

Chapter 22

Investigating, Implementing and Funding Regenerative Urban Design in a Post-COVID-19 Pandemic Built Environment: A Reading Through Selected UN Sustainable Development Goals and the European Green Deal



Maria Beatrice Andreucci and Antonino Marvuglia

Abstract Before the world was impacted by COVID-19, progress towards the 2030 UN Sustainable Development Goals (SDGs) was already uneven, and a more focused attention was needed in most SDGs' target areas. The pandemic abruptly disrupted plans and efforts towards urban transition, in some cases reverting decades of progress. The concept of resilience changed in 2020 and having to face severe health issues combined with increased socio-economic challenges in a climate change scenario, cities must urgently explore on how best to combine environmental goals with economic recovery and social justice, modifying on-going plans and initiatives, while re-arranging priorities. Acknowledging the impact that the pandemic will produce, for the years to come, on processes and initiatives towards a regenerative economy, this contribution describes most recent strategies aimed at urban transition in Europe, and critically discusses available options with respect to implementation and funding, within the framework of selected UN SDGs. Our conclusions challenge the ability of our modern society to put in practice the needed urgent actions, and call for a paradigm shift to prepare Europe to deal with climate disruptions, activate transition to a healthy and prosperous future within the planetary boundaries, and scale up solutions that will trigger transformations for the benefit of people and the environment.

M. B. Andreucci (✉)

Department of Planning, Design, Technology of Architecture (PDTA),
Sapienza University of Rome, Rome, Italy
e-mail: mbeatrice.andreucci@uniroma1.it

A. Marvuglia

Department of Environmental Research & Innovation (ERIN),
Luxembourg Institute of Science and Technology (LIST), Belvaux, Luxembourg
e-mail: antonino.marvuglia@list.lu

© The Author(s) 2021

M. B. Andreucci et al. (eds.), *Rethinking Sustainability Towards a Regenerative Economy*, Future City 15, https://doi.org/10.1007/978-3-030-71819-0_22

395

Keywords Urban transition · Appropriate technologies · Climate neutrality · System thinking · Adaptive monitoring

22.1 Introduction

The public health and economic emergency we are currently living in is the worst the world has experienced in a century. Since 22 January 2020 and as of 15 November 2020, 54.486 million cases of COVID-19 (according to the case definitions and testing strategies in place in the affected countries) have been reported, including 1.319 million deaths (Johns Hopkins University, 2020). The sanitary emergency is affecting every country, including high-income nations in Europe and North America. Globalization and the devastation of wildlife habitats facilitated the fast spread of viruses around the world. The pandemic has put governments in front of difficult choices, having to balance between protecting public safety and well-being and saving national economies. Eventually, the prospect of a large number of deaths and of the collapse of health systems have left countries with no other reasonable choice but to impose draconian measures (including citizens' lockdown and shutting down many economic activities), which have drastically affected the lifestyle of millions of people. This has led to a global economic downturn with massive job losses, and major impacts especially on vulnerable groups. Although COVID-19 and climate change are both rooted in the same "business as usual" economic development and urbanization model – already proven to be fatal for humans – governments have addressed them as separate and unrelated phenomena and have therefore insufficiently responded to them. This is a significant hindrance for the world's aspiration to achieve the UN 2030 Sustainable Development Goals (SDGs) (United Nations (UN), 2016).

Progress towards the achievement of the SDGs was already slow before the outbreak of the pandemic, but COVID-19 is now worsening the situation, further producing severe negative impacts on most SDGs (Berchin & de Andrade Guerra, 2020), so that it seems likely that many of the 169 targets will not be met by 2030 (Naidoo & Fisher, 2020). Preliminary research on the impacts of COVID-19 on cities mainly relates to four major themes: (1) environmental quality; (2) socio-economic impacts; (3) management and governance; and (4) transportation and urban design (Sharifi & Khavarian-Garmsir, 2020).

It is now urgent a widespread endorsement of the necessary commitment to the active search and experimentation of solutions to the world's biggest challenges, ranging from combatting and eliminating poverty and reducing inequality to dealing with climate change, health care, and capacity building.

With the outbreak of the COVID-19 crisis, emerging issues and related questions with respect to mainstreaming regenerative urban design, sustainability, and climate

neutrality arise spontaneously: *How did societal challenges and related priorities change in the post-COVID scenario? Should the attention paid to UN SDGs change as well? How much do innovative research and funding frameworks to boost regenerative urban design already take those changes into account? How can addressing the challenges of climate neutrality through the European Green Deal help with respect to a post-COVID achievement of the 19 UN SDGs?*

The following sections describe funding frameworks and critical pathways towards regenerative urban design in a changing built environment post-COVID-19 – such as “Innovative Urban Assets and Infrastructure”, “Circular and Just Urban Economies”, and “Climate Neutrality” – aiming at offering critical perspectives taking into consideration the above dilemmas as well as the much-awaited funding frameworks, such as Horizon Europe and the European Green Deal.

22.2 Responding to COVID-19 within the Wider SDGs Framework

Cities are engaged in an epochal conflict to cope with the COVID-19 pandemic and its long-lasting impacts. All over the world, this frightening virus is threatening cities and communities, jeopardizing public health, as well as the economy and the very fabric of our society. Over 90% of COVID-19 cases are recorded in urban areas, with the world’s most densely populated slums suffering the hardest effects. Even before the pandemic outbreak, due to rapid urbanization, four billion people (i.e., more than half of the world population) in the world’s cities faced the effects of worsening air pollution, scarce infrastructure and services, and uncontrolled urban sprawl. Progress towards the 2030 SDGs was already uneven, and a more focused attention had already been acknowledged as needed in most areas. The pandemic abruptly disrupted plans and efforts towards many of the SDGs and, in some cases, reverted decades of progress (UN, 2020). Even if none of the SDGs has remained unaffected by the consequences of the pandemic, the SDG 1 “No Poverty”, SDG 3 “Good Health and Well-being”, SDG 8 “Decent Work and Economic Growth”, the SDG 11 “Sustainable Cities and Communities”, and the SDG 13 “Climate Action” deserve now particular attention, not only for the effects already produced by COVID-19 but mostly in consideration of all possible urgent actions that should be put in place at different scales. At the same time, far from undermining the case for the SDGs, the magnitude and uneven impacts of COVID-19 have demonstrated that cities need the 2030 Agenda, the Paris Agreement on climate change, and the Addis Ababa Action Agenda, emphasizing the urgency of a coordinated and comprehensive international response and recovery effort, based on sound data and science and guided by the Sustainable Development Goals (UN, 2020).

UN-Habitat, the UN agency for housing and urban development, is working with national and local governments, helping them in preventing, facing, responding to,

and recovering from the COVID-19 pandemic. The UN-Habitat COVID-19 Response Plan aims to:

- Support local governments and community-driven solutions in informal settlements
- Provide urban data, evidence-based mapping, and knowledge for informed decision
- Mitigate economic impact and initiate recovery.

The UN-Habitat's COVID-19 Policy and Programme Framework provides, in turn, guidance for global, regional and country-level action.

A rigorous assessment is of paramount importance in order to design, monitor, and adjust the multiple performances required in urban re-developments, specifically referring to two primary trajectories (risks reduction and resources management), and six dimensions (*air* – pollutants emission, ozone depletion, urban heat islands –; *water* – flooding, storm water, domestic water, wastewater –; *land* – soil sealing, soil consumption, land use, land cover, urban heat islands, droughts –; *natural capital* – habitat, biodiversity, natural cycles, ecosystem services –; *resources* – reduction and efficiency, circularity, zero waste, renewability, food production –; and *people* – community resilience, health and well-being, welfare).

A key overarching objective would be the one of regenerating economic activities, without simply restoring old irresponsible patterns of environmental quality degradation. In this respect, social and economic emergencies impose an increased international collaboration and mutual support towards the most exposed and vulnerable communities.

In many SDGs' indicators, timing matters enormously to save lives and ecosystems, and to put in place effective governance. The issue of SDGs is tightly interlinked with the issue of resilience and the timing of the resilience. In other words, looked from the lenses of regenerative sustainability, a paradigm shift towards sustainable urbanization, based on post COVID-19 "response, recovery, and reset" in a climate change scenario, ultimately translates into a consistent call for a "regenerative" urban transition.

As a matter of fact, the COVID-19 pandemic has debunked any common belief that the Global North (Ashford et al., 2020) has the full capacity to tackle global challenges and has further stressed the need for mutual learning and adaptation in all countries towards a more sustainable and just world.

We need a "just" climate transition which is able to protect the poor and the most vulnerable people and which is not disconnected from our pandemic response. This would not only invert the tendency of the climate disaster we are already witnessing, but would also minimize the risk of new pandemics breaking out.

The new Coronavirus certainly affects every person and community, but it does so unequally. It has even further aggravated existing inequalities and injustices. Inequalities are present in all urban societies and introduce further complexity in managing pandemics (Acuto, 2020). Although sharper in unstable settlements, inequalities are not limited to the Global South (Ashford et al., 2020). Nearly two

billion people worldwide have reduced or no access to acceptable sanitation, and more than 150 million people are considered homeless (Satterthwaite, 2000).

Nonetheless, although desirable, it is not guaranteed that we will be able to leverage COVID-19 as an opportunity for healthy economic recovery, stronger community building, and more explicit considerations of urban equality. The digital response to what is probably the most “information-intensive” public-health crisis of modern times has initiated a deep digital change by boosting teleworking, web-based communities structuring, virtually delivered services, and 3D printing of essentials (Acuto, 2020). The role of information and communication technologies (ICT) in fighting against the spread of the pandemics is very important. One can, for instance, think about the role of contact-tracing mobile apps, which are able to alert people who have been in close contact with someone that shortly after has been tested positive to the virus, although they have been often criticized because of allegedly endangering citizens’ privacy (Rowe, 2020). However, ICT also carry the risk of being very dangerous in spreading a sort of other disease, which has been defined as “infodemics”, referred to as an excess of information – some accurate and some not – that makes it difficult for people to find reliable sources and trustworthy guidance when they need it (Pan & Zhang, 2020).

The very face of our cities is likely to change quite significantly in the years to come, with the pandemics having only accelerated the change that in many cases was already slowly but steadily happening. Transport infrastructures, public transportation means and public venues of all kinds (even streets) might have to be retrofitted in order to prevent overcrowding. This is likely to drive a regenerative urban transition, and ultimately transform our cities and communities, hopefully in better and more resilient ones.

We should also be vigilant in making sure that government funds are allocated to decentralized renewable energy production, because this would be a meaningful start of the implementation of the European Green Deal and would create new critical jobs within the post-COVID-19 economic crisis. At the same time, we should be active in providing universal healthcare, extending social protection, and free education to reach all vulnerable populations, and giving the necessary priority to the realization of affordable housing (Mastrucci, Byers, Pachauri, & Rao, 2019) and multifunctional urban green blue infrastructure.

A change in the governance structures and business models is required, and the city’s perception can be improved by co-designing inclusive public spaces, as well as different ways for people to engage and interact with technology and nature (Landman, 2020).

22.3 Implementing Regenerative Urban Transition

In recent years, a rapidly growing number of cities have already started to design and implement strategies and policies aiming at environmental sustainability, green economy, and green growth.

The European Green Deal (European Commission, 2018) represents a framework for policy initiatives with the overarching aim of making Europe resilient and climate neutral by 2050. The plan is also to update existing laws and regulations on climate, and introduce new rules boosting the circular economy, building restoration, biodiversity protection and enhancement, sustainable farming and innovation.

Three action clusters – and their interrelationships – can in particular be identified as prioritized sectors along the Green New Deal for sustainable urbanization, here defined as: Innovative Urban Assets and Infrastructure; Circular and Equitable Urban Economies; and Climate Neutrality. We have chosen to explore and discuss in the following sections how these three modular building-blocks of SDGs achievement, and related integrated actions, can guide a regenerative urban transition, and frame medium-term strategies towards more resilient and equitable societies (see Fig. 22.1).

22.3.1 Innovative Urban Assets and Infrastructure

Cities will never cease to need large-infrastructures; however, sometimes small-scale infrastructures, such as cycle lanes and bike sharing, or techno-ecological systems (Bakshi, Ziv, & Lepech, 2015) for climate change adaptation (SDG 13) and thermal comfort (SDG 3), can also play an impactful role in an urban area, benefiting both people and the environment (SDG 11). Appropriate technologies (Schumacher, 1973) should be considered as means to shape sustainable behaviours, and improve the daily life of the city's inhabitants, while innovations should be co-created and co-designed by and for the citizens, observing the principles of universal design and usability by people of all ages and capabilities (SDG 1). In this respect, a new role has emerged in the highly digitalized society of the developed countries: the role of “persuasive technologies”, such as mobile apps and gamification tools to induce citizens and service users to adopt more virtuous and sustainable behaviours (Huber & Hilty, 2015; Cellina et al., 2019; Ming-Chuan, Tsai-Chi and Hsin-Ting, Ming-Chuan, Tsai-Chi, & Hsin-Ting, 2020). On the other hand, collaborative initiatives like urban living labs (Bulkeley et al., 2016) and participatory planning tools (Nyerges et al., 2016; Voytenko, McCormick, Evans, & Schliw, 2016) have arisen and became operational, showing their potential in helping decision-makers towards making shared choices and realizing inclusive projects and initiatives.

However, regenerative transformation of urban assets and infrastructure will not be achievable by relying only on technologies, or providing more sustainable service offerings alone; it will progress only through a fundamental rethinking of space and the re-organization of all daily activities, addressing different urban settings at various scales, from building and open space to neighbourhoods, and up to the inter-city scale, while taking into account how people move, work, live, recreate (JPI Urban Europe, 2020). For these reasons, this concept offers a clear focus for a holistic, people-oriented and challenge-driven perspective for distinct aspects of the



Fig. 22.1 Regenerative Urban Design in a changing built environment post COVID-19: Pathways towards selected UN Sustainable Development Goals. (Adapted from JPI Urban Europe, 2020)

“doughnut economy” (Raworth, 2017) (SDG 8), and the overarching ambition of regenerative cities according to a wider Smart City and Community concept (Hauser Hand, Weber, & Bluestone, 2017).

22.3.2 *Circular & Just Urban Economies*

According to the Ellen MacArthur Foundation’s definition (2015), a circular economy provides multiple value-creation mechanisms, and is based on three principles: (1) conservation and enhancement of natural capital (SDG 3); (2) optimization of

resources by reintegrating materials, components, and products into nature, or valorizing them into other supply chains' resources, fighting resources depletion and material scarcity (SDG 1); and (3) reinforcing systemic value by identifying and designing out negative externalities (SDG 13). The Ellen MacArthur Foundation also identifies six business actions to support the three principles mentioned above: Regenerate, Share, Optimize, Loop, Virtualize, and Exchange, i.e., the "ReSOLVE levers" (Ellen MacArthur Foundation, 2015).

Circular economy is a motor for sustainable growth (SDG 11), the creation of good health (SDG 3) and decent jobs (SDG 8) and, at the same time, it is able to protect the environment and its natural resources supporting climate adaptation and mitigation plans (SDG 13). The shift from a linear urban metabolism to circularity, through integrated transformative and equitable actions, represents a critical contribution to the achievement of a regenerative and inclusive urban transition, by supporting the restoration of attractive built environments ultimately founded on livability and well-being (SDG 3), as well as implementing urban design principles able to deliver high quality and healthy public spaces (SDG 3).

22.3.3 *Climate Neutrality*

The European Green Deal traces pathways to climate change neutrality and sustainable development, supported by significant investments in green technologies and innovation. It includes the first EU Climate Law with a legally binding target of net zero greenhouse gas emissions by 2050. It also embraces a new and revised European Union (EU) Adaptation Strategy (European Union, 2020).

The EU has been an early pioneer on climate change adaptation. The 2013 EU Adaptation strategy created impact at multiple scales by mainstreaming adaptation through policies and funding instruments. The EU Member States have adopted comprehensive adaptation strategies and plans. The EU made sizeable investments in making cutting-edge climate risk information accessible, usable and useful (SDG 3). The new EU Adaptation Strategy will be even more ambitious in terms of better knowledge, better climate risk management (SDG 13), and better urban solutions (SDG 11).

To achieve energy transition in cities, it is essential to increase energy systems integration and improve energy performance to levels that go significantly beyond the ones established in current EU building codes, as well as reaching a Europe-wide deployment of Positive Energy Districts (PEDs) by 2050 (European Commission, 2016, 2018). The PED approach aims at progressing the flexibility dimension of urban districts within the (renewable) regional energy system, as well as minimizing the energy and ecological footprint of people, goods, and services. The district scale is supposed to boost economic sustainability (SDG 8), and develop synergies (e.g., efficiency deployment, flexibility, integration), through equitable and inclusive governance in distributed resources (SDG 1), and a considerable involvement of stakeholders and communities in urban planning and

implementation (SDG 11). Mainstreaming Climate Neutrality for cities and citizens implies that the development should follow four guiding principles, namely: (a) quality of life (SDG 3); (b) inclusiveness (with special attention to energy affordability and prevention of energy vulnerability) (SDG 1); (c) sustainability (SDG 11); and (d) resilience and security of energy supply (JPI Urban Europe, 2020). Districts and neighbourhoods will not be able to produce more energy than they consume without the design of new mobility solutions, and more circular use of resources. Sustainable energy systems and smart mobility solutions must consequently be prioritized, and cities should adopt circularity in order to secure health and well-being within the limits of planetary boundaries. New mobility solutions necessitate innovative energy technology and systemic design thinking (JPI Urban Europe, 2020). By system (or systemic) thinking it is meant the analytical approach by which the attention is shifted from the study of single events to the study of the systems from which they emerge (Meadows, 2008a). This means no longer looking simply at causes, effects, and mutual relationships but reasoning instead in terms of emerging patterns, structures, and the so-called *leverage points*, i.e., places within a complex system (a corporation, an economy, a living body, a city, an ecosystem) where a small shift in one thing can produce big changes in everything (Meadows, 2008b). Leverage points, therefore, are very important when seeking to produce a change within interconnected ecological, social, and economic systems (see also a link with the Nexus approach recalled in Sect. 4).

Similarly, Climate Neutrality implies a correct consideration of user behaviour and lifestyle (SDG 3), balancing the goals of cost efficiency and green growth (SDG 8), with affordability of housing and energy poverty reduction (SDG1). These three key priority clusters – Innovative Urban Assets and Infrastructure, Circular & Equitable Urban Economies, and Climate Neutrality – imply the adoption of visionary integrated approaches that support each other, as well as provide solutions to most of all the other urban critical challenges, thus revealing multiple interlinkages with the priorities set by the SDGs and the higher significance of community resilience in a post-COVID-19 scenario. The three clusters can be considered synergistic multiscale strategies aiming at supporting the climate neutrality and other sustainability achievements in cities, mostly in consideration of their increased physical, functional, and socio-economic vulnerability. Some common ground across the three clusters suggests that priority should be given to the regeneration of existing urban areas through innovative and participatory urban governance models, based on following up inputs provided by residents and inhabitants during design, implementation, and post-occupancy phases.

22.4 Benchmarking and Monitoring the Implementation and the Results of Policies and Interventions Aimed at SDGs

As already mentioned above, the enormous disruption of social, economic, and health spheres of the global society caused by the COVID-19 pandemics, directly threatens human well-being and mankind's life, jeopardizing the sought-after achievement of the United Nation's Sustainable Development Goals (Zhou et al., 2020). The 17 SDGs and related 169 targets aim to promote a global agenda for sustainable development to be achieved by 2030. The UN SDGs global indicator framework includes 244 indicators, nine of which appear under two or more different targets, resulting in 232 distinct indicators.

Specifically, SDG 3 “Good Health and Wellbeing” aims to “ensure healthy lives and promote well-being for all at all ages” (United Nations General Assembly, 2015). SDG 11 explicitly focuses on Sustainable and Resilient Cities and Human Settlements and gathers 14 of the 244 indicators.

Beyond the compelling principles that lay behind the UN SDGs, the question we ask ourselves now is: *Is there a way to reconcile the reorganization of our society after the dire damages caused by this frightening pandemic with the pursuit of the UN SDGs?*

This is certainly not an easy question to answer, but beyond any doubt, the paths towards community recovery and regeneration of our built environment after such an epochal crisis cannot overlook the complex symbiotic interrelationships that affect our economic and social system. In other words, the post-pandemic rebirth of our society is deeply anchored on the foundations of the “Nexus approach” (Bai et al., 2018). This requires a multi-disciplinary approach which overcomes governance silos and goes even beyond tracing linkages between water, food, and energy systems, but extends them also to sectors like infrastructure provision, inequality, and resilience, as proposed by Bai et al. (2018). A planner or a policymaker who embraces this comprehensive approach is aligned with the good principles of regenerative development and design (Robinson & Cole, 2015), which has “whole systems thinking” as an intrinsic feature (Mang & Reed, 2012).

22.4.1 *The Importance of Disaggregated Spatial Indicators in Integrated Planning*

Thinking more specifically about cities, where 68% of the world population is expected to live in 2050 (United Nations, 2019), it is now acknowledged that integrated planning and multi-sectors governance is absolutely needed to create healthy, sustainable, and equitable cities (UN, 2017; Lowe, Whitzman, & Giles-Corti, 2018; UN General Assembly, 2015).

Integrated planning requires the adoption and monitoring of indicators able to encompass the entire pathway of city's life shaping: from urban systems policies – defined as the most *upstream* determinants of health (Marmot & Bell, 2012) – to the more *downstream* pathways that regulate physical and mental health risk exposures of citizens, such as traffic, air pollution, physical inactivity, social isolation, safety, and unhealthy diets (Giles-Corti, Lowe, & Arundel, 2020).

The link between sustainable development, climate change, and human health is recognized by the scientific community, as well as at institutional level, with the World Health Organization (WHO) having recognized health as a distinctive marker of sustainable development (WHO, 2017), and the role of city planning in creating the conditions for good (and bad) health (WHO, 2008).

The critical role played by cities in achieving the SDGs, was recognized in the UN Habitat's New Urban Agenda (NUA) established in 2016 (UN, 2016), which recognizes the importance of quantitative and qualitative monitoring and regular tracking of progress towards cities' sustainable development (UN, 2018).

In 2017, an indicator framework to measure progress on implementing the 17 SDGs and their targets was endorsed by UN member states. This framework has then been refined specifically for cities by UN Habitat in its *Action Framework for Implementation of the New Urban Agenda* (UN Habitat, 2017). This Action Framework goes beyond Goal 11; it proposes 85 target indicators from other SDGs which have urban-based targets, of which 48 from the UN SDG global indicator framework, and 37 city-specific indicators from the City Prosperity Initiative (UN Habitat, 2015).

Giles-Corti et al. (2020) outline a conceptual framework describing pathways through which urban systems policies (i.e., city planning decisions) shape urban design and transport planning actions, and daily-life choices, thus ultimately affecting health and sustainability. They underline the importance of disaggregated spatial indicators to measure inequities in opportunities and map inequitable access to infrastructures and services, as well as the outcome of city policies on the health of inhabitants (amongst other things). "Socio-spatial equity" is in fact one of the urban challenges identified by Babí Almenar et al. (2021), pointing out that many of the case studies reviewed by the authors describe a lack of adequate distribution of living systems in urban areas (Wu et al., 2018; Anguelovski, Connolly, Masip, & Pearsall, 2018; Shen, Sun, & Che, 2017, with a consequent unbalanced distribution of their characteristics promoting health (in other words, evidence of environmental injustice).

Indicators allow benchmarking and monitoring the implementation and the results of policies and interventions. According to Giles-Corti et al. (2020), most of the SDGs and NUA indicators associated to city planning and health would allow for spatial disaggregation, although this is strongly conditioned by local data availability. With this aim in mind, therefore, they underline the importance of standardization of indicators and data collection. Going in this direction, the International Organization for Standardization (ISO) and the World Council on City Data (WCCD) have put their set of city services and quality of life indicators in relationship with the SDG-related indicators. ISO 37120:2018 (ISO, 2018) is supported by

additional standards, focusing on smart cities (ISO, 2019a) and resilient cities (ISO, 2019b). However, the ISO and WCCD approaches do not leverage the importance of spatially disaggregated indicators. This limits its usefulness for city planners and fails to unveil health inequalities as advocated by WHO (2010).

Very interestingly, Giles-Corti et al. (2020) finally remark also that, despite the importance of city planning to reach several SDGs, there are no specific city planning indicators for nine of the 17 SDGs, which is a signal of the fact that the strategic importance of spatial planning for the achievement of those goals is overlooked. Importantly, they highlight how the UN's SDG indicators framework ignores critical *upstream* indicators (like regulatory policies, or interventions and investments) that are likely to determine whether the SDGs are actually achieved. Conversely, the NUA indicators framework, which properly measures several urban design and transport planning interventions, omits important *downstream* indicators (for example, the ones measuring injury and health outcomes) that assess the results of policy implementation.

Investing in data and information technologies will be, therefore, instrumental to recover from the COVID-19 pandemic and accelerate the implementation of the SDGs (UN/DESA, 2020).

22.5 Funding Regenerative Urban Transition Through Horizon Europe

The European Commission has been paying for three decades significant attention to urban dimensions and sustainable development as real cornerstones in its funding strategies, and this trend seems to continue through the forthcoming Horizon Europe Framework Programme. The Programme aims at giving Europe a new push to a global positioning. Horizon Europe is supposed to be the biggest and most ambitious EU Research Innovation programme ever. It would possibly build on the success of Horizon 2020 and would improve it further by fostering a stronger support to breakthrough innovation through the European Innovation Council, by creating greater impact through Research and Innovation (R&I) missions and by streamlining partnership opportunities (Gabriel, 2020).

The EU research and innovation framework programme (2021–2027) aims to strengthen the EU's scientific and technological bases and the European Research Area (ERA); to boost Europe's competitiveness, innovation, and job creation capacity; and to respond to citizens' priorities and sustain our socio-economic model and values. The Commission set up a budget in excess of € 100 billion for Horizon Europe.

The Commission had already identified six priorities for the period 2019–2024:

- “A European Green Deal”: Striving to be the first climate neutral continent
- “A Europe fit for the digital age”: Empowering people with a new generation of technologies
- “An economy that works for people”: Working for social fairness and prosperity

- “A stronger Europe in the world”: Europe to strive for more by strengthening our unique brand of responsible global leadership
- “Promoting our European way of life”: Building a Union of equality in which we all have the same access to opportunities and
- “A new push for European democracy”: Nurturing, protecting, and strengthening our democracy.

Three pillars – Excellent Science; Global Challenges, and European Industrial Competitiveness; Innovative Europe – and four specific key strategic orientations (KSO) have been defined (September 2020) to frame the R&I contribution to EC political priorities:

- KSO 1 – Promoting an open strategic autonomy by leading the development of key digital and enabling technologies, sectors, and value chains to accelerate and steer the digital and green transitions through human-centred technologies and innovations
- KSO 2 – Restoring Europe’s ecosystems and biodiversity, and managing sustainably natural resources to ensure food security and a clean and healthy environment
- KSO 3 – Making Europe the first digitally-led circular, climate-neutral, and sustainable economy through the transformation of its mobility, energy, construction, and production systems
- KSO 4 – Creating a more resilient, inclusive and democratic European society, prepared and responsive to threats and disasters, addressing inequalities and providing high-quality health care, and empowering all citizens to act in the green and digital transitions.

The aim is to create a strong bridge between R&I and EU policy priorities, and give directionality towards the UN SDGs across six clusters:

- Cluster 1 – “Health”
- Cluster 2 – “Culture, Creativity and Inclusive Society”
- Cluster 3 – “Civil security for society”
- Cluster 4 – “Digital, Industry and Space”
- Cluster 5 – “Climate, Energy and Mobility”
- Cluster 6 – “Food, Bioeconomy, Natural Resources, Agriculture and Environment”.

Great attention is paid to the impacts (i.e., long term targeted effects on society, the environment, the economy and science, enabled by the outcomes of EU R&I investments) that will be produced. In particular, KPO 3 “Making Europe the first digitally led circular, climate-neutral and sustainable economy through the transformation of its mobility, energy, construction and production systems” relates to four (out of a total of 15) impacts; namely: Climate change mitigation and adaptation; Affordable and clean energy; Smart and sustainable transport; Circular and clean economy; and four clusters: Cluster 1 (Health); Cluster 4 (Digital, Industry, and Space); Cluster 5 (Climate, Energy, and Mobility); and Cluster 6 (Food, Bioeconomy, Natural Resources, Agriculture, and Environment).

Specific “missions” will be planned in the framework of pillar II “Global Challenges and European Industrial Competitiveness” (drawing from other pillars). Horizon Europe will define mission’s characteristics and governance elements. A “mission” is a portfolio of actions across disciplines intended to achieve a bold and inspirational and measurable goal within a set time frame, with impact for society and policy-making as well as relevance for a significant part of the European population and wide range of European citizens. R&I missions will better relate EU’s research and innovation to society and citizens’ needs, with strong visibility and impact.

Particularly relevant with respect to the SDGs previously identified appear two out of the five missions already identified in June 2020:

- “A Climate Resilient Europe – Prepare Europe for climate disruptions and accelerate the transformation to a climate resilient and just Europe by 2030”. Targets by 2030: prepare Europe to deal with climate disruptions, accelerate the transition to a healthy and prosperous future within safe planetary boundaries, and scale up solutions for resilience that will trigger transformations in society; and
- “100 Climate Neutral Cities by 2030 – by and for the citizens”. Targets by 2030: support, promote, and showcase 100 European cities in their systemic transformation to climate neutrality by 2030 and turn these cities into innovation hubs for all cities, benefitting quality of life and sustainability in Europe.

Each mission would involve one or more of the following:

- Launch specific calls in Horizon Europe and other programmes. These calls will encourage creativity and bottom up working from the proposer.
- Identify specific actions to change/improve policy context, which are critical for missions’ success, such as framework conditions.
- Make use of the appropriate partnerships.
- Mobilize structural funds to the alignment to mission goals.
- Establish the appropriate links with national programmes.
- Influence the international agenda, combining efforts with similar third country programmes.

When ready for investment, cities will be able to apply for a variety of instruments/funds/facilities mainly involving European Investment Bank (EIB) funds. Already, in the past (2012–2018), EIB contributed with estimated urban lending in excess of € 150 Billion, out of which nearly 20% was invested on climate mitigation actions through Natural Capital Financing Facility and Municipal Loans. Other instruments, such as the Connecting Europe Facility, provide guarantees and bonds, whereas the European Energy Efficiency Fund (a Public-Private Partnership with international banks) equips cities with market-based junior debt, mezzanine instruments, guarantees, equity, leasing structures, and forfeiting loans. Moreover, in response to the coronavirus pandemic, the EIB quickly deployed a support plan to help meet the most urgent financing needs of regions and municipalities. Recognizing, through dedicated funding, the key role of cities and regions in mitigating the pandemic’s effects while supporting the local economies will hopefully

enable a faster urban transition and allow more equitable and inclusive implementation of regenerative initiatives.

22.6 Concluding Remarks

Achieving in ten years, within European cities, what Europe plans to achieve in 30 years, is a huge challenge that requires a systemic transformation for acting on the global climate emergency, and for delivering co-benefits that will improve the health, well-being and prosperity of citizens. This transformation seems possible, because technologies and innovative solutions for sustainable energy, transport, food, water, dwelling, and material systems already exist thanks to R&I programmes developed over the last decade, and mostly considering the initiatives that will soon be made available, thanks to Horizon Europe and national R&I programmes. Green technology prices and market conditions are moving fast towards climate-friendly investments and will continue to strengthen incentives to regenerative transition. The European Green Deal, including a revision of EU directives for 2030, and the reinforced role of the EIB will thus further strengthen this trend.

In conclusion, COVID-19 has exposed our society to its biggest admission of fragility in decades, but has also presented our community a unique opportunity to rethink, replan, and redesign. However, a main dilemma remains: *Will we make use of these lessons to plan and decide for a better future? Will the most developed countries respond positively to the call for a revolutionary change in their business operation, curbing tax avoidance and reducing investments in military defence* (Naidoo and Fisher, 2020)?

This ending contribution to the RESTORE Final Book does not seek to establish what is likely to happen, but instead to make a case for “conditional optimism” about our resilience capacities, and to flesh out the reasons why one might confirm SDGs being a critical pillar of a regenerative approach to architecture and urbanization aiming at integrated transformative benefits. By this forward-looking message, it is meant that, if humanity successfully navigates the technical, ethical, and political challenges of developing and diffusing powerful transformative actions, the achievement of 2030 UN SDGs will certainly have an enormous and potentially very positive impact on health, well-being and quality of life.

Author Contributions Conceptualization, MBA & AM; Methodology, MBA & AM; Writing – original draft, MBA; Writing – review and editing, MBA & AM.

All authors have read and agreed to the published version of the manuscript.

Acknowledgements The authors are thankful to the colleagues Editors of the COST RESTORE final book, Milen Balton and Preben Hansen, for their valuable contribution and dedication in reviewing this chapter.

References

- Acuto, M. (2020). COVID-19: Lessons for an urban(izing) world. *One Earth*, 2(4), 317–319.
- Anguelovski, I., Connolly, J. J. T., Masip, L., & Pearsall, H. (2018). Assessing green gentrification in historically disenfranchised neighborhoods: A longitudinal and spatial analysis of Barcelona. *Urban Geography*, 39(3), 458–491.
- Ashford, N. A., Hall, R. P., Arango-Quiroga, J., Metaxas, K. A., et al. (2020). Addressing inequality: The first step beyond COVID-19 and towards sustainability. *Sustainability*, 12, 5404.
- Babí Almenar, J., Elliot, T., Rugani, B., Philippe, B., et al. (2021). Nexus between nature-based solutions, ecosystem services and urban challenges. *Land Use Policy*, 100, 104898.
- Bai, X., Dawson, R. J., Ürge-Vorsatz, D., Delgado, G. C., et al. (2018). Six research priorities for cities and climate change. *Nature*, 555(7694), 23.
- Bakshi, B. R., Ziv, G., & Lepech, M. D. (2015). Techno-ecological synergy: A framework for sustainable engineering. *Environmental Science & Technology*, 49, 1752–1760.
- Berchin, I. I., & de Andrade Guerra, J. B. S. O. (2020). GAIA 3.0: Effects of the coronavirus disease 2019 (COVID-19) outbreak on sustainable development and future perspectives. *Research in Globalization*, 100014.
- Bulkeley, H., Coenen, L., Frantzeskaki, N., Hartmann, C., et al. (2016). Urban living labs: Governing urban sustainability transitions. *Current Opinion in Environmental Sustainability*, 22, 13–17.
- Cellina, F., Bucher, D., Veiga Simão, J., Rudel, R., et al. (2019). Beyond limitations of current behaviour change apps for sustainable mobility: Insights from a user-centered design and evaluation process. *Sustainability*, 11, 2281.
- Ellen MacArthur Foundation. (2015). *Growth within: A circular economy vision for a competitive Europe*. Cowes: Ellen MacArthur Foundation.
- European Commission. (2016). Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee, the Committee of the Regions, and the European Investment Bank: Accelerating Clean Energy Innovation Brussels, 30.11.2016 COM(2016) 763 final. https://ec.europa.eu/energy/sites/ener/files/documents/1_en_act_part1_v6_0.pdf Accessed 15 Sept 2020.
- European Commission. (2018). *SET-Plan ACTION n°3.2 Implementation Plan Europe to become a global role model in integrated, innovative solutions for the planning, deployment, and replication of Positive Energy Districts*. https://setis.ec.europa.eu/system/files/setplan_smartcities_implementationplan.pdf Accessed 3 Sept 2020.
- European Union. (2020). *Proposed mission: A climate resilient Europe: Prepare Europe for climate disruptions and accelerate the transformation to a climate resilient and just Europe by 2030*. Luxembourg: Publications Office of the European Union. https://ec.europa.eu/info/horizon-europe/missions-horizon-europe/climate-neutral-and-smart-cities_en. Accessed 10 Nov 2020.
- Gabriel, M. (2020). *Horizon Europe: An investment in and for our future*, 06/03/2020. <https://cor.europa.eu/it/news/Pages/Horizon-Europe-an-investment-in-and-for-our-future.aspx>. Accessed 8 Nov 2020.
- Giles-Corti, B., Lowe, M., & Arundel, J. (2020). Achieving the SDGs: Evaluating indicators to be used to benchmark and monitor progress towards creating healthy and sustainable cities. *Health Policy*, 124(6), 581–590.
- Hauser Hand, G., Weber, R., & Bluestone, N. (2017). Regenerative cities: Moving beyond sustainability. *Journal of Urban Design and Mental Health*, 3, 14.

- Huber, M. Z., & Hilty, L. M. (2015). Gamification and sustainable consumption: Overcoming the limitations of persuasive technologies. In L. Hilty & B. Aebischer (Eds.), *ICT innovations for sustainability. Advances in intelligent systems and computing* (Vol. 310, pp. 7–12). Cham: Springer.
- ISO. (2018). *ISO 37120: 2018 Sustainable cities and communities – Indicators for city services and quality of life*. <https://www.iso.org/obp/ui/#iso:std:iso:37120:ed-2:v1:en>. Accessed 2 Sept 2020.
- ISO. (2019a). *ISO 37122:2019 Sustainable cities and communities – Indicators for smart cities*. <https://www.iso.org/standard/69050.html>. Accessed 10 Sept 2020.
- ISO. (2019b). *ISO 37123:2019 Sustainable cities and communities – Indicators for resilient cities*. <https://www.iso.org/standard/70428.html>. Accessed 10 Sept 2020.
- Johns Hopkins University. (2020). *COVID-19 data in motion*. <https://coronavirus.jhu.edu>. Accessed 15 Nov 2020.
- JPI Urban Europe. (2020). *Europe towards positive energy districts*. First Update. A compilation of projects towards sustainable urbanization and the energy transition. Vienna, Austria: Urban Europe.
- Landman, K. (2020). Inclusive public space: Rethinking practices of mitigation, adaptation and transformation. *Urban Design International*, 25(3), 211–214.
- Lowe, M., Whitzman, C., & Giles-Corti, B. (2018). Health-promoting spatial planning: Approaches for strengthening urban policy integration. *Planning Theory & Practice*, 19(2), 180–197.
- Mang, P., & Reed, B. (2012). Designing from place: A regenerative framework and methodology. *Building Research & Information*, 40(1), 23–38.
- Marmot, M., & Bell, R. (2012). Fair society, healthy lives. In *Proceedings of the public health international conference 2011: Health and Wellbeing – The 21st Century Agenda*, 8–9 September 2011, London, UK, 126, S4–S10.
- Mastrucci, A., Byers, E., Pachauri, S., & Rao, N. D. (2019). Improving the SDG energy poverty targets: Residential cooling needs in the global south. *Energy and Buildings*, 186, 405–415.
- Meadows, D. H. (2008a). *Thinking in systems. A primer*. London: Earthscan.
- Meadows, D.H. (2008b). *Leverage points: Places to intervene in a system*. <http://donellameadows.org/archives/leverage-points-places-to-intervene-in-a-system/>. Accessed 10 Nov 2020.
- Ming-Chuan, C., Tsai-Chi, K., & Hsin-Ting, L. (2020). Design for sustainable behavior strategies: Impact of persuasive technology on energy usage. *Journal of Cleaner Production*, 248, 119214.
- Naidoo and Fisher. (2020). Reset sustainable development goals for a pandemic world. *Nature*, 583(9), 198–201. <https://www.nature.com/articles/d41586-020-01999-x>. Accessed 7 Dec 2020.
- Nyerges, T., Ballal, H., Steinitz, C., Canfield, T., et al. (2016). Geodesign dynamics for sustainable urban watershed development. *Sustainable Cities and Society*, 25, 13–24.
- Pan, S. L., & Zhang, S. (2020). From fighting COVID-19 pandemic to tackling sustainable development goals: An opportunity for responsible information systems research. *International Journal of Information Management*, 55, 102196. <https://doi.org/10.1016/j.ijinfomgt.2020.102196>
- Raworth, K. (2017). *Doughnut economics: Seven ways to think like a 21st century economist*. New York: Random House Business Books.
- Robinson, J., & Cole, R. J. (2015). Theoretical underpinnings of regenerative sustainability. *Building Research & Information*, 43(2), 133–143.
- Rowe, F. (2020). Contact tracing apps and values dilemmas: A privacy paradox in a neo-liberal world. Impact of COVID-19 pandemic on information management research and practice. *Editorial Perspectives*, 55, 102178.
- Satterthwaite, D. (2000). Will most people live in cities? *BMJ*, 321(7269), 1143–1145.
- Schumacher, E. F. (1973). *Small is beautiful: Economics as if people mattered*. London: Blond & Brig.

- Sharifi, A., & Khavarian-Garmsir, A. R. (2020). The COVID-19 pandemic: Impacts on cities and major lessons for urban planning, design, and management. *Science of the Total Environment*, 749, 142391.
- Shen, Y., Sun, F., & Che, Y. (2017). Public green spaces and human wellbeing: Mapping the spatial inequity and mismatching status of public green space in the Central City of Shanghai. *Urban Forestry & Urban Greening*, 27, 59–68.
- UN Habitat. (2015). *The global goals for sustainable development and the city prosperity initiative*. <http://wuf9.org/sites/default/files/resources/CPI%20and%20SDGs.pdf>. Accessed 2 Sept 2020.
- UN Habitat. (2017). *Action framework for implementation of the New Urban Agenda*. <https://habitat3.org/the-new-urban-agenda/>. Accessed 2 Sept 2020.
- UN/DESA. (2020). *Policy Brief #81: Impact of COVID-19 on SDG progress: A statistical perspective*. <https://www.un.org/development/desa/dpad/publication/un-desa-policy-brief-81-impact-of-covid-19-on-sdg-progress-a-statistical-perspective/>. Accessed 10 Nov 2020.
- United Nations. (2016). *Resolution adopted by the General Assembly on 23 December 2016: New Urban Agenda*. https://www.un.org/en/development/desa/population/migration/generalassembly/docs/globalcompact/A_RES_71_256.pdf. Accessed 28th Aug 2020.
- United Nations. (2017). *New Urban Agenda*. <http://habitat3.org/wp-content/uploads/NUA-English.pdf>. Accessed 1 Sept 2020.
- United Nations. (2018). *Resolution adopted by the General Assembly (A/RES/71/313): Global indicator framework for the Sustainable Development Goals and targets of the 2030 Agenda for Sustainable Development*. <https://unstats.un.org/sdgs/indicators/indicators-list/>. Accessed 3 Sept 2020.
- United Nations. (2019). *World urbanization prospects: The 2018 Revision (ST/ESA/SER.A/420)*. <https://population.un.org/wup/Publications/Files/WUP2018-Report.pdf>. Accessed 3 Sept 2020.
- United Nations. (2020). *The sustainable development goals report 2020*. New York: United Nations. <https://unstats.un.org/sdgs/report/2020/The-Sustainable-Development-Goals-Report-2020.pdf>. Accessed 10 Nov 2020.
- United Nations General Assembly. (2015). *Resolution adopted by the General Assembly: Transforming our world: The 2030 agenda for sustainable development A/RES/70/1*. https://www.un.org/en/development/desa/population/migration/generalassembly/docs/globalcompact/A_RES_70_1_E.pdf. Accessed 2 Oct 2020.
- Voytenko, Y., McCormick, K., Evans, J., & Schliw, G. (2016). Urban living labs for sustainability and low carbon cities in Europe: Towards a research agenda. *Journal of Cleaner Production*, 123, 45–54.
- World Health Organization. (2008). *Commission on the Social Determinants of Health. Closing the gap in a generation: Health equity through action on the social determinants of health* (Final report of the Commission on the social determinants of health). https://www.who.int/social_determinants/final_report/csdh_finalreport_2008.pdf. Accessed 3 Oct 2020.
- World Health Organization. (2010). *Hidden cities: Unmasking and overcoming health inequities in urban settings*. <https://www.who.int/publications/i/item/9789241548038>. Accessed 3 Oct 2020.
- World Health Organization. (2017). Shanghai declaration on promoting health in the 2030 agenda for sustainable development. *Health Promotion International*, 32(1), 7–8.
- Wu, J., He, Q., Chen, Y., Lin, J., et al. (2018). Dismantling the fence for social justice? Evidence based on the inequity of urban green space accessibility in the central urban area of Beijing. *Environment and Planning B: Urban Analytics and City Science*, 47(4), 626–644.
- Zhou, C., Su, F., Pei, T., Zhang, A., et al. (2020). COVID-19: Challenges to GIS with big data. *Geography and Sustainability*, 1(1), 77–87.

Open Access This chapter is licensed under the terms of the Creative Commons Attribution 4.0 International License (<http://creativecommons.org/licenses/by/4.0/>), which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license and indicate if changes were made.

The images or other third party material in this chapter are included in the chapter's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the chapter's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.

