ABSTRACT

Historical study of the spatial structure of urban waterfronts reveals two conceptual models which have defined the relationship between water and city. The objective of this paper is to outline a new conceptual model that proposes an alternative idea of urban waterfront.

Traditionally, the spatial idea of waterfront is related with that of limit, of a physical and mental boundary between water and land. Like mountain ranges and river courses, coastlines have always been considered natural borders, delineating not just geographical spaces, but political, cultural and social divisions. This idea of waterfront as “front-ier” defines a conceptual model based on the contraposition between water and land.

From the Late Middle Ages until mid-19th century, some cities, especially in the Netherlands, have developed waterways as transportation and infrastructure system. This new spatial relation between water and city can be simplified in a conceptual model based on juxtaposition.

Transitivity is that particular property of an object that can transfer its own specificities to another object and vice versa. Theoretically, by transitivity, the quality and identity of two different spatialities can be also homologically transposed one to another. Therefore a conceptual model based on transposition can produce spatial correspondence between water and city and their mutual recombination can determine an alternative idea of urban waterfront: a space where the water becomes city and the city becomes water.
I | Introduction

Since the end of the twentieth century, the urban waterfront has been re-evaluated as a resource for the city. Indeed, the urban regeneration of these “fronts” between water and land, abandoned and degraded after the industrial decline of the port, has been considered crucial for the socio-economic development of the territory. Worldwide, many cities, from small towns to big metropolises, have strategically invested in the renewal of their water’s edges hoping to restart their economical, social and cultural growth.

Definitely, the “recuperación de los frentes de agua” in Barcelona between the 80’s and 90’s, has been taken as a design model for the regeneration of urban waterfronts. The significant works to open up the Catalan capital again towards the sea, as well as other urban transformations, such as the restoration and pedestrianisation of the historical city centre and the construction of innumerable public spaces, have been internationally recognised as a success, substantiated by the awarding of the RIBA (Royal Institute of British Architects) Gold Medal in 1999, for the first time ever given to a city, and an acknowledgment at the Venice Architecture Biennale in 2002.

But, despite all the important achievements and innovations in architecture and urban design, the idea to revitalise Barcelona waterfront came mainly from a general rethinking of its operational and functional aspects. Local administrators, architects and planners understood that a strategic “refunctionalisation” of these obsolete seaside areas could set off the socio-economic processes typical of the new post-industrial era. Massive financial aid arriving for the organisation of the 1992 Olympic Games and from the European development funds, as Spain became a Member State of the EU, made feasible this vision. But after the first years of public realm developments, this “refunctionalisation” has more and more followed the privatistic logic of real estate and urban speculation.

Taking Barcelona as a design model, most of the urban waterfront developments carried out in these last few decades have been characterised by the same modality and typological principles. The reconfiguration of the water’s edge has been done by the definition of new urban functions, proposing in almost every coastal city the same programs and organisational elements. Thus, if on one hand urban waterfronts have been positively regenerated after long periods of neglect, on the other they have been reorganised through a functional superimposition that has denied their original identity.

Most of waterfront renewal projects worldwide seem to be the result of forced urban stratifications determined by programmatic and functional logics. Furthermore, and more relevantly, from a conceptual perspective the design and strategic approach of these projects do not attempt to explore alternative spatial relations between the city and the water.

2 | Contraposition

Traditionally, the spatial idea of waterfront is related with that of limit, of a physical and mental boundary between water and land. Like mountain ranges and river courses, coastlines have always been considered natural borders, delineating not just geographical spaces, but political, cultural and social divisions. This idea of the waterfront as “front-ier” defines a conceptual model based on the contraposition between water and land.

Such a model can be seen in the spatial conception of the harbour as infrastructure at the city margins. In Ancient Greece, the Piraeus, considered the archetype of the port, was surrounded by walls, the Themistoklean Walls built in the fifth century BC, outlining the limit between the poles of Athens and the Aegean Sea. Yet, the Latin word portus (port) has the same etymons of porta (door) and pontem (bridge) in the meaning of “passage”. So also are the piers: fragments of bridges jutting out onto the water creating a physical passageway across the shoreline and a visual opening to the horizon. In the contraposition model harbours and piers are infrastructures at the margin between sea and city which define both boundary and its crossing. The dual condition of the port can be seen in some of Claude Lorrain’s baroque ideal landscapes, such as the “Seaport with the Embarkation of St. Ursula” and “The Embarkation of St. Paula Romana at Ostia”.

So the ship, travelling “from port to port”, has been defined by Michel Foucault as “the heterotopia par excellence”. The boat is actually “a floating piece of space, a place without a place, that exists by itself, that is closed in on itself and at the same time is given over to the infinity of the sea”. As heterotopia, the ship is place in relation with all the other places that “are simultaneously represented, contested, and inverted”. The boat can be seen as a fragment of urban space, which, sailing away from a harbour, goes beyond the city boundary to shore again at its margins in another part of the world.

At the beginning of the last century, the port became a large scale infrastructure, already perceived as something opposite to the social and public domain of the city. Indeed, since mid-nineteenth century, the harbour

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2.2 | The port as both boundary between sea and city, and its crossing: Claude Lorrain, The Embarkation of St. Paula Romana at Ostia, 1639-1640, Museo Nacional del Prado, Madrid

began to be organised as an independent structure growing autonomously from the urban realm, thus, breaking the link that has connected the social dimension of the city with the port. It was during this period that the relation between water and urban space, mainly established through the harbour, weakened.

In the modernisation processes of the city, the medieval urban space began to open up and, as Foucault has pointed out, “extension was substituted for localization”: an extension by continuity, regularities and hierarchies. Thus, spaces with no clear delineation, such as river margins and seafronts, were geometrically rectified. This demarcation of the urban water’s edge attempted to resolve the provisional nature of the coastline making clear the distinction between water and land. Urban designs along the shore, like tree-lined waterfront promenades, protruding piers and other seaside constructions, superimposed their geometry over the water delineating the limit of the city.

In the eighteenth century, the geographical definition of the boundary between water and land as organisational element of the landscape has been fundamental in many urban transformations, such as the ones occurred in the French maritime cities at the time of Louis XV’s reign, in Lisbon during the leadership of the Marquis of Pombal and in the Borbonic Naples.

The Netherlands, as an in-between zone between land and sea, has centuries of experience in dealing with water and its edges. To make the low lands inhabitable and suitable for cities a large-scale application of technology was required along with huge efforts and sacrifices. Indeed, since the thirteenth century and after the utilisation of some primitive protections against sea and rivers, the Dutch landscape has been transformed, from a natural and continuously changing system of ponds, pools, marshlands, streamlets and sea inlets, into a hydraulic system of dikes, dams, ditches, water retention areas, and mills. Actually, the invention of the windmill in the sixteenth century was an important technical innovation defining the turning point from defensive to offensive water management that made possible the reclamation of large areas of land.

In this transformation of the Dutch landscape by means of hydraulic construction, the coast was shortened and strengthened delineating a clear and more stable boundary between the terra firma and the sea. “The ongoing effort to get the water-landscape under control produced, however, a paradox. With the reclaimed polders, the coastal dikes and dams, the canalised rivers, the Netherlands transformed more and more from an intermediate zone between mainland and sea into a part of the mainland with sharp border to the sea and rivers. The obsession of 100% safety, with the straightening of the coastline, the closing of inland sea and inlets, the heightening of dikes and dams, produced a sharp separation between open water and inland, between outside the dikes and inside the dikes” (Meyer 2006).

3 | Juxtaposition

The objective of straightening the coastline and closing off tidal inlets, in order to protect the Low Lands from the water, often collided with the economic interests of the cities in the coastal areas. These cities actually formed an enclosed system with the port, which construction was possible because of the natural features of the landscape, such as sea inlets and estuaries. Furthermore, the port located in or in the perimeter of the city, was strongly interlaced with urban infrastructure. As a matter of fact, from the late Middle
Ages to the mid-nineteenth century, some cities, and not just in the Netherlands, were characterised by the union of port and canals as transportation and infrastructure system. This new spatial relation between water and city can be simplified in a conceptual model based on juxtaposition.

The spatial structure of Dutch water cities was mainly generated by a system of harbours and waterways. The framework of the urban fabric in cities like Amsterdam and Rotterdam was largely formed by the composition of hydraulic engineering constructions. The dam was the central element in the urban hydraulic structure, the main public square and the core of the city. It was the central market and meeting place for goods and people from all parts of the world, and set the direction for the social, cultural and economic development of the city. Canals and quays structured the most important component of the urban transportation system.

One of the most notable paradigms for the city as a hydraulic system was Simon Stevin’s Ideal City, conceived around the 1605-1619 but published posthumously in 1650. The urban design was based on the same principles of water management engineering, derived from the pattern of the polders, and directly applied to the city. The canals were structural spines of the urban grid, in the centre of which, the main square and public buildings were located. Stevin’s ideals can be found in various polder and fortified cities.

In the same way as in the Netherlands, in Japan the territory has also been transformed in order to be productive and usable for settlements. The old city of Tokyo, then called Edo, was a water city surrounded by canals built by large-scale civil engineering. A system arranged with harbour functions developed along the network of rivers and canals. Like in Amsterdam and Venice, shipments from large vessels anchored offshore, were reloaded in small boats and carried on the embankments along the canals. The structure of such water network cities differs significantly from the urban waterfronts in United States or Australia, based on the contraposition model, where the pier juts out into the bay.

Water cities were also built by the Dutch in other corners of the world. Cities like Mauritsstad in Brazil, Bassora in Iraq and Cape City in South Africa. At the end of went to the Netherlands, and, inspired by Amsterdam, in 1703 Founded St. Petersburg with its ring of canals.
Waterways in Edo for freight transport formed a north-south, east-west grid. As intersection between roads and canals occurred in many places of the city, a huge number of bridges were built. Also short ferry routes called watashi (crossings) were developed. Landing points called kashi (river banks) were established at various points along the waterways for unloading shipments. Warehouses and markets were set up at these landing points becoming hubs for the distribution of goods in Edo. The old Tokyo was crisscrossed by canals, and this waterscape made a frequent appearance in the ukiyo-e (woodblock prints) depicting Edo life. Today almost all of the waterways have been filled in for roads. Flowing rivers and canals are no longer a common sight in Tokyo. Moreover, the high embankments that have been constructed along the Sumida River make it hard to see the water from any distance.

4 | Transposition

In the early 1960s, a group of young architects working in Tokyo believed that people could live and work on water. In their view of seas as a possible future for human civilisation, some urban utopias of the Metabolist Movement could be seen as exploratory examples of a spatial transposition between waterscape and city.

As by transitivity an object that can transfer its own specificities to another object and vice versa, theoretically, the quality and identity of two different spatialities can be also homologically transposed one to another. Therefore a conceptual model based on transposition can produce spatial correspondence between water and city and their mutual recombination can determine an alternative urban ecology. Although Metabolists’ visions seem to be based on the superimposition of technourban structures over natural landscapes, some of their futuristic projects actually investigated the possibility of a hybrid spatiality between waterscape and urbanisation. With awareness of the rapid increase in the world population, their visionary ideas were a critical response to the Modernist view of city design. Rejecting planning methods used in Japan, these ideas aimed to improve habitat quality and solve uncontrolled urban sprawl. At the
core of the group’s utopias was a particular biotechnical notion of the metropolis as being in a constantly changing state of dynamic equilibrium, in the same way as a living organism. Therefore their main objective was to create flexible and extensible megastructures that could expand infinitely. Such radical design concepts developed as marine civilization and artificial terrains on water embodied the Metabolists’ ideals of social change.

At the World Design Conference held in the Japanese capital in 1960, Kenzo Tange proposed his plan to house 15 million people over the Tokyo Bay. This utopian plan would span above the water running along an 18 kilometre linear, “civic axis” which would take into account the crucial importance to society of mobility. Its foundation was an organised urban matrix, meant to be an extension of Tokyo uncontrolled expansion, as a network of expressways: a transportation system without intersection for direct communication throughout the city. Branching from this three-level expressway system were office buildings and residential units. These units, attached to the civic axis through perpendicular highways, could actually grow organically like leaves on a tree. They appeared random in size and position but alike in their pagoda roof shapes, and, residing on huge platforms on the water, proposed the old relationship between the population of Tokyo and the sea.

Already in the late 50s another Metabolist architect, Kiyonori Kikutake, designed floating factory on sea as a solution to the labyrinthine density of Japan’s metropolitan areas. Eventually, the early concept of these industrial islands developed in the design of Marine City with its 300 meter high towers. Each of them housed 5000 residents living in 1250 prefabricated apartment cylinders attached magnetically to the external surface. Kikutake’s city for half a million inhabitants, called Unabara in Japanese, was located in the Sagani Bay and planned as an ocean garden city around functionally zoned concentric rings. The global vision of Marine City was to “free mankind from 5000 years of civilization on continents” and to make the sea their new world.

But Kikutake’s most radical design is a linear floating city forming a 400 kilometer link between Osaka and Kyushu Island. This marine megacity would be composed of units for living, working and cultural activities, set together in one straight line cutting through the Inland Sea. The 1993 design project was intended to take the pressure off the densely populated coastal area of seven million inhabitants, largely degraded by industrial complex.

As Metabolists “floating” ideas have explored alternative spatial relations between city and sea, in recent years also in the Netherlands, after centuries of land reclamation, there has been a radical change in attitudes to water. Indeed, when several floods, some rather threatening, occurred in the second half of the 90s, it has been realised that the initial water management, with its strengthening of the coastline, severe constriction of rivers in their beds and maximum pump capacity in the polders, no longer offers sufficient guarantees for optimal protection. This has been an important turning point with regard to thoughts on the relationship between hydraulic engineering and urbanisation. Eventually, investigating other forms of water management also means that other preconditions will have to apply to urban development.

As a renewed cooperation between urban design, architecture and hydraulic technology is required, new problems as well as new opportunities and possibilities for the spatial design of water cities will arise. This implies the development of new urban conceptual models, which make use of water as an integrated and structured element of the city. Meantime, the application of new architectural construction and building types, such as various forms of floating houses or buildings on piles, has already started. The first amphibious houses in the Netherlands were built a few years ago on the river Maas which is prone to flooding. They look exactly the same as houseboats. What differentiates them is a patented technology which allows the foundation of the construction to be transformed into
a float. A foam core is encased in concrete, with steel cables securing it against the pull of potential currents. They are designed to rise and fall with the tide and can be moved elsewhere at short notice.

As officials from New Orleans have visited the Netherlands to take a closer look at the floating houses at Maasbommel to see how they might take the concept back home to address the similar climatic issues on the gulf coast, such technologies will obviously be relevant and necessary in many other parts of the world as demands for space drive people towards the coast, and climate change creates unpredictable scenarios for those who take up residence there.

5 | Conclusions

Global warming makes sea level estimates in the future very uncertain. Scientists at a recent climate change summit in Copenhagen said that earlier UN estimates were too low and that sea levels could rise by a meter or more by 2100, not including the potential impact of polar melting.

Other evidence suggests that even these revised estimates are too conservative, since they tend to be based on linear projections that do not account for cumulative effects of various aspects of climate change not generally studied together. For example, methane (a much more powerful greenhouse gas than CO2) has been found to be off-gassing from Arctic tundra now beginning to thaw during summer months. The combined effects of significant amounts of methane and CO2 tend to have an accelerating effect not previously accounted for. Scientists studying climate change effects in Antarctica have estimated that if significant portions of the West Antarctic Ice sheet slipped off its undersea perch and floated away, global sea level could rise as much as five to seven meters.

70 percent of the planet’s population already lives on coastal plains, and 11 of the world’s 15 largest cities are on the coast or estuaries. With regard to urban development strategies, the ominous range scenarios described above suggests, along with the application of new hydraulic technologies, the urgency to reconceptualise the design and planning approach of existing waterfront cities as well as to envision possible urbanisation on water. Searching for a hybrid ecology between waterscape and urban development should mean first to rethink the spatial structure of the city, not as a distinctive and close spatiality but re-adaptable and interconnected to the global environment. Such re-adaptable spatiality could mutate without losing its urban identity and quality as well as merge with the water, generating a more sustainable and synergetic ecology: an ecology where the water becomes city and the city becomes water.
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