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TOWARD RESILIENT PUBLIC PLACES ON THE WATERFRONT

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HIGHLIGHTS

- Environment and social challenges meet themselves on water issues, so design with water, could lead toward a better quality of life.
- Landscape could be the mediator key on approval processes of great urban design, to conciliate multiple scales and different users.
- Design a public park as a resilient green infrastructure means to incorporate, in the process, the strategies to allow the landscape to adapt and to regenerate itself in case of natural disasters.
- Landscape strategies could be useful to face the big scale on city requalification, where the new parks, should be instruments to address the change of urban shapes created by the transition toward the post-industrial city.

ABSTRACT

The contemporary city waterfront areas could gather a strategic and multifunctional role, as a public place to the people wellness, as well as a resilient management of floods caused by climate changes. The international scenario presents many re-appropriation processes of urban waterfront that have been realized by reconversion of decommissioned port areas: the New York waterfront plan has a great relevance, such as Brooklyn Bridge Park, which represents a paradigm of the new concept of urban public place. The design of the park aims to face the urban situations in order to mitigate their conflicts as well to find a sustainable aesthetic where the process of re-appropriation and awareness of the relationship with water is intended as an element to carry again nature in the city. The park should be much more performing compared to those of the past, not anymore an aesthetical improvement or an escape from the context but an escape into the city, including in it the urban fragments whose surrounds it.

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1. DESIGNING WITH WATER

During the ages, seafront and riverside areas have been a human settlement privileged place. The most important historical cities settled on the main routes for commerce and supply of goods in a strategic position. The cities crossed by rivers or on sea used to have a complex relationship with water, never considered as a limit but an extension of the urban fabric. When this relationship was interrupted by the industrial revolution, the urban development began its settlement in the inside territory, turning its shoulders to the water.

The fast development of technology, as well as infrastructural system progressively, caused a disadvantage to the shoreline areas which loose importance and in some cases their original shape was forgotten or artificially altered by sea fills, embankments deviations and coverings. Along the last decennials, a process of re-appropriation and awareness of the relationship with water is underway: for the first time, after the industrial revolution, the relationship between city and water are changing and today water is intended as an element to carry again nature in the city.

The water flows have the role to order the landscape of human settlements, to irrigate crops, to feed the living beings, to transport people and goods: they could determinate the difference between an abundance or a poor landscape. Environment and social challenges meet themselves on water issues, so the opportunity to design with water, as in a physical such as psychic sense, could lead toward a better quality of life.



Figure 1: Scenario on a water landscape, Minnewaska Lake, Hudson Valley, Dutchess County, New York State (U.S.A.). Source: Anna Sessarego, 2014

Magnetic resonance experiments, demonstrated that when someone looks a natural landscape image (Fig. 1), brain sectors associated to a positive attitude, to an emotional stability such as the happy memories are activated, and among all natural landscapes, the most efficient is the water. The level of peacefulness and wellness increase while people are in open air and close the water: this is useful to constrain the stress of contemporary life, it energetically recharges the brain increasing performance as well as concentration. Because of man evolved in a planet mainly made of water nuances and blue sky, in average blue is the people preferred color, so it is understandable because the human brain is so attracted to it.

2. THE NEW YORK WATERFRONT PLAN

Nowadays, the incorporation of climate changes and their management, within the design process facing disasters caused by thunderstorms, such as sea and river flood, is the main challenge of landscape architecture. Many important cities have been investing considerable resources to research and realize a resilient management system to deal with the floods.

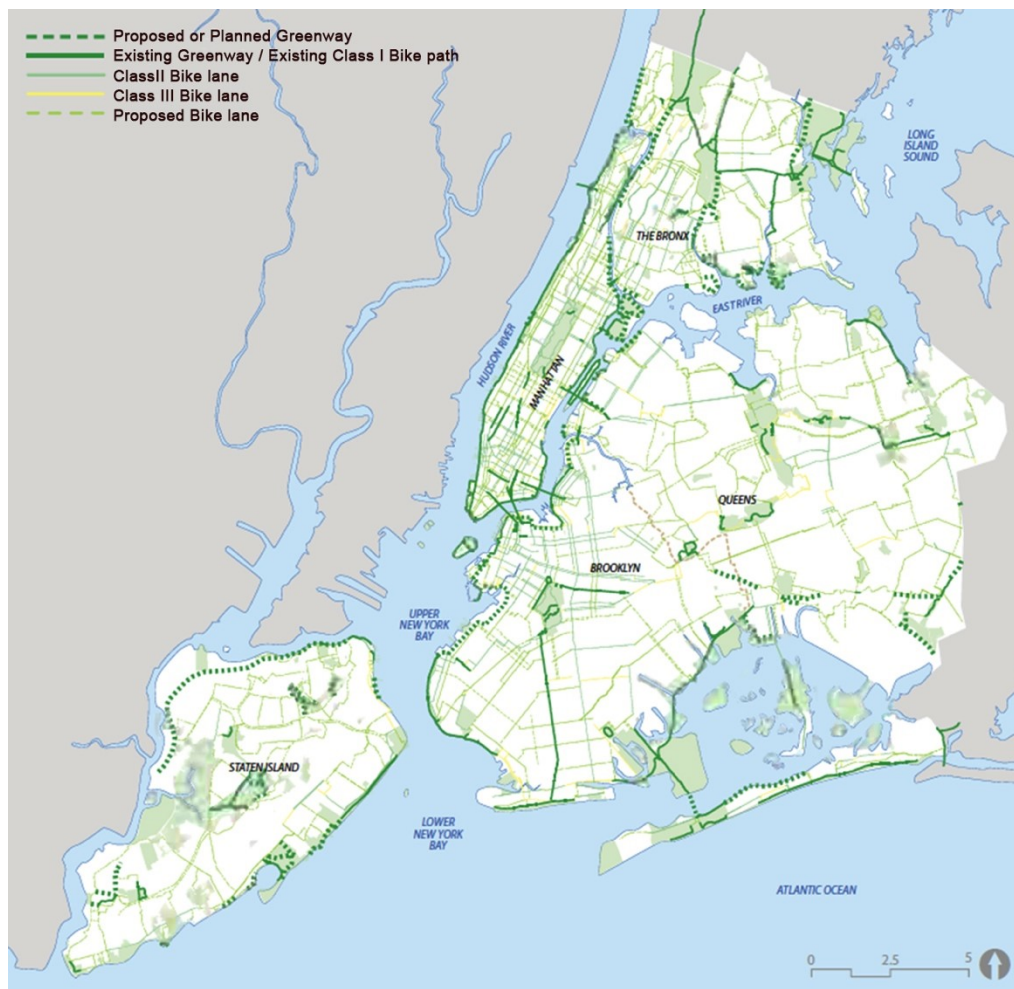


Figure 2: Existing and proposed or planned Greenways in New York City (U.S.A.). *Source: Vision 2020, The New York Waterfront Plan, New York City Department of Transportation*

The coastal infrastructures, prevalently realized by reinforced concrete, give a strong stress to natural ecosystems, favoring the predominance of more resistant invasive species, with a consequential biodiversity reduction. When an important natural event happens, the vulnerability is highlighted by the structural rigidity, with relevant economic consequences. For this reason after Hurricane Sandy, the Federal Government of United States decided to invest one billion of dollars on a research for the realization of “green infrastructures” as reported on the *Hurricane Rebuilding Task Force* (2013) document.

On June 2017, New York City announced the release of preliminary Climate Resiliency Design Guidelines changes, which provides the specific indication on incorporating projected impacts from climate change into planning, engineering, construction, and renovation of the City facilities. The Guideline’s utilization will give results in enhanced standards that will make the built environment more resilient to extreme weather and climate change while promoting the health, safety, and prosperity of all New Yorkers. The City proposal is to review and pilot the Guidelines on projects throughout the rest of 2017. The results are utilized to refine the preliminary draft, and then a final version should be released on December 2017.

New York City is the best case study, due to the speed to the intervention of planning, design, and realization that are happen in a quick succession, where could be observed and analysed in the short time the most important results and experiences of waterfront design.

New York is located at the confluence between Hudson River and Long Island Sound into the Atlantic Ocean: its port extends along the rivers, bays, and estuaries that are placed near the stream of the Hudson River. From the Fifties, the port, surrounding the south Manhattan area stretching along the Hudson and Brooklyn shore, has been eclipsed almost completely by the ship container port of the closer Newark-Elizabeth Marine Terminal (New Jersey). This has caused a process of decommissioning and dereliction of Manhattan and Brooklyn Piers, which maintained only their function of cruise ships landing, commuters ferry boat and tourist excursion boats.

In the year 1992, the City has issued the NYC Comprehensive Waterfront Plan (fig. 2) for the global regeneration of waterfront areas. For the first time of the city history, the land was not considered as a place for commerce or industry, but as a public place.



Figure 3: Manhattan Greenway Park, (a), South Cove (b), Hudson River Park New York City (U.S.A.). Source: Anna Sessarego, 2014

In 1993 started the planning process to transform the Piers, including their abandoned pertinence areas, into the Manhattan Greenway Park (Fig. 3), about thirty miles linear of development, in order to

answer back to the need of public places, for recreational and community uses in a City where residents are more than eight millions. The Park leads along the waterfront, providing places for walking, running and cycling, and when this is not possible, it finds connections along the carriage road. The realization of the Park produced a stimulus effect that increased the life quality of the surrounding areas, connecting the waterfront to the open places of the City.

In the year 2011 "*Vision 2020*", a waterfront plan, was issued, aimed to consolidate the leadership of NYC on sustainability and climatic resilience field. This plan confirms the objective to broad waterfront public accesses and to extend the coastal ecologic system restoration, planning waterways in an only one interconnected net, to increase water public transportation and cultural activities related to water. Moreover, the plan considers the impact of climatic changes and the need to find new strategies to face the rising sea level.

Some of the most important works built in the former twenty years, are in a continuous upgrading and development. They run from East River surrounding the south point of Manhattan, South Street Seaport, the parks system, from Battery Park toward north, South Cove Park, the transformation of the industrial Waterfront of the West Village and the Chelsea Cove in the Hudson River Park and continue until the historic Riverside Park in the Nord West, designed by Frederick Law Olmsted.

Chelsea Cove Park, realized on the Michael Van Valkenburgh design on 2010, provides the re-qualification of three former commercial piers, a surface of about 34.000 square meters, which gives to Chelsea historical district a public park facing the water (Fig. 4).



Figure 4: Chelsea Cove, Waterside Park, Manhattan, Hudson River, New York City (U.S.A.).
Source: Anna Sessarego, 2014

The Chelsea Cove Park was designed to resist to extreme meteorological events and to water power. The designer has worked in a synergic mode with hydraulic engineers to repair and reinforce the piers structures. The new wharfs are protected by a system of fenders, designed to resist the impact of ice blocks or debris flowing along the waterways as well as possible ship disbandments over them. The park develops on different height levels, realized by earth movements designed to reduce at minimum the load on the platforms, utilizing an expanded polystyrene filling foam (EPS) and a lightweight aggregate, stabilized by soil, to ensure that the floating foam couldn't explode, in case of floods. These prevention strategies for flood mitigation have been tested on 2012's Hurricane Sandy. At the storm peak, the sixty percent of the park was flooded by salted water until the height of one meter and a half. Beyond some vegetation light damages, the design choices oriented to resilience allowed the survival of the park leaving it uninjured.

The need of New York City to rethink about the relationship with the Hudson River estuary has a double target, to realise public places close to waterfront and to face the effects of climatic changes that have been shown up during the Hurricane Sandy. In the year 2014, was launched the International Design Competition with the aim to research a solution to protect New York City from the raising risks of flooding. The team BIG, Bjarke, Ingels Group, with the design named Dry Line won the competition: the name of the design arise from the assonance with the High Line, the linear park realized on the disused railway track elevated respect the urban ground floor, and the Low Line the underground park realized in subways disused tunnels, both in the City. The Dry Line project is a belt U shaped that wraps Lower Manhattan with a serial of interconnected landscapes that configured it as a natural park that in case of flooding could be used as water absorption, immediately neighboring Manhattan skyscrapers. The solution incorporates the twelve kilometers of the social infrastructure of Manhattan Greenway integrating the public places close the River with a flooding protection system. The Dry Line extends itself leading from the 57th street behind Battery Park and up to 42th street providing to Manhattan a protection “green pillow”. The earthworks, which shape the waterfront are covered by vegetation and crossed by foot and cycle paths. Inside of the earthworks there are mechanical barriers that could be raised in case of a flood.

3. A CONCEPT OF NEW URBAN PLACE: BROOKLYN BRIDGE PARK

The Brooklyn Bridge Park, among the projects included in the Vision 2020, is one the most relevant from the “Waterfront Revitalisation Program” (Fig. 5).



Figure 5: Brooklyn Bridge Park, New York City (U.S.A.). Source: Anna Sessarego, 2014

The Park is placed over a large area, long and narrow, under the tracing of Brooklyn and Manhattan bridges, extended for two kilometers on the right side of the East River, including six piers of the old port of New York, overlooking Manhattan south side from there, which could be reached by subway or ferryboat. The works in the park started in the year 2003 and are still in phase of completion.

The post-industrial coastal area has been transformed in a Park of thirty-four hectares that has become the connective element between the city and the water. The park is a place for urban life that collects a wide range of activities, including playgrounds and multifunctional sport fields all on the Manhattan Skyline background, with views ranging from Statue of Liberty, to Wall Street, to Freedom Tower, and to Brooklyn Bridge (Fig. 6).

The greater part of the park is settled on the piers: their shape and dimension, is the result of the naval industry need of goods storage. They were built on 1950 from the New York and New Jersey Port Authority; in the eighties, they were decommissioned by the development of the container transportation, which made them obsolete.



Figure 6: Granite Prospect, Pier1, Brooklyn Bridge Park, New York City (U.S.A.). Source: Anna Sessarego, 2014

The first reconversion design of the area included a massive development of residential buildings that was rejected. After then started a strong debate that led to a consolidation of the idea to realize a public park of which Michael Van Valkenburgh was charged to design the master plan.

In the way to finance the realization of the park, such as to ensure the management along the time, was utilized a public-private model, the choice that brought to reserve some areas to building development. In synthesis behind the operation of Brooklyn Bridge Park there is a fusion of public and private energies, designers fantasy, builders enterprise, social society vitality, where the landscape has been the mediator key on the approval process of the great urban design, among multiple regulations, compromises and revisions, to conciliate multiple scales and different users.



Figure 7: Brooklyn Expressway seen from Pier 2 (a), meadow along park greenway, on the left the hill that hides Brooklyn Expressway (b), Brooklyn Bridge Park, New York City (U.S.A.). Source: Anna Sessarego, 2014

The park design was addressed in terms of urban issue's solutions: as example the abandoned port area, was forgotten and separated from Brooklyn residential district by the Brooklyn Expressway for many years. One of the main problems of the area was the traffic noise pollution, the design remedy was the construction of a hill artificial system covered by vegetation with the double task to protect the area from noise as well as to be a green barrier to hide the views of the urban area from the inner park (Fig. 7). There have been realized some expedients to introduce ecologic processes to mitigate the previous whole artificiality of the site, which was built on pillars or by fills. The Greenway, the sinuous main path, which unified the whole park, contrasting the rigid shape of piers, is part of the cycle path connecting all Brooklyn shoreline for twenty-three kilometers.

Many functions have been introduced in the Park, in order to satisfy the citizen recreative needs: places for exhibitions and art festivals, soccer fields, basketball courts and skating rinks, protected by canopies, so they could be utilized when rains or during winter time. In the inner area is settled a tropical garden accessible by a path which reminds the jungle, in the way to demonstrate as climate changes are shifting the rules, allowing exotic fauna to survive. Some beaches were made, not for bathing because water is polluted, but equipped to practice water sports, so provided by canoes and watercraft rental service.

The design of the park aims to face the urban situations in order to mitigate their conflicts as well to find a sustainable aesthetic. The park is innovative, in the choice of materials as recycled wood and granite slabs, collecting rainwater, such as the choice of vegetation including the basic conditions for species plantation and enforcing right processes to let plants to reach beauty and sustainability along the time. The park's vegetation consists in species grouped such as meadows, floral meadows, ornamental gardens, native woodlands, freshwater gardens, salt marshes where management is characterized by sustainability, as utilizing compost, capturing water and not using chemical pesticide

in the way to guarantee biodiversity. Taking care of plants by biologic methods encourages birds, butterflies, ladybugs presence allowing a dynamic vegetation's development.



Figure 8: Salt marsh on Pier 1, Brooklyn Bridge Park, New York City (U.S.A.). Source: Anna Sessarego, 2014

Pier 1, the largest one, presents five water garden, almost hidden by wooden shrubs, each one characterized by different species and connected by four dams pumping collecting and filtering rain-water in the way to be re-utilized for the park's irrigation. These gardens include many blooms and fruits native species, birds, insects, butterflies, and turtles habitat. Along the south side of the pier, there is a salt marsh (fig. 8) consisting by a monoculture of *Spartina Alterniflora*, a fast-growing herbaceous salt water tolerating, which reaches two meters of height, utilized to counteract the erosion of the U.S.A., North West shores. When the plant's roots are immersed in salted-water most of them die, losing oxygen, otherwise *Spartina* is able to shift oxygen from leaves to the stems under the water. This ecosystem is artificially maintained in the park, removing the natural debris they are collecting among the grass, because if it would be left to natural evolution, during the time *Spartina* could succumb, leaving its place to less saltwater tolerant plants. The community is protected by a ballast that allows the entry salt water and provide a habitat for ducks and other water-birds which live and feed themselves among the grasses together with shellfish and crustaceans.

On Pier 4 there is a sandy beach and some artificial rocks, realized in *ecoconcrete*, an ecologic concrete product that allows the biodiversity restoration, utilized in coastal infrastructure. Some cavities are reproduced inside the rocks, to look like the water pool left on cliffs after tides, providing a representation of a sea habitat. Fronting the beach, there is the “Bird Island” an inaccessible artificial natural reserve, built on a ferry bridge residue, settled on the bed of the river where have been planted trees, shrubs and grasses salt tolerant. Even here, there are artificial rocks and a platform to attract the fishermen hawks (fig. 9).



Figure 9: Greenway and Bird Island, Brooklyn Bridge Park, New York City (U.S.A.). Source: Anna Sessarego, 2014

The design, aimed to realize a public park as a resilient green infrastructure, has been demonstrating its effectiveness: when the 2012th Hurricane Sandy caused a remarkable salted water flood, the damages were a minimum. The utility to incorporate, in the design process, the strategies to allow the landscape to adapt and to regenerate itself, in case of natural disasters, have been confirmed. The experimentation showed some information about the species adaptability to tolerate salt-water, how some plants well support the salt at the leaves level but not at the roots level. Moreover, emerges the need to find some strategies to reduce the salt level in the soil after the flood. In the areas at the highest level should be utilized plants tolerating salt on the leaves and on the stamens, while at the lowest levels, plants have to be able to tolerate salt at the radical apparatus.

The outer edge of the shoreline, originally formed by deteriorated walls of reinforced concrete have been replaced by big free rocks embankments: this solution is more permeable, elastic and flexible and allows the waves to break and let water to flow through the rocks. The rocks are free to move and to absorb the impacts rather than break and fall, thus resisting against the violence of the considerable amounts of water.

The Landscape Architecture profession, with Brooklyn Bridge Park, came back to work on the great urban scale. The Park is considered not anymore as an escape from the city, referring the European public park concept of a “piece of countryside in the city” (Calcagno Maniglio, 1983), developed by Frederick Law Olmsted in Central Park of New York, but as an “escape into the city”, including in it the urban fragments which surrounds it and framed it at distance.

Brooklyn Bridge Park represents the synthesis of the last one hundred years evolution of Landscape Architecture. It could be considered as a park, such as an urban design because it has a direct impact on city and citizens, it matches with urban planning such as the creation of urban public places mirroring Olmsted principles, by the role of the landscape architect to address the social and industrial challenges of the urban era.

Nowadays, we are living a transformation time toward a post-industrial city, where it is necessary to address the change of urban shapes created by the transition. Landscape strategies could be useful to face the big scale on city requalification, where the new parks should be much more performing compared to those of the past, not anymore an aesthetical improvement or an escape from the context, but instruments of the change.

4. CONCLUSION

The waterfront cities have a special task: designing areas facing water is an opportunity to make landscape sustainable, improving safety and quality of life, helping people to rebuilt its sense of identity. The waterfront is the place where all the landscape dynamic strengths converge in the urban ones such as in the ecological scale, by the potentiality to define its identity, by the extraordinary capability to enforce linking and welding processes with other city's areas, allowing the creation of new centralities, by innovative shapes of place's use.

Mainly in landscape architecture designs, the storytelling and the enhancement of riverbanks and coastal shores give back the opportunity to carry back nature in the city, incorporating strategies to allow the landscape to adapt and regenerate itself.

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