

Ernesto Antonini, Jacopo Gaspari

Architectures for Next Generation EU Cities

Challenges, Key Drivers,
and Research Trends



Ricerche di tecnologia dell'architettura

FrancoAngeli 



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and Research Trends**

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Table of contents

Introduction	pag.	11
Section 1 - Climate resilient cities		
1. Resilient urban environment: challenges and mitigation strategies	»	17
<i>Rosa Schiano-Phan</i>		
1.1. Challenges of contemporary and future urban environments	»	17
1.2. Mitigation strategies towards long-term resilience	»	23
1.3. Resilient urban environments	»	26
2. Exploring synergies in sustainable, resilient and smart buildings to address new design paradigms in the next generation of architecture	»	31
<i>Licia Felicioni</i>		
2.1. Introduction	»	31
2.2. Three design approaches	»	35
2.3. Three principles for a sustainable, resilient and smart built environment	»	39
2.4. Final reflections and future directions	»	42

3. Running after pathways: a critical reflection on climate change roadmaps	»	47
<i>Saveria Olga Murielle Boulanger</i>		
3.1. Recent key facts about the climate change	»	47
3.2. The mitigation, adaptation and compensation approaches	»	49
3.3. The green&smart city as a utopia for the future	»	50
3.4. Running after the pathways and “the pathway problem”	»	52
3.5. Conclusions and further works	»	58
4. Citizen’s shaping power in the city in the digital age	»	63
<i>Selin Tosun</i>		
4.1. Introduction	»	63
4.2. Smart and sustainable cities	»	65
4.3. Pressing issues to address	»	72
4.4. Conclusion	»	74

Section 2 - Energy, buildings, users

5. Addressing rising energy needs of EU cities of tomorrow: positive energy districts	»	79
<i>Laura Aelenei, Jacopo Gaspari and Lia Marchi</i>		
5.1. Context and challenges	»	79
5.2. From NZEB to Positive Energy District	»	82
5.3. International initiatives around PEDs	»	84
5.4. Example of PED initiatives at the EU level	»	88
5.5. Example of PED initiatives at the national level in Portugal	»	91
6. Energy efficient buildings and behavioural implications	»	95
<i>Jacopo Gaspari</i>		
6.1. Context and background in the field of energy efficient buildings	»	95
6.2. Challenges, barriers and trends	»	98
6.3. Methodological approaches	»	103
6.4. User-centred design and behavioural implications on energy savings and comfort	»	106

7. Factors influencing the social perceptions and choices towards circular renovation in the housing sector	»	113
<i>Beatriz Medina, David Smith, Inés Fábregas, Christina Reis, Tamara Vobruba and Adela Crespo</i>		
7.1. The role of social sciences in the circular housing sector	»	113
7.2. Analysing perceptions and beliefs of stakeholders involved in circular solutions in the renovation of European buildings	»	115
7.3. The qualitative social approach to collect evidence regarding stakeholders' attitudes towards the use of solutions in a circular housing model	»	116
7.4. Results about attitudes, planned behaviour, and perceptions towards circularity in the renovation of buildings	»	118
7.5. Discussion about problems, enablers, and needs encountered for addressing circularity in the renovation of buildings	»	123
8. Renewable distributed generation evolution: perspectives and new trends for prosumers in Brazil and Italy	»	129
<i>Felipe Barroco Fontes Cunha, José Alexandre Ferraz de Andrade Santos, Francesca Pilo', Carlo Alberto Nucci, Marcelo Santana Silva and Ednildo Andrade Torres</i>		
8.1. Introduction	»	129
8.2. Scope, specific objectives and methods	»	130
8.3. The electric power system and the challenges to enable the energy transition in Brazil and Italy	»	130
8.4. Brazil and Italy in a comparative perspective	»	133
8.5. Perspectives and trends for prosumers in the energy markets in Brazil and Italy	»	138
8.6. Conclusions	»	142

Section 3 - Adapting systems and components to Next Generation needs

9. Balancing operational and embodied energy and embodied emissions of greenhouse gases in renovation projects	»	151
<i>Antonín Lupíšek</i>		
9.1. Design strategies for buildings with embodied energy and greenhouse gases	»	152
9.2. Extension of the service lives of the existing buildings and significant reduction of the operational energy demand	»	152
9.3. Examples of extensions of the service lives of the existing buildings and significant reduction of the operational energy demand using prefabricated modules	»	153
9.4. Conclusion	»	162
10. Embodied Energy in building's environmental impact balance	»	165
<i>Ernesto Antonini</i>		
10.1. Targeting on downing Operational Energy	»	165
10.2. The increasing relevance of Embodied Energy share in buildings	»	167
10.3. Remedy the underestimation of the Embodied Energy share: why and how	»	169
10.4. Filling the gaps	»	173
11. Bamboo utilisation as a sustainable approach in shaping the diverse built environment: key values and challenges for Vietnam	»	179
<i>Dinh Phuoc Le</i>		
11.1. Introduction	»	179
11.2. Bamboo's ecological background in Vietnam	»	181
11.3. Promising values of bamboo in sustainably shaping the built environment	»	182
11.4. Value manifestations of bamboo in the built environment	»	185
11.5. The shortcomings of current bamboo utilisation in the built environment in Vietnam	»	190

11.6. Conclusion and future prospects of sustainable utilisation of bamboo in the built environment	»	191
12. A multiscalar approach to renovate the building stock towards a resilient and adaptive built environment	»	199
<i>Fabio Conato, Valentina Frighi and Laura Sacchetti</i>		
12.1. Introduction	»	199
12.2. European and national renovation trends	»	201
12.3. The conceptual framework for the multi-criteria support tool	»	203
12.4. A multiscalar approach to renovation for a more flexible built environment	»	204
12.5. Conclusions	»	208
Section 4 - Predicting, simulating, assessing sustainable features and circular systems		
13. Circular economy in the built environment	»	213
<i>Kevin Hom</i>		
13.1. Introduction: what is the circular economy?	»	213
13.2. Background	»	215
13.3. Implementation of circular economy	»	217
13.4. Global agreement	»	218
13.5. Impact of the built environment: progressive solutions	»	219
13.6. Environmental management waste and resource management	»	221
13.7. Built environment and the circular economy expanding agenda	»	222
13.8. Built environment: next steps	»	224
13.9. Barriers to implementation	»	226
13.10. Current examples of implementation	»	229
13.11. Conclusion	»	232
14. Design support tools for circularity-driven renovation projects	»	235
<i>Lia Marchi</i>		
14.1. Building renovation as circular action	»	235
14.2. Circular principles in renovation projects	»	237

14.3. Implementing circular thinking in renovation projects	»	240
14.4. Positive trends and prospects	»	245
15. Is circularity a measure of complexity in architecture?	»	249
<i>Arzu Gönenç Sorguç and Müge Kruşa Yemişcioğlu</i>		
15.1. Sustainability and resilience concepts in socio-ecological studies	»	249
15.2. Sustainability, circularity, and resilience	»	253
15.3. Panarchy, circular economy, life cycle assessment and built environment	»	255
15.4. Conclusion	»	258
16. Improving the efficacy of circularity in the building sector to cope with climate change: shared actions among operators	»	263
<i>Fuat Emre Kaya and Antonello Monsù Scolaro</i>		
16.1. Circular economy concept and its relation with climate change	»	263
16.2. Climate change within the building life cycle	»	264
16.3. Key stakeholders and circular actions	»	267
16.4. Circular actions shared among the key stakeholders	»	272
16.5. Remarks and future considerations	»	275
About the authors	»	281

Section 1 - Climate resilient cities

1. Resilient urban environment: challenges and mitigation strategies

Rosa Schiano-Phan

2. Exploring synergies in sustainable, resilient and smart buildings to address new design paradigms in the next generation of architecture

Licia Felicioni

3. Running after pathways: a critical reflection on climate change roadmaps

Saveria Olga Murielle Boulanger

4. Citizen's shaping power in the city in the digital age

Selin Tosun

3. Running after pathways: a critical reflection on climate change roadmaps

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Cities are since several years now at the centre of a growing debate about their role in climate change. Multiple measures, responsibilities and directions have been identified in order to cope with this growing issue. There is a deep reason why cities are at the core of this debate, more than other areas: cities are the places where most people live and where it is expected that the majority of mankind will live in the future.

The availability of services, relational places, support groups, and working spaces has made urban areas the elected environment to live in. More than reversing this trend, the COVID-19 pandemic has somehow increased the need to reshape cities in order to ease and improve life quality in them, with the implementation of new and more significant green and open spaces. Those reflections and interventions usually go also in the direction of improving urban adaptation capabilities to climate events. Green and open spaces are, in fact, some of the most used strategies to make cities more resilient. However, those actions do not seem to be sufficient to improve people's life nor to really support the climate transition.

Some of the last reports on climate change show that even if some measures have been taken, those are still not sufficient to meet the expected goals. This chapter will deepen these points, trying to focus on climate transition roadmaps and pathways.

3.1. Recent key facts about the climate change

The Intergovernmental Panel of Climate Change (IPCC) is a key United Nations body for assessing the science related to climate change. Their reports are recognised as the most important current studies about climate change. This is why the release of new reports from this body is seen by the scientific debate and by institutions as a key moment for reflecting on the actions we are taking to fight climate change. The last report has been the Sixth Assessment Report, composed of different relevant focuses titled “Climate Change 2022: Mitigation of Climate Change” which is the contribution of the working group III - WGIII (IPCC, 2022b) and “Climate Change 2022: Impacts, Adaptation and Vulnerability” (IPCC, 2022a), which is the contribution of the working group II - WGII. Both documents are crucial for the understanding of our current climate change status.

The report of WGIII, in particular, shows how, despite the efforts made worldwide, we are not on track to maintain the average surface temperature behind +1.5/2 °C (IPCC, 2022b). The report, in particular, defines in point B1 that *total net anthropogenic GHG emissions have continued to rise during the period 2010-2019, as have cumulative net CO₂ emissions since 1850. Average annual GHG emissions during 2010-2019. Were higher than in any previous decade but the rate of growth between 2010 and 2019 was lower than that between 2000 and 2009* (IPCC, 2022b). This finding means that some improvements have been made in the last ten years, in comparison with the 2000-2009 decade, but that there is still a significant increase in cumulative CO₂ emissions. As the report goes on, it points out that:

- GHG (greenhouse gas) emissions have been 12% higher than in 2010 and 54% than in 1990 (point B1.1);
- the GHG emissions’ growth has been present across all major GHG groups, with the largest growth in CO₂ from fossil fuels and industry;
- around 17% of historical cumulation of CO₂ emissions since 1850 are concentrated between 2010 and 2019 (point B.1.3).

Additionally, the report recalls the role that urban areas have in emissions (point B.2.3), saying that in 2020 urban areas were responsible for 67-72% of the global share and it recognizes the importance and strategic role that policies and laws addressing mitigation are putting in reducing emissions (point B5). If this report focuses mainly on climate mitigation, the Working Group II reported key facts and data on adaptation and climate vulnerability (IPCC, 2022a). After confirming the role that mankind is playing in changing the climate and the biodiversity and in the resulting impacts on health (see, for example, points SPM.B.1 and following) and pointing out that extreme

events are expected to increase in the future, especially in urban settings (SPM.B.1.5), this study points out very clearly that climate change impacts and risks are becoming more complex and that we should expect the concurrence of multiple climate hazards at the same time, especially if we fail in maintaining the average surface temperature behind $+1.5^{\circ}\text{C}$ (point SPM.B.5). Moreover, point SPM.C.1 refers that *Progress in adaptation planning and implementation has been observed across all sectors and regions, generating multiple benefits. However, adaptation progress is unevenly distributed with observed adaptation gaps. Many initiatives prioritize immediate and near-term climate risk reduction which reduces the opportunity for transformational adaptation* (IPCC, 2022a).

This is a crucial aspect in order to understand the weaknesses in the current action implementation systems: short-term planning seems to be a key point in this analysis. To sum up, IPCC's last reports are evidencing how the current paths are not meeting the expected results. In particular, it is clear that COP26 goal of maintaining the average surface temperature below 1.5 or 2°C is at risk. In the next paragraph, some considerations about current strategies of adaptation and mitigation are provided.

3.2. The mitigation, adaptation and compensation approaches

Three core actions are nowadays commonly used for tackling climate change: mitigation, adaptation and compensation. Mitigation refers mainly to implementing strategies for direct CO_2 and GHG emissions reduction, while adaptation refers to strategies improving the built environment (and economy and society) vulnerability to changes that are already present. In particular, adaptation includes the concept of anticipation as a way to prepare in case of adverse events (European Environment Agency). Compensation, also referred to by the terms “carbon compensation” or “carbon offsetting”, is different from the first two definitions, as it is more linked with finding compensative actions for damages that already happened as well as for covering emissions that are not possible to reduce in the place where they are produced. This usually involves private individuals (citizens) and other bodies, such as industries, services, institutions, etc. In this last meaning, compensation measures are, for example, financing projects that capture greenhouse gases or planting new trees. Part of the compensation strategies is, for example, the so-called carbon taxes. If the first two methods (mitigation and adaptation) are the ones more investigated in the international debate, compensation remains less considered a “real” action against climate change,

especially as some authors argue that compensation can be used as an easier way to avoid facing the problem of emissions overproduction (Hyams and Fawcett, 2013; Anderson and Bernauer, 2016; Zeller, 2019). If mitigation and adaptation both embed the possibility of reducing climate modifications and of lowering their eventual impact as much as possible, compensation mainly refers to a scenario where damages are happening, and no more prevention measures are possible. Other authors (Farber, 2008) refer to compensation in relation to ethics and climate justice, considering how to compensate for the costs of losses due to climate, including life losses.

Some forms of carbon compensation are rising and pursued at the institutional level. This is the case with the carbon taxes that are intended by the European Union as a way to force highly pollutant industries or bodies to implement green actions. There are several forms of environmental taxes and fees, such as real taxes on specific emissions (e.g. from transport, agriculture, waste disposal, etc.), deposit-refund schemes (e.g. allowing people to get refunds while buying a product if they bring back the packaging), tradeable permits schemes (which are quotes for pollution allowed in an area), offsetting schemes (which are proper compensation of emissions through paying equal or greater environmental restoration somewhere else) and finally paying for ecosystem services (European Commission, 2019). These days, a growing concern is regarding forms of carbon compensation by planting trees that are happening in New Zealand at a very high-speed (Driver, 2022). Despite the presence of several contributions highlighting the importance of each of these macro-strategies, and the growing role that compensation measures are taking, this chapter will mainly focus on mitigation and adaptation, as these are usually the most included in climate strategies, climate pathways, roadmaps and scenarios.

3.3. The green&smart city as a utopia for the future

It is now several years that cities worldwide have been trying to cope with climate change. Since the first recognition of climate as a key topic for mankind's future, several steps have been taken. Strategies, scientific reports, and several reflections at different societal levels have been proposed during the last decades: from the global and international level to the more site-specific country and city-level strategies. From the end of the previous century, in particular, growing attention has been put to cities' evolution, using several claims: "digital city", "smart city", "green city", "recycling city", until the most recent "15-minute city". Why within not much more than 30

years, there have been so many names and claims assigned to cities? Several years ago I wrote an article (Boulanger, 2015) arguing that this need to find new names to identify a new direction for cities was in line with a utopian thinking approach. Today I confirm this interpretation because utopian thinking and utopia creation are both very linked with ages framed by big transformations, when people have the necessity to put in place strategies and to think differently about the future (Claeys, 2020). According to this interpretation, the proliferation of such types of claims can be seen as the search for an improved future, especially in relation to climate change and social gaps. According to Gregory Claeys (Claeys, 2020), utopias need to be plausible and realizable and can play a positive role in solving real problems and envisioning pathways for transition. He, in fact, says: *Utopia represents a fantasy of escapism, the rejection of unpleasant reality and substitution of an inverted or dream-like opposite, polar set of pleasures, sometimes portrayed realistically [...]. And if we need large-scale [...] social planning to deal with problems of the future, then we also need an image. Of the future that accounts for long-term problems and. Offers long-term solutions on a global scale. This, then, is a utopia in a positive sense* (Claeys, 2020). In this way, the current idealisation of projects such as the “smart city” or the “green city” or the “15-minutes city” can be intended as utopian tensions, at least, claiming the need to make cities evolve into a more aware and responsive form to climate and societal changes. Indeed, all those strategies start from the identification of a current negative starting point, where challenges and weaknesses are more evident than positive aspects. In the case of smart cities, for example, the topic has its premises directly from the experimentations of a more functional architecture made during the last century, meeting the new technological development of the Internet of Things and the subsequent rise of digital instruments and portable devices. The first ideators of the Smart City saw in these potentialities the premises for a world shaped by high-tech services and infrastructures, where people would have been entirely supported by machines able to predict their needs and ease their life. However, the idea of the smart city rises from the observation of the present: inefficient, with multiple services not connected to the other, with several leakages in the grid systems (not only energy grids but also water ones), with multiple steps required from people to do anything (from presenting documents at the municipal offices, to using domestic appliances) (Hall et al., 2000; Nam and Pardo, 2011; Anthopoulos and Vakali, 2012; Batty, 2015; Bertello et al., 2013; Neirotti et al., 2014). The Smart City is presented as a futuristic strategy to solve societal problems and to transit mankind into the future. And in this, its discourses remain strictly linked with this limited vision. The

tentative to enlarge the objectives of the Smart City tended to produce new claims, suggesting that the role of technology was not enough and aspiring to a more “resilient” and “green city”. Also, in these approaches, the references start from the current situation toward the identification of a vision of the future, which is again limited. Resilient and green cities are proposed as contexts where the natural element (both green and blue) take a protagonist role (Danish Ministry of Climate, Energy and Buildings, 2012; State of Green, 2018; Berkowitz and Kramer, 2018; Boulanger, 2020). Current cities are mainly covered by asphalt or concrete, with limited capacity to autoregulate temperature and water flows. Frequent heat islands and drought, in summer, and landslides and floods, in winter, call cities to reintroduce trees and green surfaces, while reducing concrete with multiple projects going in the direction of urban reforestation, urban gardens and similar. Then, the inclusion of a more citizen-centred and services-centred approach produced the recent “15-minute city”, in which people should live at no more than 15 minutes of walk or cycles from any activity or service they need, especially the basic ones but also leisure (Allam et al., 2022; Moreno et al., 2021; Pozoukidou and Chatziyiannaki, 2021).

Those approaches have some similarities in their construction and sometimes they cross-fertilize each other, as proposed by Zahir et al. recently, who approached the “15-minute city” through the spread of digital technologies and the 6G (Allam et al., 2022). It is possible to see contribution referring to a composition of those approaches. However, even with some interrelations, it is possible to argue that a predominant vision is always present: a people-centred or services-centred one, or a digital or a green one. If those ideations can have a role in framing visions for the future, the creation of roadmaps following just one of them can be a failure. Urban systems are very complex environments framed by multiple layers of needs and potentialities, thus, the conformation of strategies just to digital infrastructures, or to greenings or mobility or others will not be able to deal with this complexity.

In conclusion, effective pathways and roadmaps can benefit from envisioning a future with very specific characteristics, but they then need to be rooted in the specificities of the different contexts and complexities.

3.4. Running after the pathways and “the pathway problem”

As said in the previous paragraph, it is possible to see, in the proliferation of city-related claims, the need of envisioning and designing the city of the future. This is then put into practice through sets of strategies and actions

currently going under the name of “pathway” or “roadmap” and sometimes of “scenario”. Due to the urgency of taking action against climate change, it is possible to see a proliferation of these instruments. Several levels of roadmaps are available: from the institutional ones to consulting agencies proposing innovative approaches, to design-related instruments, and finally to cross-national networks, rankings and certifications aiming somehow to measure and define the best strategy for the future. The next sections of this chapter will analyze some of these cases, trying to put in evidence their structure, interesting elements and also weaknesses.

According to the Oxford and Collins dictionaries, the definitions of the pathway, roadmap and scenario are multiple, but in general, they align under the followings:

- “A pathway is a path which you can walk along or a route which you can take” and “A pathway is a particular course of action or a way of achieving something” (Pathways);
- “A road map is a map which shows the roads in a particular area in detail”; “A road map of something is a detailed account of it, often intended to help people use or understand it”; “When politicians or journalists speak about a road map to or for peace or democracy, they mean a set of general principles that can be used as a basis for achieving peace or democracy”; “A plan or guide for future actions”; “Any plan or guide to show how something is arranged or can be accomplished” (Roadmap);
- “If you talk about a likely or possible scenario, you are talking about how a situation may develop”; “a predicted sequence of events” (Scenario).

What emerges from these definitions are the following key elements:

- pathways are future-oriented
- they are composed of steps
- they can include alternatives (scenario)
- they should include guidance to support the implementation
- they should have enough details to understand the current position and the direction.

Not all the most important climate pathways include all these elements, but some are recurrent. A long-term goal definition, the identification of intermediate steps, actions that should lead to meeting the goal and the presence of a monitoring phase often appear as common elements, while the comparison of alternative scenarios is less frequently included. The strategic importance of those instruments asks researchers to have a deeper look at them. In particular, an interesting approach is given by Rawls, Gilabert and

Lawford-Smith that in 2012 (Gilabert and Lawford-Smith, 2012; Houston, 2021; Kenenhan and Katz, 2021) raised the so-called “pathway problem”. In their works, they strictly link climate pathways to political feasibility.

This model implies that when deciding the steps that have to compose a pathway, political bodies tend to consider both the desirability of the transition and the likelihood, based on probabilities of achievement. This means that, according to Gilabert and Lawford-Smith, when an institution has to decide which actions and steps to take in the climate transition, they usually reflect on how much this transition is desirable but also on how much it will probably happen. The probabilistic approach goes along with the necessity of making these steps for the transition. However, as Houston (Houston, 2021) remembers, the climate is non-predictable, especially in the long term and this implies that even if the Gilabert and Lawford-Smith model seems to be applied by political bodies, in reality, it should be, because the future is non-scientific and, thus, institutions seem more to speculate on it than taking actions with correct information. As an example, we do not know how in reality carbon emissions will go, even with actions undertaken, but mainly more important, we do not know the economic, political and social environment in the future. The COVID pandemic and the Ukraine-Russian conflict are an expression of this uncertainty.

This point is also highlighted by other authors (O’Neill et al., 2014, 2017; Riahi et al., 2017) and recalled by the IPCC, when referring to the Shared Socioeconomic Pathways. These are innovative ways to understand, analyze and forecast future climate scenarios not only according to predicting specific climate-related indicators, such as carbon emission but linking strictly those climate-related indicators with social, economic and political hypotheses. These studies are relevant because they evidence how it is not possible to predict climate change future. After all, it is strictly linked with mankind and our decisions also on other non-climate-related aspects. To say it with Wolfgang Behringer’s words: climate is a cultural history (Behringer, 2019).

An additional element of complexity is again recalled by Houston (Houston, 2021) when saying that it is crucial to take into account the different competing agents involved in the climate crisis (deciding, opposing and dominated). In his theory, deciding agents are those able to make decisions about the climate transition, for example, institutional bodies and government. Also citizens, and civil society can be included here if they are *sensitive to the moral demands of climate justice and enjoy the power to enact political change* (Houston, 2021, p. 199). Dominated agents are those that do not have the power to make those decisions, but somehow they are hit by them. They can be sensitive to the problem but do not have the power to take

decisions: poor people are usually inside this category. And, finally, opposing agents, who are agents that have the powers to act and may also be sensitive to the problem but in a negative way, being hostile or insensitive to it. In this category, for example, fall *some fossil-fuel corporations, morally callous politicians beholden to the former's sway, and climate-denying citizens among the global affluent* (Houston, 2021, p. 199)

According to Houston's study, current pathways mainly address the deciding agents and do not consider the others as proper agents of the change, with specific and individual intelligence. And this is one of the main barriers, in his opinion, to the actionability of those action-guidance instruments. Furthermore, he suggests the use of alternative pathways as complementary instruments able to encounter multiple possible futures. Houston's and Gilabert and Lawford-Smith's studies are both interesting in their critical approach to the current structure or pathways and roadmaps. In the following sub-paragraph, I will explore some of them to provide a clearer picture of what is currently ongoing in reality. Several existing climate pathways and roadmaps have been studied and analysed, investigating multiple aspects such as the structure, the goals, the timeframe, the geographical level, the actors involved and the impacts. The following sub-paragraph describes only a few of them, providing some elements of reflections more than complete descriptions (which can be found in the references). The selection has been made qualitatively, trying to identify the most important and strategic climate transition pathways ongoing across different geographical levels.

3.4.1. Real case pathways and strategies

Cross-national pathways are instruments not specifically linked with a precise country. They can be supra-national and still refer to a specific geopolitical dimension (e.g. the European strategy which is referred to European Union), or they can be detached from a proper geopolitical dimension or applicable worldwide. The last one is the case of instruments such as the ones proposed by the Covenant of Mayors or the Green City Accord, or the 100 Resilient Cities. In this broad category, a small selection of the most interesting ones is composed of the 2050 European long-term strategy, the Sustainable Development Goals roadmap, the Covenant of Mayors and the 100 Climate Neutral Cities. Those instruments are very different from one to the other for multiple reasons (scope, extent, relevance, object of application), but they have in common the interest in supporting a high-level transition to more sustainable and resilient territories.

Fig. 3.1 – Main strategic plans with related targets and key features.

	Extention	Targets	Key elements
2050 EU long-term strategy	European Union	Singles countries, citizens, industries	Climate neutrality by 2050 / Composed by multiple and theme specific sub-plans / Presence of a vision / Addressed to all actors / Specific requirements to single countries / Presence of a long term strategy
SDGs roadmap	United Nations (worldwide)	World	2030-2050 Sustainable Development / 17 goals with specific visions and indicators for each / New Sustainable Development Pathway (2022)
Covenant of Mayors	Europe / Worlds	Single cities and mayors	2050 decarbonized territories / Resilience as a core target / Monitoring report / Action plans tailored to the local levels and leveraging local values
Denmark 2050 strategy	Single country (Denmark)	Denmark territory, citizens, industries, etc	Strong guiding principles / Deep analysis of the state of the art / Milestones for the mid-term and specific actions toward welfare and cost-effectiveness / Attention to true actions without considering shortcuts / Very high commitment

Source: Elaborated by the author.

The first is the 2050 European Strategy. An innovative aspect of this strategy is its structure composed of multiple sub-elements that are, in some cases developing the vision (“A clear planet for all”) (European Commission, 2018), in others, the proper long-term strategy (European Commission, 2019) and finally the operationalisation of both the previous European Commission, 2019). Inside this structure, it is evident how the European Commission is focusing on defining a framework with which all countries inside the union should align with. The definition of a precise vision is a key aspect of this pathway as it sets the major themes, values, and aspects that are at the core of the actionable strategies. From the operationalization perspective, the European Green Deal tend to focus more on mitigation actions than on adaptation or compensation. This is also supported by the main claim of the 2050 strategy, which is to become carbon neutral by 2050. Of course, some adaptation measures are still present, especially in some of the more thematic and specific actions included in the European Green Deal. Another interesting aspect is the involvement of actors inside the transition as the European Commission has set two specific complementary tools for this: the New European Bauhaus, which targets citizens, creative people, and single professionals, especially in technical and creative fields; and the European Climate Pact, which also targets communities on a broader level to empower them in taking actions. According to Houston’s model (Houston, 2021), it seems that despite the EU efforts in involving civil society and despite the vision of encountering a just transition, mainly deciding agents are targeted here.

There is mainly attention to institutions on the one hand and middle-class citizens on the other. If opposing and dominated agents are included this doesn't seem to be a core objective of this strategy.

The second instrument analysed is the 2030 Agenda for Sustainable Development, also known for its explication of 17 Sustainable Development Goals. This strategy was developed in 2015 by United Nations and other 195 countries, with worldwide attention. The key and most recent interesting points on this strategy are the following. At first, the strategy is explained in 17 thematic goals, each of them having a specific thematic vision, targets and indicators to measure it. Recently the Economic and Social Council of the UN published a report that contains the impact analysis of this strategy, the acknowledgement that not enough progress has been made and the proposition of a new Sustainable Development Pathway toward 2050 (United Nations - Economic and Social Council, 2022). In this pathway, there is a specific proposition of key urgent lines to be implemented, such as the deployment of negative emission technologies and carbon dioxide removal technologies, the focus on “a decent house for all”, and others. Also in this strategy, some positive key elements can be recognised, such as the presence of indicators and visions which are tailored to specific themes, the high efforts put into monitoring results and improving the strategy along the way. Again, applying Houston's model, it seems that also this strategy is mainly directed to deciding agents even if there are some specific goals, such as the number 17 that focuses on creating effective partnerships among different actors. Dominated agents seem more like a target group to which provide solutions than a real partner in the transition.

The last strategy analysed is the strategy behind the Covenant of Mayors for Climate and Energy initiative (CoM). This initiative was launched in 2008 by the European Commission to support and engage single mayors in starting a transition pathway in their cities. It has been a very important innovation as it directly targeted local governance structures, completely skipping the national and regional institutional levels. As also recalled in this recent paper (Boulanger and Massari, 2022; Covenant of Mayors), the CoM saw a large diffusion both in Europe and worldwide. Its main target has always been to create a supporting service for cities willing to become more sustainable and resilient. As a difference from the previous ones, the CoM targets not only mitigation measures but also adaptation ones, having included specific adaptation action plans in the years. Even if resilience and adaptation are a core part of the CoM action plan, greater attention is still posed to mitigation actions, especially in how they are monitored. Also, in this case, the agents involved are mainly deciding ones, both institutional

actors, citizens and associations, while opposing and dominated ones seem not to be present.

On the national level, an important pathway is the one developed in Denmark. This pathway was presented in 2020 under the Paris Agreements and it can be considered a lighthouse for the development of national strategies (Danish Ministry of Climate, Energy and Utilities, 2020). The relevance of this instrument relies on different elements that compose it, starting from the identification of Guiding Principles conceived as mandatory for the pathway. These principles can be seen as visionary aspects, but in reality, they are very precise and operative.

The first principle, for example, acknowledges that climate challenge is a global issue but that Denmark *must be a leading nation in the international climate effort, a nation that can inspire and influence the rest of the world. Furthermore, Denmark has both a historical and moral responsibility to take the lead* (Danish Ministry of Climate, Energy and Utilities, 2020, p. 9). This is a very strong commitment to the climate challenge that goes beyond the simple taking into account the challenge but targeting to assume full responsibility. Another principle expresses the necessity of the transition of the most cost-effective as possible while ensuring enough welfare and quality standards for all citizens.

The last principle, then, says: *The initiatives to be taken to reduce greenhouse gas emissions must result in real domestic reductions, but it must also be ensured that Danish measures do not simply relocate all of the greenhouse gas emissions outside of Denmark's borders.* Even this aspect of ensuring a real reduction of greenhouse gases without using shortcuts is crucial. Similarly to other strategies, also Denmark defines a 2030 and 2050 vision of decarbonization, but as a difference from many other countries, Denmark is almost maintaining its goals, as in 2018, they reduced by 65% the emissions in the energy sector (target of 70% for 2030). The strategy then assesses quite precisely the current situation in a very critical way, putting in evidence the shadow sides of the implementation of ongoing actions. Finally, this pathway very precisely identifies networks of collaboration, priorities and main aspects to work on.

3.5. Conclusions and further works

The analysis presented in this chapter showed how pathways could be a key instrument to achieving the decarbonization objectives. They are very used across countries to identify and set the path toward a more sustainable

future. However, several critics can be made of their structure, goal and organization. Some common elements that seem to have positive effects on their concrete realization are the following:

- pathways should be operative instruments to implement short-term actions with a long-term goal. They should have a long-term vision, but they should identify precise short and medium-term milestones;
- the presence of monitoring systems and indicators of performance is crucial to evaluating intermediate steps;
- details and guides for action implementation should be provided, detailing different aspects, such as costs, timeframes, and actors;
- alternative pathways or scenarios are necessary to ensure enough flexibility of the instrument to change along time;
- there is the need to involve all agents, including opposing and dominated ones, at the same time to identify ways to collaborate with all the actors of the society;
- pathways should be aligned with local and specific vocations, needs and necessities.

Far from aspiring to exhaustiveness, this chapter aimed to put in evidence some key criticalities and aspects that are framing the adoption of transition pathways and roadmaps. Further works will encounter a systematic review of all instruments currently available across geographical levels to even detect more elements of success and failure. The different National Recovery Plans will also be included in this work for the parts relevant to climate change.

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Cities are facing unprecedented challenges driven by different forces. On the one hand the ever-increasing effects of climate change are impacting on the urban microclimate and environmental balance, on the other one social, political and economic issues are influencing the living conditions, the accessibility to primary services and resources, as well as growth opportunities for the younger generations.

The rise of a social awareness regarding these topics suggests how relevant scientific-based evidence could be and calls for additional efforts to bridge the gap between science and society, in order to stimulate a collective responsibility and due actions.

The complex interaction among these factors inspired a forward-looking reflection not only on key drivers of change but also on possible future trends for research assuming an interdisciplinary and multiscale perspective. The book collects several experiences from different contributors working in many contexts and countries, but sharing the same projection to the future. Four key priorities are addressed: the resilience to climate-related events and impacts, the energy issue with reference to both the advances at building level and the role of end users, the capacity to adapting components and systems to emerging needs, and the adoption of assessment and simulation tools for improving the design capacity within a circular system perspective.

The book provides therefore insights, experiences, approaches to deal with current and especially with

future transition processes which are expected to shape the cities of tomorrow. Thus, its ambition is not to provide definitive answers but to become a starting point for exploring promising research pathways for the next generation cities.

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La passione per le conoscenze