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Re-designing Public Spaces in Times of Climate Change

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Abstract

Climate change, linked to the global warming of the planet, is making our cities and territories increasingly vulnerable, posing new questions and new themes for urban design and planning. To face the consequences related to climate change and implement countermeasures in defense of cities and territories, scientific research proposes a model of resilient city, capable of reacting to environmental and socio-economic shocks through adaptive solutions. Starting from a critical reflection on some emblematic projects -such as "the BIG U" for the coastal area of Manhattan, that due to the magniloquence of the design solutions and the uniqueness of the place it lends itself to being a great propaganda manifesto to promote climate-resilient strategies, the paper discusses about the meaning of a resilient approach to the project with the aim of obtaining new tools and strategies for effective design solutions in a key of mitigation and adaptation. Re-designing the public space of contemporary city, taking into account the ecological issue, could be a way for introducing adaptive solutions and for climate mitigation, but also to improve the quality of life in open urban spaces.

Keywords: re-design; adaptive public space; urban design; climate change; resilient city.

1. INTRODUCTION

The natural disasters that have hit territories and countries in all parts of the world are leading to a new awareness of the fragility on the planet and, at the same time, to a different approach to the urban project.

Every year hurricanes, cyclones, floods cause devastation of many territories, forcing to relocate urban settlements. Also, in the coming years rising sea levels will expose large urbanized coastal areas where millions of people live by. Even in less catastrophic terms, the increase of rainfall on the waterproofed surfaces of cities, as well as the increase of CO₂ levels in the air, or the effects induced by heat island create situations of great criticality in the cities.

Nowadays it seems to be acquired the awareness that the environmental question is essentially determined by anthropogenic factors and that the cities, which have become more vulnerable with respect to increasingly aggressive and "anomalous" phenomena linked to climate change, are among the biggest responsible for the disastrous consequences produced by these phenomena [1].

The solution to the problem of global warming and greenhouse effect requires, of course, a radical change in world development policies, involving all States in adopting more restrictive policies with respect to CO₂ emissions in the atmosphere. The predictions of scientists are so catastrophic, that

they could discourage those involved in urban planning and urban design. The question that can be asked, with respect to such a huge topic is: what design can do?

Nevertheless, the disciplines that deal with cities can still do a lot, especially if there is widespread intervention. It must be considered that the issue of the vulnerability of territories to "exceptional" natural events is very much linked to the human actions of territorial modification limited to a local area.

The impermeability of the soils, the pollution of water, soil and air, the urban climate, the disposal of waste, the deterioration of the water cycle are direct consequences of the urbanization of the territories. In the last sixty years we have also built in areas with hydrogeological risk, or in fragile, mountainous, coastal and river areas, where anthropic pressure has often produced irreversible changes to habitats and ecosystem balances. In these areas natural events, certainly more intense due to climate change, have produced devastating effects, much more resonant because they have produced house destructions and loss of human lives.

The urbanization process has led to covering vast urban areas of houses, parking lots and roads, producing a homogeneous waterproofing of the soil in the cities, with the effect of increasing the urban heat island and reducing the draining effect of the floors during heavy rains. The so-called "water bombs" that now hit our cities, have disastrous effects, create torrents in urban streets, where the sewer system fails to cope with the disposal of meteoric water.

What emerges from scientific studies, is that cities are among the main culprits of air pollution, with the emission of greenhouse gases (from cars, power generation, industry, use of biomass). While covering only 3% of the planet's surface, they consume most of the natural resources and produce 75% of global CO₂ emissions (to feed buildings and transport systems). In Europe, 75% of the population lives in cities and use about 80% of the energy produced, with a trend that is difficult to reverse.

In this scenario it is clear that the problems of cities linked to climate change should be addressed starting from the cities through mitigation and adaptation interventions.

The solutions proposed by European cities move in different directions, promoting concepts of "resilience", "smart", "eco". However, within the urban design and planning discipline these concepts have difficult translation and risk becoming easily misunderstood concepts, as it happened in the past for "sustainability".

In this regard, the European Union promotes policies to support cities starting from a series of strategies for adaptation to climate change, providing a framework for local administrations [2].

Through the "Covenant of Mayors for climate and energy" the EU aims to build more sustainable and resilient cities, with the aim of implementing the Paris Agreement on climate, for low-carbon development aimed at containing the global rise of the planet's temperature.

The issue of climate change, however, is accompanied in this decade by a profound economic and social crisis, which has necessarily led to a critical revision of the urban planning and urban design disciplines.

We need to ask ourselves if the project of the contemporary city should have more short-term objectives, imagining more contingent scenarios, in which urban transformations can be reversed; perhaps we need to completely change our approach to the urban project, working only on the existing through local recovery and regeneration strategies that focus on urban green and public space.

2. WHAT DESIGN CAN DO? KEY PROJECTS AND FRAMEWORK

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"What design can do?" Is the synthetic and direct question that gave a title to a series of conferences at the 2017 Dutch Design Week in Eindhoven, as part of the event "Good Design for a bad World" [3], where the theme of adaptation to climate change has been debated with respect to different scales, from the metropolitan planning, to urban design, to product design.

In the Architecture Biennale of Venice in 2018 a huge wooden model of the BIG "U" project for Manhattan stands out in a room, with its green infrastructure that unfolds along the coast from East to West, passing through Battery Park, including important places in the city.

A visionary project that includes public spaces for temporary uses, created under existing infrastructures, presented through a video that shows Manhattan flooded with water that however resists, having been able to prevent the catastrophic event.



Figure 1. Model of the BIG U project in Manhattan at Biennale of Venice 2018.

Even Boston, with the SCAPE project "*Resilient Boston Harbor flood*" developed a plan to prevent flooding in the most vulnerable coastal neighborhoods of East Boston and Charlestown [4].

Dutch architects MVRDV carried out a project with the Australian company Hassell, for the "*Resilient bay area challenge*" contest in San Francisco Bay Area, which required ways to protect the

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city from the effects of climate change. The team has re-imagined a series of San Francisco Bay Area waterfront communities “as vibrant, fundamentally public places for everyday use, but also vital for environmental and emergency needs” (MVRDV website). The project combines defensive strategies with new hypotheses of urban development, which includes several new adaptable structures, floating stadiums, pop-up restaurants.

Many other cities have already started strategic plans to tackle disastrous phenomena for several years: from New Orleans, after Hurricane Katrina in 2005, to Toronto (*Ahead of the storm*, 2008), to Seattle, Berlin, Malmo, to the North West England (*Climate Change Action Plan*, 2007-2010), to the Netherlands, where the challenge of flooding from the sea has been addressed for many years[5].

On the other hand, global problems cannot be solved with a colossal investment in just one point of the planet, nor can magniloquent and expensive solutions, such as the one proposed for Manhattan, be applied in a systematic and homogeneous manner everywhere.

The issue of climate resilience in urban areas is a highly complex issue and requires a change of approach, which must take into consideration a large number of factors within the urban project.

Much can be done in terms of urban resilience, working on local themes in an intelligent way, with Nature Based solutions (NBS), which take mitigation strategies from the existing ecological context. Some virtuous examples come from Denmark. The project of the SLA group for the Inner Nørrebro area of Copenhagen, entitled *The Soul of Nørrebro*, deals with a theme of urban regeneration starting from natural adaptive solutions, which aim to contain the effects of snowfalls and rains that carry floods, in the *Hans Tavsens Park*. The project addresses the issue not only under ecological and ecosystem aspects, but also through the creation of new public spaces for the community.

The issue of soil permeability and water drainage in urban areas is at the basis of the project for the redevelopment of the San Kield district (in Copenhagen) by the architectural firm Tredje Natur, who designed and tested a new flooring system, which should drain meteoric water into adjacent green flower beds.



Figure 2. SLA Architects, project “the soul of Nørrebro”, with a public park designed like a wetland.

In Tianjin, landscape architects McGregor Coxall designed a wetland area called *Lingang Eco Park* as a pilot solution for the *Sponge City* program in China, which uses permeable materials and green areas to prevent urban flooding.

Many projects concretely address the issue of urban metabolism linked to the water cycle, in the awareness that the waste of water resources on a planetary scale may compromise the possibility of existence of many cities starting as early as in the next twenty years.

The *Qunli Stormwater Park* in China, signed by the Turenscape is born precisely to mitigate the development of a satellite city for a million and a half inhabitants in an area prone to floods, becoming an urban park, in which the ecological collection and disposal basins rainwater becomes a distinctive aesthetic element.

The same attention to waste water, which is usually introduced into the water networks of our cities without particular regard to water bodies, is set by Henri Bavà in the project for the *Parc De Billancourt*, on the banks of the Seine on the outskirts of Paris, where porous floors and vegetated areas are designed so that nothing goes into the city's white sewers.

Beyond well-known examples, different actions can be taken to counter the effects induced by natural events on the cities, working properly with nature and with *Natural Based Solutions*.

The mitigation actions always foresee the presence of vegetation, because nature has its own adaptive capacity, to react to natural phenomena and to survive climate change.

Urban green spaces can perform various mitigation functions: from flood protection, acting as a barrier to water and a draining surface; to the function of accumulation and lamination of rainwater; to the mitigation of the heat island, so present in urban centers where large surfaces of asphalt reflect heat by increasing the perceived temperature; without neglecting the mitigation effects of green areas on environmental stressors, such as air pollution, noise pollution, overcrowding.

We can therefore do a lot if we interpret urban planning and territorial planning in terms of resilience [6], through actions that are not overly innovative, as pervasive and widespread, starting from the systematic care of the territory and the re-design of the existing city.

3. DISCUSSION

The aforementioned project by BIG Architects, winner of the competition "the rebuild by Hurricane Sandy Design", with its green mega-structure that aims to protect a 10-mile strip of Lower Manhattan from flooding, creating new parks and public spaces that could act as barriers during storm surges, poses some reflections in emblematic terms.

In particular, whether the economic investments to achieve mega structures resilient to climate change are truly sustainable and can really contribute to restoring ecological structures, rather than creating new socio-economic imbalances [7]. Several authors fear the risk that such grandiloquent interventions on the territory could induce new processes of gentrification, stressing that in New York the huge investments concentrated in some areas have changed their economic values, in fact leading to the exclusion from those places of the same residents who are said to protect [8].

The presence of greenfield within the brownfield is in itself a good practice, strongly supported by EU policies, but it cannot be an indicator of sustainability and quality of intervention on its own. Nowadays, the economic evaluation of greenfield initiatives is being carried out with greater attention, taking into account the sources of funding, but also the possibility of long-term maintenance, as underlined by the directive EU Strategic Environmental Assessment Directive [9].

The landscape design project always requires a complex assessment of the ecological and social effectiveness of the intervention[10], or the cost-benefit ratio measured over a long period, but above all it does require to be commensurate with the context.

Sustainability is a complex concept that is difficult to measure, who has been subjected to a wide declaration in these years[11], making it lose almost its meaning; and the same could happen to the term "resilience".



Figure 4. The "East River Valley" visionary project by Mark Foster Gage Architects (Contest commissioned by New York Magazine for the future of New York City, 2017).

The "East River Valley" proposal by Mark Foster Gage Architects for the future of New York city, which provides a deliberately provocative way to stem the East River to create a new "valley" with over 15,000 hectares of gardens, farms and parks, shall invite to reflect on how the idea of bringing nature back to the city can take a utopian drift [7].

"Greening the city" can become a superficial slogan to promote grandiloquent and not necessarily effective projects, if the interventions remain detached from the socio-economic reality and the resilience of the urban system is not adequately considered [8].

Beyond some good practices and famous projects, there is still a certain incapacity in the urban planning and urban design discipline to tackle projects in deeply ecological terms to cope with climate change.

The evaluation of the impacts of urban transformations on the environment, regulated in Italy by procedures of a certain complexity such as the VIA and the VAS, has often been relegated to ex post verification procedures by specialists with the aim of legitimizing the interventions, rather than orienting them.

The risk is that the specialist and quantitative evaluation will not be able to provide strategic indications and that the project will remain in a superficial and aestheticizing context, without including the ecological component in effective terms to make the interventions truly resilient.

Resilience is the property of complex systems to react to stress phenomena, activating response and adaptation strategies in order to restore operating mechanisms. Resilient systems react external stresses renewing themselves, but retaining the functionality and the recognizability of the systems themselves[12]. Resilience does not therefore imply the restoration to an initial state, but the restoration of functionality through mutation and adaptation[13].

With reference to the city, the definition of resilience could be the following: “A Resilient City is one that has developed capacities to help absorb future shocks and stresses to its social, economic, and technical systems and infrastructures so as to still be able to maintain essentially the same functions, structures, systems, and identity” [14].

Within a urban system, resiliency can be useful to explain those path-dependent processes which are based on some territorial peculiarities that enable the territory itself to react external shocks, throughout an autonomous rearrangement [15].

With regards to the irreversibility of global warming, the resilience of a city or a community can be defined as the ability of a system to survive, adapt and develop, facing negative scenarios.

Facing the challenge of climate change for the project means, on the one hand, reconsidering the fragility of the territories and their vulnerability, operating in terms of risk prevention; on the other, intervening on the existing in terms of re-design to improve the resilience of ecological and social systems (SESS) with mitigation and adaptation works[16].

The vulnerability of an urban or territorial system is influenced by physical exposure to risk, or rather by the presence of previous stress, but also by its development path, its governmental institutions and social cohesion [17,18].

A resilient approach in terms of prevention and risk reduction, must take into consideration the negative scenarios and introduce in the project all the elements to face them, working also on strengthening the capacity to resist local communities following disasters, climate change and economic crises [19].

Instead, working on the existing city to increase resilience to climate change means to intervene in situations where damage has already been created, where soils are waterproofed, where ecological balances are already severely compromised.

Considering the city in an evolutionary key, the project should interpret mutations and existing processes and intervene in terms of adaptability and reversibility, both to face negative scenarios and to allow the choice of future alternatives.

4. CONCLUSIONS

In times of economic crisis and climate change, interventions on the city should essentially be interventions for the redevelopment of the urban space.

Redesign of public space to tackle climate change, therefore, means adaptive work on the existing city, redeveloping places with light and reversible interventions that interpret their evolutionary dynamics and fit into the place looking for a new equilibrium arrangement.

On the other hand, designing in adaptive terms does not mean looking for patched solutions, for places that will soon be left to abandon, but rather to have a capacity for prefiguration that will consider evolutionary scenarios for the project; or to program open solutions, which already have the seed for their own rebirth after the change of scenery.

The redesign of urban space certainly means working with vegetation, not so as to systematize interventions on territorial scales, but in a rather interstitial way, carefully assessing local and contingent issues, both in ecological, social and fruition terms[20]. Green infrastructures, urban parks, green areas in general, are ideal spaces to accommodate pedestrian flows, urban functions even for seasonal periods and return to play a mere ecological function in the absence of use.

The urban project should favor the pedestrian fruition of public space, without triggering processes of gentrification. More diversified interventions that work as a network system (think of the ecological network defined by the Regional Landscape Territorial Plans) work better, in terms of resilience, than the concentration of all investments in a single point of the city, without taking into account the relations of the urban system.

Redesigning the city, in times of climate change, means working on a temporary dimension, imagining that the footprint left by the intervention may have a relatively short stay; but above all on flexibility, providing for example different alternative uses.

In the scientific literature on climate change and adaptation strategies the reference to flexibility emerges implicitly from the expression formulated by Gregory Bateson in the field of ecology. The loss of flexibility can lead, according to Bateson, to reiterate behaviors that offer short-term advantages, but in the long run pathogenic for the survival and evolution of the ecology of the system[21].

Designing flexible spaces means providing open, non-rigid solutions, adaptable to future scenarios, according to a sense of resilience that leads to considering flexibility not as an intrinsic quality of the system, but also as an adaptive capacity of society[10].

A resilient system, in fact, takes advantage of the diversification of risk and solutions that provide possible alternatives [22], but also of the collaborative capacity of communities [23]. Redesign of the public space, in this sense, means working on the material dimension of the city and at the same time on the immaterial dimension of human actions and activities, relating multiple systems, entering into harmony with the places, sharing the processes not only in terms of ecological evolution, but also of social development.

The project of the resilient city, at the time of climate change, must be inclusive and work on the logic of local cooperation, capable of triggering virtuous dynamics to stimulate daily life, placing itself as a process, as an "open work" for future interpretations [24], but also open to the unexpected [25] and to the subsequent evolutionary possibilities.

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