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Journal of
Land Use, Mobility and Environment

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THE CITY CHALLENGES AND EXTERNAL AGENTS.
METHODS, TOOLS AND BEST PRACTICES

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The cover image is a photo of the 1966 flood of the Arno in Florence (Italy).

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Project role for climate change in the urban regeneration. Reinventing cities winning projects in Milan and Rome

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Abstract

The effects of the climate change employ a strong impact on the city and on the inhabitants, in fact the risk appears to be particularly clear in the metropolis. The urban setting fulfils a leading role in the consequences on the climate situation and the cities turn out to be the mainly responsible for the emissions of pollutants. In this situation the urban regeneration, as an opportunity to operate on the city's "wounds" through an accurate plan, tries to improve the reactions of the urban territory even in terms of environmental sustainability. Becomes particularly important summarising the different kinds of knowledge of the various disciplines to assure the management of complex processes, like those of the transforming city that need a new way to intervene in the urban project. The urban regeneration is a "multidisciplinary container" that can efficaciously face the needs of the territory, a way to obtain the urban quality. The Italian metropolis manifest the will to align to the international expectations through the implementation of targeted urban regeneration built-in programs. The Reinventing Cities projects present solutions attributable to those typological features necessary by now in the sustainable urban regeneration projects, showing vision of a renewed architectural projects.

Keywords

Climate change; Urban regeneration projects; Metropolitan cities; Reinventing cities

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1. The city regeneration to answer to world change

The effects of the climate change employ a strong impact on the city and on the inhabitants. The atmospheric pollution, as declared by the European Environment Agency (EEA), continues to significantly impact the citizens in the urban areas (EEA, 2019). The risk appears to be particularly clear in the metropolis, where three-quarters of the population are exposed to very high level of concentrations of particulate.¹ The climate change is the direct result of the atmospheric pollution and appears today as the biggest environmental threat for the human well-being. Significant impacts of the climate change influence more and more all the countries and the people worldwide (Papa et al., 2015). The threat of the phenomenon has persuaded to act even the United Nations, that have introduced the goal n° 13 among the "Sustainable Development Goals (SDGs)", aimed at fighting the climate change, for the decrease of the pollution and the global warming. A fight that starts from the city, as disclosed by the goal n° 11 of the 2030 Agenda of the United Nations: it is necessary to make the cities and the villages long-lasting and sustainable (ISTAT., 2019). It is inevitable to think to a strict relation among environment, sustainability and city. The urban setting fulfils a leading role in the consequences on the climate situation; the cities turn out to be the mainly responsible for the emissions of pollutants in the atmosphere, primarily due to urban mobility, buildings and factories (Leoni & Viti, 2018). To turn the tide, it is necessary to start again from the cities, transforming them from pollution generation to urban lungs. The urban regeneration, as an opportunity to operate on the city's "wounds" through accurate plan, tries to improve the reactions of the urban territory even in terms of environmental sustainability (Di Lascio & Giglioni, 2017). A well-structured action that, among the main goals, is determined to: reduce the polluting emissions through implementation strategies that favour the use of the sustainable mobility; support the use of renewable energies, sustainable and environmentally friendly materials, preferring them to polluting building materials (CNAPCC, 2012). An eco-friendly core that behaves as "multidisciplinary container" (Fig.1), that includes the totality of aspects such as social, economic, environmental, landscape, architectural, technical etc. (Cabras, 2017). According to this premises two questions are founded: can the coordinating role of the different fields that act on the urban transformations be led to the architectural project? How can the project action answer to the atmospheric pollution of the cities, in terms of environmental sustainability and urban regeneration?

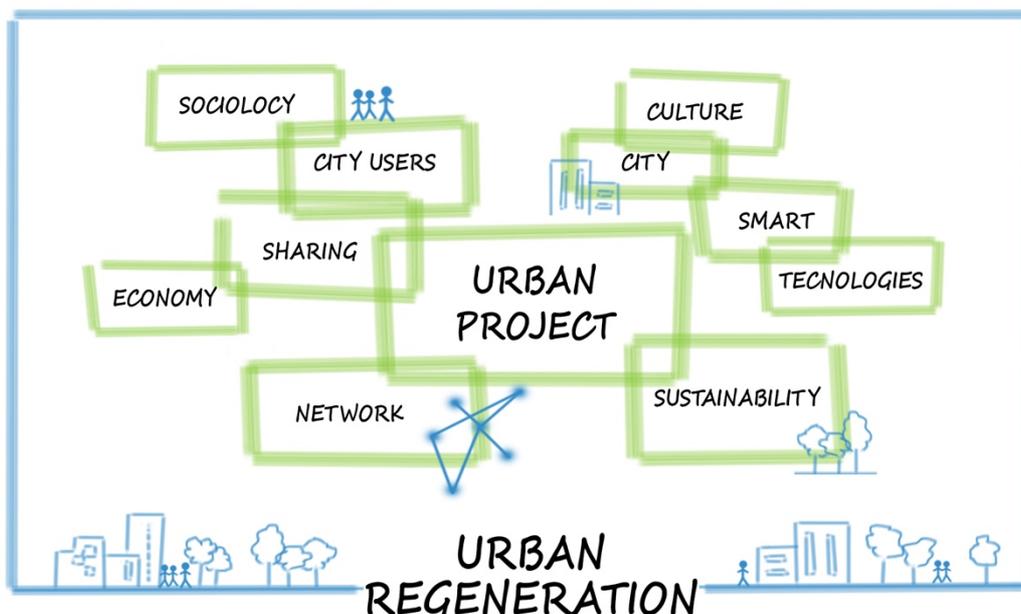


Fig.1 The shared centrality role of project in Urban Regeneration, a multidisciplinary container of urban items

¹ The WHO (World Health Organization) sets PM 2,5 as limit for the particulate.

Those aspects, structured and integrated with each other, give rise to complete policies able to efficaciously face the needs of the territory. Becomes particularly important summarising the different kinds of knowledge of the various disciplines to assure the management of complex processes, like those of the transforming city that need a new way to intervene in the urban project. With this statement, the aim is to confirm as the urban project is evolving from unconditioned centrality to "shared centrality". The challenge recognizes an occasion to reach a common goal in the potentialities of the integrated projects: the urban quality (Berdini, 2014).

1.2 The urban quality

"The image of object seen for the first time may be identified and related not because it is individually familiar but because it conforms to a stereotype already constructed by the observer [...]. A workable image requires first the identification of an object, which implies its distinction from other things, its recognition as a separable entity. This is called identity, not in the sense of equality with something else, but with the meaning of individuality or oneness. Second, the image must include the spatial or pattern relation of the object to the observer and to other objects. Finally, this object must have some meaning for the observer, whether practical or emotional. Meaning is also a relation, but quite a different one from spatial or pattern relation."²

The quote by Lynch (1960) inspires to think about the importance of the image of the city and its perception, an aspect strictly connected to the quality of the city spaces, compromised in the case of a crumbling urban environment. The goal declared by the regeneration relies on this aspect, indicating as ultimate purpose the achievement of the urban quality, as well as the renovation of the city from the current crumbling image (De Carlo, 2013).

Pursuing the urban quality means to dynamically relate all the elements linked to the redevelopment of an area to the wider ones connected to the background where it stands (Blečić & Cecchini, 2016).

The sum of several good projects is not enough, indeed, to guarantee the improvement of the quality in the urban experience for the inhabitants, but it offers a vision physically limited to the reinstatement of the quality of the project area (Cocco, 2017).

The parameters to consider for an action that has such purpose are countless; however, it is not possible to analyze the possible scenarios in their entirety because each place is subject to the influence of several variables, whether physical or not, that condition the urban area.

The good architect, to chase this purpose, must accept the "new planning analysis" proposed by the regeneration schedule and must analyze the city to regenerate from a wider and more critical point of view (Falzetti, 2004).

To clarify the concept, it is necessary proposing some examples of territorial and social markers useful for the achievement of the goal. Those parameters can't be neglected; they are observed in most cases, that can represent a starting point for a more extensive and contextualize analysis:

- A performance analysis of the urban setting, the energies and the materials used for the control of the polluting emissions. Knowing the "sustainability level" of the urban area;
- The identification and the analysis of the urban fabric that characterize the urban morphology;
- A qualitative analysis related to the consolidated construction industry, with the identification of dynamic areas for the uncontrolled expansion that need regulatory and upgrading interventions;
- The process of locating of cornerstone areas for public and social life;
- Analysis of the local economy related to the urban background;

² Kevin Lynch, back in the '60s, with his book "The image of the city", expresses an idea still efficient and actual. He describes as the image of the city is perceived by the inhabitants and how this vision influences the identity of the urban place itself. The today's issues on the urban regeneration recalls the theories of Lynch, directing the way toward the renovation of a quality urban image.

- The process of locating of the administrative and public activities and a quantificational and qualitative analysis of the public and private services for the inhabitants (transport, pedestrian and cycle mobility, itineraries and parks, public areas) (Bertuglia & Vaio, 2019).

As a support for the actualization of regenerative actions, finalized to the achievement of the urban quality, AUDIS has developed the urban regeneration document and the urban quality matrix (Tricarico & Wanner, 2012). The document clarifies and deepens the concept of quality itself and it shows a model to adopt for urban projects for the fulfilment of plans finalized to the sustainable urban improvement. Among the essential requirements listed in the document for urban regeneration by AUDIS, it is especially highlighted the one related to:

- *Environmental quality*, that aims to equilibrate the relation between the environment and the built, in favour of a sustainable development. To achieve the goal, it is necessary starting from an accurate evaluation of the pre-existing environmental conditions; it is important acting to preserve the environmental conditions in favour of the inhabitants' health. This marks the first step for the assignment of the intended use of the places;
- *Energetic quality*, for the cities prefigured as energy-intensive organism, composed of buildings mainly constructed during the half of the last century. The plan proposes a change of course to make the buildings' cases more efficient, to reduce the waste of energy. Converting the cities into eco-cities, characterized by a control of the consumptions and use of the renewable resources. An attitude finalized to the environmental and human well-being, that experience the built³.

In the urban regeneration plan, the "building issue" represents, therefore, an important role, in the matter of energetic efficiency of pre-existing buildings, to renovate and newly built.

The projects in line with the principles of urban regeneration must inevitably include the use of sustainable materials and renewable energy, in case of rehabilitation projects of the pre-existing buildings, preferred to the newly built projects, and act to improve the energetic class of the older buildings, therefore substituting the old heating system with those of the latest generation, that use renewable and green energy (Lombardi, 2008).

The role of the project is to take on the sustainability challenge, including the answers on the energetic and environmental efficiency, for a new ecosystem built of sustainable and energetic auto-sufficient spaces. The architectural project, therefore, is able to provide a concrete reply to the need of greener and cleaner cities, showing a new awareness and a renewed will to act, answering to the contingent request of renewed liveability and sustainability of the territory and of the inhabitants themselves (La Varra, 2016).

So, the project supports an intervention line for the cities finalized to the achievement of the "urban welfare" that satisfies the needs of both the city user and the urban resilient organism, meant as an active organism able to evolve and change depending on the needs change (Bertoglio, n.d.).

A first step toward the decrease of the emissions of the urban organism is linked to the transport network, to the pedestrian and cycle mobility (Bianco, 2008). If each city succeeds to guarantee a more efficient transport network, a cycle lane network across the entire city, well-structured and safe pedestrian paths and sharing services, the use of private vehicles would be reduced improving the quality of the air. The issue of the transport has a huge role in the pollution of the city; however, is just one of the culprits of the climate change (D'Ambrosio, 2015).

The problem indeed is more entrenched, and it can't be limited to the smog due to the transport but it should be deepened, as suggested in the document about quality by AUDIS, in terms of several aspects intrinsic in the urban background.

³ The issues disclosed come from the synthesis of the definitions of quality suggested in the urban regeneration document by AUDIS (Tricarico & Wanner, 2012).

1.3 Milan and Rome, the sustainable action to urban regeneration

The atmospheric pollution is one of the main problems that affect the “metropolitan city”⁴. In fact, the improvement of the air quality is the first goal to be achieved to obtain the urban quality in the cities. Rome and Milan are the symbol of this topic. Their territorial extension, the inhabitants’ density, the mobility and the land-use negatively affect the environmental efficiency of the urban system, contributing to the increase of the climate pollution (Mazzeo, 2019). In this context, the environmental aspects are a fundamental component to city planning. The actions for the development in the strategics and territorial plans converge toward an urban planning and a social-economics development of the city, integrating sustainable solutions for the transport management, the increase of the sustainable mobility, the promotion of the pedestrian and cycle mobility, the reforestation of city areas with high building density, the conversion of municipal waste management towards a policy based on 70%-80% on recycled resources. These are solutions aimed to reduce the pollutant emissions and to the purification of microparticles emitted by the city as an energy-consuming organism. However, the applied effort is not enough to reach the goal of making the cities sustainable. In fact, the climate change fulfils a leading role in the Italian metropolis, in which the particulate emissions overcome the maximum level during most of the year. As showed by the annual report published by Legambiente⁵, the riskier situation involves the major cities in Italy, first Milan and Rome (Fig.2). Despite the “unlawful”⁶ Italian cities decreased from 62 to 26 entities in the last 10 years, Milan is still first in line having exceeded the limit of emissions 10 years of 10. Rome, instead, even if it is lower in the list, is still far from being a sustainable city, recording an excess of emissions 7 years of 10 (Fioravanti et al., 2020).

YEARS IN WHICH THE LIMIT IS EXCEEDED	CITIES THAT HAVE EXCEEDED THE LIMIT OF FINE DUST (PM10) FROM 2010 TO 2019
10/10	Alessandria, Asti, Brescia, Cremona, Frosinone, Lodi, Milano , Modena, Napoli, Padova, Pavia, Reggio Emilia, Rimini, Rovigo, Torino, Treviso, Venezia, Verona, Vicenza
9/10	Bergamo, Ferrara, Monza, Parma, Piacenza, Terni
8/10	Avellino, Como, Mantova
7/10	Benevento, Novara, Ravenna, Roma , Vercelli
6/10	Biella, Bologna, Palermo, Pescara, Trieste, Varese
5/10	Forlì, Pordenone, Prato
4/10	Cagliari, Firenze, Lecco, Lucca, Pesaro, Sondrio
3/10	Ancona, Caserta, Cuneo, Perugia, Salerno, Trento
2/10	Genova, Latina, Macerata, Pisa, Udine

Fig.2 List of cities that have exceeded the limit (50 microgram per cubic foot) of PM 10 in the last 10 years by Legambiente (Legambiente, 2020)

Doing a parallelism between the two metropolitan situations, we can identify as in Milan the change toward the “sustainable future city” has already started. The very urban morphology that characterizes the city allows an easier insertion of systems of pedestrian and sustainable mobility. The presence of different metro and tram lines, indeed, favours the use of the public transport, as well as the possibility to use sharing car or bike systems whether electrical or not. The action is not limited exclusively to the use of an eco-friendly means of

⁴ The Italian metropolitan areas are identified by a national law, n. 56/2014, which provides for the institution of ten “metropolitan cities” on the territory of the previous provinces. The new institutional subject interest the cities of Rome, Milan, Naples, Turin, Genoa, Venice, Bologna, Florence, Bari and Reggio Calabria. They are characterized by a specific system based on qualitative consideration and on their social, cultural, economic and territorial topic of the cities (Mazzeo, 2018).

⁵ Legambiente, with the report “Mal’aria di città 2020”, launches a further warning about the increase of the pollution in the Italian city, whose emissions are mainly due to: traffic, domestic heating, factories and rural activities. The primary particulate represents the 30% of the total emissions, divided in turn by the combustion of the wood (60%) and by the cars (12%). The second particulate is instead responsible of the 70% of the pollutant emissions, namely those developed from trailblazing gasses such as ammonia, nitrogen oxide and volatile organic composites, mainly coming from the rural field and from the traffic.

⁶ With “unlawful” are meant all those cities that exceed the set limit of PM 10 emissions.

transport but it also aims to a re-statement of the urban territory toward a scenario that places the city user in the centre of the urban planning, meant as "pedestrian" user in the city, giving to it the chance to experience the territory through the increase of the pedestrian paths, the public places such as squares, parks and green areas, converting the city in a series of "urban opportunities" for the psychophysical well-being of the user. So, the public urban areas will not be just meeting points for the inhabitants but they will become the connection between city and nature, building a bridge between built environment and nature, that embellishes itself of a strong common and social value for the city users (Zanchini et al., 2019). A very significant fact that proves how Milan is ready for a change, with its "multimodal" population, namely used to use different mobility systems in addition to their own means of transport, with a percentage of 90%; a fact that in Rome is less significant showing a percentage of 35%. On the other hand, the capital, both for its morphology and its territorial expansion, must face problems that make it difficult to effect plans focused on the realization of pedestrian and shared itineraries; nevertheless, the purpose is to convert even such a huge city into an urban territory "suitable" for a multimodal population. The evaluative comparison is finalized to understand the development phase of two Italian metropolises, located in two different territorial background far from each other (north and centre of Italy), to identify the differences and understand the reasons, with the goal to extract a critical analysis related to the regenerative and sustainable action in place in the Italian cities.

2. Reinventing Cities: the urban projects

Among the atmospheric pollutant, produces by combustion processes, one of the most dangerous is obviously the CO₂, predominant greenhouse-effect gas; together with ozone and soot from diesel fuel, they all have a huge impact on climate, being responsible for the global warming (European Commission, 2016; European Parliament, 2020). To fight the problem of the emissions, with special attention for the decrease of the CO₂ emissions, it is important to display the action conducted by the C40 Cities plan, a network of cities located worldwide and active in their fight against the pollutant emissions, working for a more sustainable future with zero carbon emissions projects to spread all around the cities. An action that materializes with the launch of the international competition "Reinventing Cities", a global design competition for climate change and resilience⁷ a call for urban regeneration of unused or crumbling sites, now at the second edition.

"The Reinventing Cities competition has inspired exactly the inventive collaboration we need to combat the climate crisis – from the skills and creativity of architects, artists, environmentalists and entrepreneurs. Reinventing Cities is more than an innovative competition – it is providing vital solutions to build the urban future we want."⁸

The project "Reinventing Cities" performs an action toward a better future for both city and inhabitants, aiming to globally stimulate new zero carbon emissions projects by effecting the best ideas to transform under-used or unused sites into symbols of sustainability and resilience. A competition among cities and sustainable development. We need to work on the cities, that are the bigger culprits for the global pollution. The challenge launched by the call C40 aims to contrast the planning attitude that has led to the actualization of the current environmental problems to encourage an aware action to build a better and more respectful world. The main goals of the Global Competition are:

- Reducing the emissions from the buildings to decarbonize the built environment;
- Stimulating an innovative urban planning and new sustainable services for the cities;
- Creating smart and reproducible solutions;

⁷ A resilient city is an urban system that is not limited to the adaptation to current changes, in front of which the cities are more and more vulnerable, but it is a community that transforms itself planning social, economic and environmental innovative answers that allows it to resist for long time to solicitations from environment and history.

⁸ Mark Watts. C40 Executive director. 4 Decembrer 2019. https://www.c40.org/press_releases/reinventing-cities-competition-2.

- Catalysing an ecologic revolution and a change of paradigm in the urban development.

Within the 2050, another 2.5 million people will live in the cities; it will so necessary building almost a billion of new houses. To decrease the emissions, it will be necessary planning more performing buildings, fulfilled with sustainable and recycled materials helping to reduce the consumption of the global resources of which the construction industry is responsible for the 30%. The buildings are totally responsible for the 50% of the urban emissions in the cities; therefore, the sustainable planning in the regeneration plans performs a fundamental role. The action on the buildings is one of the three issues listed in the plan C40, from which the following goals are taken:

- BUILDINGS: making sure of each new house is zero-emissions within the 2030;
- MOBILITY: making zero-emissions both public transportation and entire urban areas; promoting walking and cycling schemes;
- WASTE: reducing by 50% the total amount of waste and reducing the production of garbage by 15% per capita.

The methodology actualized for the realization of the plan considers the initial identification of under-used or unused urban sites, from the public entity, to be sold or assigned for the redevelopment. Then it organizes and supports the competition C40, to which the multidisciplinary teams who attend it, composed of architects, engineers, entrepreneurs, economists, artists, etc., will propose their ideas as integrated regeneration plan. Finally, per each listed site, the projects that best answers to the suggested goals will be chosen. To date, there have been two editions of Reinventing Cities: the first ended in 2019 in which participated only Milan, like an Italian city; the second edition⁹, not yet completed, with the participation of Milan and Rome, showing the willing to take steps to sustainability (De Stefani, 2020).

2.1 The first edition of “Reinventing Cities”

The first edition of the call C40 has responded with great success to the environmental and social requests, establishing new models of city project. Eco-construction projects, wooden buildings, use of bio and local materials (mud bricks, hemp), reuse of scrap material from demolition sites are promoted. Sustainable design projects and passive and reversible buildings, co-housing; high energy efficiency buildings, that produce clean energy from renewable resources. The adoption of alternatives such as sustainable mobility, car-free places, bike sharing, electrical vehicles validates the sustainability of the proposed ideas. Milan is the first Italian city to take part to the competition “Reinventing Cities” with 4 winning projects (Fig. 3):

- Scalo Greco Breda, winner with the project “L’innesto”, the first zero-impact Social Housing in Italy;
- Scuderie de Montel, winner with the project “Teatro delle terme”, a new urban park characterized by blue-green infrastructures (water-park), transforming a historical building into a thermal place in a strategic location (Sar Siro neighbourhood);
- Viale Doria (Doria Site), winner with the project “Co-Inventing Doria”, manifesto of the urban sustainable regeneration, where public and private spaces interact, creating a resilient and sustainable spaces for the city users;
- Via Serio (Serio Site), winner with the project “Vitae”, a permeable architecture that poses itself as bridge between private and public life; nature is its main constituent, the building able to “breathe” and purify the air.

L’innesto: a new way to live in sustainability; it is an element for mending the urban fabric able to create connections; it integrates and valorises the project area with the surrounding neighbourhoods, both from energetic and social point of view. The project is characterized by three purposes:

⁹ The second edition of Reinventing Cities is not yet completed, for this reason in this paper will see in detail only the winning project of first edition, to comprehend the role of architectural project in the regeneration programs of cities.

- Environmental sustainability: aiming to balance the emissions of CO₂ making them equal to zero;
- Economic sustainability: providing a system of resources, spaces and community management, embracing the basis of the circular economy;
- Social sustainability: realizing a human adaptive zone inside the neighbourhood.



Fig.3 Reinventing Cities I call: winning projects in Milan

The winning project proposes a new neighbourhood for the social housing in Milan, the first in Italy with zero emissions, synergistic and sustainable. It is surrounded by the green that covers more than 60% of the total surface, among community vegetable gardens, greenhouses orchards, didactic green spaces and pedestrian public itineraries. Moreover, it is expected the tree planting of 640 species to mitigate the emissions of CO₂ and reforest the urban areas. As further solutions for the decrease of the impact on the environment, itineraries for the pedestrian, shared and electric mobility are integrated. The proposed strategies to reduce the car ownership and encourage the use of ecologic vehicles, public transport, bicycles and seamless mobility would convince a behavioural change, thus limiting the use of their own vehicles with a decrease of CO₂ emissions amounting of 8.022 tons until 2050. The project will be managed with resilient and coordination, thanks to the involvement of several public and private stakeholders, establishing a collaborative and inclusive neighbourhood. The buildable surface measures approximatively 24 thousand square meters; 21 thousand square meters will be intended to social housing (up to 1,500 new inhabitants) and 3 thousand to additional function (coworking spaces, commercial activities, supermarket). The new accommodations will be all "Nearly

Zero Energy Buildings (NZEB)", mostly fulfilled with sustainable, renewable or recycled materials, integrated with construction and technological prefabricated systems to minimize the emission of CO₂ and the production of construction waste, allowing to disassemble and reuse the structure 100%. It is considered a structural system able to adapt to different design needs, with flexibility and attention to the entire life cycle of the buildings. A prefabricated construction system allows the optimization in the use of materials, according to their physical-mechanical characteristics, allowing the containment of material waste and minimizing the production of construction site waste. The buildings are equipped with heating systems with radiant floor panels and with photovoltaic systems, an architecture based on sustainability. They also provide for sustainable water management for the reuse of rainwater 100% in situ, saving the 30% on drinking water and the 15% of black water. The water will also be heated with a fourth-generation heating system, powered by renewable energy sources. To make the buildings emission-free is the high-performance and low-consumption thermo-acoustic insulation system that allows the user to monitor and manage their consumption. Finally, great attention will be given to the waste cycle, providing a separate collection system with weight detector. Great value is given to the concepts of community and inclusion, with the birth of a Human adaptive zone consisting of spaces and services for everyone: laboratories, food hub, circular economy district, energy centre; areas that adapt to the needs of the inhabitants, in which interaction and social cohesion are facilitated and promoted. The sharing spaces were created as flexible and multifunctional places, aimed to encourage relations between the inhabitants, involving the entire neighbourhood in the care of the common areas, generating a sense of belonging to the place (Reinventing Cities, 2019a).

Teatro delle terme: a multifunctional centre, which recovers the relationship with water, land and vegetation, exploiting the logic of well-being and balance as a connection between the urban community and nature. The Thermal Park and the SPA find space within the new urban park, the result of the recovery of the existing stables and green areas, thus defining a harmonious confluence between architecture and nature. The goal is to provide the city users with an urban oasis, made up of gardens, vegetable gardens and green paths, for the psycho-physical well-being of people. Starting from the recovery of an existing building already represents a design approach based on sustainability; however, the volumes of new construction integrated with the pre-existing ones are minimal and made almost entirely from eco-sustainable materials, low energy consumption, highly performing for the constant maintenance of comfort living inside the building. The materials used (biocompatible, removable, replaceable and reusable) have low CO₂ emissions both during production and in life and they are recyclable at the end of their life cycle. The construction method is sustainable, mainly of the "dry" type, minimizing the use of materials and reducing construction time. In addition, particular attention was paid to the recovery of the existing building, in order to ensure energy containment; were used solutions for the energy improvement of the building envelope (thermal insulation, opaque vertical surfaces, thermal break windows). To complete the building, were added performance and energy-saving systems that use advanced technologies for air treatment, exploiting the characteristics and the thermal energy of the air outside the building. Inside the building, the thermo-hygrometric comfort is guaranteed through innovative plant solutions, equipped with a high-efficiency heat recovery system. The energy intended for the SPA comes from renewable sources, specifically from the thermal solar panels installed on the 110 m² roof. In this case, the focus was on two main aspects, the energy and material and the naturalistic one, presenting a highly performing project that integrates itself with a strong presence of greenery as a compensation for CO₂ emissions (Reinventing Cities, 2019b).

Co-Inventing Doria: the project of an innovative hostel with public functions, that opens to an innovative urban sociality, understood as accommodation connected to the social context and to the use of innovative technologies for the containment of energy consumption. The proposal puts pressure on the concept of sharing economy, overcoming the idea of ownership for the definition of a public quality. Places of social cohesion made up of gardens, woods and tree-lined avenues, linked by squares, cycle paths and services; versatile

spaces, capable of reconfiguring themselves to accommodate different functions over time. The area has excellent accessibility, enhanced by cycle-pedestrian mobility systems, soft mobility and sharing platforms. The building is part of a congested area between two buildings and, therefore, not being able to act on the orientation of the building, a compact building was proposed, with a maximized coverage area for the exploitation of solar energy. The building envelope is composed of a Breathing Wall that takes on the function of heat collector and filter, inside which are generated air flows for the ventilation of the building. An ad hoc module A.M.I.C.A. (Integrated Modular Environmental Control Apparatus) was invented for the project, able to modulate the air flow through a mechanical ventilation system placed above the windows, reducing the use of air conditioning systems. The building has a hybrid system consisting of a hydrothermal heat pump that will cover the heating and cooling load, while most of the energy needs will be covered by the roofing photovoltaic system. In addition to the use of energy originated from renewable sources, there is particular attention to the use of sustainable materials, such as wood for the bearing structure mixed with ready-mixed concrete consisting of 55% recycled materials and reinforcement bars with 96% recycled material. The goal of the project is to aim at the shared use of urban spaces; experimenting new approaches for the management and use of public spaces, *Co-Inventing* promotes the development of Apps to encourage sustainable behaviour for shared space (Reinventing Cities, 2019c).

Vitae: An advanced model of urban coexistence, result of a cross-fertilization process from different fields of interest. The project shows a domestic soul designated as guest house that it adds up to several functions, such as office and cancer research laboratories. Within the complex the vetrine Horto are located, a catering project uniquely sustainable, that uses zero food miles products and from a hydroponic greenhouse.

The working space are conceived as sustainable spaces that guarantee a thermal comfort combined with energy saving; spaces that intertwine with the green pedestrian path that surround the whole building establishing a strong harmony with nature, in which the selection of the plants was made in order to defend the biodiversity.

A Green Spiral to connect the terraces, surrounded by greenery, that hosts activities dedicated to health and to wellness, solutions aimed to the re-acquisition of the high quality of life in the office and the improvement of the liveability of those who live there. With the presence of green areas that develop throughout the building, a connection is established between inside and outside, a necessary bridge to bring the external environment into the inside and the work that takes place inside becomes practicable also in the outside, improving the quality of work.

The building is constructed with a hybrid construction system, using different materials (concrete and wood), able to respond to different spatial configurations. The building is powered by certified green energy, partially from on-site renewable sources, photovoltaic panels, rainwater recovery and groundwater source. The latter is used for heating domestic water and for building air conditioning, so it was not necessary providing thermal solar panels, thus maximizing the extension of the green roofs. The building system is completed with an innovative technological system for the façade, which allows to adapt the envelope to different sun exposure, weighing the amount of shading according to the intensity of the sun's rays. To minimize the waste, the project envisages the adoption of a BACS (Building Automation and Control System) system for the automatic regulation of plants, integrated with renewable source and safety & security systems.

The introduction of BMS systems (Building Management System) and the application of IoT technologies are also planned, for the intelligent monitoring of energy consumption, for the reduction of pollutants present in the air and for the automatic regulation of environmental comfort in function of the individual user and of the changing external climatic conditions. Solutions to improve the performance of the building envelope, for energy saving and for thermo-hygrometric well-being for those who experience the spaces.

A green lung to improve the quality of air and life, which is part of a regeneration process for the environment and for humans, focusing on the importance of people's psychophysical conditions in the workplace (Reinventing Cities, 2019d).

2.2 The emerging disciplines in the scenario of the urban regeneration

The description of the winning proposals of the first edition of the C40 call shapes up to be a representative process for a comparison among the design interactions and the disciplines that are most involved in the current scenario of the urban transformation. These proposals present a homogeneity of technological solutions, almost classifiable in a "typification of interventions", with contents that are now essential in the sustainable urban regeneration projects. The fundamental and recurring aspects are related to:

- bioclimatic design, which focuses on the use of technical solutions for the saving of energy consumption, making the buildings highly performing (NZEB buildings);
- the use of recycled and sustainable materials, designed to be reused at the end of their life-cycle;
- the reduction of polluting emissions, providing design solutions for an urban reforestation and a stimulation for soft and sustainable mobility (CNAPCC, 2012).

Finally, the weight of the environmental sustainability in the regeneration of the cities also represents a further confirmation of the widespread theming of common principles and aims, reconfirming itself as a key issue articulated among multiple application fields. A highly specialized network that confirms the importance of synergic actions in the urban project. The architectural project, "historically" exclusive and centralized in urban redevelopment, combines with different declinations of well-known fields, related to the city, initiating new professionalisms (Haddock & Moulaert, 2009). Their inclusion allows to involve sectoral issues that become complementary to the urban project, hypothesizing fruitful connections aimed to solve the city's vices through the application of a single articulated plan. A complex network of contaminations affects the planning and design subject, "compromises" it in its autonomy, bringing into it the technical-scientific conditions about environment, economy, finance and society (D'Onofrio & Talia, 2015).

Reinventing Cities¹⁰ represents the example of how professionalism and fields oriented to economic and social development, although differentiated, can work in synergy and for articulated projects. In fact, a fundamental requirement to participate in the call for tenders sees the establishment of a multidisciplinary team as a strength (De Stefani, 2020). To this end, the participation of economists, sociologists, climate and transport experts, etc., plays a decisive role in the cognitive phases of the city and in the re-organization of the related analytical data in all its aspects, an organizational chart guaranteeing the achievement of the identified aims. The local regeneration plan is thus precisely focused both on the needs of the territory and on the involved disciplinary declinations (Bollini, Laniado & Vittadini, 2018). The emerging professionals are placed in the process of the urban project and the project on the scale of the building at different moments of its definition: one that proceeds in parallel to its preliminary settings, the other that interacts with its solutions. The first is aimed to search for objective data, useful for reading and understanding the economic and social configuration of the place; the second is rather aimed to build an operating program focused on the potential in terms of local economy, urban social release in the more general perspective of the

¹⁰ Reinventing Cities shows even more his multidisciplinary approach in the second edition of C40. The requests and objectives of program have increased compared to the first edition, and they are grouped into 3 macro categories: *Carbon impact* (Energy efficiency and low-carbon energy, Life cycle assessment and sustainable materials management, Low-carbon mobility); *Resilience and Sustainability* (Climate resilience and adaption, Ecological services for the neighbourhood and green jobs, Sustainable water management, Sustainable waste management, Biodiversity, urban re-vegetation and agriculture); *Architecture and social impact* (Inclusive actions, social benefits and community engagement, Innovative architecture and urban design). Some challenges are mandatory in order to submit the projects and they are the ones aimed at meeting the primary objective of reducing the CO₂ emission in order to fight climate change; some others are optional and on completion as supplementary categories, in order to diversify as much as possible the competing proposals.

environmental sustainability. This interaction between the humanistic field of architectural design and the scientific one, typical of disciplines addressed to the environmental control and its economic enhancement, is what made C40's action successful.

Each winning project is related to a program that is developed by deepening differentiated aspects according to the area in question. This gives a greater resonance to the use of innovative technical solutions for the environmental sustainability, proposing within the regeneration plan initiatives for the "care" of sociality and the local economy (Haddock & Moulaert, 2009). Interdisciplinary plans that become activating tools of living citizenship and improvement processes of the local economy that aim to increase the commercial activities in the city in question (Di Giulio, 2013). The contamination between different types of knowledge aims to improve the cities, in their form and substance. A collaboration in which the designer is configured as the inventor and composer of the new urban shape, as a physical container, and the economists, sociologists, environmentalists, etc., become writers of the collective plan, which gives "substance" to the envelope in order to fulfil a complete and lasting regeneration of devitalized urban places (Andorlini, Bizzarri & Lorusso, 2017).

3. Results and conclusion about the role of architectural project

It is now clear that the architectural project, in the outlined scenario, can be a useful device to start vital actions that hinder the phenomena of urban decay and it is besides clear that its role is all-embracing with respect to the "built" (Dematteis, 2011). In this background, the urban project is asked to be inclusive, sensitive to the needs of the city user and integrated with the other professional fields (Bertell & De Vita, 2013). The innovative technical solutions, widely used in sustainable regeneration and urban planning today, such as the minimization of polluting emissions, the reduction of soil consumption and the decrease in the use of natural resources, are equally and clearly recognized. These two fields, both legitimized by the aim to improve the anthropic space, coexist among realities endlessly looking for balance; on the one hand the urban project, as a conceptual moment that prefigures future scenarios, free from determinist involvements, on the other hand the analytical models of the environmental disciplines that tend to bring complexity back into a measurable order, towards a "regulated development" of territories and urban places, which instead belong to the sphere of sustainability. In the multidisciplinary interaction, the project, whose role is crucial for the development of the urban regeneration program, becomes a "tool" that proposes formal solutions developed considering the requirements that emerge from analytical data (Cottino & Domante, 2017). The traced path confirms the great responsibility of the architectural project towards the dynamics of the urban transformation. The constant research for compliant solutions, result of the analysis of various disciplines and binding external conditions, forces the project to give integrated answers that meet the technical-environmental and climatic needs, without giving up its primary aesthetic paradigm: quality.



Fig. 4 Urban Regeneration: a transformation from polluted city to sustainable city. A conversion process to urban high quality

An example is the construction of the NZEB buildings, or the urban reforestation or the reduction of emissions that generally formulate the agenda of interventions establishing the starting conditions and requirements. Innovative technical solutions that embody the concept of environmental and social sustainability, combining the idea of natural inclusiveness within the building envelope. Same requests that are finalized in planning results that are not predictable or repeated. It is recurring to identify design solutions in which the facade is

transformed into a vertical forest, where the green dresses the building in its entirety, aiming at the goal of urban reforestation. Buildings that are reconfigured using innovative systems in response to the imposed premises, accepting limiting conditions, if related to the morphology of the place. In conclusion, the architectural project reinvents itself in a sustainable key, including soil and building projects in a single strength. In this vision, urban greenery and squares are incorporated into the composition of the building, as the connections, which become the tool to promote gentle and sustainable mobility. Hallmarks to achieve the goal that takes on typifying traits of sustainable design. So, the response of the project to the needs of a resilient urban environment shall not be only a fulfilment of sustainable solutions for the city regeneration (Fig.4), but it should be followed by a vision in which the architectural project reinvents itself, changes its rules and aligns its matrices.

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Image Sources

Fig.s 1-4: Images of the author.

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