Chapter 20

The Green Building Approach: Recent Initiatives in the Evolving Italian Scenario

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Abstract Several analyses and reports on sustainable design are pointing worldwide in the direction of what is known as the ‘Green Building’ approach: an integrated, multi-sectoral approach to the implementation of improvements that aim to increase levels of well-being, social inclusion and long-lasting development in cities, on the basis of most urgent aspects of environmental quality, efficiency and circularity of resources, in a climate change scenario. In Italy, in 2017, the ‘Future City Manifesto’ was launched as part of the initiatives of the Italian General States of the Green Economy in Architecture, aiming at mainstreaming the Green Building approach within the international Green City Network. The objective of this chapter is to present and discuss recent initiatives in the field of sustainable architecture and green economy in Italy, pointing at innovative processes, strategies, methods and tools in a Green Building approach, suitable to activate policy actions and foster significant results as regards future green growth and urban development.

Keywords Green economy · Green city approach · Sustainable architecture · Environmental quality · Green growth and development · Circularity of resources

20.1 Introduction

Designing, building and dwelling are words that constitute the essence of being human and citizens. They have been the subject of profound reflections by great intellectuals of the last century, who have left their indelible mark: from the foundations laid down in Martin Heidegger’s famous ‘Building Dwelling Thinking’ (1951), to the developments recently explored with the concept of *open city ethics*, by Richard Sennett’s in his recent book ‘Building and Dwelling’ (2018). A *sustainable* and *green* reading of these terms determines first of all a priority and an

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urgent necessity for every contemporary scholar and researcher to provide answers to the current problems by radically improving the environmental quality of the designing, building and dwelling categories of human actions. It also appears necessary to shift the attention, when designing and building, to strategies for:

- Regenerating and redeveloping existing assets, protecting land and improving resilience through climate adaptation and mitigation
- Improving energy efficiency and bioclimatic systems and incentivizing resource circularity
- Promoting the ecological conversion of cities, architecture and our way of living, producing and consuming through a new approach to dwelling
- Incentivizing the proactive role of all the players involved in such processes – from public authorities to commissioning clients, architects and qualified and specialized entrepreneurs
- Benefitting from the contribution provided by universities and state-of-the-art scientific research

so as to foster the pioneering technological and environmental approach to project design (United Nations Environment Programme (UNEP), 2017).

Out of the many pressing questions that demand an answer from every individual and citizen who cares about the culture of dwelling – in its multiple meanings –, and the conservation of the environment in which we live and of which we are an integral part, four questions particularly demand an answer. Why should we change the way we build and dwell in our built environment – particularly cities – in a sustainable and green direction? Why should we proactively and tangibly promote a commonly agreed methodological approach and scientifically founded strategies to achieve that aim? Why do we need to study the attempts and best practices that have been implemented over the past four decades at least – though this activity has intensified in recent years around the world? Why should we all contribute to speed up these green processes in the hope of securing a future for our cities? The reasons are to be found in some storytelling and, in a sense, grim statistics.

Over four billion people – out of the 7.8 billion alive today – live in the world's large urban centres, generating 80% of GDP but consuming 75% of the Earth's natural resources, responsible for over 70% of CO₂ emissions, producing 50% of the waste, using aqueducts that lose, on average, approximately 40% of their water, living in housing 70% of which is over 40 years old, consuming over half of the world's primary energy, experiencing the worst traffic and continuing to consume land. The world's top 600 cities are already home to 20% of the population, generating over 50% of the planet's wealth – a percentage that is growing – but living in conditions that are far from what we would term social well-being and of environmental quality. In Italy, 32 urban areas have illegal levels of air pollution because they exceed maximum levels of particulates, and our country is, moreover, the one with the highest number of deaths from pollution, relative to the population in Europe (Gesellschaft für Internationale Zusammenarbeit (GIZ) and International Council for Local Environmental Initiatives (ICLEI), 2012; International Energy Agency (IEA), 2018; Intergovernmental Panel on Climate Change (IPCC), 2018;

World Economic Forum (WEF), 2018; Istituto Superiore per la Protezione e la Ricerca Ambientale (ISPRA), 2019).

The European Union is convinced that an approach to strenuously relaunch the priorities of urban ecological quality, sustainability and resilience is needed (European Commission (EC), 2016). This is also in consideration of the most recent developments in the green economy, understood as sustainable development, and in the circular economy as its fundamental basis (EC, 2017), in an era of climate crisis (Circle Economy, 2019). While focusing on increasing the ecological quality of cities is a decisive factor if we want to ensure the well-being of its residents, interaction among the green economy and architecture, urban planning and technological design culture offers a major opportunity to fundamentally enrich our knowledge and improve our approach to renovation and urban development if we want to improve social inclusion and promote local development and new forms of employment. This is because it allows us to reformulate architectural, technological and urban designs drafted ways, not to mention town plans, both from a strategic/planning point of view and from a technical/construction point of view (UN-Habitat, 2016).

The green economy is a general economic model that results in 'improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities' (UNEP, 2009) and, as far as this aspect is concerned, it boasts a wide body of work, particularly at international level, whose aim has been to promote high ecological quality as a way of boosting regeneration and relaunching the economy and society. It is not coincidence that 'the ecological conversion of cities' is one of the most important strategic themes that the Green Economy promotes, as shown by the many initiatives (United Nations (UN), 2016; Organization for Economic Co-operation and Development (OECD), 2017; UNEP, International Resource Panel (IRP), 2017; World Business Council for Sustainable Development (WBCSD), 2017) that identify actions and measures as key factors for a kind of 'urban green growth' that offers us the chance to improve the quality and sustainability of cities, that can provide a response to climate change, safeguard and enhance natural, cultural, social and technological capital, and regenerate and redevelop the many assets that exist in our urban systems, opportunities for investment, employment and, in a word, for planning a more desirable future.

The model, which is advancing on a European and international level, is called 'green city': an integrated and multi-sector approach to cities based on key aspects of environmental quality, resource efficiency and circularity, mitigation and adaptation to climate change. The green city approach has been recently wisely defined by The European Bank for Reconstruction and Development (EBRD) based on the International Council for Local Environmental Initiatives (OECD-ICLEI) methodology in 2017. Such model was also adopted as a basis for a green economy development programme in cities with the Economics of Green Cities Programme by the London School of Economics, LSE Cities, led by Nicholas Stern (Stern, 2015). In 2010, the integrated approach towards green city had already been adopted by the European Commission for the European Green Capital Award (EGCA), an

award which, by promoting the green city model, aims to support the advanced and sustainable development of European cities.

It therefore becomes essential to promote this green vision and publicize at all levels the important contributions and documents that are being produced, principally in an experimental and heuristic way, as the basis for constructing and developing a framework of priority strategies that, aware of the enormous variety and vibrancy of applications, can provide cities and architecture with guidelines, strategic benchmarks and tangible examples of how these strategies have been tried and implemented wherever they have been applied on the international scene over the past few decades, whilst always keeping the different scales – in an ascalar sense –, the various different disciplines – in a multi- and transdisciplinary sense – and the various sectors of knowledge and know-how – in an inter-sectoral sense – closely and inextricably linked (Antonini and Tucci, 2017).

20.2 Guidelines to the Processes of a Green City Approach in Italy

In Italy, this new approach has been supported by significant contributions. The relationship among the green economy, the green city and an adaptive design for the urban systems was the focus of the contribution of Sapienza University of Rome's Research Unit to the Italian Project of Relevant National Interest (PRIN) Research 'Adaptive Design and Technological Innovations for the Resilient Regeneration of Urban Districts during Climate Change', funded by the Italian Ministry of Scientific Research, in which this Operating Unit, based in Rome and coordinated by the author of this chapter, developed these themes during the period 2016–2019.

Furthermore, in coordination with PRIN research developments, in Italy, there have been important developments that led to the elaboration and presentation of the 'Future city' Manifesto (SGGE, 2017), proposed by a group of faculty coming from 20 Italian and foreign universities in 2017 coordinated by F. Tucci, in the framework of the General States of the Green Economy initiatives, and over the last year the development of this new approach has been boosted by the international Green City Network promoted by the Sustainable Development Foundation, institutions that the author of this chapter had the opportunity to coordinate in both instances.

The main goal was to encourage the development with respect to the relationship among the main principles that lie at the heart of the Green Economy and architectural and urban growth, on the one side, and regeneration and development, on the other. An internal debate was launched – through a direct confrontation with the international design practice – endeavouring to bring Italian cities closer to the development already achieved by other European cities, registering significant results in terms of *green* growth and redevelopment. In the '2017 Report on the state of the green economy in Italy', the Sustainable Development Foundation focused on the urban green economy, building on an analysis illustrating strategically

relevant trends in the administrative centres of the Italian provinces already in place. A commitment towards climate and renewable energy sources, the management of water resources, sustainable mobility and public administration's 'green' procurement was generally shown. The emerging framework is characterized by moments of light, with some excellent initiatives, and others characterized by shadows and delays. Through the adoption of an integrated approach towards the green city, it is possible to jointly tackle different aspects and problems, enhancing potential synergies and coming up with a comprehensive urban agenda for the Italian cities. The evaluation of some particularly important topics, such as urban regeneration, building and urban upgrading, air quality and circular economy, was consequently proposed. Territorial planning and urban management in Italian cities have traditionally obtained scarce results because they favoured, or allowed, decades of real estate expansion with low-quality constructions, particularly in the peripheral urban areas, and with high levels of soil consumption. Even though we are witnessing a generalized reduction of the latter in the last few years, in Italy soil consumption keeps increasing. Between November 2015 and May 2016, new artificial roofs invested 50 km² of the territory, a little less than 30 hectares per day (ISPRA, 2019). Moreover, the data analysis concerning the 14 Metropolitan cities shows how the total amount of soil consumption, referred to 2016, represents 21,4% of the national total, and constitutes an increment higher than the national average referred to the same year (ISPRA, 2019). High soil consumption, sprinkling and sprawling effects, recorded in most of the urbanized areas have caused the erosion of agricultural land, extended soil sealing and increased hydrogeological risk. Those phenomena required the employment of significant amounts of resources in terms of dedicated urban development works, and increased the time and cost of transportation. On the one hand, Italian cities bear a great potential, as we can also observe in a review of the key sectors; on the other hand, except for a few excellent exceptions, they lag behind and experience a hard time positioning themselves next to the leading group composed by the most advanced European and world cities (Tucci and Battisti, 2020).

A new approach to the drafting and management of design processes and priorities is motivated by problems – current problems that can no longer be ignored, as mentioned earlier – is inspired by a vision – based on key principles and objectives that have proved themselves to be able to upgrade themselves and be called into question on a regular basis – and is supported by a method – that can be linked to a framework of guidelines, strategies and measures/categories of actions that can offer a clear benchmark and at the same time are able to adapt to different circumstances, characteristics and needs.

So, what should we do next? What logical/cognitive steps should we now take in order to support a methodological approach? What requirements should we look for if we want to properly set up *green* design and building processes and orient sustainable, balanced and responsible dwelling?

No doubt that if we want to successfully introduce design answers to momentous problems of an environmental nature in the spheres of building and dwelling, in cities, architecture and the living spaces of daily life, then all the disciplines involved must join forces to tackle common objectives, all sectors of human activity must

cooperate closely and all scales of building and dwelling must communicate with each other (Stati Generali della Green Economy, 2017; Tucci, 2017).

The inevitable clash between so many different priorities can only be resolved by resorting to a vision, a plan and a way of completing improvement work that are founded on a deep-rooted awareness of the need for a systemic, as well as heuristic, view of action at the various different levels and sectors and drawing on different fields. A view that always focuses on coordinated action, where public authorities, commissioning clients, architects and contractors work together right from the beginning of the process. As well as limiting the impact on the environment, such an approach clearly has a strong social dimension: the user can be involved both during the design phase and the construction phase and, above all, during the management phase. An approach that also considers the importance of 'design for social innovation' can definitely encourage users to appropriate space, responding to the changes that families, workplaces and educational centres have undergone.

A multi- and inter-disciplinary, ascalar and inter-sectoral methodological approach will allow us to rationalize all aspects involved in different spheres of redevelopment and in process-, project- and product-based arenas, which are also inextricably linked, combining traditional and innovative methodologies. The well-being of users, the proper regard for places, the management of water, energy, bioclimatic and physical resources, the control of economic, social and environmental costs, the promotion and enhancement of natural, cultural, social and technological capital, all these are elements which should be constantly kept in mind (Tucci, 2018).

20.3 Materials and Methods for a Green City Approach

During this working process and research phase, it has proved essential to fine-tune, at first, the methodological approach and the criteria and requirements used to adopt it and, later, the ecological guidelines and development strategies of *green* building and dwelling (Green City Network (GCN) and Fondazione per lo Sviluppo Sostenibile (FSS), 2018). This was needed in order to strengthen our awareness of the priorities and main challenges that cities, architecture and technology are asked to face. But, also, to objectively share our knowledge of the best practices that have been implemented the world over, working with scientific knowledge and taking a heuristic vision in the hope of finding innovative, environmentally and technologically aware design solutions. Those solutions that can prove sensitive to the differences of each context and adapt to the specific characteristics of each case, but that take their cue from the creation of a common strategic platform, in order to promote and implement a new urban, architectural and technological environmental policy.

Progress is being made thanks to the work of the above-mentioned national group of experts from the Green City Network and the General States of the Green Economy for architecture and urban planning, a group that has been working during the last year on a new phase that involves a further stage that will fine-tune an even more complex and in-depth system of best practices and draft a set of benchmarks

and innovative indicators designed to help assess and compare the measures adopted and the practices implemented.

That is why we must continue to develop an increasingly dense and active network of national contacts in order to foster the connection and sharing of information, a comparison with common strategic frameworks, the development of demonstration projects and the use of existing EU support programmes as part of a policy that encourages cohesion and research. All of the above is essential as part of a process to build and offer a strategic benchmark framework for guiding green-inspired regeneration in cities.

An extremely important aspect that influenced the structure of works and research operated while pursuing the above-mentioned objectives concerns the strategic fields and the relative measures that should be adopted, which are the recurring themes that the challenges that affect all cities in this day and age face as regards 'green' Building and Dwelling. Its purpose is to offer a planning framework of issues, guidelines, strategies and measures that is generally agreed in the scientific community and in practice at an international scale, systematically organized and made available to all, a framework that public authorities and architects should tackle broadly with regeneration work in their territories and contexts (GCN, 2018). (see Figs. 20.1 and 20.2)

The idea was to provide a range of solutions to be applied *sic et simpliciter* – indeed, it could not be possible to believe that such a thing can be done a priori – as the solutions should be found through a design-based approach, adapting common strategic courses of action to the different circumstances of each context and the specific nature of each case, on a case-by-case basis, thus keeping in mind, above all, the main characteristics of each location as regards environment, climate, social characteristics, economy, culture, size, etc. The 'tool box' metaphor is perfect: the tools are not the solution; they are the methods and instruments used to *repair* problems and find solutions. Hence, we could say that the work underway hopes to provide an initial tool box that can be implemented and expanded over time as experimentation increases.

20.4 Result and Discussion: Adaptive Actions of Regeneration Towards Green Cities

As regards the success of improvement work based on those objectives, processes and methods, the issue of urban and architectural regeneration is the key, a category that can orient all the most efficient and effective actions designed to achieve a Green City model. Today, urban regeneration is the strategic choice if we want to restore the appeal of our cities by efficiently using and reusing our existing built heritage and urbanized areas, thanks to the renovation of public and private buildings, improving urban quality, thus tackling such phenomena as decay,

GENERAL OBJECTIVES		GUIDELINES	
FIRST GENERAL OBJECTIVE	ENSURING HIGH ENVIRONMENTAL QUALITY	1.	AIMING AT URBAN AND ARCHITECTURAL QUALITY IN THE CITY
		2.	GUARANTEEING A SUITABLE AMOUNT OF URBAN AND PERI URBAN GREEN INFRASTRUCTURES
		3.	ENSURING GOOD AIR QUALITY
		4.	MAKING URBAN MOBILITY MORE SUSTAINABLE
SECOND GENERAL OBJECTIVE	USING RESOURCES EFFICIENTLY AND CIRCULARLY	5.	AIMING AT URBAN REGENERATION AND REINFORCING SOIL PROTECTION
		6.	EXTENDING UPGRADING, RESTORATION, AND MAINTENANCE OF THE EXISTING DWELLING PATRIMONY
		7.	DEVELOPING WASTE PREVENTION AND RECYCLING
		8.	MANAGING WATER AS A STRATEGIC RESOURCE
THIRD GENERAL OBJECTIVE	ADOPTING MEASURES AIMED AT CONTRASTING CLIMATE CHANGE	9.	CUTTING DOWN GREENHOUSE GASSES' EMISSIONS
		10.	REDUCING ENERGY CONSUMPTION
		11.	DEVELOPING ENERGY PRODUCTION AND USE FROM RENEWABLE ENERGY SOURCES
		12.	ADOPTING MEASURES AIMED AT CLIMATE CHANGE ADAPTATION

Fig. 20.1 General objectives and guidelines for green cities in Italy

MEASURES / ACTION CATEGORIES

- Identification, protection, and valorisation of the cultural assets and the identity of places
- Definition of directions, criteria, standards to improve the architectural and urban quality of the built environment
- Valorisation of the anthropic-cultural ecosystems of urban areas
- Promotion of a culture economy
- Promotion of a certain degree of homogeneity and equity in the urban environment quality distribution
- Promotion/valorisation of green infrastructure, of their multi-functionality and multi-purpose
- Promotion/valorisation of ecological corridors and green belts, according to the context and biodiversity
- Promotion/valorisation of parks and gardens, trees, green facades, and roofs, according to the context
- Promotion/valorisation of urban farming and short production chain systems, according to the context
- Scheduling of green maintenance/management
- Cutting down air pollution through the management and reorganization of urban system activities
- Cutting down air pollution through focused actions aimed at increasing green surfaces in the city
- Cutting down air pollution through traffic management
- Cutting down air pollution through regulation of industrial facilities in the area
- Absorption of atmosphere pollutants within the system territory-city-building
- Limitation of private car circulation in cities and promotion of public transportation circulation
- Increase of cycling and pedestrian networks through new or existing linear infrastructures
- Regulation of private car parking areas in public spaces
- Promotion of shared mobility through technological advancement, also using ITC and ITS systems
- Incentivisation of electric, hybrid, and biofuel car use
- Densification of the urban fabric object of study, the urban "voids" and the "non-places"
- Hybridization of monofunctional areas through the introduction of functional mix, and mix of activities and use
- Renewal of residential and non-residential urban areas in decay or abandonment through physical transformation and functional reconversion
- Renewal of urban infrastructures in decay or abandonment, through physical transformation and functional reconversion
- Prevention of hydrogeological risks through the improvement of surface permeability, urban drainage networks, etc.
- Planning of diffused and continued public and private dwelling patrimony upgrading
- Planning of existing dwelling patrimony maintenance to improve its quality and extend its life
- Prevention of dwelling patrimony seismic risks, also through procedural and permit facilitations
- Upgrade and reuse of the dwelling patrimony aimed at responding to new residential needs, most of all social ones
- Upgrade and reuse of the dwelling patrimony aimed at responding to new service and financial activity needs
- Employment of eco-compatible materials, nature-based, recycled-based, environmentally performative
- Prevention and reduction of waste production from building and living processes
- Separate collection and recycling of waste from living processes
- Separate collection and recycling of waste from building and demolishing activities
- Circular organization of the production-use-production processes
- Collection and reuse of grey and rainwater resources in buildings and open spaces
- Limitation of water consumption and efficient water use in buildings and open spaces
- Use of water purification networks with high purifying effluent's quality and mud treatment-recycling
- Promotion of diffusion and reuse of purified water and water from polluted sites' remediation operations
- Year-round diffusion and distribution to all citizens of potable, good quality water in sufficient quantity
- Acceleration of Deep Energy Renovation processes aimed at cutting down greenhouse gas emissions
- Adoption of performance-based design methods aimed at cutting down emissions
- Valorisation of the relationship between green (at different scales) and CO₂ subtraction
- Valorisation of the relationship between sustainable urban mobility and greenhouse gas emissions' reduction
- Record of greenhouse gas emissions and evaluation of the economic, environmental, and social impact
- Energy efficiency and reduction of consumption in buildings and dwelling complexes, both public and private
- Application of passive bioclimatic solutions through natural ventilation and cooling systems
- Application of passive bioclimatic solutions through natural heating and lighting systems
- Adoption of smart automation systems, domotics, and building management to support energy performance improvement
- Adoption of design methods based on environmental Simulation and Modelling processes
- Use of energy production technologies from renewable solar sources
- Use of energy production technologies from renewable wind sources
- Use of energy production technologies from renewable geothermal sources
- Use of energy production technologies from other types of renewable sources, e.g., biomass, water, hydrogen, etc.
- Use of Smart Grid or Dynamic Smart Grid for the diffused and adaptive distribution of renewable energy
- Development of plans and/or programmes for resilience and adaptation to climate change
- Adaptation to heat island phenomena
- Increase of resiliency to heat waves
- Increase of resiliency and adaptation to droughts
- Adaptation to intense precipitation, thunders, and Pluvial flooding phenomena

Fig. 20.2 Measures/Action categories for green cities in Italy

functional decline and urban chaos, redesigning marginal spaces without consuming greenfield sites and reducing artificial land cover.

The strategic priority of urban regeneration, when inspired by a green city approach, is ecological quality, so as to ensure the sustainability and resilience of improvement programmes and projects at a time of climate change and dwindling natural resources (European Commission, 2016; Arup, 2015). Green city-inspired urban regeneration calls into question both its overly simplistic version – based on small actions that lack context, vision and the necessary ecological quality – and its generic version, which though based on wider economic, social, cultural, residential and infrastructural content is nevertheless inconsistent with, and fails to prioritize, urgent ecological challenges, and is therefore weak and qualitatively inadequate. In contrast, the green city-inspired urban regeneration model focuses on making the various connected aspects of high ecological quality the real priorities on which improvement programmes and projects should be based, adopting an integrated and multi-sectoral approach.

This, combined with the awareness that we now have – thanks to confirmation amply provided by research and greater knowledge as well as the consolidated experience of the best practices put forward and verified in many cities – that social objectives (the quality of well-being, safety, cohesion and social inclusion) and economic development (reviving and relaunching local economic activities and job opportunities) are inextricably linked to, and dependent on, ecological quality both in big cities and small towns, dependent on the liveability, appeal and the renovation and repair of degraded areas and buildings. Although we are forced to proceed by concentrating on separate parts, we need to work with an organic and consistent plan that aims to create high ecological quality.

To this end, we need to establish and update an overall town strategy and the guidelines for town planning, creating suitable occasions for participation and consultation, using the green city vision as our benchmark for urban regeneration projects and improvements, while establishing a list of recommendations in order to ensure the right level of ecological quality and make the most of possible combinations and synergies.

Among the first topics to deal with is the theme of halting land consumption. This is not just an outcome, it is a central aim of urban regeneration plans and projects, as part of a framework of measures designed to strengthen land protection and reducing artificial land cover, efforts that are consistent with the European objective of reducing greenfield consumption to zero. Land consumption reduces the availability of a resource that is scarce, essential and basically unrenewable. Cities that expand by consuming greenfield sites have a significant impact on their quality.

High land consumption, which we find in most urbanized areas, has had a negative impact on the landscape, leading to the loss of natural areas and farmland, erosion and soil sealing, increasing hydrogeological risk. Before embarking on regeneration projects, available urbanized areas and unused building stock should first be surveyed, such as derelict, abandoned and under-used areas: not just the usual former industrial estates but degraded urban fabric as well, unplanned fabric

featuring a combination of random functions, former railway infrastructure and infrastructure of other kinds, former small business premises and craft workshops, as well as degraded, abandoned and unused buildings, unauthorized or unfinished constructions that can be renovated if they are of a suitable quality or demolished if not.

If we want to achieve zero land consumption, we need to tackle the growing demand for urban development with an innovative approach to urban regeneration, adopting an integrated strategy applied to various different sectoral policies, designed to meet various needs as well as heighten the ecological efficiency of the urban network, resulting in social and economic benefits.

Another central issue concerns the lower greenhouse gas emissions. Today's climate crisis is having a significant impact on cities, an impact that is increasing, and cities must play a leading role in adopting mitigation measures so as to lower greenhouse gas emissions. Urban regeneration work should include the energy upgrading of entire buildings, combining active and passive solutions thanks to the use of innovative materials and technologies. It also needs to promote the use of systems that can assess the energy and environmental performance of buildings, building complexes and networks, as well as outdoor spaces in the urban environment based on indicators that allow us to highlight our priorities and the most effective solutions, restoring the role these systems once played as climate modulators.

We need to make the best passive technical solutions as widely available as possible so as to reduce energy requirements and improve living comfort: from natural ventilation and passive cooling systems to limiting solar radiation, from natural lighting to passive heating and the natural regulation of humidity. We need to reduce and manage energy demands using monitoring systems and intuitive interfaces for users; to promote forms of energy distribution and exchange between 'prosumers' using smart grids and by combining local resources, such as capturing the excess heat produced by manufacturing and tertiary activities in order to meet residential heating needs, or using dynamic modulation systems that change to suit different demands depending on the time of day, the season or even the time of year.

We need to analyse which renewable sources can be used locally and promote the best production technologies available, which can be integrated into buildings and cities in order to move towards a 'positive energy' model: active solar energy systems, mini and micro wind turbines, geothermal energy supply systems using either vertical or horizontal heat pumps, systems that run on biomass using suitable emissions-reducing technology or on biomethane produced from organic waste, fuel cell systems that can be used in urban areas, micro-cogeneration systems, trigeneration systems and the use of district heating networks, etc.

Finally, the reduction in the vulnerability of the built environment. Integrated strategies designed to prevent and reduce the vulnerability to extreme weather events must be identified and planned so as to improve resilience and mitigate their effects. Regeneration projects should draw on specific expertise regarding local climate characteristics in order to carry out technical analyses of the risk caused by climate change. They should stop soil sealing and increase the number of projects designed to reverse it. Nature-based adaptation solutions should be given pride of place both in urban regeneration plans and specific projects.

As regards problems caused by pluvial flooding, the increasing frequency of floods and, in general, the difficulty of managing water resources during emergencies, green and blue networks and infrastructure are extremely important both as microclimate moderators and when absorbing and retaining larger quantities of rainwater. For example, city squares or parks below road level can help accumulate rainwater during extreme weather events, and particularly intense rainwater can be channelled towards specially created areas, existing urban drainage networks should be monitored more closely and we should ensure that sewage systems – complete with spillway – remain isolated from the network of canals and rivers, even during intense rainfall.

Tools that can analyse and assess the ability to adapt to increasingly frequent heat waves and growing heat islands should be used. On the basis of such analyses and assessments, adaptive technical, administrative and design solutions should be included in urban regeneration and when renovating buildings and their outdoor spaces. We need to promote measures controlling the bioclimate of buildings, measures for shading and solar radiation control systems and measures encouraging natural ventilation and cooling and improving insulation using, among other things, innovative materials. It would also be useful to use and expand green infrastructure and improve cooling by employing, whenever possible, phreatic zones and surface water bodies.

Urban regeneration requires the implementation of projects designed to redevelop and enhance existing urban heritage, both historic, consolidated building stock as well as new buildings, which combine increased environmental performance with the improvement of design and architectural quality and benefits for the community, and that can ensure the creation of buildings that are pleasant to live in and inspire a heightened sense of belonging. If we aim to achieve high town planning quality when carrying out urban regeneration programmes, we have to protect and enhance the wealth of identity forming and historical values, cultural manifestations, know how, works and products that are typical of the areas concerned.

Such projects should be designed to suit the urban environment, particularly encouraging the integration of buildings with the open spaces near them, adopting a unified architectural approach. To this end, it is worth identifying guidelines, criteria, best practices, indicators and standards when drafting projects and assessments of the architectural, urban and environmental quality of urban regeneration programmes, while updating and improving existing ones.

When carrying out urban regeneration work, particular attention should be paid to redeveloping public spaces, both in central and peripheral areas, as they play a decisive role when creating urban quality: city squares, streets, porticoes, parks and gardens, playgrounds and pedestrian zones all have a significant effect on environmental and social quality.

As regards the problems associated with sustainable mobility in the areas included in regeneration programmes, the availability of pedestrian zones and/or zones that limit access to motorized vehicles, slow traffic zones, the availability of protected footpaths and cycle paths, public transport services and mobility sharing, not to mention infrastructure for recharging electric vehicles, are all essential.

The proper attention should also be paid to measures designed to reorganize areas of urban sprawl and ‘hybridized’ single-function areas with the creation of complementary and compatible uses, including spaces for collective use, in keeping with the principle of *mixité*, at the same time ensuring that land permeability is maintained and increased, and that ecosystem functions are restored and green infrastructure developed. When implementing urban regeneration programmes, social housing projects should not only meet the demand for homes, they should also guarantee residential well-being and social integration, supporting the development of resident communities by, among other things, designing shared and open collective spaces.

When carrying out renovation, restoration, reuse or maintenance work on existing public and private building stock, we should not only increase comfort, we should also improve energy efficiency, the efficient use of water and the proper ecological management of waste; keeping in mind the increased hydrogeological risk and the widespread areas at seismic risk, such improvements should be verified and combined, whenever necessary, with measures designed to reduce vulnerability and prevent such risks. We should also encourage the use of construction materials and components that boast a high ecological quality during their entire life cycle, products that can be reused or recycled.

In urban regeneration programmes, urban and peri-urban greenery, and particularly the development of green infrastructure, carries out an essential role. Everything from tree-lined avenues to vertical gardens and roof gardens, from public and private gardens to allotments and from parks to green belts significantly contribute to improving air quality and reducing pollution, mitigating and adapting to climate change, safeguarding water, managing surface water run-off and protecting the biodiversity of the urban environment.

We should support and promote nature-based solutions by focusing on green infrastructure, which can carry out a number of functions and ecosystem services. Such solutions also provide facilities for cultural activities, recreation and sport and support the well-being and health of residents. The development of green infrastructure as part of urban regeneration programmes not only requires the active contribution of public authorities, it should also involve the private sector (businesses, shops or even private citizens) that, as is already happening in some cities, can fund both the construction and the maintenance of urban greenery, both public and private (trees, hedges, gardens, balconies, vertical gardens and roof gardens on homes, shops and tertiary premises).

The implications for green city local development are quite interesting: support of a more suitable local development, promotion and development of technologies, green innovations and tools and strategies for the exploration, identification and application of green business and governance models, supporting identification and diffusion of new opportunities for green investments (GIZ-ICLEI, 2012).

As emphasized by the report ‘Towards a Green Economy’ (UNEP, 2017), green cities can effectively contribute to social inclusion and overall quality of life. The reinforcement of public transportation systems, as an example, can reduce inequality by improving service accessibility and contribute at the same time to the reduction

in traffic congestion, especially in peripheral areas. Cleaner fuels for transportation and energy production can reduce local pollution, which traditionally affect the weaker sections of the population. Traffic reduction and the improvement of security conditions of pedestrians and cyclists can sustain social cohesion. In fact, evidence demonstrates how children who live close to green areas are more stress resilient, less inclined to suffer from social disorders and have a higher self-esteem. Green areas stimulate social interaction and improve well-being. Moreover, according to UNEP (2017), the transition of cities to a green economy can create new job opportunities. Also, the EU Green Week 2019, dedicated to green jobs, underlined the high potential of new and good job opportunities generated by a green economy. Involving the private sector is equally important, through agreements aimed at promoting the social responsibility of enterprises involved in the race towards the improvement of cities and territories, making their actions and contributes to the green city transparent. Enterprises ought to be also involved in the promotion of targeted investments, services and other policy instruments, with the scope of improving cities environmental performance efficiently and sustainably in terms of costs, and maximizing economic and social benefits (Ronchi, 2018; Tucci and Battisti, 2020).

20.5 Conclusions

The guidelines/strategies and primary measures/actions categories generated by people and institutions towards a green economy and taken in the implementation of the international experimental initiatives would appear to provide incisive responses when it comes to making a practical, feasible change in the accepted approach to *thinking, building and inhabiting* architecture and the city, or what by now we refer to with a unified term of the *green city approach*. Because, as has been demonstrated, this is the true key to entering once and for all into a fully operative outlook from which to promote the *green economy* – and, therefore, the *circular economy* – as an economic model characterized by a search for ways in which to arrive at maximum levels of inclusion and social well-being, as well as the best possible ecological-environmental quality of dwelling.

To the extent that it proves to be based on substance, this will also lead to a new conception of building, in the ecosystem, interrelated sense of the term, taking in the regeneration and upgrading of sites, the use of renewable energies, the reuse of raw materials, the augmentation of energy and bioclimatic efficiency, the development of forms of resilience, mitigation and adaptation to climate change, along with the optimization of natural, cultural and social capital. All grounded in the formulation of specific procedures for the planning and design of technologies, materials, products and systems designed to promote and favour truly circular flows for the use and management of resources, so as to limit impacts on our biotic system and on the biosphere in general. The policies represented under the categories of recurring Measures/Actions that can be found in the two tables are probably only some of

those that a future rich in experimentation holds for us. Others may take shape following the activities of research and experimentation which are constantly moving ahead in Italy, as well as on the international scene. (Hausladen & Tucci, 2017)

The activities involved in the planning, design, implementation and management of the initiatives regarding the transformation of the architectonic and urban systems which are to be regenerated and upgraded, along with the activities involved in the preservation, safeguarding and optimization of historic or well-consolidated resources of construction and dwelling call for precise 'green-oriented' perquisites to be met, and for strategic guidelines to be pursued, in addition to which a framework must be established that proves adaptable, flexible, always ready to be challenged and rendered obsolete by the ongoing evolution of experiences, though it must also be scientifically grounded, in addition to offering good practices, meaning measures and the actions that can represent, for a technologically and environmentally oriented approach to planning, a practical reference for proper conceptualization and elaboration of the solutions to be tested and the results to be achieved.

Public policies have a key role in the path towards green cities, through direct involvement of administrations on all levels: municipal, regional and national. We can state that such path demands equally great attention to the use of available European funds and national and regional public funds, employable, in their totality or in part, to implement measures for green cities.

A green city project ought to be supported by suitable information tools, so as to be known and shared by citizens, and – as Edo Ronchi (2018) said in a recent interview – ‘we need to foresee punctual and recurring information and documentation tools to monitor activities, objectives, and results. It is also good to foresee broad consultation forms, which are nowadays possible thanks to digital technologies, aimed at stakeholders involved in projects and actions’.

We need to publicize improvement work that boasts high ecological quality wherever it has been tried, to publicize the measures that have been most successful given the contexts where they have been applied, promote an awareness of the key role that properly drafted design plays in environmental and technological aspects, aiming for a future in *building* and *dwelling* where buildings, neighbourhoods, urban districts and cities boast certified ecological, bioclimatic, energy and environmental functions that are part of the lifecycle of materials and, generally speaking, all manmade products. That is why we increasingly need to focus on the role of research, to support experimentation, innovation and the exchange of best practices, encourage the world of innovative start-ups, inform and train public authorities, professionals and entrepreneurs, foster companies that include green choices in their economic criteria, focusing, for example, on the efficient use of resources, material and energy savings and eco-innovative processes and end products.

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