Article

Making Less Vulnerable City: Resilience as a New Paradigm of Smart Planning

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Abstract: The manuscript wants to investigate the debate on urban resilience and climate change linking theory and practice, describing the possible innovations that concern urban design, urban normative and regional laws developing in different countries. The approach pursued would encourage resilience and flood protection through smart planning and through the architectural and urban project; considering public space as strategic soil where developing the resilient city, using engineering technical climate defence as new space for citizens and communities. Resilience themes are included in all levels of government and in spatial and strategic development policies such as in some project concerning public and private space and in municipal plans; the urban defense structures has to become new pleasant space for the city; these actions will not only contribute to making cities more resilient but will contribute to the creation of a more pleasant and attractive urban environment. The Resilience is the main keyword of some strategic vision of the Netherlands and of Italian laws and the concept is tested in some best practice such as in Rotterdam, in Bordeaux, in London and in the research carried out by "Arquitectos de Cabecera" in Barcelona. Resilience is seen as a new paradigm of smart planning.

Keywords: resilient urban design; smart planning; climate change; resilient regional laws; pleasant public space

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1. Introduction

The contemporary city, especially for its complexity and for political and technical difficulties in governance, often fails to give answers to many urban problems in terms of containment of energy consumption, efficiency, performance of services and infrastructure, technological risk, social inclusion and urban safety. The air and water pollution, the non-optimal waste management, the social segregation, the low safety standards, the energy inefficiency, the use of land and non-renewable resources, the high environmental impact, need new methods of construction and operation in the city and in its systemic logic, moreover in a period of climate change, favoring resilience and sustainable climate adaptation.

Smart City is, by definition, the living space of varying size and surface area, where it is possible to deliver advanced services for citizens and for the manufacturing base, with the ultimate goal of improving the quality of life of the community. Resilient city is a conquest of contemporary planning, deriving by smart tools applied to cities and urban settlements to govern and manage urban transformations in relation to climate change and mitigation of environmental hazards. Resilience is a concept comprimed in the meaning of smart city and, contempled in the paradygm of smart planning. Smart city is caused by smart planning that has the resilience as one of its main aims. [1]

Climate adaptation means making the city less vulnerable and more resilient; the challenge is to link climate adaptation to other urban measures, projects and initiatives such as the management and

maintenance of roads and public spaces; but it is also important to develop urban strategies that aim to increase the sensitization of the population so to promote the active collaboration from the smallest "backyard actions"; to facilitate collaboration from below it is necessary to make people aware of the benefits they will have if they contribute to the pursuit of climate adaptation; as, for example the strategy “Green Team. Paving out, Plants in” [2].

It is investigated how the issue of resilience is the main keyword of some strategic vision of the Netherlands [3] and of some Italian regional and sectorial planning laws [4], and how it is tested in some successful European projects as in the case of the Port of Rotterdam Masterplan, in the implementation of the urban Climate Strategy, in the "Place Leon Aucoc" project in Bordeaux [5], and "Cineroleum" in London and in the research and design experimentation carried out by the research group "Arquitectos de Cabecera" of the ETSAB in Barcelona [6]. Main aim is to show how resilience could be seen as a new paradigm of smart planning and how this concept involve all scales of urban interventions such as national, regional, provincial and municipal authorities, architects and urban planners, firms and enterprises, citizens and communities; everybody have a leading role in making less vulnerable city but to pursue this every space, public and private, that belongs to city has to be conceived by a available space where to implement urban visions and strategies developed to achieve the creation of a more pleasant city that adapt itself to nature’s transformation, to climate change, producing a more pleasant environment for living.

2. Materials and Methods

2.1 Rotterdam: urban design for a waterproof city

Dutch architecture and urban planning, recognized in the last two decades as a leading country of architectural modernity, is highly pragmatic and is dominated by professionals and academics of considerable media appeal such as Rem Koolhaas and OMA, the MVRDVs of Winy Maas and the West 8 by Adrian Geuze, the Mecanoo of Francine Houben, Claus en Kaan or Coffelang BVB. Rotterdam, located between the Rotte and Maas rivers, has always stood out for its desire for progress and dynamism; the recent urban planning instruments are oriented to transform the city into a "child city" [7]; the 2010 Plan Building blocks for a child-friendly city, with a Vision to 2030, provides a detailed strategy for future planning based on gentrification: buildings, public spaces, services and infrastructures become spaces for experimentation of the creative city; the city is beginning to attract middle class families and young people precisely because the administration is distancing itself from zoning-based modernist planning and is encouraging the functional urban mix; a particular emphasis at this stage of urban planning is given by the "statement" of the Urban Vision Rotterdam 2030 [8], approved in 2007, which seeks to favor the creation of an attractive urban environment.

Responsibility for water management in the Netherlands is entrusted to Rijkswaterstaat (the executive branch of the Ministry of Infrastructure and the Environment) and to the Water Control Committees; the Rijkswaterstaat (RWS) is responsible for the management of the main waters, such as the sea and rivers, and ensures that the responsible authorities are promptly warned in the event of floods or stormy seas. Furthermore, RWS maintains dams, dunes, cages and overvoltage barriers and protects the coast by regimenting and expanding the floodplains and building secondary canals. The impacts of rising sea levels due to climate change are an important and obvious concern; currently about 75% of the Dutch coast is protected by sandy dunes, 15% is made up of "hard" man-made constructions such as dams, and artificial barriers, while the remaining 10% is characterized by flat and very wide beaches.

Rotterdam is an example of resilience and adaptation to climate change; the theme of urban resilience has been at the attention of the municipality for about fifteen years; in the central districts of Rotterdam, urban retrofitting actions are experimented through new technologies and new functions applied to existing structures, and in line with the climatic changes taking place. Through some programs, including the "Rotterdam Climate Initiative" [3], the city is seeking, with the collaboration of the government of organizations, businesses firms, research centers and of citizens, to reduce pollutant emissions by 50% by 2025, trying to adapt the city to climate change in progress and promoting five main initiatives focused on the concept of resilience: 1) floating houses; 2) the water squares; 3) enhanced water collection systems; 4) green roofs; 5) the sustainable port.

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Rotterdam is configured as a city with a strong role as logistic and commercial center of the European hinterland; Port is seen as a great resource for the city even if the strategic planning of the municipality of Rotterdam constantly questions on the best configuration to be implemented for the best relationship between city and port; the relationship with the port began to change in the 80's when, after the post-war reconstruction, the main urban problem was the lack of the relationship between the old historical city and the Maas river that was identified as an urban limit. To try to solve this problem, the "Rotterdam Waterfront Program" was launched, which considered the presence of disused industrial areas within the port area as strategic for the city's identity.

The relationship between port and city is effectively described by Brian Stewart Hoyle in the following diagram (Figure 1.):

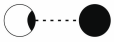
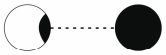
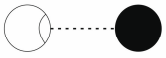
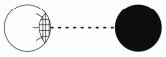
STAGE	SYMBOL ○ City ● Point	PERIOD	CHARACTERISTICS
I Primitive port/city		Ancient/medieval to 19th century	Close spatial and functional association between city and port.
II Expanding port/city		19th - early 20th century	Rapid commercial/industrial growth forces port to develop beyond city confines, with linear quays and break-bulk industries.
III Modern industrial port/city		mid - 20th century	Industrial growth (especially oil refining) and introduction of containers/ro-ro require separation/space.
IV Retreat from the waterfront		1960 s - 1980 s	Changes in maritime technology induce growth of separate maritime industrial development areas.
V Redevelopment of waterfront		1970 s - 1990 s	Large-scale modern port consumes large areas of land/water space; urban renewal of original core.
VI Renewal of port/city links		1980 s - 2000 +	Globalization and intermodalism transform port roles; port-city associations renewed; urban redevelopment enhances port-city integration.

Figure 1. Different stages in the traditional port-city interface. Fonte: Hoyle, B.S., (1998), "The redevelopment of derelict port areas". The Dock & Harbour Authority, Vol. 79, No. 887, 46-49 [9].

During the 1980's, the city of Rotterdam adopted a proactive and audacious redevelopment program in the port area with the aim of bringing the river to the center of Rotterdam's identity vision; the plans drawn up for the port redevelopment have been characterized by a sophisticated mechanism of understanding the territorial specificity and aimed at creating spaces characterized to be highly usable public place.

For the implementation of a resilient urban project, involving both the port area and the entire city center of Rotterdam, the city administration has developed a "Rotterdam Climate Change Adaptation Strategy" strategy that aims to make the city completely safe by climate change by 2025; Rotterdam is structurally protected by a primary flood defense system consisting of dunes along the coast and by dams along the rivers; there are also many flexible barriers that can be closed to protect the city in case of need. Within the dam system there are many polders that are meant to drain excess water through the channels and an additional system of secondary dams that protect the inland areas from flooding.

The strategy should not only affect the inhabitants of the city but also the companies, universities, consortia and all the interest groups in Rotterdam; the strategy indicates that there is still time to adapt to climate change so that it is now possible to link adaptation to other urban strategies and to spatial development projects to improve the management and improve the maintenance of some urban areas; this strategy is indicated with the slogan "moving to the rhythm of the city".

In defining the strategy, the city of Rotterdam has been divided into six zones: the port area, the Stadshaven, the outer dyke, the inner dyke, the compact city and the neighborhoods built at the end of the Second World War; the main difference between these six zones is if they are defended by the dykes (inner dyke) or if, on the contrary, they are lacking (outer dyke); in other areas the main difference is in the presence and availability of potential public spaces or, on the contrary, in the compactness of the fabric that precludes or limits the sustainable project of public space.

The main priority in the climate strategy is the protection of the city from floods and strategic attention is paid to the port and to some strategic infrastructures mostly exposed to risk; in the most populated areas

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with the highest building density, some projects will be carried out on public space, such as water squares; water storage capacity will be increased through the regulation of the city's canals, and the permeable surface will be increased with an increase in green areas and a decrease in paved areas. A "blue and green" strategy will then be implemented which will also contribute to making the urban environment more attractive and enjoyable.

Rotterdam's climate adaptation strategy is based on some actions to optimize the water defense system; on improvement of resilience through adaptive measures to be implemented throughout the urban environment; on the combined and agreed action with all urban stakeholders, considering climate adaptation as a strategy that can innovate the city making it more interesting and innovative. The strategy gives close attention to some key actions such as safe, flood-proof construction, floating buildings such as the Rijnhaven project, or water-based public spaces that increase the resilience of the system.

The water squares, the green roofs, the increase in the flow and in the section of the canals, are strategic elements for the increase of urban resilience; these actions contribute to the maintenance of the water levels of the Schie and Rotte rivers, preserving the area from flooding. Some specific actions are also planned to increase the resilience, for example in the Merwe-Vierhavens dam, in Rozenburg and in some parts of the IJsselmonde; moreover, in the long run, the dams of Hoek of Holland and Maasboulevard will have to be reinforced. The construction of new dams for the protection of Rotterdam could also be envisaged, in addition to the existing ones.

The group of architects "De Urbanisten" has defined several projects concerning the management of urban water in Rotterdam and in neighboring polders, realizing many water squares. For example, the project for is interesting the Benthemplein water square, a large multifunctional water square that combines rainwater collection with the creation of an outdoor public area; the project was defined after three preparatory workshops in which the natural elements and the form of public space were discussed. (Figure 2).

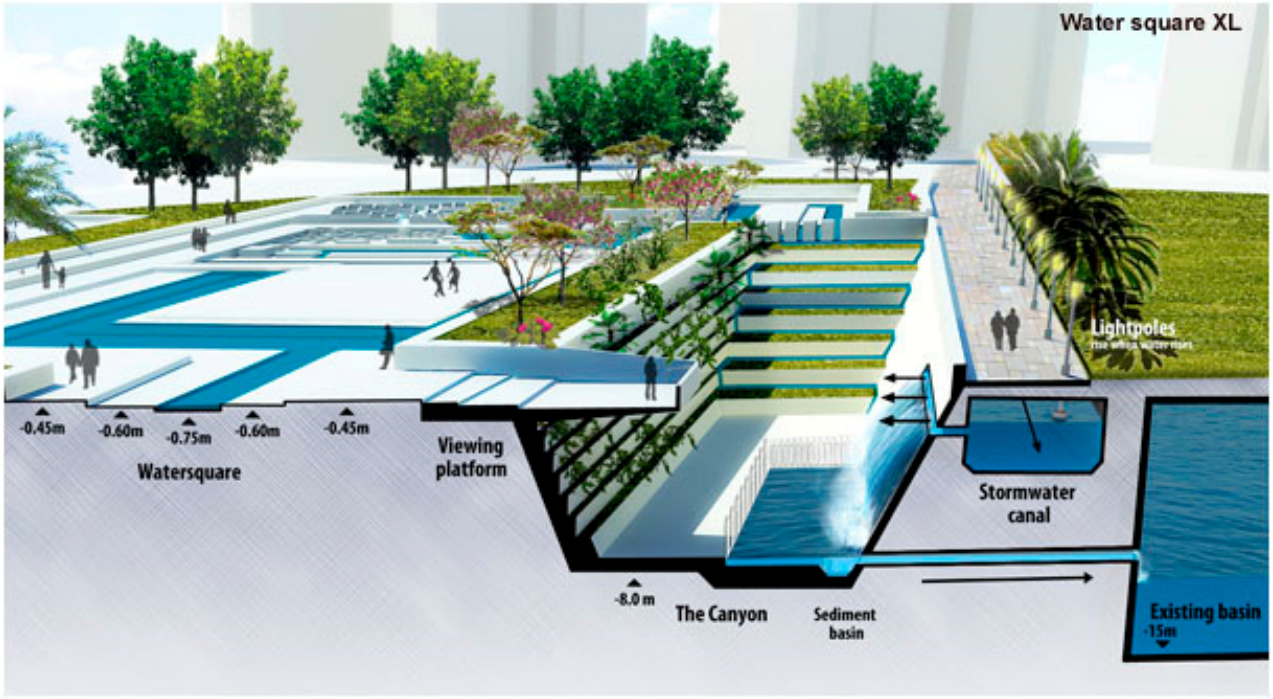

Figure 2. Water square XL in Rotterdam. Resilient Urban Design. De Urbanisten. [3]

The areas of water accumulation within the city must also be strengthened, increasing the canal section, by implementing new channels and small lakes for the stagnation of water; there is the need to strengthen the blue lines within the city and connect them, in a reticular perspective, to the urban water system. In addition, the Blue Corridors also have another important function, that of an attractive space for sociality and leisure. Measures to make buildings more resistant to heat include the use of white and green roofs, the installation of easy-to-open windows, awnings, blackout screens and designing the interior distribution of

housing in such a way that the bedrooms they are located on the lower floors and on the north sides of the buildings.

2.2 Energy resilience in the Rotterdam port project

Resilience is also connected to energy performance of buildings and open space; in every resilient strategy there is some clear strategy that attends energy consumption and the rigt use (to encourage) of renewable resources. According to the European strategic plan, policies on infrastructure networks and transport, play a decisive role in achieving the purpose of smart, sustainable and inclusive growth, in particular those aimed at "reducing greenhouse gas emissions by at least 20% compared to the 1990 levels, [...] bring the share of renewable energy sources to 20% and improve energy efficiency by 20% ". In line with the implementation of the growth objectives of the European strategy, the European Commission presented the Connecting Europe Facility initiative package aimed at supporting investments for infrastructures in the transport, telecommunications and energy sectors. [10] This led to the definition of a detailed regulatory framework and strategic orientation that would strengthen and emphasize the central role played by ports as nodal points of the European commercial and transport system to enhance the unquestionable potential of European seas and oceans and coastal regions, and to solve at the same time the economic problems affecting the maritime sectors. Another "European" priority is the increase in the competitiveness of the port system to be implemented through the upgrading of port infrastructures and equipment, including their adaptation to the best environmental, energy and operational standards - in view of the fact that the maritime sector is increasingly global panorama (since 2000, trade has intensified with a compound annual average rate of change of 3.5%, a positive change of 0.7% compared to that recorded between 1970 and 2000) and that the sector reports growth in traffic in several of the world's major ports and is the only one characterized by both sectoral integration dynamics and supply chain logics with investments mainly made by parties outside the transport world

The relationship between the energy/transport/infrastructure sectors is increasingly, above all because it is believed that through possible innovative solutions, multiple environmental sustainability aims can be pursued - emissions reduction, energy consumption reduction, measures to combat climate change -, and economic feasibility by channeling specific incentives or from several sectors and supply chain benefits in terms of investments for the territories involved. The state of the art confirms that the trend, in terms of policies for sustainable development in ports and in port-cities, is to invest in sectors and activities related to energy by creating low-impact plants for the production of energy from renewable sources: energy efficiency and renewable energy, therefore, in ports and not only for ports. A priority for stimulating the production of energy from renewable sources is Europe [11].

The new REN21 Report [12] shows that, globally, renewables have grown by 135 GW of new capacity, marking an increase of 8.5% over the previous year. In the last decades the world economy has grown without a corresponding increase in CO2 emissions, despite the 1.5% increase in world energy consumption. According to the same Report, our country has positioned itself at the top of the world rankings. Last year, onshore and offshore wind energy globally added around 46.6 GW to the energy supply. It is expected that wind power will increase by 17% by 2030. Unfortunately, offshore plants - which have interesting advantages in terms of reducing the impact they are taking off in our country. In recent years, the bottom off the coast of our country has been affected by more than 15 projects of wind farms, but the approval process is often complex. In Europe, on the other hand, offshore wind farm installations are on the rise and projects are planned with a further 26.4 GW capable of meeting 4% of the energy demand, thanks also to the continuous technological and production improvements affecting the sector.

The temporal asynchrony between Europe and Italy and the different scales and dimensions of the projects condition the achievement of effective results for resilience; at international level, there are some investment strategies related to the energy sector and related to different types of ports or port cities: Ostende for "Haliade 150", the largest offshore wind turbine and Rotterdam for the "Dutch WindWheel", self-sufficient hi-tech mill in terms of energy and "smart" control units. Among the Italian experiences we point out Taranto for the "first off-shore" shipbuilding and Civitavecchia for the project of an "electrified quay" that guarantees energy efficiency and optimization of port services. The feasibility, size and extent of the projects do not depend on the territory or the port in whose waters the plants are inserted, but on other

factors. The difficulties of taking offshore offshore in Italy reside in the persistence of doubts about the complete environmental compatibility of the plants, with attention to birdlife and fish species, the noise generated by commercial or military shipping routes, etc.

From the state of the art of European experiments, interesting results emerge in terms of reduction of impacts but also of possible economic repercussions with the installation of fish farming and tourist facilities (a study carried out by Legambiente refers to the plants of Alpha Ventus, Horns Rev, Yttre Stengrund, Thanet, Texel, Sheringham Shoal) and with the induced: the implementation of other sectors involved in the transformation process promotes the strengthening of ties with the territory and with the plurality of subjects located in the technology supply chain.

2.3 Vision 2030 for the port of Rotterdam: Maasvlakte 2, the sustainable extension

The most important European maritime port has already elaborated the development path of the next twenty years, which it presents in the Vision 2030 program. The main points concern environmental sustainability and access to the hinterland. A central aspect of the program is environmental sustainability and resilience, which translates into increased production efficiency and the use of second-generation biofuels, including those generated with algae and enzymes. The port will also increase the production of electricity through renewable sources, such as biomass, solar and wind. As for the territorial development, Vision 2030 aims above all to the connections with the hinterland. These will be ensured both by computer systems for traffic management and by new infrastructures, such as the Blankenburg tunnel and the A4-Zuid road.

Today the port of Rotterdam is the largest in Europe: Maasvlakte2 is its last extension, the project will increase the capacity of the port that will accommodate ships for the commercial transport of 18,000 containers. The city of Rotterdam, which rapidly grew after the Second World War thanks to the progressive reduction of trade barriers among the Member States of the European Union, today is the physical, commercial and economic representation of its port.

Another novelty of the port of Rotterdam concerns the construction of 800 port electric cabins that can supply up to 5,000 boats.

Recently the onshore power supply plan on the docks of the port has been completed, which is able to supply the port of Rotterdam with safe energy. An "onshore" power supply plan that - where "sustainable supply" will allow an overall reduction of CO2 emissions and a decrease in the concentration of nitrogen oxides and particulates, with significant progress in reducing air pollution.

The ports consume tens of millions of kWh each year and for this reason funds have been allocated to activate interventions aimed at drastically reducing the tens of thousands of tons of harmful emissions per year by encouraging the production of energy from renewable sources.

It is therefore necessary:

- identify the problems related to the development of offshore wind energy;
- to succeed in combining territorial vocations (availability of different primary sources - not only eolic -, localization of consumption) with the technologies available to optimize production, consumption and distribution of energy.

A recent Enea study shows that Italy's potential is undisputed: "the Adriatic region has an average potential of 2 kWh / m, the western coast of Sicilia up to 5 kWh / m while for the western coast of Sardinia it is called 10 kWh / m ". It means recognizing the potential of clean energy, in all its forms, for the coastal territories of the EU, "by harnessing this energy, it could contribute to the energy autonomy of the islands and peripheral maritime regions". From the point of view of resilient planning, as the port area of Rotterdam extends for more than 40 km and is located in the outer dyke belt, and it is directly connected to the river Maas and to the North Sea, it is a strong vulnerable element for environmental hazards; in the most recent expansion, in the Maasvlakte project, the roads are built at the same height as the dams so they will continue to operate even in adverse conditions; a good climate strategy, such as that experienced in this area, should preserve the port area through the use of marine protection systems and through the creation of some safety zones, shelter areas, which secure ships and goods at times of emergency.

2.4 Resilient Urban Projects

The current conditions of many western cities have challenged not only the idea of a type of progress and continuous development of modernity, but also the disciplinary instrumentation of the architectural project, which cannot avoid listening to the needs of the reality contemporary urban areas.

The ruins after the crisis, have produced in the last decade a series of actions that emphasize the social need to conceive spatial transformations, at different scales, according to participatory and inclusive criteria. In Europe, we are witnessing a different consciousness that comes from the city itself and from many architects who want to "listen" to the city. Plato claimed that the city is like a pasture: therefore, if it were well cared for, then citizens will live in an environment perceived as a common good.

Are investigated three best practices that move in different areas and offer us the opportunity to reflect on the most current issues of the architectural debate. These are three original approaches to the architectural project - both from an academic and professional point of view - for the applied methodologies and the results obtained, which reflect the changing conditions of the current architect's actions. These methodologies are also, and perhaps above all, based on the resilience of the city and architecture.

When reading these experiences - somehow very innovative - it is clear that the theoretical instrumentation of architecture is not always able to grasp the meaning of the current architectural reality: in this perspective it is necessary to rethink the disciplinary tools: if «the theory is a toolbox "- as Deleuze said - then it is useful to develop a cognitive system that allows the reading of current phenomena that can otherwise be interpreted as marginal with respect to the 'classical' readings and of which the architectural literature has just start talking.

Based on these considerations, here we propose an interpretative approach based on the observation that architecture - and, more generally, the built and transformed environment - is like a patient who must be listened to and whose symptoms reveal possible pathologies. The architectural project that seeks an inclusive methodology and dialogue, instead of imposing intentionally resolutive forms and strategies, is placed next to the urban needs and can also take advantage of the places of daily life, of ordinary space - and also of the infraordinary - of the urban interstices or the remaining infrastructural spaces, which always have a certain degree of resilience.

From the end of the last century, when we began to perceive the need for careful use of the resources at our disposal, the architects paid attention to the resilience of the buildings, that is, the capacity they have to be useful again. Giving buildings a second chance, extending their lives, is not a new idea: the reuse and recycling of architecture have been known since antiquity. However, in an ecological vision of the world, a constructed building is a resource that should not be lost and, in fact, should be reintroduced into the life cycle of cities. The construction of a new architecture has an important ecological footprint; while it is very low in an existing building ...

The interventions that in some way manipulate and transform the space are joined by others that would open a positive reflection: we refer to the zero degree of architecture, or rather, to those cases in which there is no architectural intervention in the forms that we usually know. The case of the Place *Léon Aucoc* in Bordeaux is, in this sense, is very significant and illustrative: the architects Lacaton & Vassal in 1996 was commissioned, within a municipal plan of urban embellishment, to redesign the *Léon Aucoc* square. In an article, published a few years later in the Spanish newspaper El País, Iñaki Ábalos describes the attitude of the two French architects, at the request of the Bordeaux authorities, such as Bartleby the Scrivener: his answer is in fact: "We would prefer not to". Lacaton and Vassal propose non-intervention stating that: "the square is already beautiful. As a project we've proposed doing nothing apart from some simple and rapid maintenance works (replacing the gravel, cleaning the square more often, treating the lime trees, slightly modifying the traffic) of a kind to improve use of the square and to satisfy the locals"[5].

No operation, therefore; after visiting the places and having long talked with the inhabitants of the neighbourhood, Lacaton and Vassal decide that the best thing that can be done for that square - which in their opinion and that of the inhabitants is already beautiful in itself - is to abstain from transformation. According to French architects, the square is resilient: therefore, one must know how to exploit its potential to reactivate its use. Lacaton and Vassal propose a very light "care" program: continuous maintenance, a little extra cleaning and some adjustments here and there. This is one of the few cases in which the architect retracts, he does not want to put his signature on a place as a guarantee of quality of architecture: the city

and its space in many cases work thanks to the relational balance that is established between the citizen and the spaces in which everyday life can freely flow.

Since 2013 the School of Architecture of Barcelona (ETSAB) has started an interesting educational path, establishing a working group that connects the school and the city, and with the city it experiments design solutions for architectural regeneration: *Arquitectos de Cabecera* (General Architects like General Practitioner) de Barcelona is a collective of architects and architecture students born in 2013 at the ETSAB, who work, along with other professionals, in the 'care' of dwellings, immersing themselves and integrating themselves in critical realities. The basic idea of AC is that the architect, as a professional of proximity, must take care of the person who lives in those places and the relations they have with the architectural space.

The idea proposed by *Arquitectos de Cabecera* opens, in our opinion, towards a new possible territory of the architect's profession. In the wide range of possibilities and professional opportunities, in addition to large real estate transactions and large infrastructure projects, there is a wide field of work consisting of interventions that work on the resilience of buildings. These are actions that range from simple maintenance to structural or energy rehabilitation; from the reorganization of the domestic space to the change in the use of the buildings or, again, to the care of the public space. In short, a set of architectural and urban opportunities that need the skills of the architect.

The young students, led by teachers (Ibon Bilbao and Josep Bohigas), have experienced in these years the possibility of responding to the specific needs and urgencies of the inhabitants of the Raval neighborhood, which is the most disadvantaged part of the historical center of Barcelona. The young architects listen to the needs of the patient, who is made up of the inhabitant and the building and, as competent technicians and with a global vision of the problems at stake, propose possible solutions [6].

Another interesting example of architectural resilience is the project carried out by an architectural collective, the Assemble Studio based in London, which since 2010 has been working on urban and architectural regeneration through participatory methods.

The *Cineroleum* project (realized in London in 2010) consists of the conversion of an abandoned petrol station into a cinema. The experiment derives from the reflection made by Assemble Studio around the fact that there are more than four thousand petrol stations in disuse throughout the United Kingdom. From this observation, the London team has experimented with the reconversion of this infrastructure, located in Clerkenwell Road in London, involving about a hundred citizens, who have lent their work to create the new cinema.

The "new" cinema radically changes the perception of that place, which until a while ago was simply an infrastructure without any particular quality. The intervention of Assemble Studio and the citizens of London who created *Cineroleum*, with a very contained action, has prolonged the existence of an obsolete and abandoned urban element, giving it dignity and a new life.

2.5 Urban resilience in the Italian regional laws

Urban resilience is commonly understood as the ability of a territory, of a city and of a community to prevent and "resist" correctly to some environmental and social problems: natural disasters, changes in climatic conditions, physical, social, economic degradation phenomena, in urban areas [4].

What should be the application of a resilient approach to planning on an urban and territorial scale?

Resilient city is an urban system that does not limit itself to adapting to climate changes (in particular to global warming) which, in recent decades, have made cities increasingly vulnerable with ever more dramatic consequences and enormous costs. The resilient city modify itself by constructing new social, economic and environmental responses that will allow it to resist the stress of the environment and history, over the long term.

Resilience is therefore today a necessary component for sustainable development acting, first of all, on the governance and management models of urban systems. A sustainable city is therefore a resilient city. The concept of resilience is associated with the climate change we are producing. The effects mainly concern the built environment ; the risk of exposure to natural phenomena can no longer be considered an eventuality but, under certain conditions, become an urban constant, as the inhabitants of Genoa and of many other Italian cities know that they often have to deal with the devastation of the floods.

In New York, the experience of Sandy Hurricane marked the start of a reflection on the shape of the city that includes the possibility that it changes based on the amount of space gained by water at every atmospheric event. In this scenario, some urban sectors should be considered as permanently submerged, it may be cheaper to surrender to the presence of water rather than investing large amounts of public money to defend itself unnecessarily from it [13].

The following are some significant models referable to Italian regional laws.

The new Regional Urban Law of Emilia-Romagna in the Organizational Technical Arrangement (DTO No. 8/2017) indicates, in a nutshell, that the objectives of the regional urban reform are: "to increase the attractiveness of cities with urban regeneration policies, enriching the services and strategic functions, environmental quality, resilience to climate change, seismic safety, etc. "

And, in Article 34 - Strategy for urban and ecological environmental quality, it states: "The PUG (the municipal urban plan), through the urban quality and ecological environmental strategy, pursues the goal of strengthening the attractiveness and competitiveness of urban centers and the territory, elevating the settlement and environmental quality through: the growth and qualification of services and technological networks, the quantitative and qualitative increase of public spaces, the enhancement of identity, cultural and landscape heritage, the improvement of environmental components, the development of sustainable mobility, and the increase of the resilience of the housing system referring to the phenomena of climate change and seismic events. "

The Urban Planning Law of Tuscany indicates inside article 62 - Quality of settlements – some indications about energy containment performance of buildings and urban blocks with reference to energy containment, resilience to climate change, usability and safety.

Title VIII - Rules for sustainable construction - Chapter I - Rules for sustainable construction - Article 217 - Sustainable construction. Purposes and public actions, the law gives as indications: "The Region promotes and encourages environmental sustainability, energy saving in the construction of public and private building works, as well as urban regeneration intervention; under Title V, Chapter III, inspired by the principles of the eco-district gives indications to pursue energy self-sustainability through the integrated use of renewable sources, resilience to climate change, rational management of resources, the use of low-carbon technologies, mobility systems multimodal sustainable.

Calabria, however, with the Regional Law 5th August 2016, n. 28 "Further amendments and additions to the Regional Law of 16th April 2002, n. 19 (Rules for the protection, government and use of the territory - Calabria Region planning law) "in Article 1 (Amendments to Article 3 of the LUR) indicates in paragraph 1. That after letter f) of paragraph 2 of the article 3 of the regional law of 16 April 2002, n. 19 (Rules for the protection, government and use of the territory - Town Planning Law of the Calabria Region), the following is added: "promote plans and programs of" Urban regeneration "aimed at the redevelopment of significant parts of cities and urban systems for to favor a territory saving, a mooring of urban fabric without attractiveness that satisfies the housing needs within the existing urban perimeter, creating, possibly, economies of scale.

These plans and programs must guarantee social inclusion, quality of life and urban resilience. The Regional Council, on the proposal of the Councilor for territorial and urban planning, approves an operational guidance document, to define the implementation modalities of the aforementioned plans and programs of "Urban regeneration", to which the local authorities can comply. ".

Particularly significant is the ten-point document of the ANCI (National Association of Italian Municipalities) on the resilience of cities.

With a view to resilient system, it is necessary to start from municipal civil protection plans. In fact, while the national, regional and provincial plans focus mainly to the other civil protection plans, the municipal plans are addressed directly to the citizens. The ANCI has long imagined a New Civil Protection System, which invests on the role of the City, of the Metropolitan City and of the Mayor, and enhances the principle of subsidiarity, the awareness and participation of citizens, implementing concrete projects such as the establishment of a National Civil Protection Day, the establishment of special territorial conferences, and the use of the civil service for the promotion of young projects on risk mitigation activities. In this context, the “Making resilient cities programme” can be the starting point for building a new civil protection that starts from local communities.

The 10 points to guarantee the resilience of a city.

- Ensure that within the local administration a coordination structure is set up to identify and reduce the risk of disasters, based on the participation of citizen groups and on alliances with civil society. Ensure that all sectors of the administration are aware of their role in reducing the risk of disasters and are ready to take action.
- To allocate specific resources to reduce the risk of disasters and give economic incentives to homeowners, to low-income families, to firms and to the community, investing in risk reduction.
- Maintain an up-to-date system of data on local risks and vulnerabilities, carry out risk assessments and take them into account in plans and decisions on urban development in cities.
- Ensure that these information and urban resilience plans are easily accessible to the public and have been publicly discussed.
- Investing in resilient and sustainable infrastructure that helps to reduces risks, ensuring maintenance and necessary adaptations to climate change.
- Checking the safety of all schools and health facilities and adjust them if necessary. Introducing and applying appropriate risk criteria in building regulations and land use planning.
- Identify, where possible, safe land to be allocated to low-income citizens and develop regeneration programs for unregulated settlements.
- Ensure the implementation of disaster risk reduction's training course and education programs; protecting ecosystems and areas that naturally act as prevention, to mitigate the effects of flooding, of intense weather events and other events to which the city is vulnerable. Adapt to climate change through effective risk reduction actions.
- Implement local monitoring systems for the preventive alert system and emergency management plans and regularly carry out exercises that involve citizenship.
- After each disaster, ensure that the needs of the victims are placed at the center of reconstruction and that they and civil organizations are directly involved in the definition of solutions.

3. Results

The manuscript analyze the issue of urban resilience through some best practices that have successfully tested its concept in some European areas; the resilience is declined with particular attention to the topic of water and energy efficiency in the Rotterdam's case study, regarding the building design in Bordeaux, Barcelona and London, and from the normative point of view and urban strategies, offering an overview of the italian and dutch case studies. But resilience is also in every project that regards public space that become the best space where to implement projects that have, as main aim, the goal to adapt cities and territories to contemporary climate change making a less vulnerable city and mitigating environmental hazards.

The comparison shows that in The Netherlands greater attention is paid to the strategic aspect of urban planning; in the dutch policies, resilience becomes part of appropriate urban strategies promoted by municipalities but shared with all urban stakeholders and climate adaptation assumes the role of a real urban strategy that can innovate the city, making it more interesting and innovative.

Rotterdam's climate adaptation strategy is based on some actions to optimize the water defense system; improvement of resilience through adaptive measures to be implemented throughout the urban environment; the strategy shows great attention to some key actions such as safe districts, flood-proof construction, floating buildings such as the Rijnhaven project, or water-based public spaces that increase the resilience of the system.

It is planned also the development of public areas used to store rainfall, which will be used to irrigate urban green areas; the storage capacity of underground water will be improved; collective water gardens will be implemented, mostly in the common private areas; the green roofs will allow the storage of part of the rainwater. Especially from the Dutch case study, it is clear that resilient and defensive urban design actions are contained within appropriate urban planning policies and instruments; currently, the structural reinforcement of dams and of the water defense systems are responsibility of the Ministry of Waterways and Public Works but, from the point of view of cooperation, it is desirable to involve in this process, provinces, municipalities, private companies, universities, research centers and citizens in the implementation of all the actions envisaged for the increase of urban resilience.

Additional areas of water storage are included in the projects that are currently being implemented in Rotterdam, for example in *Centraal Station* or in *Kruisplein* and also in the urban visions 2030 or 2050 as "Rotterdam child friendly city" or "Wilderness school playgrounds". Strategic initiatives such as "moving to the rhythm of the city", and "Green Team. Paving out, Plants in " containing resilient concept. The creation of a waterproof city requires individual approaches to the problem and intensive cooperation between water boards, the ministry, the municipality, urban developers, private companies, housing corporations and above all the direct involvement of the inhabitants of the city. It is absolutely essential that everyone does their part to implement the strategy defined for the creation of a resilient city.

The approach pursued through the manuscript want to encourage resilience and flood protection through the architectural and urban project; use public space as strategic soil where developing the resilient city, use engineering technical climate defences as new public spaces for citizens and communities.

Resilience themes are included in all levels of government and in all urban planning instruments and spatial and strategic development policies such as in some project concerning public and private space; The defense works become spaces for the city; These actions will not only contribute to making cities more resilient but will contribute to the creation of a more pleasant and attractive urban environment.

In all the mentioned urban projects, architects and urban designers are finally responding to the threats of rising sea levels by "welcoming the water" into city; water became a resource, an opportunity and become the “leitmotiv” to reuse and regenerate communities and the public space of a contemporary city.

4. Discussion

The projects illustrated in this manuscript belongs to the category of urban transformation projects that seek to respond to happening climate change trying to contribute to the formation of a resilient contemporary city, capable of adapting to the environmental transformations and contributing to the construction of a city that is waterproof and energy performed; a city that has equipped itself with suitable urban governance tools and has adopted smart planning and the resilient concept in the sectors that drive urban transformation.

If the meaning of "Smart City" in its complexity includes Smart Economy, Smart People, Smart Governance, Smart Mobility, Smart Environment, Smart living, we are called on to develop - working in close collaboration with public and private entities that operate on territories - a platform design, a set of actions that aim to make them "smart", as it can produce high technology, reduce energy consumption in buildings, promote clean transport and improve the overall quality of life of all its inhabitants. The prospect of smart cities is to think of urban organisms that produce a better management from their own internal capacity, mobilizing technology and behavioral resources, capable of making more sustainable, and therefore more attractive, the urban environment. The environmental virtuosity has to be a common element of all the smart and resilient city.

Smart planning becomes the laboratory-zip, a strategic and operational interface between "content" and "container". The design of the smart city it will affect all levels and sectors. In particular, residential and specialist (structures, systems and finishes) and their relationship with the functionality of the system.

The principle of efficiency is the basis for planning and for performance on which is based the agenda of all the resilient cities, while the principle of conservation of energy is the basis of civilized behavior of the citizens. For this reason, the smart and resilient city must link "instances of the city," and must transform the detractors of urban quality (and contingent problems that are inherent in every urban reality) in new requirements for quality and performance, must deal with the rapid extension of the residential, industrial, commercial, and tourist districts, must develop energy efficiency and climate change using appropriate tools to support the smart growth answering to the challenge of increasing its competitiveness, identify the forms of service and innovative management models, in relation to the types of activities, that are able to achieve an efficient use of available resources. Smart planning is the new model for integrated planning of the smart city, that is not completed within the standards and codes, but it is also building the "owned" idea of the city, the management of its implementation through monitoring the environment data.

A waterproof city needs individual actions and cooperation between water boards, ministries and municipalities, urban developers and private firms, the housing corporations and, over all, the citizens and, above all, is deeply important that Resilience theme is included in all levels of government and in all urban

planning instruments and spatial and strategic development policies; in this way it could be the key factor to develop a new vision of public space and of safety communities.

Urban governance is the best place to establish goals and objectives that must be pursued for the creation of a resilient city. The city must be a unique, resilient project, and every part of it, both public and private, must be seen as a potential space in which to pursue climate adaptation policy. To make smart planning implementable and equip it with the new paradigm of urban resilience, all levels of government and all the stakeholders involved in the urban milieu of which we are working for, must be involved. The resilient city is an urban challenge, but it is also a political and economic challenge; making the city resilient means, as happened in the Netherlands, to anticipate environmental risks and to encompass them within the planning domain; constructing an urban planning that is a puzzle of specialized skills that only in their unitary design can lead to tangible results and to the creation of a desirable, less vulnerable city for smart citizens.

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