort analysis.

In light of the complex relationship between climatic, social and urban conditions, the text aims to enhance awareness on the urban requalification practices, and proposes interventions that address microclimate mitigation, urban resilience, process, and social innovations as an adaptive approach to compensate extreme heat waves and health risk conditions.