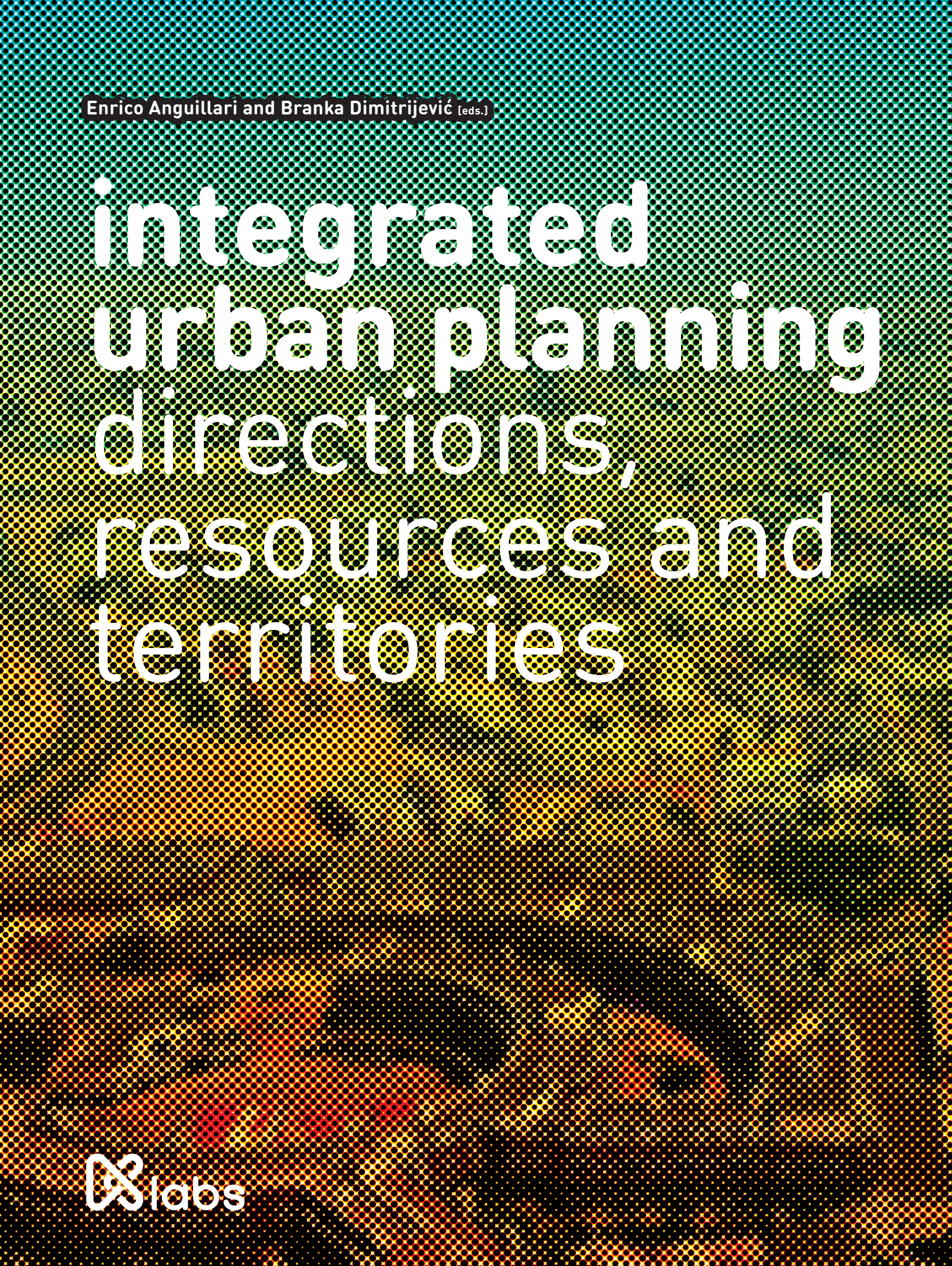
Enrico Anguillari and Branka Dimitrijević [eds.]

# integrated urban planning directions, resources and territories



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Creating the Network of Knowledge Labs for Sustainable and Resilient Environments – KLABS

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# Integrated Urban Planning
## Directions, Resources and Territories

**Editors**
Enrico Anguillari and Branka Dimitrijević

**Reviewers**
Harry Coccossis, Brian Mark Evans

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# **integrated urban planning** directions, resources and territories

**Enrico Anguillari and Branka Dimitrijević** [eds.]

# Preface

**Saja Kosanović, Alenka Fikfak, Nevena Novaković and Tillmann Klein**

The continuous evolution of the notion of a sustainable and resilient built environment demands repeated examination. For this reason, the state-of-the-art thematic series *Reviews of Sustainability and Resilience of the Built Environment for Education, Research and Design* contributes to the comprehensive understanding of the two approaches and their interrelations in the built environment by retrospectively investigating their development, addressing current issues, and speculating on possible futures. The series represents one of the results of the Erasmus+ project, Creating the Network of Knowledge Labs for Sustainable and Resilient Environments – KLABS, dedicated to establishing a comprehensive educational platform within the second cycle of higher education across the Western Balkan Region.

The sustainable and resilient built environment is a multi-layered and multi-disciplinary construct. To successfully tackle the intricacy of the points in question, the series of books comprises five thematic volumes that initially approach sustainability and resilience from the socio-spatial perspective, subsequently address sustainable and resilient urban planning and urban design, and then focus on individual buildings and a range of approaches, methods, and tools for sustainable and resilient design, placing particular emphasis on energy issues. By addressing different levels of the built environment and different aspects of sustainability and resilience in a systemic way, 83 academics from 12 different countries gave 54 contributions in the form of narrative or best evidence articles with the main objectives of informing the development of specialised knowledge, building critical awareness of interdisciplinary and transdisciplinary knowledge issues, and connecting university education with the domain of scientific research. The broad aim is to develop the collection of reviews of sustainability and resilience of the built environment that are useful for students, educators, professionals, and researchers, all of whom are dealing with these two important subjects internationally.

We express our gratitude to all authors, editors, reviewers, and members of the publication board for investing significant efforts in the development of the book series in the framework of the Erasmus+ project, KLABS.

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# Reviews

**Harry Coccossis and Brian Mark Evans**

**I**

This book provides a valuable overview and insight on contemporary urban planning challenges with special reference to a region undergoing significant changes and pressures in many aspects, the Western Balkans. In that respect, it can also be valuable for many other areas in the world seeking to incorporate ongoing priorities and perspectives in their planning systems.

The broader thematic context of the volume is Integrated Urban Planning, meaning the incorporation of sustainability and resilience in planning for the built environment. To that end, the Introduction provides the basic principles and framework for a new perspective in planning on the basis of key challenges towards facing contemporary environmental, social, and economic development issues, such as climate change and biodiversity losses, migration and ageing, globalisation and technological change, etc., which require new directions, a different way of coping with resources and territorial organisation, in a new planning perspective towards integration. Subsequently, the volume provides a systematic exploration of theoretical approaches, methods of analysis and policy tools, as well as concrete examples of implementation in terms of the three sub-themes: directions, resources, and territories. Special emphasis is placed on ongoing experiences in such approaches in the Western Balkan countries.

From a substantive point of view, the book offers a useful modern perspective in urban planning. Sustainable development and resilience are key priorities in the global policy agenda, which obviously also influence planning. The incorporation of contemporary issues such as climate change adaptation, strong migratory flows, population ageing, spatial development polarisation, etc. is crucial for modern planning agendas, so the book is useful in a broader context. As such, it is extremely interesting and useful in general, aside from its potential usefulness in the context of the specific geographical area, the Western Balkan countries or other world regions undergoing similar change.

Its content is relevant and compatible with the stated objectives of the overall book series (five thematic volumes), providing a focus on sustainable and resilient urban planning and urban design. From a theory of planning perspective, it is interesting as it brings in a political economy and ecology perspective, thus potentially becoming a valuable addition to existing relevant mainstream literature. In this respect, it is expected

to be useful for educational purposes, particularly at the upper levels of university education, as it brings research and innovative practice into perspective for researchers, professionals, and policy makers.

Overall the book is very well organised and presented with several supporting figures, diagrams, maps, photos etc., as well as providing an extensive relevant bibliography, valuable in many respects for educators, researchers, and professionals.

**Prof. Dr. Harry Coccossis**
*Volos, Greece, March 2018*

**II**

This book is part of a series of five volumes that are being produced as the culmination to an EU exercise that looks at ongoing research into integrated urban planning (IUP) from the universities involved in the project Creating the Network of Knowledge Labs for Sustainable and Resilient Environments (KLABS). This is an impressive body of work and represents a major output for the project.

The first strategic comment that may be made concerns the move by the editors in selecting the title for the work and in particular the use of the word 'integrated' as the qualifying adjective in the title of the book describing the purpose of the volume and its content. In 2015/16, UN-Habitat prepared a report on the UNECE World Region prepared and submitted to Habitat III under the direction of Secretary-General Joan Clos (Evans et al., 2016 - https://www.unece.org/housing/habitat3regionalreport.html). The report was entitled 'Towards a city-focused, people-centred and integrated approach to the New Urban Agenda' and stressed that only through acting in an integrated way can we hope to address the challenges faced by urbanisation in the 21 century, particularly in terms of urban development and urban governance processes. All of the countries of the Western Balkans are member states of the UNECE (United Nations Economic Commission for Europe). Some are already members of the EU and some are accession states. An 'integrated' approach therefore is of fundamental interest to the theory, policy, and practice of territorial planning in these countries as they seek to upgrade their planning systems and build institutional capacity.

The book is structured in three sections – 'directions', 'resources', and 'territories' – and this is very helpful to the reader seeking to navigate their way around the subject.

*Directions*
There are three papers in 'Directions': In the first, Benegiamo presents a comprehensive overview and narrative of 'urban resilience'; in the second, Milojević explores the barriers to integrated planning following political restructuring and how these can be overcome by improved methodologies, professional education, and institutional capacity

building. The charts provided are helpful, as is the effort to relate the work of UN-Habitat to masters level courses, and good use is made of directing the reader to specific examples. The third paper by Milovanović Rodić, Čolić & Maruna looks at urban governance models to support the preparation of policies for sustainable urban development as a precursor to the implementation of IUP as well as the potential role of the university in the implementation of policy. There is a clear parallel here with the experience of Barcelona in post-Franco Spain in the 1980s, although it is not referenced. The paper is strong, however, on principles for, and case studies of, integration.

*Resources*

In the second part of the book there are four papers. Girardi deals with the wise use of natural resources in order to plan efficient and productive cities with good passages in the section on Efficient and Resilient Built Environment and Transportation that cover Urban Form and Sustainable Urban Mobility. This is an excellent overview with good case studies and useful illustration, in which the reader can find out more e.g. Hammarby Sjostad. In the second paper, Nenković-Riznić introduces the concepts behind resource efficiency, waste reduction, reuse, and recycling (now widely referred to as the circular economy) and their importance in IUP. There is good structure in this paper dealing systematically with theory and methodology leading on to good examples. This part concludes with two chapters by Marković and Topalović dealing with different aspects of flood management. The first (Marković & Topalović) provides an excellent overview with a good structure and illustrations working through from the national to local, neighbourhood and building scale. The second chapter (this time by Topalović & Marković) provides a good overview of risks and integrated flood management and measures with good case studies from the Netherlands and the UK.

*Territories*

The third part of the book 'Territories' deals with economic, political, and social pressures and the instruments of governance directed to this purpose such as 'process', for example. In Transformations of Urban Fabric and Resilience Building, Narita opens with an exposition of the effects on cities of neo-liberal economy and market-forces. Mitrović, Marić & Vuković deal with informal city growth and the application of integrated masterplanning as a technique in this regard, with a good exposition of Belgrade. Finally, in the concluding chapter, Broz deals with participatory approaches as a complement to state-led land use planning and also addresses issues related to urban-rural balance and the importance of balancing top down and bottom up approaches. There is an interesting Italian case study from Milan, although this is quite specific to green issues and agriculture.

*Suggestions for future editions*

This is a well-researched and comprehensive volume of papers and it is understood that the work will be revised and updated. In this respect, there are some matters that become clear upon review that would benefit from inclusion in future editions. These include:

- The chapter on Resilience would benefit greatly from reference to the emerging body of work on the subject emanating from network of Resilient Cities supported by the Rockefeller Foundation;
- On some occasions more evidence is needed to support conclusions: for example it is suggested that the 'globalisation' promoted by international competitions is suspect and yet the example provided – the Moscow Agglomeration competition of 2012 – is extensively documented in Russia where extraordinary efforts were made by all teams involved to focus attention on the economic and cultural issues affecting Russia and in Moscow. It is helpful to have this mentioned, but it would be more helpful to direct the reader's attention to the extensive literature on the case study;
- The chapters on flooding by Marković & Topalović could usefully be expanded into a standalone monograph on the subject, but for this particular volume, the reader would be better served by these being combined into one strong overview;
- The chapter on Transformations of Urban Fabric and Resilience Building is strong on ecologically driven approaches to urban development that contribute to the resilience of natural and built environments, but in future editions more could be said about economic and social resilience since it is more liberal economic and social policies rather than environmental policies that can be seen as an antidote to neoliberal economics;
- There is a strong and welcome exposition of Belgrade as a case study, however the subject of the chapter would benefit from international examples of best practice to better make the case;
- Given the importance of participatory processes in IUP, it would be good to see other examples introduced to support the chapter Spatial Policies and Resilient Urban-Rural Communities: An Italian Case Study with some research guidelines;
- Finally, the book would benefit from a concluding chapter by the editors with a review of lessons learned and conclusions to pave the way forward.

*Conclusion*

Overall this is a well-researched and comprehensive volume of papers. It is to be welcomed that so much of the material has been sourced from the Western Balkans. This is essential, but the papers that work best are those that also cite examples of best practice from elsewhere set in the European mainstream. Taken overall however, the balance is there and will provide the reader with an exhaustive, informed, and useful insight into the topic. This is a very good piece of work and the reader will be left well informed about integrated urban planning and its relevance to the Western Balkans and with a very useful tool for helping to set the IUP agenda for policy makers.

**Prof. Dr. Brian Mark Evans**
*Glasgow, Scotland, April 2018*

# Introduction

**Enrico Anguillari and Branka Dimitrijević**

The purpose of the book on integrated urban planning (IUP) is to present ongoing research from the universities involved in the project Creating the Network of Knowledge Labs for Sustainable and Resilient Environments (KLABS).

Although sustainability and resilience have been largely explored in many complex social-ecological systems, they have only recently been applied in the context of cities. Both concepts are useful when seeking an integrated approach to urban planning as they help to look at the city as an interconnected, multi-dimensional system. Analysing the sustainability and the resilience of urban systems involves looking at environmental, social and economic aspects, as well as at those related to technology, culture and institutional structures.

Sustainability, resilience as well as integrated urban development are all focused on process. Their objectives are typically defined around the ongoing operation of the process and they can change during the time. Therefore, building a sustainable and resilient city is a collective endeavor that is about mindsets just as much as about physical structures and their operation, where capacity to anticipate and plan for the future, to learn and to adapt are paramount.

The papers published in this book show that the recent and current research in those institutions focuses on the directions of development of IUP, the processes that support sustainable and resilient use of natural resources and their application in the Western Balkan and some other European countries. Each essay aims to provide an overview of key aspects of the research topic.

The division of the book into three parts - directions, resources and territories - underlines how the challenges that the contemporary city poses can be dealt with more effectively by integrating different paradigms, concepts and trends of urban development and governance; taking into account the numerous problems linked to the availability and exploitation of the main natural and non-natural resources; and looking at the city and the territory as systems in constant transformation, not reducible within rigid dichotomies such as urban/rural, dense/sprawled, formal/informal, etc.

*Directions*

Over the first two decades of the 21st century, some significant changes have been taking place in the natural environment (climate change, loss of biodiversity), societies (increased migrations, population growth and aging, increasing gap between poor and rich), and economy

(globalisation, financial crash, digital revolution and increasing automatisation), new directions are emerging for sustainable human development with the aim to overcome those problems. Some novel research directions are reviewed by Maura Benagiamo whose chapter provides an overview of the critiques of the resilience paradigm, the recurrent concept of de-growth, as well as of the political ecology approaches towards the potential resolutions related to the problems of implementing IUP. When a significant and not yet fully functional political restructuring takes place, as in the case of Republic of Srpska within Bosnia and Herzegovina, a certain situation arises: the barriers to implementing IUP and the directions for their removal by improving the IUP methodology, the related professional education, and the training, as well as strengthening of the institutional and socio-economic capacities, are analysed by Brankica Milojević. Following an outline of the concept of a new urban governance model required for IUP and the application of IUP as an instrument for creating sustainable public policies on urban development, the chapter by Danijela Milovanović Rodić, Ratka Čolić and Marija Maruna provides information on the implementation of the IUP principles in the teaching of master students at the University of Belgrade.

*Resources*

The key issues in the use of natural resources in order to plan efficient and productive cities are explored by investigating the relationship between the concepts of resource efficiency and resilience in the chapter by Antonio Girardi. One of the aspects of resource efficiency, that of waste reduction, reuse, and recycling in Serbia, is analysed in the chapter by Marina Nenković-Riznić and demonstrated by presenting innovative approaches to waste management in the municipality of New Belgrade. As natural resources and the built environment made of those resources need to be protected from natural disasters such as flooding, two chapters by Žana Topalović and Đurica Marković provide an overview of integrated flood management approaches and flood risk management procedures, policies, and practice.

*Territories*

The final group of chapters focuses on how territories are affected by economic, political, and social pressures and what governance instruments should be improved to address them. The negative impacts on cities of neo-liberal economy through market-driven global investments are investigated by Dan Narita who proposes ecologically driven urban development approaches that increase the resilience of natural and built environments. The pressure of informal city growth and how to resolve this challenge through responsive master planning are key issues explored in the chapter by Biserka Mitrović, Jelena Marić, and Tamara Vuković. Participatory approaches instead of state-led land use planning are proposed as a way forward for IUP of urban-rural communities in the chapter by Martin Broz, who discusses how they can support a balanced agricultural production and strengthen relationships between urban and rural areas.

The above essays provide evidence of the research on some of the key problems that must be solved when applying IUP. The need for improving governance systems and instruments that will enable the application of IUP principles to emerge as a cross-sectional theme. The researchers' engagement in real-life case studies demonstrates that their proposals for improvements in policies, practice, and professional education are founded on valuable insights. We believe that the presented research outputs will be an important source of knowledge for the students at various new MSc courses that focus on sustainable and resilient built environments in Western Balkan countries, as well as for policy makers, urban planners, and other researchers in this field.

PART 1

# Directions

# Resilience, Political Ecology and Degrowth _

## A Critical Review of Three Main Approaches to Political Geography and Urban Planning Theory

**Maura Benegiamo**[1]

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ABSTRACT **Resilience, political ecology, and degrowth constitute three main approaches to address resource-society relationships in the context of the integrated energy-food-climate nexus and of its crisis. These diverge substantially, despite some common points, such as the idea of a non-equilibrium-ecology and of a more complex engagement of human-environment relations. Resilience has raised criticism for not taking into account how environmental injustice, power relations and the capitalist mode of production shape contemporary ecological issues, key concerns for political ecology scholars. After providing an overview of the main criticism addressed to the resilience paradigm, the chapter aims to introduce the political ecology approach, in order to move toward a more inclusive paradigm that is able to address the environmental question in relation to social justice concerns. The third section introduces the emergent debate on degrowth as an alternative paradigm to address socio-environmental sustainability and reframe global challenges such as austerity and deindustrialisation in urban areas. The chapter concludes in summarising the main aspects emerging from the critical review of these three notions, presented in the context of political geography and urban planning theory. It further argues for a greater integration of the 'agency of nature' and of the role of biological processes in the understanding of the way society functions.**

KEYWORDS political ecology, degrowth, environmental justice, neoliberal governance, post-human thinking

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# 1 Introduction

It was in 1962 that the North-American scientist Rachel Carson published her book *Silent Spring* (2002). In the essay, which went down in history as one of the first manifestos of the environmental movement, Carson reassembled the results of years of research on the disruptive impacts of synthetic pesticides on the environment, especially DDT, and evidenced the interfering effects on the food chain and human health. Beyond the irreversible loss of biodiversity and the incapacity of nature to indefinitely absorb polluting substances, *Silent Spring* seriously questioned the neutrality and the safety of technological progress – especially when it is growth-driven. Carson's claims had a strong influence on and inspired thousands of activists in the USA. Since then, the environmental question has gained attention within the global political debate, and rapidly merged with energy-transition concerns. In 1972, the Stockholm Conference on the Human Environment and the Rio Earth Summit of 1992 enshrined the entry of the environmental question into the global agenda (Normann & Carr, 2009). However, despite more than forty years of policies and initiatives, humanity still faces critical ecological issues. Environmental migration is growing and, despite technological advances in agriculture, about 795 million people suffered from undernourishment last year (FAO, IFAD & WFP, 2015). Events like climate change or soil degradation have deep social implications and roots. These, in turn, attest to the strong connections between politics, economy, and the environment. Finance speculation, chain-monopoly, and unequal patterns of resource access can transform a drought into a famine (Davis, 2001; Watts, 1983) and an energy transition policy into a food crisis (Chakrabortty, 2008; Rosset, 2009). It is, therefore, important to adopt a theoretical and analytical approach that takes into account multiple aspects of the environmental question, thus avoiding simplistic explanations.

The chapter focuses on three main approaches dealing with ecological concerns and their integration into planning. In the first section the idea of resilience is discussed. This is a dominant paradigm that, in the last thirty years, has increasingly gained importance, becoming a central framework that systematises the relations between humans, the environment, and the future, particularly in a development-related context. However, despite its success, the analytical framework of resilience remains limited. In particular, the resilience framework gives little attention either to the role of power relations in influencing environmental issues, or to the strong inequalities that underpin environmental vulnerabilities. Imbalanced self-responsibility, normative commitments, and maintenance of the status quo are among the main critiques faced by resilience. In order to address these limits, section two presents the political ecology (PE) approach and its reception in the urban context by urban political ecology (UPE). The principal ground of PE consists inrecognising that both the idea of nature and resources are social constructions and heavily contested concepts. By this means, PE enables the re-politicisation of environmental issues and takes into account broader scalar processes. The third section aims to introduce the degrowth idea as an alternative guiding concept and target as well

as a more viable and equitable response to the global economic and ecological crises. The chapter concludes in summarising the main aspects that emerge from the critical review of these three notions, presented here in the context of political geography and urban planning theory. It also argues that both PE and degrowth research would benefit greatly from a better understanding of the functioning of the ecological processes they address and their role in shaping social practices.

## 2 Resilience: Governing Unpredictability

The concept of resilience entered into the planning discipline mainly through the field of disaster risk management and rapidly expanded to other domains (Pizzo, 2015). Often suspected to be just a sort of 'buzzword' (Anderson, 2015), its versatility has raised criticisms claiming a general lack of precision and difficulties for translating it into effective planning practices (Davidson, 2010). Nevertheless, it is possible to retrace a common matrix behind the multiple uses of the word 'resilience'. This leads to a specific organisational and interpretative logic, which concerns the relationships between humans, environment, and technology. This peculiar framework becomes even clearer when resilience is shifted "from an ecological theory into a socio-ecological governance framework" (Evans, 2011, p. 224). Therefore, it is worth analysing the ensemble of premises that the paradigm of resilience brings together – and how it does it – in order to enhance the understanding of its possible implications.

The contemporary diffusion of the concept comes from the works of Crawford Stanley Holling, a Canadian ecologist who, in the '70s, introduced the idea of resilience to biology, taking it from the field of engineering-physics. This contributed to the reframing of the classical vision of the behaviour of ecosystems (Holling, 1973; 1996). Making a distinction between engineering (ENR) and ecological resilience (ECR), Holling defined ECR as the "amount of disturbance that a system can absorb before it changes state", whilst the ENR is described as the "time of return to a global equilibrium following a disturbance" (Gunderson, Holling, Peterson, & Pritchard, 2002, p. 230). While ENR refers to the measurement of the speed that a system takes to bounce back to its previous state of equilibrium, ECR measures the extent of the changes that a system can sustain before definitively transforming itself (Davoudi, 2012). In other words, with Holling's definition, resilience became the measure of a system's ability to persist, despite having undergone variations (Adger, 2000). It describes the capacity of a system to reorganise itself in the face of unpredictable, extraordinary, or drastic events yet without compromising itself and its functionality (Davoudi, 2016). This interpretation conveys two important implications. Firstly, it moves away from the idea of a single state of equilibrium, which was the predominant vision among ecological economists (Nelson, 2015). By demonstrating the existence of ever-changing and non-equilibrium systems, ECR shows how ecosystems tend to reach their stability through the continuous establishment of multiple and alternative

equilibria. A direct implication of this interpretation is that of shifting the focus on relationships between the system and its components rather than on their systemic function (Davoudi, 2016).

The awareness of the existence of non-linear dynamics in ecosystem functioning (Bjørnstad, 2015) has been crucial in reframing ecological strategies to better address socio-ecological issues, such as those of desertification and soil degradation. It also enhances understanding of territories as co-products of human activities and ecosystem functioning. Indeed, in some contexts, the anthropic component, instead of representing a factor of disturbance for ecosystem dynamics, can be essential to maintaining its equilibrium. This is, for instance, the case with rangelands and pastoral territories (Westoby, Walker & Noy-Meir, 1989). Human action – and labour - are also components in the generation of ecosystem services (Depietri, Kallis, Baró, & Cattaneo, 2016). Nevertheless, it is important to consider the implications of introducing a biological principle into a socio-environmental system like a city.

For planning, resilience defines an approach integrating short-term actions (risk management) and medium-term actions (development policies). However, as Barbara Pizzo (2015) points out, less is said about the kind of resilience that should be pursued, how and to what ends. These are strictly political questions that involve different 'cities imaginaries', i.e. ideas and representations about how cities should look, function, or be experienced (Bridge & Watson, 2002). Take the example of water management: one can provide cities with rainwater retention tanks in order to reduce flooding and stock water for periods of drought, or it can be decided to address urban inequalities in water access and consumption, or to reduce overbuilding. Resilience goals are usually outlined as improving sustainability, reducing risk, and recovering from shocks. However, these answers are still very vague as they end up omitting the issue of the crisis itself. The notion of crisis tends to be aligned with its initial ecological definition indicating the interruption of an equilibrium and consequently being reduced to a general label covering a large range of events from earthquakes to terrorist attacks or economic crises (Ahern, 2011; Doyle, 2016; Folke et al., 2010; Swanstrom, 2008; Walker & Cooper, 2011). Similarly, resilience literature often focuses on urban reconstruction but tends to give less importance to the nature of the disaster (Vale & Campanella, 2005). However, as Barbara Pizzo (2015) points out, not all the shocks are the same, nor are they equally unwelcome: a strike or a street-protest differs in many aspects from an electricity shortage. An uncritical approach to the crisis also leads to the avoidance of questions concerning geographical scale, as well as the structural causes of the situation at hand (Armitage & Johnson, 2006). This is evident when resilience is employed in marginal and peripheral areas, where the idea of vulnerability replaces more political concepts like poverty or class. A further implication is that of perceiving a crisis as normal and unavoidable, limiting the question to a matter of coexistence (Cifadoloz et al., 2011; Evans & Reid, 2013; Folke et al., 2010; Olsson, Folke & Hahn, 2004). This is, for example,

the case with climate change, where the frontiers between mitigation and adaptation are increasingly blurred (Evans, 2011).

The legitimacy of proactive planning is directly brought under scrutiny by the definition of ECR itself. Despite a shared tendency among scholars to prefer the ECR definition over ENR, also referred to as evolutionary resilience in order to stress a deeper commitment to change (Davoudi, 2012; Doyle, 2016), ECR remains highly conservative. This is not only because of a strong focus on system equilibrium but also because of an essential shift in the understanding of stability. As declared by Gunderson et al. (2002, p. 230) the distinction between ECR and ENR relies on "a focus on maintaining efficiency of function (engineering resilience) versus a focus on maintaining existence of function (ecological resilience)". Moreover, projecting future equilibria is not only considered unrealistic, given the unpredictability of threats, but also unsuitable as it risks undermining the potential for new stages to emerge (Evans & Reid, 2013). In some contexts, spontaneous reactions prove to be more efficient than strong regulation or advanced planning frameworks (Harrald, 2006; Webb & Chevreau, 2006). Resilience, therefore, is achieved through the reinforcement of technological and infrastructural connections in order to share information and increase the range of individual reactions to shock. The emphasis is put on self-reliance and self-responsibility (Olsson et al., 2004). In this sense, resilience is invoked for policies aiming to strengthen people's capabilities to face socio-environmental challenges. Nevertheless, the different degrees of vulnerability have historical, social, and cultural roots and are influenced by political choices, thus they require far-reaching structural reform in order to be addressed. Scholars underline that limiting actions to the improvement of self-organising, adaptation, and managerial skills of local populations often results in the tendency toward the individualisation of responsibility, which is often matched with imbalanced self-responsibility (Coaffee, 2013; Davoudi, 2016).

Resilience is also usually linked to participation (Innes & Booher, 2010; Pearce, 2003), as a way of facilitating the reframing between civil-society and institutions and to enrich the exchanges of knowledge between experts and locals (Folke, Hahn, Olsson, & Norberg, 2005; Olsson et al., 2004). However, participation is not always horizontal, nor does it necessarily mean effective empowerment (Holden, 2011; Kesby, 2007). Power asymmetries, such as those connected with class, gender, or race are crucial in determining the conditions of access to participatory arenas and the possibilities to influence them. Power is also embedded in knowledge and discursive formations (Foucault, 1980) as is the case for the resilience discourse.

This shift towards guiding and influencing people's behaviour to develop their resilience attitudes displays the deeply normative side of the resilience paradigm when it becomes part of governmental logics (Pizzo, 2015). Normative commitment and power/knowledge formations are the basis of Foucault's (2004) definition of neoliberal governmentality, a form of government that acts through the indirect conditioning of people's behaviour. Scholars claim that there is a substantial homogeny

between the neoliberal governance rationality and the resilience thinking, especially in its Anglo-Saxon version (Joseph, 2013). Walker and Cooper (2011) highlight how resilience and neoliberalism share a similar worldview. According to Nelson (2014, 2014a), the resilience paradigm played a pivotal role in influencing the post-Fordist-neoliberal logic of governance. Emphasis on system-instability and systemic risks have facilitated reframing concerns about the inner unsustainability of contemporary production and consumption patterns as economic issues and a matter of efficiency. This results in a deepening of the commodification process, documented by the rise of the green economy, the marketisation of ecosystem services and the recent trends in biotechnology research. This in turn highlights the increased stress on the natural world and biological processes in order to reach preservation and mitigation objectives (Pellizzoni, 2011).

## 3 Political Ecology, Urban Political Ecology and the Global Urbanisation

Power relations and capitalist accumulation dynamics are central concerns for political ecology (PE): a multidisciplinary research field that integrates different methodologies and analytical tools to explore the social bases of environmental issues (Robbins, 2011). The analyses in political ecology underline the multiple processes of value and meaning attribution related to nature (Agarwal, 2001; Bell, 2016; Bridge & Wood, 2010; Martinez-Alier, 2003). Scholars focus on power-relations and systems of public/private governance associated with space and environment (Adams & Mulligan, 2003; Agrawal, 2005; Beymer-Farris & Bassett, 2012; Davis, 2001; Sundberg, 2008). PE is equally interested in commodification processes and related patterns of appropriation, distribution, and production (Fairhead, Leach & Scoones, 2012; Heyen & Robbins, 2006; Ojeda, 2012). In this sense, rather than defining a specific discipline's boundaries, PE adopts a critical approach that combines the main concerns of political economy – i.e. how broader socio-political aspects shape economic relations such as those in production and distribution- to the field of ecology (Blaikie & Brookfield, 1987). Though political economy constitutes the original substrate of PE, anthropology, environmental science, and human geography contribute to providing PE with specific analytical tools. These highlight different aspects of the relationship between nature and society. Finally, PE is also influenced by postcolonial and subaltern studies and increasingly articulated by gender studies, feminism, peasant studies, and social movement analyses. Questions of class, race, and ethnicity have a central role in understanding uneven and unequal patterns of access to, and control over resources as well as impact distribution. Accordingly, PE research topics are mostly focused on conflict analyses, processes of marginalisation and environmental justice issues (Schlosberg, 2007). The term subaltern studies derives from the works of the Subaltern Studies Group (SSG), a collective of South Asian historians who analysed post-colonial history from a subaltern point of view (Guha & Spivak, 1988). The term subaltern refers to the ensemble of more marginalised

people such as peasants, women, or informal settlers and workers. These people tend to be considered as disempowered subjects and their role in shaping historical and political dynamics is often minimised. Contrasting this vision, scholars within the SSG analyse the political role played by the subaltern subjects in shaping the postcolonial state (Spivak, 1988; Chatterjee, 2004).

Despite this strong interdisciplinarity, the PE approach has its own specific analytical tools such as the idea of 'production of nature', the notion of metabolism and 'metabolic rift' (Clark & Foster; 2009; Foster, 1999). The central thesis of PE is that nature is a social construction and a heavily contested concept. According to PE scholars, nature is not something separate from human society; on the contrary, "nature is mediated through society" (and vice versa) (Smith, 2008, p.33). Human relations with nature are an historical product (Smith, 2008). The economic system and in particular the capitalist mode of production is currently one of the main patterns of nature production. This interpretation echoes the EcoMarxist analyses and Lefebvre's insights into the production of space (Lefebvre, 1991) and is further integrated by the idea of 'second nature'. The latter refers to the re-modelling of the natural world through human action (Harvey, 2011). The EcoMarxist view builds on the idea that, within a capitalist society, nature is subsumed as a means of production that, unlike human labour, cannot be daily and indefinitely replicated (O'Connor, 1988). In this sense, nature is portrayed as a fictitious commodity (Polany, 1944) on which capitalism depends for its continuity, but which it is unable to generate, as nature creation is external to capitalistic production. This leads to what James O'Connor (1988) defined as the second contradiction of capitalism, which is also the fundamental cause of the ecological crisis, unless capitalism is to re-form nature in order to maintain the value accumulation process. O'Connor wrote his theory in the '80s; nowadays, the generation of natural elements is at stake in biotechnology research. Building on this insight, Neil Smith's idea about the production of nature tries to account for nature's entanglements in market logic. In the words of Noel Castree (2000, p. 26): "[...] nature itself becomes internal to the economic system. Simplifying, this internalisation takes two forms, namely intentional production (as, for example, with GMOs) and unintentional production (as, for example, in the new ecologies created unintentionally by aquatic, terrestrial and atmospheric pollution)".

PE approach also led to a better inquiry into existing relations between social injustices, marginalisation and the ways that nature (and space) are constructed. Further debate on the neo-liberalisation of nature has shown how nature has become a new arena for economic accumulation, from the privatisation of urban water services to the financialisation of ecosystem-services (Heynen, McCarthy, Prudham & Robbins, 2007). Moreover, the deepening of the process of nature's commodification tends to result in an increase in environmental conflicts (Swyngedouw, 2005; Temper, del Bene, & Martinez-Alier, 2015). Besides commodification, PE is also interested in illustrating the political, cultural, and technological infrastructure that determines what a given

society defines as a resource, and how it does so (Martinez-Alier, 2009). While scientific knowledge and technology can enable the exploitation of a determinate natural element, thus allowing its definition as a 'resource', it should be noted that the defining of a resource is also affected by various cultural, moral, and/or religious factors. Similarly, certain characteristics of resources are considered intrinsic. However, they are more likely to be socio- political constructions (Bridge, 2009). This is the case for the notion of scarcity related to oil, which is more related to socio-political constraints than geological ones (Bridge & Wood, 2010). It follows that deterministic approaches to resources as intrinsically abundant or scarce should be carefully examined. However, physical qualities of resources should also be taken into account. Timothy Mitchel (2011) demonstrates how the physical and geophysical proprieties of carbon and, subsequently, oil have contributed to the building of modern and contemporary democracies. In his book, *Carbon Democracy*, he shows how these two resources have had a significant and distinct impact on the organisation of protests and political dissents in a number of countries worldwide. Finally, it is important to bear in mind that considerations over a resource's value and utility are multiple, and not always compatible. Conflicts are also the result of clashes between different imaginaries and interests. Furthermore, what is considered a resource for some may engender dispossession or pauperisation for others. Green technologies are good examples: the environmental impacts of producing the wind turbines or solar panels is mostly sustained by peasants living near rare-earth mining (Parry & Douglas, 2011). Indeed, the rising importance of green technologies has led to the expansion of extraction projects to provide minerals essential to their functioning (Massari & Ruberti, 2013). However, the relationship between mining, violence, and the degradation of health and environment is well documented in literature (Ali, 2014; Holterman, 2014; Bebbington & Bebbington, 2012; Deneault & Sacher, 2012). Moreover, the capacity to supply the expanding green technology industry with rare-earth minerals is being questioned (Moss, Tzimas, Kara, Willis, & Kooroshy, 2011; Wübbeke, 2013). On a similar note, fiscal incentives on agro-fuels have fostered a shift in agricultural production from food to fuel and encouraged policies that enabled land-grabbing in the global south (Benegiamo, 2016; GRAIN, 2013). These examples challenge the sustainability of an energy transition that does not include a serious reduction in consumption. Exactly what needs to be reduced, and how this will be administrated, are still political questions that need answering.

Introducing a multidimensional and scalar approach that takes into account transnational flows and processes is essential to addressing local sustainability, especially in urban contexts (Neumann, 2009; Roberts & Parks, 2009). The idea of socio-ecological metabolism, developed in the field of ecological economics (Fischer-Kowalski, 1998, 1998a), is helpful in decrypting these processes. Ecological economics studies the economy as a metabolic process that mainly involves energy and material flows as input and pollution, and waste as output. In the urban context, the notion of urban metabolism has enhanced the understanding of how cities function, challenging

the perception of cities as mere social artefacts (Heynen, Kaika, & Swyngedouw, 2006; Swyngedouw, 2006; Zhang, 2013). This approach is integrated with quantitative input-output-type frameworks such as Material and Energy Flow Accounts (MEFA), Human Appropriation of Net Primary Productivity (HANPP), Energy Return on Investment (EROI), and the water footprint (Dinarès, 2014). The metabolic frame also gives birth to a conception of cities as open-systems, allowing us to see the urban dimension as a global socio-ecological process that extends beyond the physical limits of the city (Keil, 2003). Indeed, because of this interconnection between the urban space and peripheral zones, urbanisation has become the principal feature of a globalised space and it can be better defined as a global process of transformation of space, distinct but related to the city (Lefebvre, 2003). Cities arose as one of several privileged observatories to study this process (Angelo & Wachsmuth, 2015).

By bringing the main insights of PE into urban domains, urban political ecology (UPE) seeks to understand how unequal power relations, and differentiation such as race or class, may inform the production of specific urban environments, which in turn contribute to the re-production of these inequalities (Heynen, 2017; Razack, 2002). Kaika and Swyngedouw (2011, p. 103) define cities as "contested socio-natural processes", consisting of the deterritorialization and reterritorialization of both material and social circulatory flows (from energy and water to migrants). These flows cross economic corridors that are in turn both physical and social as supported by natural, technological, political, and institutional infrastructures. The terms deterritorialization and reterritorialization are two neologisms coined by Gilles Deleuze and Félix Guattari (1972) to indicate two subsequent moments in a control driven process of territorial transformation. In geography and urban political ecology, they are mostly employed to describe globalisation as a process of capitalist accumulation involving spatial restructuring through the delocalisation and displacement of capital (Brenner, 2004). Kaika and Swyngedouw (2011, p. 97) indicate four main orientations in urban socio-ecological research (p. 97): i) research on neo-liberalisation of urban environments; ii) socio-ecological urban movements and environmental justice; iii) urban socio-ecological imaginaries - such as those related to the degrowth approach described in the remaining part of this section; iv) research on urban metabolism.

Recently, the reception of Latour's work (2005) and Actor-Network Theory (ANT) in PE and UPE has led researchers to pay closer attention to the 'agency of nature' and ecosystem functioning. The ANT approach has brought "a sensitivity to the material interventions of matter and the animal world in how agency and politics are constituted" (Müller, 2015, p. 34). ANT's main claim consists in contesting that man has an ontological priority over other material and living entities. Thus, ANT is interested in exploring relations between humans and non-human entities and their role in co-producing specific knowledge frameworks and socio-material realities. Related notions of hybridity or assemblages of hybrid elements have been especially developed within UPE (Braun, 2005). That of hybridity is a concept that allows us to understand the

agency of the natural world in an urban context. For example, in his work on the relationship between urban water systems and the development of the industrial city, Gandy (2004) highlights how cultural and scientific knowledge about hygiene and bacteria behaviour play a greater role in shaping urban architectures, for example through the action of micro-organisms involved in water purification processes. Thus, nature is not just perceived as a passive entity but rather as a series of chemical, biological, and physical processes that influence the way we build cities and the way we inhabit them. According to Zimmer (2010, p. 347), an important role of urban political ecology is to then direct attention toward the identification of "winners and losers of specific forms of hybridization".

## 4 The Degrowth Proposal

After having introduced resilience and political ecology, it would be beneficial to present the notion of degrowth, an emergent framework that was developed in the fields of ecological-economics, economical anthropology, and within the environmental movement (Martinez-Alier, Pascual, Vivien & Zaccai, 2010). Degrowth is an expansion of PE concepts and combines them with critical research on development and developmental ideology (D'Alisa, Demaria & Kallis, 2014). It calls for policies and practices enabling the reduction and the equalisation of social metabolism. These are, in turn, rooted in an alternative vision of society and economy (Kallis, 2011). The degrowth approach builds on the idea that economic growth is by no means compatible with socio-environmental sustainability goals since inequalities and environmental injustice represent both the premises and the results of a growth-led economy. However, such a statement does not imply that degrowth is an attempt to return to the past or a romantic reunification with nature, but rather a change in the scale of values enabling the emergence of solutions other than growth. Scholars of economic anthropology and economic philosophy demonstrate that market ideology, as well as the growth imperative, are historical socio-political constructs rather than the product of innate human tendencies, which are subject to change (Mauss, 1970; Scott, 1976). Thus, scholars of degrowth are concerned with alternative developmental practices and patterns (Gezon & Paulson, 2017). A similar notion is that of selective growth, which concerns the reframing processes about what should be 'grown' and what is better to 'de-grown'. Degrowth also relies on the main insights from the literature on the connections between ecological and economic crises as well as the constant presence of crises in contemporary society (Evans & Reid, 2013). With respect to these issues, the degrowth approach aims to construct a proactive and alternative response to the economic crisis. Hence, an interesting debate within degrowth literature is the one related to rethinking austerity and austerity policies (Garcia & Martinez-Iglesias, 2017). Scholars argue for a re-evaluation of the current approach to austerity, which involves reductions in welfare and increased unemployment, by moving toward a more functional organisation of the national/regional budget and

taxation, for example by rethinking consumption and food production practices (Agyeman & McEntee, 2014) and/or by reducing working time and providing citizens with basic income. Calling for a "positive reconstruction of austerity" Agyeman & McEntee (2014, p. xv), suggest that the degrowth hypothesis could be both a viable solution to increase welfare and improve the quality of the environment as well as a more suitable response to the crisis. Experiments in this direction have been started, for example the case of Detroit. Here, according to the analysis provided by Seth Schindler (2016), civil society's response to the Detroit bankruptcy has been more oriented toward the improvement of policies that challenge the growth-orientation imperative and the emergency narratives characterising urbanism and city governance proposed in periods of austerity (Schindler, 2016; Peck, 2012).

Another interesting field for the degrowth approach is the Shrinking Cities debate on the decline of cities following deindustrialisation (Béal, Collet, De Filippis, Ocejo & Rousseau, 2017). Co-housing, eco-villages, city-farms, squatter settlements, and sharing practices are often listed as examples of degrowth (Cattaneo & Gavaldà, 2010; Domènech, March & Saurí, 2013; Lietaert, 2010). However, doubts have arisen regarding their effectiveness in reaching degrowth goals, such as that of reducing urban metabolism (Xue, 2014). Other examples of a degrowth-driven reform process mostly focus on redistribution, improving public services, and/or moving toward a re-localisation of the economy and reducing exposure to competition (Kallis, Kerschner & Martinez-Alier, 2012). The degrowth paradigm has been criticised because it lacks precise indications about how it would be measured and effectively turned into success. The latter point also raises the important issue of authority, giving way to questions about what kind of power, legitimacy, and institutions a degrowth oriented reform will leverage. In response to these and other criticisms, Giorgos Kallis stresses the pro-active role that the degrowth framework plays, as it "gives purpose and connects policies and citizen initiatives" (Kallis, 2011, p. 874), thus acting as an effective counter-hegemonic vision allowing for social change.

## 5 Conclusions

This chapter has presented an overview of related literature on resilience, political ecology, and degrowth: three key notions for assessing socio-environmental issues. These have been explored in the context of political geography and urban planning theory. By exposing the main limits and the implicit neoliberal drift in the resilience approach, this chapter argues for resilience's integration with analytical tools developed by PE and UPE. It further argues that the PE approach and its adoption into urban disciplines may enable a better understanding of socio-technical constructs that underpin environmental issues, including that of resilience itself. By highlighting the deeply conflictual character of environmental issues and the presence of inequality at every level, PE and UPE allow the re-politicisation of socio-environmental processes, such as cities. A further step in this direction is represented by the

degrowth debate. The degrowth approach focuses on alternatives to growth and explores related emerging practices and governmental and developmental patterns. It then constitutes a proactive field of analysis that advocates the rethinking of critical global challenges such as the ecological crisis, austerity, and shrinking cities. However, despite a deeper commitment to environmental issues, both PE and degrowth share a tendency to focus preferentially on the effect of society rather than of nature. This potentially risks neglecting the role of biological processes in the reshaping of how society functions. As stated above, the effects of these dynamics are increasingly recognised, especially in UPE where conceptual instruments from Actor-Network Theory, such as those of hybridisation and assemblages, have been introduced. Additionally, within the degrowth debate movements for orienting the research toward a non-anthropocentric approach have been made (Escobar, 2015). In this sense, resilience thinking, with its idea of non-equilibrium systems, contributes to fostering an awareness of ecosystems as the co-product of human and natural action, thus reintroducing biological processes back into urban analysis. However, it is more committed to orienting the governance of these processes toward growth objectives. For their part, both PE and degrowth research would benefit greatly from a more complete integration into their analytical framework of the functioning of the ecological processes they address. Otherwise conveying the idea of nature as an inert and passive entity is likely to reproduce a dualistic vision where human domination over nature is the unilateral agent of transformation within society. Development, planning practices, and social dynamics are not only rooted in, but also constructed by biological processes. Think for instance of the increasing integration into planning theory of the knowledge of the functioning of the ecosystem services or of microorganisms' actions (de Groot et al, 2010; Pedersen Zari, 2015). This shows, among other things, that besides human actions, animal actions, such as those of invertebrates (Lavelle et al., 2006) and insects, are also essential for ecosystem development. Awareness of this can lead to the reframing of the notion of human superiority and thus lead to a changing in the scale of values underpinning the perception of the human/nature relationship. In terms of the importance of scientific knowledge and biological processes, an example is provided by neuroscience and neurophysiological research in the development of analytical neural modelling on deep learning (Kohonen, 1988). These are used by new technologies such as automated driving systems, car transportation, and food delivery software applications. These, in turn, are changing the experience of mobility and consumption in urban areas. However, both these planning approaches and new technologies are conditioned and influenced by power relations that need to be studied because they are crucial in determining who will benefit and who will be excluded by future development patterns.

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# Integrated Planning as a Mechanism for Creating Sustainable and Resilient Settlements

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ABSTRACT **Urban development today is a process that is directed towards sustainable and resilient settlements. That goal cannot be reached without integrated planning. Many problems faced by urban areas seeking to do so are the result of, among other things, underdeveloped practices of integrated planning, particularly in the post-socialist countries of Europe. Starting from this hypothesis, the first part of this work deals with the theory of integrated planning as a planning approach that has evolved from the mid-twentieth century until today, specifically its indissoluble connection with the complex character of urban space and a sustainable and resilient environment. The second part deals with the methodology of integrated planning based on a problem-oriented analysis of the environment, society, the economy, and the urban planning institutional potential, from the perspective of collaboration and participation. Research has shown that the implementation of integrated planning is directly connected to the socio-economic conditions, legal frameworks, technology, and professional and educational potentials of urban areas, which differ for each country. It is important to make efforts at municipality level to implement projects that promote integrated approaches to planning sustainable and resilient environments, which can be a stimulus for the improvement of legislation and socio-economic conditions at a higher level of government, and a development of good practice in other cities. Research has shown, through concrete examples, that the practice of integrated planning is more prevalent in cities in EU countries than in post-socialist countries. This article focuses on the case study of the Republic of Srpska, where there are many problems in its implementation. Based on the analysis of this case study, it can be seen that it is necessary to constantly work on improving the methodology of integrated planning, education, and the training of planners and stakeholders, as well as strengthening the institutional and socio-economic preconditions for its implementation, particularly in post-socialist countries.**

KEYWORDS integrated planning, urban space, sustainable development, sustainability, resilient settlements

# 1 Introduction

Integrated planning is one of the basic approaches to modern planning and is, due to the complex character of spatial phenomena, a logical and necessary one. The term 'integrated' is widespread today and describes all phenomena of sustainable development and management. Sustainable development nowadays is based on the balanced development of society, economy, and environment, while considering spatial and contemporary relations (Albrechts, 2004; ECTP-CEU, 2013). It also integrates spatial-physical and social forms of development of urban space. Policy-making for sustainable urban development and the creation of institutional frameworks at all levels has acknowledged integrated planning as the mechanism for achieving a sustainable and resilient urban space and environment. For this reason, a further relationship can be proposed: sustainable development includes sustainable urban development through integrated planning. According to Geerlings and Stead (2003), the creation of integrated policies is complex and depends on numerous factors, such as organisational, individual, political, economic, financial, contextual, process-like, etc. Resilience is a crucial prerequisite for achieving sustainability and sustainable development (Folke et al., 2002); it is a component, a "subset of the broader concept of sustainability science" (Folke, 2016, p. 5); a resilient socio-ecological system is "ecologically, economically, and socially sustainable" (Holling & Walker, 2003, p. 1).

Integrated planning is, in theory, based on the evaluation and improvement of the rational planning of the 1950s (Abukhater, 2009; Lawrence, 2000), and is a result of the complex nature of the urban context and the overall development of socio-economic relations, which have, in the last decades, become very dynamic (Pickett, Cadenasso, & Grove, 2004; Ray, 2012). The degree of development nowadays in the fields of economy, social culture, and technology, and the historical flow of these processes, show the permanent complexity and interactive effect of influential factors on urban space and environment (Milojević, 2015). The enormous transformations of our cities, societies, and environment over the past few decades call for a more effective and resilient planning and development perspective (Pickett et al., 2004). The integrated planning of resilient urban environments has been developed to address the negative impacts of climate change, rapid urbanisation, and the modern style of life (Pickett et al., 2004; Zahao, 2010). It is based on the trans-disciplinary nature of cities and problems that require interdisciplinary collaboration (Abukhater, 2009), which is not easily achievable.

Besides horizontal inter-sectoral integration in planning, there is also vertical integration related to planning at various spatial and governance levels (Geerlings & Stead, 2003). As some urban phenomena do not have clear spatial boundaries, it is necessary to analyse them through all spatial scales, from the local to the regional, national, and international levels, including the time dimension, which activates short- and long-term aspects of problems and their planning solutions (Abukhater, 2009). Planning should be comprehensive in terms of including complex

and dynamic development aspects. It should improve mechanisms for socially responsible, adaptable, and participative planning, with the aim of having sustainable and resilient planning of urban space and environment. Planning should also have a human aspect by improving the quality of citizens' life through the protection of nature, created values, and optimal conditions for present and future generations.

Integrated planning also includes defining the appropriate methodology of the planning process, the involvement of stakeholders and the public in the planning process, and urban management, which require additional knowledge and skills. The creation of appropriate regulations and policies in the field of socio-economic and ecological conditions, such as system organisation at the international, national, and local levels, are preconditions for the realisation of integrated planning in practice.

The sustainable development of cities is considered at all levels of governance in creation of strategy documents for sustainable urban planning. UN-Habitat, in *The World Cities Report* (2016b), an analysis of the last twenty years, shows with compelling evidence that there are new forms of collaboration and cooperation, planning, governance, finance, and learning that can sustain positive change in many cities in the world but also demonstrates that the current urbanisation model is unsustainable in many respects, puts many people at risk, creates unnecessary costs, negatively affects the environment, and is intrinsically unfair (Ban Ki-moon, 2016, *Foreword* of *The World Cities Report*). *UN-Habitat III - New Urban Agenda* (UN-Habitat, 2016a), defines a common vision for settlements, principles of and commitments to environmentally sustainable and resilient urban development.

*The Urban Agenda for the EU 'Pact of Amsterdam'* (EC, 2016) is a coherent set of actions for key European actors (member states, regions, representatives of urban authorities, the European Commission, the European Parliament, the Union's advisory bodies - Committee of the Regions, European Economic and Social Committee, the European Investment Bank and other relevant actors) who work in partnership. It strives to involve urban authorities responsible for all levels of governance in achieving better regulation, better funding, and better knowledge for smart, sustainable, and inclusive urban growth. Among the priority themes are strategic urban planning with balanced space development and an integrated and participatory approach.

Twelve thematic priorities have been agreed for an EU urban agenda and feature in the *Pact of Amsterdam* (EC, 2016): jobs and skills in the local economy; urban poverty; housing; inclusion of migrants and refugees; sustainable land use; circular economy; climate adaptation; energy transition; urban mobility; air quality; digital transition; and innovative and responsible public procurement.

The EU supports the creation of a network of European cities under the common theme of sustainable urban development. As reported in *New Planning Culture in German Cities* (Schaber, Wékel & Zdiara, 2016), many successful initiatives in this domain have already been realised.

The renewal of urban space in German cities is the result of the new planning approach, proclaims the German Association of Cities (2013).

Apart from the creative sustainable development of cities, it is clear that the more important goals have not yet been achieved, such as equality, security in many places, protection from climate change and so on (Ban, 2016; Doughty & Hammond, 2004; Kenworthy, 2006; Moore, 2007). One of the reasons for this is the lack of integrated planning, especially in transitional countries (Kosareva & Puzanov, 2012; Vujošević & Spasić, 2007). The importance of this theme immediately shows the need for theory and practice research to systematically improve planning methodology, regulations, institutional capacities, social economy, and education for the implementation of integrated planning.

This paper explains the concept of integrated planning and its theory and practice in the EU, with a special focus on planning practice in the Western Balkans (Case Study of the Republic of Srpska).

## 2 Development of an Integrated Approach to Planning

Theories of integrated planning are based on the integrated nature of the planning process and urban phenomena. Urban planning can be described as a technical and socio-political process concerned with the welfare of people, control of the use of land, design of the urban environment, and the protection and enhancement of the natural environment. It is a multidisciplinary process that includes professionals from various fields in common planning activities. For a long time, they worked separately, and cities suffered from many chronic urban problems related to social justice, unemployment, traffic congestion, and environmental pollution. That these problems perpetually extend shows "the importance of across-space-and-time planning approaches that account for short and long-term consequences and multiple levels of impacts of city and metropolitan-scale problems, including local, regional and national levels" (Abukhater, 2009, p. 67).

Apart from improving the planning process, the comprehensive approach did not follow societal processes, and its aims went beyond human intellectual capabilities and technical and organisational capacity (Lindblom, 1959) in the 1960s. The relationship between social processes and planning, a crucial precondition for responsible and sustainable planning, has not been installed for a long time. Knowledge gained over recent decades of socio-economic development, environmental challenges (such as uncontrolled degradation of natural resources and climate change), and rapid technological progress in information accumulation and management should be passed on with the aim of supporting sustainable development with an integrated development approach.

Awareness of the necessity for global protection of the environment, social equity, poverty reduction, and the right to health and education

has resulted in the idea of sustainable development that provides a path to desirable and appropriate outcomes. These ideas have been developing at international conferences for more than four decades (see, for example: the *United Nations Conference on the Human Environment*, Stockholm, 1972; *Habitat I and II - Conference on Human Settlements*, Vancouver, 1976 and Istanbul, 1996; the *United Nations Conference on Environment and Development*, Rio de Janeiro, 1992; the *World Summit on Sustainable Development* or *ONG Earth Summit 2002*, Johannesburg, 2002; *Rio+10*, 2002 and *Rio+20*, 2012). Activities related to urban planning and housing are coordinated by UN-Habitat, which produces studies and publications on all types of human settlements with the aim of protecting the environment and ensuring a better quality of life for the present and future generations (*Cities and Climate Changes*, 2011a; *Affordable Land and Housing in Europe and North America*, 2011b; *Planning and Design for Sustainable Urban Mobility*, 2013; *New Urban Agenda*, 2016a; etc.) An integral part of this idea is the creation of a sustainable and resilient urban environment. *How to make cities more resilient - A Handbook for Local Government Leaders* (UNISDR, 2012) gives ten essentials for making cities disaster-resilient: (1) institutional and administrative framework; (2) financing and resources; (3) multi-hazard risk assessment; (4) infrastructure protection, upgrading, and resilience; (5) protect vital facilities: education and health; (6) building regulations and land-use planning; (7) training, education and public awareness; (8) environmental protection and strengthening of ecosystems; (9) effective preparedness, early warning, and response; and (10) recovery and rebuilding communities.

Climate change, economic recession, and refugee crises, which have affected the whole planet, emphasise the actuality of sustainable development and the necessity to permanently search for models for planning a sustainable and resilient environment. At the heart of this approach is integrated planning.

The global consideration of these issues through the institutions of the United Nations represents the highest level of integrated approach to development issues, which has both spatial and planning implications. *The New Urban Agenda* (UN-Habitat, 2016a) promotes integrated planning that aims to balance short-term needs with the long-term desired outcomes of a competitive economy, high quality of life and sustainable environment. *The Agenda* defines many other aspects of planning and management of urban and spatial development such as balanced territorial development policies and plans, high quality of buildings and public space, promoting integrated and participatory approaches in planning process, multiple use of space, etc. The *Urban Agenda for the EU* (EC, 2016) is based on the principles of *The New Urban Agenda* and contributes to the implementation of *The 2030 Agenda for Sustainable Development,* notably goal 11 – "Make cities and human settlements inclusive, safe, resilient and sustainable" (UN, 2015, p. 14). Apart from the need to coordinate with the UN documents, the results of the social, economic, and ecological connectivity of European space are integrated development policies, which EU bodies adopt for all their members. From this emerged the idea of the spatial integration

of European cities (ECTP-CEU, 2013), which plays a key role in pursuing the *Europe 2020* objectives (EC, 2010).

The above UN and EU documents are significant political, institutional, and organisational guidelines for the implementation of an integrated approach to planning and managing urban development.

## 3 The Relationship Between Integrated Planning and a Sustainable and Resilient Environment

The objective of sustainable development is creating and *maintaining* prosperous social, economic, and ecological systems (Folke et al., 2002; Albrechts, 2004) that are adaptive and able to flourish and grow in the face of uncertainty and constant change. Achieving sustainability requires innovation, foresight, and effective partnerships among corporations, governments, and other groups. While it is not possible to tell the future, governments and other agencies can equip themselves to adapt to the turbulence ahead. The complex nature of urban space shifted to the idea of resilient environments in the 1970s in the field of ecology through the research of Holling, who defined resilience as "a measure of the persistence of systems and of their ability to absorb change and disturbance and still maintain the same relationships between populations or state variables" (1973, p. 14). Humanity has a strong *need for persistence* and depends on services of ecosystems for its wealth and security. That's why humanity and ecosystems are deeply linked. As a result, it is imperative that humanity strives for resilient socio-ecological systems through sustainable development (Pisano, 2012).

Other theories define resilience as "the ability of a system to absorb disturbances and still retain its basic function and structure" (Walker & Salt, 2006, p. 1); as "the capacity of a social-ecological system to continually change and adapt yet remain within critical thresholds" (Folke et al., 2010, p. 1); or the "capacity of a system to survive, adapt, and grow in the face of unforeseen changes, even catastrophic incidents" (Center for Resilience at the Ohajo State University, n.d. para. 1). Thus, the resilience of the built environment may be the key to global sustainability.

Space is a physical framework for all development processes. It is possible to draw several relationships from this definition, such as the fact that processes in space are the result of natural and created influences; natural influences can be taken as priority processes and human activities must be harmonised with them; and there is a mutual impact and integration of natural and created influences that form the urban environment. They all act in space and time, which results in continuous transformations and dynamics of urban context that have been especially emphasised in the last development period (ISOCARP, 2012).

This period is also characterised as a time of immense challenges to sustainable development (UN, 2015). UN efforts from the 1970s

up to now (Habitat I, 1976; Habitat II, 1996; Istanbul +5, 2001; Habitat III, 2016), to create institutional, social, economic, knowledge, and financial networks for sustainable development, have played a major role in pointing global development in the right direction. Sustainable urban development and management are recognised as crucial to the quality of life of the world's population, which is why one of the seventeen sustainable development goals of the UN is to make cities and human settlements inclusive, safe, resilient, and sustainable by 2030. This means to "enhance inclusive and sustainable urbanisation and capacity for participatory, integrated and sustainable human settlement planning and management in all countries" (UN, 2015, p. 26). Spatial planning must embrace all the processes happening in society, economy, and environment (Abukhater, 2009). Natural and created processes and their interactions are complex and require integrated planning and management of all developing processes, including the creation of sustainable and resilient urban environments (Pickett et al., 2004; Yigitcanlar & Teriman, 2014).

Among the different spatial aspects (environment, building structures, spatial functions, social activities, economy, politics, people, culture, institutional framework, etc.), there are mutual influences and regulations accepted by integrated planning (Abukhater, 2009; Yigitcanlar & Teriman, 2014). It is important to analyse all of them, particularly the environment and its natural processes, with the aim of planning for the mitigation of the causes of climate change and preservation of ecosystems.

Based on an analysis and assessment of overall contextual situations regarding the space and the adopted policies at the local and global level, there should be a responsible planning approach to create spatial conditions that will correspond to the current and future needs of people. In accordance with the UN *2030 Agenda for Sustainable Development* (2015), which provides integrated, indivisible, and balanced assessments of the three dimensions of sustainable development – the economic, social, and environmental – the UN-Habitat *International Guidelines on Urban and Territorial Planning* (2015, p. 14-21) defines the main principles for planning in those domains. These are: "adequate standards of living and working conditions for all; an equitable, better quality of life; cultural heritages and cultural diversity; a framework for new economic opportunities; better connectivity at all territorial levels; a spatial framework to protect and manage the natural and built environment; human security; and environmental and socioeconomic resilience, enhancing the mitigation of, and adaptation to, climate change".

At the same time, integrated planning, as a good practice, should be proactive and offer new development potentials and guidelines for future development, like, for instance, that which is present in German cities (Schaber et al., 2016).

## 4 The Methodology of Integrated Planning Process

The transition from traditional land-use planning to strategic planning was crucial for the development of the methodology of the integrated planning process. Strategic planning is about process, institutional design, and guidelines for integrated development. Land-use plans, with their 'physical' solutions to social problems, became strategic plans with short-term actions and the framing activities of stakeholders to help achieve shared concerns about spatial changes (Albrecht, 2004). Albrecht (2004) defined such a planning concept as a four-track approach with the tentative integration of different types of rationality: value rationality (the design of alternative futures); communicative rationality (involving a growing number of actors in the process); instrumental rationality (looking for the best way to solve problems and achieve the desired future); and strategic rationality (a clear and explicit strategy for dealing with power relationships).

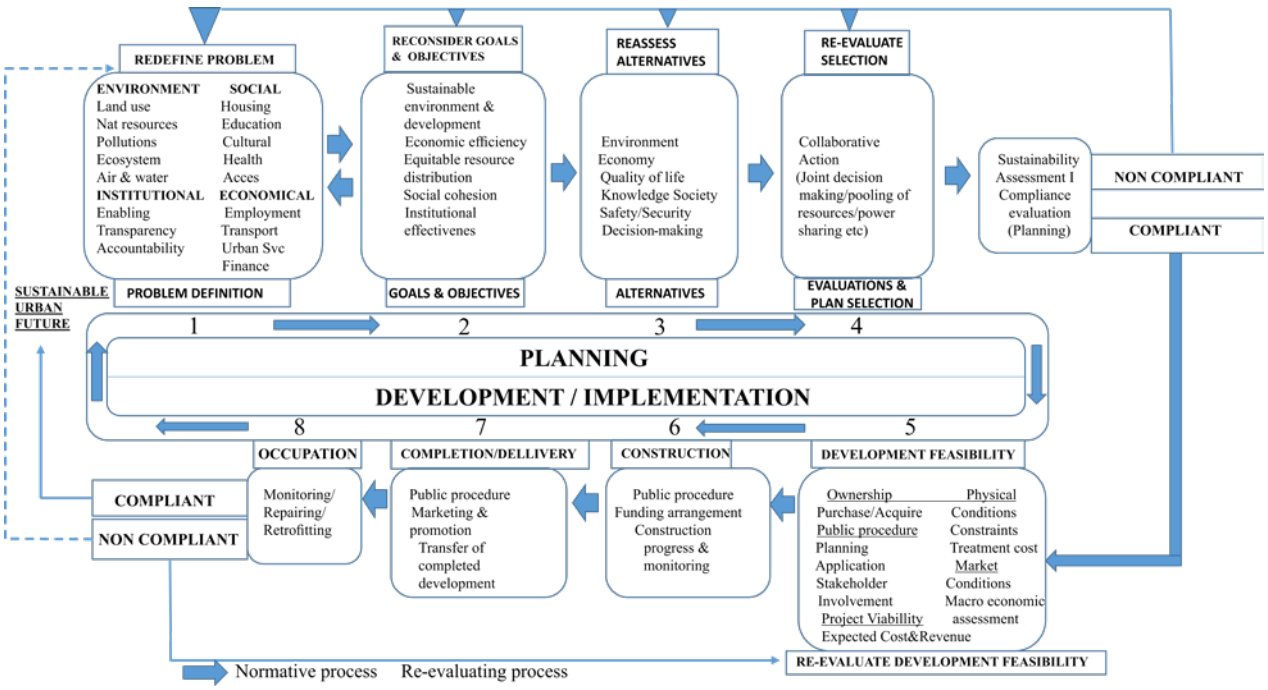


FIG. 4.1 Proposed integrated urban planning and development process *(Yigitcanlar & Teriman, 2014)*

Adopting a system approach involves the integration of the three key components – planning, development, and ecosystem sustainability – into a single urban planning and development process to create a sustainability-oriented urban planning and development culture. (Yigitcanlar & Teriman, 2014, p. 346). The role of planners in this approach changes from one of merely providing expert opinion and technical leadership to mediating between and communicating with stakeholders (Yigitcanlar & Teriman, 2014). Teriman (2012) defined eight steps in the integrated planning approach: (1) redefine the problems in the domains of environment, society, economy, and institutions; (2) reconsider goals and objectives; (3) reassess alternatives; (4) re-evaluate selection; (5)

development feasibility; (6) construction; (7) completion/delivery; and (8) occupation (Fig. 4.1). This model offers sustainability assessment, which takes place after (4) and (8), as a very important mechanism for controlling the planning process. From that point, activities could be back to step (1) redefine the problem.

There are numerous sustainable urban development assessment methodologies that measure different sustainability dimensions of the built and natural environments such as land use, transport model, urban infrastructure, urban-ecosystem, etc., which support integrated urban planning and development processes.

A multidisciplinary analysis of all relevant environmental factors that influence planning – such as geomorphology, geology, seismology, natural resources, renewable energy resources, vegetation, climate, and climate change – as well as factors generated by human activities (such as construction, urban facilities, residential housing, education, cultural/health access, and the economy) is crucial for a comprehensive and integrated planning approach. Given the complexity of urban space in the domains of environment, society, economy, and institutional framework, such an analysis has the potential to redefine the problems, goals, and objectives of planning.

There is a necessary interaction among the basic planning steps that needs to be achieved in the process of integrated planning and management of the sustainable development and resilient urban space and environment. The whole planning process presents cycles in which the steps and activities influence each other.

It is also necessary to ensure the participation of all stakeholders in the development and implementation of the plan. Strengthening participation through the involvement of citizens in the planning and decision-making process is an important prerequisite to a comprehensive review of the problems and needs of the population, especially at the local level.

Integrated planning involves the flexibility achieved by using zoning and abandoning strict regulatory planning (Counsell, Allmendinger, Haughton, & Vigar, 2006). Zoning is the recommended model of regulation for the wider urban territories and areas with a lower construction index. It offers flexibility in defining building roles, parcels of land, and permitted, conditionally permitted, and prohibited land use. Thus, a dynamic social, economic, and environmental urban context (Kosareva & Puzanov, 2012; Ray, 2012) can be more easily accepted in the planning process. Zoning began much earlier in American cities and Western Europe while strict regulatory planning was common in former socialist countries. While zoning in American cities is a matter of an administrative document, in the European continent it still requires a regulatory document prepared by urbanism professionals. The zoning model is still being developed in former socialist countries and needs to be adapted to the specifics of their society, economy, history, law, land regulation, and urban development through history. Such a zoning

model was developed through pilot projects in some municipalities in Bosnia and Herzegovina (B&H) between 2010 and 2011 and then passed into law. It should also be noted that strict regulatory planning has been, and still is, applied in relation to some aspects of planning in many countries (e.g. in conservation areas, areas with a high index of construction) and might continue to be used if considered necessary in some urban areas.

The end of the 20th and the beginning of the 21st centuries are characterised by a strong, intensifying link between society and technology. The information network called 'smart city' is used to detect changes, analyse them, and, consequently, improve the efficiency, safety, and sustainability of urban spaces and processes (Stupar & Mrdjenović, 2015). Information technology is considered a powerful instrument for achieving integrated planning and development.

To plan a sustainable and resilient urban space, it is important to create a spatial information system with all the relevant data that will allow a comprehensive understanding of the phenomenon of urban space and natural environment. GIS technology has been adopted as a tool for the creation of a database for sustainable planning and management of different spatial categories and resources (Rotondo & Selicato, 2014).

The database that records climate changes and their effect on urban space and the environment is especially important for the implementation of integrated planning, as well as for measures to protect sustainable and resilient urban space and the environment from harmful effects (Milojević, 2016). Protection against floods in the context of climate change implies making development decisions on the basis of current and potential future risks of extreme hydrometeorological events (Gencer, Stephens, & Johanson, 2015). Therefore, some countries in the EU, like the Netherlands, create maps of risk and flood hazards, wind, and other extreme climatic conditions to support planning for resilience.

Improving energy efficiency for all planned buildings has already become a legal requirement in all EU countries, in accordance with EU directives no. 2002/91/EC and 2010/31/EU. The regulative frameworks in accession states such as Serbia and B&H are in compliance, while strategies to improve the energy efficiency of the existing building stock have been adopted under the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) support. The publication *Typology of Residential Buildings in Bosnia and Herzegovina* (Aksić at al., 2016) is the result of research collaboration between the universities of Sarajevo, Banja Luka, and Belgrade, the priority being to find a way to reduce energy consumption in both new and existing residential buildings.

In addition to creating a spatial information system, it is necessary to continuously update the database on natural processes, disasters caused by climate processes, and anthropogenic activities (soil erosion, landslides, desertification, deforestation, etc.), and processes that are the result of human activities and planning processes (land use,

construction, housing, transport, water supply, solid waste, energy and technology resources, education, culture, health, protection of cultural heritage, etc.). Evidence of planning documents and the transition dates of all elements of planning regulation, from the present to a planned state, also represent a part of the planning process and require continuous updating. Using GIS in planning and collecting spatial data and the education of staff in new approaches to planning and urban management are also necessary for an integrated planning process.

Institutional support and regulation frameworks, which are also included in integrated planning processes, are preconditions for sustainable development. That's why the integrated planning approach is more developed and implemented in the EU than in the Balkan region. Implementation of integrated planning is based on planning methodology, recognised more through theory and less through planning practice. Despite good urban practice in some countries (Germany, Spain, Italy, Netherlands, France, etc.), it is evident that many theoretical assumptions in integrated urban planning have not been achieved in real-world practice (Ban, 2016), which has been the case in former socialist countries since the 1990s. Figure 4.2. presents a proposed planning methodology in Republic of Srpska in accordance with the law for spatial planning, which consists of the main elements of integrated planning, but which is not yet implemented in planning practice.

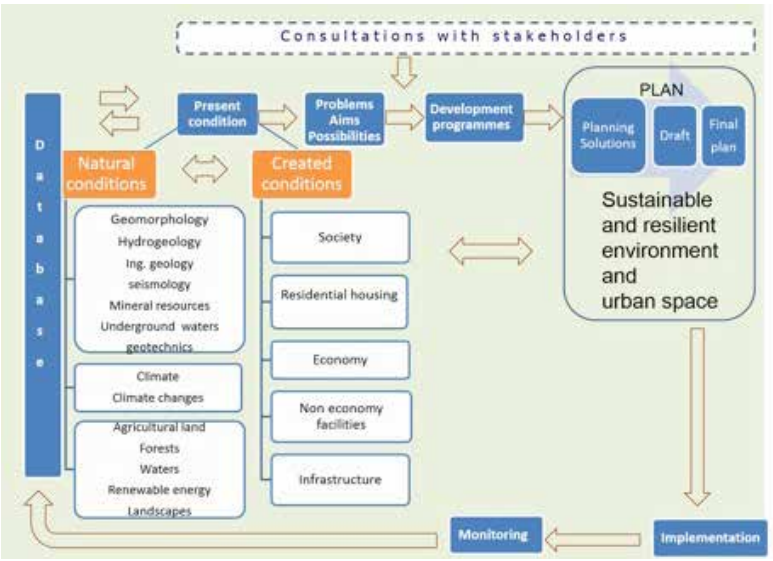


FIG. 4.2 A proposed methodology for integrated planning in Republic of Srpska in accordance with the law for spatial planning and construction *(Image by Author, 2015)*

As cities are key actors in development, integrated urban development planning is the new informal planning approach. It is a target–oriented and implementation-oriented strategic control instrument. Committed to serving public interest, equal opportunities, and gender mainstreaming, integrated urban development planning is based on the diversity of local conditions that proclaim the planning process without uniform standards. The content and methods are determined by local challenges and planning practice, supplemented by urban development management. Integrated urban development planning

is actually the process that results in integrated urban development strategies that often form the umbrella brand of different modules. This planning approach, adopted by the German Association of Cities (2013) has already been used in many German cities (Schaber et al., 2016). One of the principal cross-cutting topics of strategic significance is the international outlook and cooperation between European cities.

## 5 The Influence of Socio-Economic Policies on Integrated Planning

The complexity of urban space points to the necessity of adopting numerous strategies and development policies for managing natural resources, environment, and public utilities (health, education, culture, sport, communal activities, economy, social protection of vulnerable groups, etc.), which is the basis for planning sustainable and resilient built environments. The strategies and policies adopted by governments should be synchronised through the various sectors and spatial levels. These activities require strengthening of the organisational structure, which must connect the local (municipality) level with higher levels of government (regional and state). In some European countries, there are two regional levels – in France, there are regions and departments, in Italy regions and provinces, and in Germany there are districts. The planning system is directly connected with the political and administrative division of the territory. Responsibility for spatial and urban development, land policies, and housing is different in many European countries. In general, the process of decentralisation started in the 1970s, when the regional governments had a high degree of autonomy in this field within the state's legal framework. Accordingly, the municipalities have jurisdiction over the development of their territories, including urban planning. In many countries, national associations of cities are formed to represent the cities and municipalities at state level (Austria, Germany, Netherland, Denmark, Sweden, Finland, etc.). The cities and municipalities can ask for the support of the association in solving some problems of urban development, defining projects for application for loans, collaborating with other cities, etc. There are also supranational and transboundary systems at the highest levels of governments for multinational regional strategies, which "could help direct investment to address global issues such as climate change and energy efficiency to enable the integrated expansion of urban areas in cross-border regions, mitigate natural risks and improve the sustainable management of shared natural resources" (UN-Habitat, 2015 p. 2).

Policies for sustainable and resilient development and the responsible management of these processes are the most complex challenges for society today. There are huge obstacles standing in the way of achieving this, especially in the post-socialist and underdeveloped countries, which directly affect the implementation of integrated planning. They are related to the lack and incompatibility of relevant strategies, policies, and laws. *Energy Strategy of Republic of Srpska* up to *2030* (Government of the Republic of Srpska, 2012) was not harmonised with

the law for spatial planning and construction (NSRS, 2010) that was adopted in the same year. The updated law (NSRS, 2013) accepted the energy strategy and EU directives in the domain of energy efficiency. The implementation of this strategy now depends, among other factors, on the professional capacity to define standards for designing, constructing, and using energy-efficient buildings and the education of all actors in this domain. The economic decline and lack of governance capacity at national and municipality levels in post-socialist countries limits their capabilities to create and implement relevant policies of sustainable and resilient development, which directly cause problems with the implementation of integrated planning.

The planning system in each country is determined by its political system and legislation. The legislation on spatial planning and development created by the responsible ministries is usually adopted by a parliament in each state. The relevant ministry in Republic of Srpska is the Ministry of Spatial Planning, Civil Engineering and Ecology; in the Federation of B&H, it is the Ministry of Spatial Planning; in Serbia it is Ministry of Construction, Transport and Infrastructure; and in Croatia, the Ministry of Civil Engineering and Spatial Planning. Regions and municipalities are obliged to respect them and synchronise the lower levels of the spatial regulatory system accordingly. The states define spatial development strategies, policies, programmes or spatial plans, and regional and municipality plans should be harmonised with them. In many countries, such as Italy, Germany, Belgium, Denmark, Norway, and Sweden, the regional level of government is responsible for urban planning, land use, building, issuing permits for buildings, licences, and urban standards.

In the Republic of Srpska, there are entity and municipality levels of governments. The entity adopts the law for spatial planning and construction (NSRS, 2013) and the *Amendments to the Spatial Plan of Republic of Srpska by 2025* (Ministry of Spatial Planning, Civil Engineering and Ecology of Republic of Srpska, 2015) as umbrella planning documents. The municipalities adopt the spatial plans for the territories of the municipalities and urban plans for cities. At the Federation of B&H, there are state, regional (cantonal), and municipality levels of planning responsibility. Each of the 10 cantons adopts a law for spatial planning, which is synchronised with the entity one. The creation of proper legislation plays an important role in providing all the necessary preconditions for integrated planning. Planning legislation in B&H defines the following: multi-disciplinary aspects of the planning process (requirements for licensing the professionals and institutions, character and importance of spatial planning), procedures, responsibilities, actors, the basic planning methodology, etc. Public participation needs to be defined by the law in a proper way, just like the integrity of the planning process. The law should define the context of the planning documentation, planning steps and the responsibilities of government and institutions at the state, regional, and municipality levels, and planners and other actors for their preparation, design, adoption, implementation, and monitoring. It is necessary to define

planning methodology as a particular guideline for the practice of integrated planning.

Education is very important to ensure skilled planning experts for responsible and competent participation in the process of integrated planning and management of spatial development. Urban development units need varied staff with interdisciplinary qualifications and professional experience for effective integrated urban management. The necessity of strengthening the capacity of development units for more efficient and collaborative urban management is recognised as the task to be completed in post-socialist cities. This is why planning professionals and their institutions and municipal departments for urban planning should collaborate with institutions of learning and training (faculties or institutes for urban planning) to increase their capacity for integrated urban planning. Educational institutions should also make the effort to review and develop university and professional curricula on urban and territorial planning. UN-Habitat (2015) recommends using the *International Guidelines* to achieve this.

Some university master courses, in contrast to traditional learning, contribute to the development of integrated and strategic planning. They provide teaching processes based on the real problems of planning practice at local/community level and create solutions through dialogue with a broad network of participants.

Processes in space and society over the last few decades, as well as advances in information technology, show the necessity of adapting spatial planning to these processes. This requires the ongoing education not only of experts and students, but everybody involved in the planning process and management of spatial development.

Changes in socio-political relations at the global level change the global demographic picture. The refugee crisis is a new challenge for Europe, as well as for other countries. We can search for a response to critical situations through sustainable and resilient policies of social and economic development at the national and global levels. In 2015, many refugees, mainly Syrians, started moving to West European countries to escape war and poverty. The reaction of the countries on their migration route (Turkey, Greece, Former Yugoslav Republic of Macedonia, Serbia, Hungary, Croatia, Slovenia, Austria, Germany, France, and the UK) varied. At first, they worked together to allow the refugees to move onwards to the country they wish to reach. When the process threatened to spiral out of control, some countries (Hungary, Croatia, Slovenia) closed their borders. This showed the difference in human rights policies among the countries in the EU.

Besides creating system preconditions under the jurisdiction of the state, there are also preconditions that need to be adopted at the municipality level to consider integrated planning. They include municipal policies related to local urban regulations, the creation of private-public partnerships, strengthening of participation and cooperation with stakeholders, adoption of local development strategies, and the

responsible management of the processes of preparing, adopting, and implementing plans.

Due to the complexity of managing policies of socio-economic development, which are rarely defined or harmonised, the implementation of integrated planning is hard. The question is whether the integrated socio-economic policies are also preconditions for integrated planning, or whether integrated planning can improve integration policies in different fields (Counsell et al., 2006; Acheampong & Ibrahim, 2016).

It is certain that integrated planning, due to its character, is a mechanism for developing a more sustainable and resilient environment, as is evidenced in some German cities. Although it depends on general socio-economic conditions, it can play an active role in improving the integration of different policies through the spatial dimension that connects them.

## 6 Integrated Planning of European Space in Theory and Practice

It is clear that there are different approaches to integrated planning in Europe. They are established through the consideration of the theories of planning (Abukhater, 2009; Albrecht, 2004; Berke et al., 2006; Folke, 2016; Geerlings & Stead, 2003; Holling, 1973; Jabareen, 2013; Kosareva & Puzanov, 2012; Picket et al., 2004; Teriman 2012; Yigitcanlar & Teriman, 2014; and others) and the recommendations of UN-Habitat (2015; 2016a) and EU bodies (EC, 2016), which coordinate many processes by defining integrated development policies, including urban development. The models of integrated planning are also connected with the tradition and practice of each country (Kosareva & Puzanov, 2012). They are the result of specific spatial and urban development at the national level, administrative divisions, regulatory frameworks, planning systems, economic development, organisational and institutional support, and education.

At the municipality level, models of integrated planning are limited by the capacity of the local community to manage urban development in a competent, sustainable, and responsible way, the education process, collaboration with stakeholders, and public participation. In some EU cities, these limits have been overcome to initiate integrated urban development planning as an informal instrument that broadens the system of official planning (German Association of Cities, 2013).

Finally, the integrated approach to planning also depends on planners' skills at managing the planning process, accepting the global achievements in planning theory and practice, and developing their own methodological approaches.

## 6.1 Integrated Planning in the EU

The establishment of the EU in 1992 had a significant influence on general planning guidelines in Europe. The *Treaty on European Union* (Council & Commission of the European Communities, 1992) defined the main objectives of the Contracting Parties (Union) as: to promote economic and social progress that is balanced and sustainable; to assert its identity on the international scene; to strengthen the protection of the rights and interest of the nationals of its Member States and to develop close cooperation on justice and home affairs. Integration politics included urban development and integrated planning (EC, 1997), which were followed by the development of theories and approaches in practice in certain EU countries.

Albrechts (2004) states that according to the European Commission (1997), more open and flexible EU planning systems were recommended. It was also suggested that land use should not be defined precisely, so it could develop alongside rapid changes in social and economic conditions.

"All the EU member states, except the United Kingdom and the Republic of Ireland, use detailed planning instruments which play a determining role in guiding the location of development and physical infrastructure, and the form and size of development tasks" (Albrechts, 2004, p. 744). Traditional planning of land use is being replaced with the flexible zoning system, and 'consensus building'. Cooperation and an open dialogue with all actors are advised. Counsell et al. (2006) think that the planning system is becoming a mechanism for improving integration policies – horizontal, sector-like, and vertical among political and management levels. They conducted research on the degree of integration of various spatial planning policies in England, Northern Ireland, Scotland, and Wales in 2005.

It has been noted that in these countries, the policies connected with housing, economic development, transportation, sustainable development, biodiversity, and storage of solid waste were highly integrated with spatial planning but not social policies. Education and skills are the least integrated with spatial planning, which opens a wide field of action, including education on integrated planning.

Wider research of spatial documentation at the local and regional levels for the Berlagen area in Sweden (Elbakidze et al., 2014) showed that the stakeholders were not properly involved in the planning process, and there is room for improvement of integrated planning.

The Association of German Cities promotes a 'new planning culture in German cities' in accordance with 'integrated urban development planning and urban development management'. With the support of the association, 55 projects were realised in 35 German cities – examples of best practice in individual cases where cities have set qualitative standards for their planning goals and their own planning procedures (Schaber et al., 2016). The renovation and redesign of public urban spaces for a dynamic urban society, with a variety of functional

requirements, were realised in Augsburg, Bielefeld, Hamburg, Hanover, and Leipzig. Adjustment of traffic space to a change in mobility patterns, using energy-saving and low emission mobility, was realised through the projects in Augsburg, Dortmund, Freiburg, Kassel and Munich (Munzinger, 2016). New urban quarters were realised in Bremen, Essen, Heilbronn, Munster, Dortmund, Frankfurt am Main, Cologne, Leipzig, Munich, Regensburg, Stuttgart, and Wiesbaden. They promote integrated sectoral urban development concepts for housing, participation, new concepts of funding, etc. (Schaber, 2016). Projects that ensured the quality of urban design, preservation, and reconstruction of urban space were realised in Biberach, Dortmund, Mainz, Munich, Dresden, Halle, Potsdam, Saarbrucken, Siegen, and Wolfsburg (Wekel, 2016). A process-oriented approach and strategic urban development planning were realised in Bremen, Heidelberg, Berlin, Erfurt, Frankfurt am Main, Freiburg, Hamburg, Karlsruhe, Munich, and Schwerin. It is evident that the integrated urban concepts of towns (like the Berlin Urban Development Concept 2030) are based on the old plans, new cross-department strategies and concepts, workshops with key actors, city forums for the public, and events for special target groups (Schmidt, 2016). Guaranteeing civil participation in urban development processes is present in most German cities (Zdiara, 2016).

Six EU countries (Germany, Italy, France, Holland, England and Spain) started creating Smart Cities and Communities in the EU (EC, 2016) based on topics such as energy efficiency, sustainable energy networks, and transportation. Activities were supported by the European Commission by including new countries and towns in Europe.

It is evident that integrated planning is attracting more interest in the EU among professionals through different topics that target urban development, the final goal of which is an integrated, sustainable, and resilient town.

## 6.2 Integrated Planning in Post-Socialist Countries

There were significant differences in the planning approach between Western European countries and the countries in the socialist block until they started the process of transition to a capitalist system. The transition started in the final decades of the 20$^{th}$ century with the aim of changing the political system from the undivided power of the Marxist-Leninist party, with its dominant state and preponderance of bureaucratic coordination, to pluralistic political systems that were friendly to private property and the market, with dominant private property and a preponderance of market coordination (Kornai, 2000).

While in most Western and Central European countries democratic processes and an integrated approach to planning have affected the development of planning theory and practice, the rational planning used in the socialist countries had no characteristics of integrity. By starting the transition process, the former socialist countries have features of integrated planning, but the problems remain. These are directly

connected with the transitional processes in the domains of economy, society, institutional capacity, professional education, etc. Russian urbanism theoreticians (Kosareva & Puzanov, 2012) find that urban planning in Russia needs to improve on its simplified regulation, land use, and urban development from the previous period.

Integrated urban planning needs to be proactive and stimulate urban development. If such planning is competently defined and implemented, it will create efficient tools for managing socioeconomic development and thus a good living environment. Russian urbanism nowadays tends to accept concepts of contemporary planning in hyper-dynamic urban contexts, including integrated approaches such as flexibility, adaptability, and participation (ISOCARP, 2012). In ex-socialist cities, globalisation is visible in the international urban competitions for wider urban spaces (Moscow Agglomeration Development – The 2012 International Urban Competition; Belgrade on the Water 2014), the building of mega structures (international airports, arenas, shopping malls), etc.

In the first phase of the socio-economic transition in the Western Balkan countries, planning mechanisms could not protect public interest and provide active participation. Planners adaptation to new conditions happened simultaneously. Vujošević & Spasić (2007) have a critical view on planning in Serbia at the end of the 20th and the beginning of the 21st centuries. They find that "new ideologies of planning came to the surface, thereby rendering the current practice a peculiar mix of various concepts of "quasi/pseudo planning" exercises" (Vujošević & Spasić, 2007, p. 22). Milojević (2015) thinks that the participation in planning in the first transitional phase in B&H, due to the lack of strategies for spatial and urban development, resulted in the protection of private interests, to the detriment of public interest.

Generally, it is evident that transitional countries do not implement GIS and integrated spatial information systems, unlike the EU countries where new technologies and the updating of spatial data had begun much earlier. There is also a difference between the transitional countries themselves. The countries that started socio-economic and political transition and planning reform earlier, such as the Czech Republic, also introduced information systems and the principles of flexible planning earlier. In this way, they created the preconditions for the implementation of integrated planning.

## 7 Problems in the Implementation of Integrated Planning in The Republic of Srpska

In spite of the different opinions about when transition starts and when it is finished, there is a widely accepted view that the transition is unfinished as long as the composition of output and real fixed assets is distorted and has not yet adjusted to demand, or the standard of living has not caught up with that of the traditional market economies (Kornai, 2000). In the case of B&H, (The Republic of Srpska and the Federation

of B&H), the preconditions for a completed transition have not yet been reached. Although integrated planning is mentioned in laws as one of the general principles of planning, there are still no socio-economic preconditions for integrated planning in the Republic of Srpska.

This is evident in the lack of regulations, strategies, and harmonised policies at the national level, organisational capacities, and knowledge of integrated planning. Planning teams lack multidisciplinary capacities, which further disables multi-aspect analyses of urban space and environment. Apart from having experts who can deal with the various created artefacts of physical space, it is also necessary to involve professionals in the fields of social sciences and the population as the final users of urban space.

The methodology of integrated planning should be improved with the aim of ensuring more collaboration between professionals and stakeholders, interaction between various planning services, and efficiency in planning procedures. The legislation on flexible planning the law for spatial planning and construction (NSRS, 2010), and an updated version (NSRS, 2013) - as one of the mechanisms of integrated planning, was adopted in 2010 and 2013 in the Republic of Srpska. After 2010, zoning was defined in the law as a new regulatory planning document, which offers more flexibility than the regulatory plan but its implementation in planning practice is progressing slowly. There is a necessity to further improve the planning methodology of zoning and to increase professional capacities for new planning practice. Because of this, and other problems in the society, which is still in transition, the implementation of integrated planning has not yet happened. Consequently, guidelines for integrated planning for planners and all other actors involved in the process of preparing, designing, adopting, implementing, and monitoring the plans are needed.

The law on energy in the Republic of Srpska, adopted in 2009 (NSRS, 2009), created regulations for energy efficiency but it has not yet been implemented because of the lack of standards and educated professionals. Increasing capacities in this domain and other measures for the mitigation and adaptation to climate change are vital for the implementation of integrated planning.

The Land Registry in B&H has not yet been updated for the whole territory. In this time of climate change, there is a need to have a database on natural spatial features formed under the influence of natural and anthropogenic factors. This refers to geological data on landslides activated after the great floods in 2014, maps of flood risks and hazards, maps of renewable energy resources, etc. This data should be connected to the European spatial data infrastructure and expanded with other sources of information and standards to integrate with INSPIRE. It is based on existing resources at the national and subnational levels, which engage user communities and geographic information stakeholders by organising them in spatial data interest communities (Craglia & Annoni, 2010).

The education of students, experts, and other stakeholders to enable their active and competent participation in the planning process and the management of sustainable and resilient development, is not yet at a satisfactory level and, therefore, should be continuously improved. All of this implies that integrated planning is not currently present in planning practice to the extent needed to create a sustainable and resilient space and environment.

## 8 Conclusions

Integrated planning is a mechanism for creating sustainable and resilient settlements that tends to the needs of modern society. Its importance is particularly pronounced, and there is a need to define and develop it through both theory and practice. Studies of urban development today show that there are significant problems in achieving sustainable and resilient urban areas in many countries (UN-Habitat, *2016b*), and one of the reasons for this is the insufficient application of integrated urban planning.

The nature of integrated planning arises from the complexity and interconnectedness of urban spaces and socio-economic conditions, which tend to develop continuously in space and time. Studies about developing an integrated approach to planning show that it evolved in tandem with the socio-economic development of urban areas and an increasing awareness of the need to create sustainable and resilient environments, which present the highest goals of development on a global, regional, and national level. Integrated planning methodologies have developed especially rapidly over the last few decades, characterised as the age of hyper-dynamic urban context. Urban development involves complex interactions of factors – the natural environment, human-created spaces, the economy, activities connected with socio-cultural and political processes, technology, and planning activities themselves – which all have an effect on the urban space. Integrated planning, as a tool that has developed as the challenges of negotiating these multi-layered interactions have emerged, is one of the most powerful tools for achieving this goal.

Integrated planning methodology is based on the integration of three components – planning, development, and ecosystem sustainability – into a single process. This process can be divided into multiple steps - 8, according to Yigitcanlar and Teriman (2014) - which planners can use to work through all the relevant, interacting features of the local environmental conditions, society, economy, and institutional networks to create the plan, and help to get it adopted by applying expert criteria, collaborating with stakeholders and the public, and applying good negotiating skills. Given the complexity and dynamism of the urban context, integrated planning should be adaptable to frequent changes in space and society; it should also be collaborative, participatory, flexible, and efficient. Flexibility can be achieved by implementing zoning, rather than rigid regulatory planning. Efficiency can be facilitated by ensuring

the system is driven by up-to-date databases containing information on land registration, planning proposals and actions, changing local climatic conditions, and so on, as well as by maintaining a collaborative relationship with stakeholders etc. Legislation relating to spatial planning, which is usually made at the national level, should define the need for an integrated approach to planning that takes into account local conditions, effectively making integrated planning a requirement, which has not yet been achieved in the case of the Republic of Srpska.

Socio-economic policies at both the national and regional levels can have a direct positive effect on the character and application of integrated planning by: basing development strategies and policies on the goal of a sustainable and resilient environment; adopting appropriate legislation that enshrines good practice; establishing strong institutional frameworks; ensuring sufficient capacity of government employees at the national and municipality levels; staff training; and education of planners, students, and stakeholders in the planning process. The recommendations in the UN-Habitat (2015) are of great benefit for all countries, especially for those in transition, such as Republic of Srpska.

Integrated planning in the EU, as defined by common regulations on sustainable urban development (such as the *Urban Agenda for the EU*, 2016 and *The European Charter of Planning*, 2013) is present through projects that apply smart city solutions and offer support tools that allow citizens to contribute to the process in a number of European cities. Although the theoretical assumptions of integrated planning have been developed to apply universally, and are, in the EU, underpinned by common legislation, one of the features of the methodology is that it takes into account local conditions. Integrated planning processes are, in practice, also specific to the localities in which they take place, adaptable to the traditions, development models, and practices of each country individually.

Integrated planning is generally more prevalent in the territory of the EU where, despite some successful examples, a number of challenges remain. Transitional states are still faced with the challenge of developing the socio-economic conditions and corresponding planning systems, which can enable the widespread application integrated planning. To reap the benefits of integrated planning as a tool to create sustainable and resilient environments, post-socialist countries need to improve all aspects of socio-economic relations, strengthen participatory planning, and provide an environment where government, professional, and educational institutions – and the public – can participate in planning processes.

This is especially important for the Republic of Srpska, where there are many problems in integrated planning practice. These problems could be mitigated by following the example of many German cities, where efforts are made at the municipality level to promote integrated approaches to creating sustainable and resilient environments. The participation of professional, scientific, and educational institutions in spatial planning

activities is of great importance for defining a unified methodology of integrated planning, and training planners to implement it. Civic initiatives are also important for different types of engagement and expression of citizens' interests in urban development. In this way, the initiatives of local communities, citizens, educational institutions, and professional associations can contribute to improving regulation at the national level and strengthen the general socio-economic conditions for the implementation of integrated planning.

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# The Role of University in a Policy Making Process _

## Introducing Integrated Urban Projects for Effective Urban Governance in Serbia

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ABSTRACT **This chapter suggests a new view on the arrangement of urban governance for Serbia, where an Integrated Urban Project (IUP) is examined as an instrument for achieving sustainable development. Policy-making in Serbia's urban development is faced with the challenge of transition from a traditional, bureaucratic, and autocratic system towards a new, efficient, effective, communicative, and flexible one. The process of searching for new instruments for its realisation was initiated due to the existing model's inability to deal with complex problems brought about by the post-socialist economic and social transition, as well as global influences related to Serbia's planned accession to the European Union (EU). The first part of the chapter briefly outlines the concept of a new urban governance model. The second section defines the characteristics of an IUP as an instrument intended to create and implement sustainable public policies in the field of urban development. The third part presents curricula of master's theses and master's projects for three generations of students of the Integrated Urbanism master's programme at the Faculty of Architecture, University of Belgrade: (i) IUPs for Inner City Development, (ii) IUPs for Disaster Risk Management, and (iii) IUPs for Municipal Development. Regardless of the differences in topics and locations, the students' assignments were to work with specific local institutions to devise IUPs in response to identified problems of the 'real' context and indicate how these might be put into practice. This section details the results achieved by the latest generation of students: (i) the IUPs as urban governance instruments, focusing on their integration potential; and (ii) the IUPs development process, showing the types and techniques of communication and knowledge dissemination amongst students, as well as between students and mentors, and with the local community and the broader professional and academic public.**

**Besides aiming to contribute to a comprehensive innovation of the curriculum in the local context of a post-socialist country, the purpose of this chapter is to point out the options and opportunities for collaboration between academic institutions and local communities in the introduction of new topics, ideas, concepts, and instruments for effective urban governance in Serbia.**

KEYWORDS integrated urban project, urban governance instruments, curriculum innovation, academia – local community collaboration

# 1 Introduction

In post-socialist societies, which induce a crisis in professional activities, the academic community has the opportunity and obligation to contribute to the redefinition of the position and role of the urban planning profession. Planning in market economy circumstances requires new skills and knowledge, where the traditional model of planning education within the field of engineering does not provide a sufficient response to current complex requirements (Bajić Brković, 2012; Maruna, 2015; Milovanović Rodić, Živković, & Lalović, 2013). By applying creative methodological approaches in teaching, the academic community can exert influence on the introduction of new knowledge into existing practice, and change the areas and products of its operation. An important precondition for the success of these initiatives is the establishment of an academic teaching process based on real problems of planning practice at local/community level, and the creation of solutions through professional dialogue within a broad network of participants. In the Serbian local context, this type of course module is an innovative departure from traditional teaching practice.

The methodological framework of the Integrated Urbanism master's programme at the Faculty of Architecture, University of Belgrade, and the development of an Integrated Urban Project framework as its main instrument, are based on a specific approach. Firstly, it is focused on contemporary themes according to international and EU policies – sustainable and integrated inner-city development, urban resilience and risk disaster management, urban and territorial governance, and management of public property – that are highly relevant in the Serbian context. Secondly, the case-studies are 'live' cases, which require a problem-solving approach. Thirdly, the methodology of master thesis development includes collaboration with visiting practitioners and subject experts besides mentors, and through guest lectures, presentations, consultations, and workshops. Finally, the methodology of IUP development includes those activities listed above, but also the collaboration between domestic and international students, subject experts and representatives of local institutions through site visits, workshops, interviewing local partners and citizens, consultations, public communication via facebook, exhibitions, and presentations. This enables students to better understand the problems, and to develop and apply the new knowlegde (Geppert & Cotella, 2010; Maruna et al., 2015; Mironowicz, 2015).

The participants in this process are students and teachers, the local community, professionals from various sectors of the public administration, as well as representatives of the private and civil sectors. Hence, besides helping students to understand the issues of 'real' planning practice, such a module should also change the perception of participants from the professional arena, and introduce new instruments into their practice.

This section will provide an overview of the concept of new urban governance within the local Serbian context, and the role of an IUP

framework within this context. Then it will discuss the methodological innovation of the IUP framework in relation to traditional teaching methodology in Serbia using three different case studies. In addition, it will also highlight the experiences of the latest generation of students to explore the integratory characteristics of IUPs and the process of their development.

## 2 A New Urban Governance Model

The main characteristics of the proposed new urban governance model in post-socialist societies were developed after recognising the need for changing the role of governments in designing and implementing public policies. Hence, an authoritarian 'government' as the single decision-making authority was to make a shift towards the 'governance' model that takes into account a large number of stakeholders in different institutional settings in order to coordinate and integrate all available community resources (Čolić, 2015; Perić & Maruna, 2012).

The new urban governance model is outlined in all United Nations (UN) key documents, starting with *Agenda 21* (1992) and including *UN Habitat II* (1996), UN Habitat *Global Campaign for Good Urban Governance* (2002) to the latest UN *New Urban Agenda (Habitat III)* (2017). All these documents are based on the UN's *Universal Declaration of Human Rights* (1948). The following definition was proposed during the *Campaign for Good Urban Governance*, launched by UN-HABITAT in the early 2000s: "Urban governance is the sum of the many ways individuals and institutions, public and private, plan and manage the common affairs of the city. It is a continuing process through which conflicting or diverse interests may be accommodated and cooperative action can be taken" (UN-Habitat, 2002, p. 14). This definition of governance recognises the importance of stakeholders, the nature of governance as a process, and the establishment of mutual interests by consensus. The value of the concept of governance lies in its ability to provide a framework within which to understand the changeable process of governing.

The interpretation and discussion of the genesis and interdependences between development contexts, governance modes, and urban planning and development can be followed through the theoretical works of the following key authors: Harvey (1989), Healey (1996), Le Gale's (1998), Hydén (2011), DiGaetano and Strom (2003), Garcia (2006), Innes and Booher (2003; 2010). According to Le Gale's (1998, p. 496), governance represents the 'capacity' of the local community to unite and articulate different entities, both internally and in relation to the external environment. The focus is on understanding the mechanisms and processes that enable the acquirement of a structured mode of governance, far more than defining the governance itself. Modes of governance are the "informal arrangements that define the governing relationships among and within formal institutions implicated in urban politics" (DiGaetano & Strom, 2003, p. 362). Socially innovative practices in urban governance and territorial development are also

invariably associated with the emergence of new institutional forms that draw heavily on a greater involvement of individuals or actors from both the economy and civil society (Moulaert, Martinelli, González, & Swyngedouw, 2007).

Following Halfani, McCarney, and Rodriguez (1995, p. 95), "governance, as distinct from government, refers to the relationship between civil society and the state, between rulers and the ruled, the government and the governed". Governance relationships have been described as *joint action* and *negotiation mechanisms* (Garcia, 2006). The operationalisation of the new urban governance model has its basis in the "historic legacy of the principles of good governance, and the universality of its applications" (Cities Alliance & N-AERUS, 2016, p. 21). The basis is the UN definition of *Good Governance*, with its eight characteristics: (1) it follows the rule of law; (2) it is consensus-oriented and participatory; (3) effective and efficient; (4) accountable; (5) transparent; (6) responsive; (7) equitable; and (8) inclusive (UN-ESCAP, 2009). The implementation of urban governance principles should represent authentic practice, tailored to the specifics of the environment, which cannot be easily replicated to produce similar results (Cities Alliance & N-AERUS, 2016). In contemporary conditions, urban governance "relies less on normative blueprints and more on practical experimentation" (Hyden, 2011, p.19). Hence, urban governance means setting up *places* and mechanisms where, and through which, various *community interests* can negotiate priorities, needs, and values amongst each other, and this entails the involvement of multiple stakeholders and the examination of the specific local context, but also an understanding of the constantly shifting framework of urban governance (Cities Alliance & N-AERUS, 2016). These principles were the basis for understanding the concept of urban governance and developing IUP in the local context of Serbia.

## 3 Integrated Projects for Effective Urban Governance

One of the essential characteristics of contemporary urban planning is its tendency for an integrated approach. The justification for this view is rooted in new forms of collaboration and partnerships, resulting from the recognition of a number of different actors whose interests and influences co-exist in space. However, the integrated urban planning approach has a broad meaning (Amin & Thrift, 1995; Healey, 1998, 2006a, 2006b; Moulaert et al., 2007; Polèse & Stren, 2000). The integrated approach has become a recurring topic in European cohesion policy developing over more than two decades. This section is focused on the experience and practice accumulated within European Union programmes URBAN I (1994-99) and URBAN II (2000-06), co-financed by two of the European Community's Structural Funds: the European Regional Development Fund (ERDF) and the European Social Fund (ESF) and formulated in *Leipzig Charter on European Cities* (EU, 2007), *Toledo Declaration* (EU, 2010), European Commission's *Cities of Tomorrow* Report (EU, 2011), *Urban Agenda for the EU* (EU, 2016) and *The New Urban Agenda* (UN, 2017) which all laid the ground in defining

principles of integrated urban development. Taking into account the practical orientation of IUPs, we focus on the following aspects of the framework for an integrated approach:

– Integration of different aspects of development – economic, social, environmental, and cultural – as the basis of sustainable development, as well as themes of urban mobility, social inclusion, urban resilience, demographic aging, brain drain, employment, urban-rural linkages, social and technical infrastructure, identity, marketing, and more (EU, 2007; EU, 2010; EU, 2011);

– Integration of different policies, strategies, and plans: in addition to traditional urban and spatial plans, these include national and local strategies for sustainable development, economic development, housing, tourism, agriculture, energy, culture, and more, with special emphasis on European policies of urban development and new urban agendas (EU, 2010; EU, 2011; EU, 2016; UN, 2017);

– Integration of different spatial levels: from the neighbourhood and municipal level to the city/village level, followed by the territory of a region, state, border region, European Region, and so on (EU, 2010; EU, 2011);

– Integration of various administrative levels of government in accordance with the country's administrative arrangements, ranging from the local, municipal, and city levels to that of administrative district and province (regional level), to the national and supranational levels (EU, 2010; EU, 2011);

– Integration of various actors and institutions that can be accessed through analysis of actors/institutions in the public, commercial, NGO, and civil sectors, as well analysis of stakeholders in and/or drivers of urban development (EU, 2010; EU, 2011; EU, 2016);

– Integration of various forms of funding: local, regional/provincial, and national budgets; public-private partnerships; available EU funds, international sources of finance, and donor programmes, and other sources (EU, 2010).

These changes reflect the influence of European policies and structural funds, which finance most diverse programs and projects to foster development. In these circumstances, an integrated approach to urban development is understood as spatial, temporal, and thematic coordination and integration of different policies for planning and defining precise objectives through (financial) instruments.

# 4 Integrated Urban Development Projects

This section presents the results of the teaching process of three generations of students of the Integrated Urbanism master's programme at the Faculty of Architecture, University of Belgrade. Students formulated IUPs as sustainable solutions to a problem identified in the real context. This was achieved in collaboration with local communities, public authorities, public enterprises, the commercial and civil sector, and members of the public. In addition, projects involved consultants: experts from national planning institutions, professional associations, staff of international programmes (Deutsche Gesellschaft für Internationale Zusammenarbeit, GIZ), etc. Instruction was conceived so that the master's thesis and master's project constitute an integral whole. The task of the master's thesis was to: (a) expose students to theoretical papers, international documents, and good practices and so enable them to understand urban governance at a theoretical and methodological level and formulate a 'desirable' urban governance model whilst focusing on the key topic; and (b) allow them to identify their topic and 'action space' within the regional, national, and local development contexts.

Although diverse in terms of the themes and applications of the spatial framework, all projects are founded on the understanding that sustainable urban development can be achieved by integrating different: (i) aspects of development; (ii) instruments for urban governance (policies, strategies, plans, etc.); (iii) spatial levels; (iv) administrative levels of government; (v) the various actors and institutions; and (vi) different forms of funding.

The last part of this section presents 23 IUPs of the final generation of students in detail, focusing on the content and process framework of IUP as a new urban governance instrument, and the modes for its introduction into professional discourse through collaboration in teaching between academia and the local community.

## 4.1 IUPs for Inner City Development: The Case of Kragujevac

The projects of the first generation of 13 students (mentored by six teachers in the academic year 2013/14) of the Integrated Urbanism master's programme were undertaken through the co-operation of the Faculty of Architecture, University of Belgrade, and the GIZ-AMBERO project *Strengthening the local land management in Serbia* (Müller et al., 2015). The students were given the assignment to choose one development measure envisaged under the *Integrated Urban Development Strategy for the Inner City of Kragujevac: Kragujevac 2030* (Jevtović, Čolić & Cerhe, 2013), and formulate an IUP for its implementation. The Strategy, which had at the time just been enacted, represented a new instrument in Serbia's planning and development context, and aimed at allowing environmentally responsible, socially balanced, and economically justified development of the city's

central core. The Strategy was developed jointly by GIZ-AMBERO, the Kragujevac local government, officers of the relevant local institutions, and members of the public, following the latest European experiences in urban governance (Jevtović et al., 2013).

In addition to being able to confer with their mentors and commission members from the Faculty of Architecture, the students could also consult officers of the relevant institutions and organisations, such as the Ministry of Construction, Transportation and Infrastructure, Serbian Institute of Architecture and Urban and Spatial Planning (SIAUSP), Belgrade Town Planning Institute (TPI), Serbian Chamber of Engineers (SCE), Kragujevac Directorate for Urbanism (DU), and GIZ/AMBERO of Belgrade (Figure 4.1).

FIG. 4.1 Workshop with consultants
*(Image by authors, 2014)*

The students' projects covered a broad range of topics, including: local economic development based on cultural heritage and tourism; enhancing quality of life by improving public spaces, developing green and recreational networks, increasing mobility, and revitalising riverbanks; activating abandoned spaces by allowing for their temporary use; and revitalising brownfield sites in the city centre by redeveloping them into an innovation district. All the projects are presented in *Integrated urban projects for Kragujevac inner city development* (Maruna & Čolić, 2014) and were also exhibited at the Faculty of Architecture and in the lobby of the Kragujevac City Hall.

## 4.2 IUPs for Disaster Risk Management: The Case of Obrenovac

The projects of the second generation of 11 students (mentored by four teachers in the academic year 2014/15) of the Integrated Urbanism master's programme were undertaken by the University of Belgrade, Faculty of Architecture, in co-operation with the GIZ/AMBERO project

*Strengthening the Local Land Management in Serbia* (Müller et al., 2015) and the Urban Management master's programme of the Technical University in Berlin. They investigated the impact of climate change on the development of cities in the context of severe floods that affected Serbia in the spring of 2014. The IUPs took as their point of departure a report of the UN Office for Disaster Risk Reduction entitled *How to Make Cities More Resilient: A Handbook for Local Government Leaders* (UNISDR, 2012). The municipality of Obrenovac, which suffered the greatest damage and losses in the 2014 flooding, was chosen for the development of IUPs. The first stage of independent research was followed by a 12-day workshop at the Faculty of Architecture in Belgrade with 4 Serbian and 3 German mentors-teachers and 11 Serbian and 26 German students of differing levels of education and professional backgrounds (architecture, landscape architecture, urban planning, construction, geography, economics, etc.). The students formed cross-sectional international teams to develop IUPs to address previously identified key issues (Figure 4.2).

FIG. 4.2 Workshop of TU Berlin and AF Belgrade students *(Image by authors, 2015)*

Support from a broader consulting team was again secured this year - this was made up of officers of the relevant national and local institutions, and a guided tour of the assignment location was organised.

The final students' projects constitute the concept of an Action Plan that consists of individual IUPs for disaster risk management in the

municipality of Obrenovac. These IUPs cover a broad range of issues, such as management and diversification of green spaces and introduction of reservoirs with water filtration systems to reduce housing exposure to flooding; development of GIS databases to manage flood risk; enhancing the resilience of vital urban services such as healthcare facilities and schools; improvement of housing construction; development of green infrastructure to regulate precipitation; remodelling of flooding defence lines (embankments); training and awareness-raising of the general public in how to act in emergencies; etc. All the projects are presented in *Integrated Urban Projects for Flood Risk Management: The Case of Obrenovac* (Čolić, Maruna, Milovanović Rodić, & Lalović, 2015), which is exhibited at the Faculty of Architecture and the Obrenovac City Gallery. The IUP *GIS Application for Disaster Risk Management in Obrenovac* won the first prize at the 2015 GIS Day at the Faculty of Civil Engineering in Belgrade.

## 4.3 IUPs for Municipal Development: The Case of Pančevo

The projects of the third generation of 27 students (mentored by three teachers in the academic year 2015/16) of the Integrated Urbanism master's programme were undertaken in co-operation of the Faculty of Architecture, University of Belgrade, and the City of Pančevo. The main topic for students' assignments was *Integrated Urban Governance Instruments*, with particular emphasis on multi-level urban governance instruments. The students were asked to come up with an IUP for an identified problem in the given development context, as well as to specify instruments for its formulation and implementation.

The starting point for these IUPs was the *City of Pančevo Development Strategy: 2014-2020* (City of Pančevo, 2014), the city's current development framework. To allow students to gain insight into a 'real' development environment in Pančevo and other areas of Serbia, they were given access to public officials and representatives of business associations, the City of Pančevo Business Council (CPBC) and the Regional Chamber of Commerce (RCC). As had happened in previous years, the development of students' final projects was facilitated not only by local stakeholders, but also by officials of key national planning and urban government institutions, the Ministry of Construction, Transportation and Infrastructure (MCTI), Serbian Chamber of Engineers (SCE), Belgrade Town Planning Institute (TPI), and the Standing Conference of Towns and Municipalities (SCTM), who attended workshops as consultants. Various forms of communication with 'external actors' took place throughout the process, with differing purposes and outcomes.

Students' projects will be presented in greater detail below to provide a general illustration of the content of IUPs and process of their development in support of the *City of Pančevo Development Strategy: 2014-2020* (City of Pančevo, 2014).

## 4.4 IUPs Content Framework

Students' projects are grouped into seven thematic units: City that Lives on the River; Fair City and Active Communities; City of Enhanced Mobility; City of Culture and Active Heritage; Good Governance; Healthy, Accountable, and Safe City; and Good Living in the Country that correspond to aspects of the development vision for the city: "Pančevo is a place with many small and medium-sized businesses, well-equipped industrial zones, numerous shops, well-developed agricultural production, modern residential areas, a rich tourist offering, cleaner rivers, regulated riverbanks, promenades, beaches, more green spaces, and a developed old city core" (City of Pančevo, 2014, p.11).

All students' projects share a common key characteristic: they constitute an integrated response to the spatial, environmental, technological, and social potentials, as well as the limitations, needs of the community, and capabilities of the local government, summed up as 11 strategic development priorities in the Development Strategy. These projects offer solutions in various forms - whilst some predominantly deal with spatial interventions and changes to physical structure, others are focused on social or economic objectives and the design of institutions and mechanisms that facilitate change. Thus, they differ in both how detailed they are and in the spatial levels at which they are implemented. The key characteristics of these projects, by integration criteria from (i) to (vi), are shown in Table 4.1.

These IUPs constitute a set of mutually compatible and complementary projects in support of the *City of Pančevo Development Strategy: 2014-2020* (City of Pančevo, 2014). They are based on research of the regional, national, and local context, institutional framework, international documents, theoretical papers, and best practice examples. They differ in many respects, but, regardless of their variation, they are all rooted in the understanding that sustainable development is possible if various sectoral policies are integrated, co-ordination is allowed between various levels of governance, active and continuous co-operation is established between stakeholders when solutions are formulated and implemented, and various sources and modes of financing are integrated.

| MASTER'S PROJECT TOPICS | INTEGRATED URBAN PROJECTS CONTENT FRAMEWORK: INTRODUCING NEW INSTRUMENTS: IUPS INTEGRATE | | | | | |
|---|---|---|---|---|---|---|
| | (i) Strategic Priorities | (ii) Policies | (iii) Spatial Levels | (iv) Level of Governance | (v) Stake-holders | (vi) Funding |
| **City That Lives on the River** | | | | | | |
| Environmentally and socially sensitive tourist potentials' activation: Riverbanks | 2, 5, 11 | 3, 4, 5, 6 | 4, 6 | 1, 2 | 2, 4, 5, 6 | 1, 2, 3, 8 |
| Pančevo Green Meridian for flood risk management | 3, 5, 8 | 1, 4, 5, 6 | 4, 9 | 1, 2 | 1, 5, 6, 7 | 2, 3, 8 |
| Re-branding for sustainable development: Biophilic city beach | 1, 2, 5, 11 | 4, 5 | 1, 4, 9 | 1, 2 | 2, 4, 5, 6, 7, 10 | 1, 2, 3, 8, 9 |
| Partnering to revitalise First Steam Mill brownfield site as an artisan centre | 1, 2, 5, 9, 11 | 4, 6, 8 | 1 | 1, 2, 3 | 2, 4, 5, 6, 7 | 1, 4, 7, 8 |
| Partnering to enhance SME business: Bathing area development | 1, 2, 5, 10 | 4,6 | 1, 9 | 1 | 2, 4, 5, | 1, 2, 3, 4, 5, 8, 9 |
| **Fair City and Active Communities** | | | | | | |
| Civic involvement in the activation of public spaces: Kotež 2 neighbourhood | 5, 8, 10 | 4, 5 | 4, 8 | 1 | 2, 5 | 1, 4, 6 |
| Neighbourhood Committees to facilitate activation of unused public spaces | 5, 8, 10 | 4, 6 | 2, 4 | 1 | 2, 5, 10 | 1, 6 |
| Allowing access to city centre office space for social entrepreneurship | 1, 2, 9, 10 | 2, 4, 6 | 1, 4, 9 | 1 | 2, 3, 4, 5, 7, | 1, 3, 8 |
| Urban gardens as a sustainable mode of using abandoned spaces in Pančevo | 3, 5, 9 | 4, 6 | 1, 4 | 1 | 1, 5, 7 | 1, 3, 8 |
| **City of Enhanced Mobility** | | | | | | |
| Cycling development: Joining the Eurovelo Network | 2, 3, 5, 11 | 1, 2, 3, 4, 8 | 1, 6, 9, 10 | 1, 2, 3, 4 | 2, 3, 4, 5, | 8 |
| **City of Culture and Active Heritage** | | | | | | |
| Development of tourist infrastructure: Inner city film tours | 2, 3, 11 | 4, 6, 7 | 1, 6 | 1 | 1, 2, 3, 4, 5, 9 | 1, 2, 3, 5, 8 |
| Industrial tourism as a means of revitalising indust. heritage: City centre | 1, 2, 3, 11 | 2, 4, 6, 7, 8 | 4, 6 | 1, 2, 3 | 5, 7, 8 | 1, 2, 3, 8 |
| Creative industries as a means of revitalising industr. heritage: Glassworks | 1, 2, 3, 11 | 2, 4, 6 | 1, 4 | 1, 2, 3 | 2, 3, 4, 5, 6, 7 | 1, 2, 3, 8 |
| Cultural offering of Pančevo as part of the Danube Route cultural network | 2, 9, 10, 11 | 2, 3, 4 | 1, 6, 9, 10 | 1, 2, 3, 4 | 4, 5, 6, 7 | 1, 2, 3, 5, 8 |
| **Healthy, Accountable, and Safe City** | | | | | | |
| Mapping environmental pollutants based on GIS | 5, 8, 10 | 2, 4 | 9 | 1, 2 | 3, 5, 7, | 1, 2, 3, 8 |
| Sustainable system to manage hazardous household and farm waste | 3, 4, 5, 6 | 2, 4 | 1, 6, 9 | 1, 2, 3 | 1, 2, 3, 4, 5, 7, 9 | 1, 3, 7, 8 |
| Construction of a biogas facility | 3, 5, 7 | 2, 4, 5 | 1, 6, 8 | 1, 2, 3 | 3, 5, 7 | 1, 2, 3, 5, 8 |
| **Good Living in the Country** | | | | | | |
| Co-operatives in support of organic farming: Dolovo village | 2, 4, 5, 10 | 2, 4 | 7, 9 | 1, 2, 3 | 2, 3, 4, 5, 7, 10 | 1, 2, 3, 5, 8 |
| Rural tourism as an incentive for rural development: Ivanovo village | 2, 9, 10 | 2, 3, 4 | 7, 9, 10 | 1, 2 | 2, 3, 4, 5, 6, 7 | 1, 3, 8 |
| **Good Governance** | | | | | | |
| E-platform for development ideas | 1, 3, 8, 10 | 4 | 9 | 1 | 1, 2, 3, 4, 5, 9 | 2, 3, 8 |
| Increasing city block density through public-private partnerships | 1, 2, 3, 10 | 2, 4, 6 | 2, 8 | 1 | 3, 5 | 1, 5 |
| Integrated branding as an instrument for govern. sustainable local development | 1, 2, 8, 10 | 4 | 9 | 1 | 1, 2, 3, 4, 5, 6, 9 | 1, 3, 8 |
| Monitoring implementation of the Development Strategy | 1, 8, 10 | 4 | 9 | 1 | 1, 2, 4, 5, 6, 7, | 1 |

TABLE 4.1 IUP Content Framework for implementation of the 'City of Pančevo Development Strategy: 2014-2020'

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*TABLE LEGEND:*
***(i) Strategic priorities**: 1. Improving the business environment, 2. Increasing employment, 3. Enhancing utility infrastructure, 4. Improving farming and rural infrastructure, 5. Enhancing quality of the environment, 6. Developing sustainable waste management, 7. Improving energy efficiency and use of alternative sources of energy, 8. Enhancing the planning process, 9. Improving the position of vulnerable groups, 10. Improving the operation of public services, 11. Tourism development.*
***(ii) Policies & documents**: 1. EU policies / Danube Strategy, 2. National policies, 3. Regional policies, 4. Municipal policies, 5. General urban plan, 6. Detailed urban plan, 7. Urban design project, 8. Architectural design project.*
***(iii) Spatial level:** 1. Land parcel, 2. Block, 3. Quarter, 4. Area, 5. Belt - corridor, 6. Network, 7. Village/ neighbourhood, 8. City, 9. Municipality, 9. Region*
***(iv) Level of government:** 1. Local, 2. Provincial (regional), 3. National, 4. Subnational (Danube region).*
***(v) Stakeholders:** 1. Citizens, 2. NGOs, 3. Entrepreneurs, 4. Professional associations, 5. Local authorities, 6. Provincial authorities, 7. National authorities, 8. International organisation (GIZ, REC, etc.), 9. Media, 10. Academy.*
***(vi) Sources of funding**: 1. Local budget, 2. Provincial budget, 3. National budget, 4. Private funds & donors, 5. Private-sector capital, 6. Community funds, 7. International: donors' programs (GIZ, USAID, ECF, SC), 8. EU instruments (Cross-border cooperation, IPA, INTERREG, etc.), 9. International financial instruments (WBIF, CEB, EIB, EBRD, WB, KfW, Green for Growth Fund, commercial banks).*

## 4.5 IUPs Process Framework

FIG. 4.3 Workshop *(Image by authors, 2016)*

The project development process is designed to allow continuous, active, and constructive communication amongst students (Figure 4.3); between students and mentors, the city administration and residents of Pančevo (Figure 4.4), and the professional and academic communities; and between Pančevo officials and consultants.

The process involved three key forms of communication between the stakeholders; these differed in their purpose, and, as such, in the methods and techniques of communication utilised:

– Information release: Dissemination of information via the media, exhibitions, and publications, designed to allow residents of Pančevo and the academic, professional, and broader communities to learn more about the topic chosen for co-operation and the results of joint efforts. Information was published in local and national broadcast and print media; designs were exhibited; and a publication outlining the outcomes of the process was also released (Milovanović Rodić, Maruna, & Čolić, 2016).

- Consultation: This entailed interactive lectures and organised visits to relevant institutions to facilitate exchange of information and so allow students, mentors, city officials, staff of Pančevo's local institutions and associations, and consultants from national professional associations and planning institutions to gain knowledge and understanding of development-related issues and opportunities. The residents of Pančevo were also able to voice their views on the IUPs as part of the participatory budgeting process.

- Collaboration: Collaboration and joint work by students with one another and with mentors, city officials, staff of Pančevo institutions and associations, and consultants from national professional associations and planning institutions in the process of coming up with solutions.

- Results verification: The quality of the results achieved was subject to multiple forms and modes of professional and external verification, of which the most important included:

    - The projects were exhibited and received awards at the international Urban Planners Exhibition (Nis, Serbia, 2016), the international Landscape Architecture Exhibition (Belgrade, Serbia, 2017), where the publication won first prize in its category, and the national Salon of Architecture (Belgrade, Serbia, 2017).

    - The best-rated projects were included in the City of Pančevo participatory budgeting process for 2017, with the involvement of the students (who had by then graduated) and the mentoring team. The public and residents of Pančevo selected one project, and RSD 5 million (EUR 40,000) was allocated from the city's 2017 budget for its implementation.

    - The Teaching and Scientific Council of the Faculty of Architecture, University of Belgrade, has accepted this model of collaboration between a local authority and a university to implement the City of Pančevo 2017 participatory budgeting project as a 'scientific research result', an outcome used in evaluating research quality, in the category of 'New technical solution applied at the national level', and has applied for its approval with the appropriate Scientific Committee of the Ministry of Education, Science and Technological Development.

    - The City of Pančevo and the Faculty of Architecture have signed an agreement to continue collaboration in teaching. A new generation of students is engaged in developing their master's projects in Pančevo on the topic of 'Application of urban governance instruments for better use of public property at the local level'.

    These types and modes of communication and knowledge verification, as well as the various approaches to external verification of results, are shown in Table 4.2.

FIG. 4.4 IUPs exhibition in Pancevo City Hall, July 2016 *(Image by authors, 2016)*

In addition to allowing students to understand the characteristics of the development environment and so enhance the quality of their projects, the process was also designed to permit an exchange of knowledge and experiences, and to disseminate the notion of the need for an integrated approach to governance and the characteristics of integrated urban projects as instruments of such governance.

| **INTEGRATED URBAN PROJECTS PROCESS FRAMEWORK** | | | |
|---|---|---|---|
| **Introducing new instruments: Communication and dissemination tools** | | | |
| **I. Information release** | **II. Consultation** | **III. Collaboration** | **IV. Result verification** |
| **1. Media features on**:<br>a. Pančevo local radio and television<br>b. Serbian national broadcasting corporation<br>c. *Pančevac* local weekly<br>d. Faculty of Architecture web site<br>e. Pančevo local government official web site<br>f. eKapija business-oriented web site<br>**2. Publication of a peer-reviewed monograph**<br>**3. Exhibitions of projects**:<br>a. Pančevo City Hall<br>b. Faculty of Architecture ceremonial hall | **1. Organised city tour** with Pančevo Public Enterprises' officials<br>**2. Study visits to:**<br>a. CPBC<br>b. Construction and Development Directorate<br>c. SCTM<br>**3. Experts' guest lectures:**<br>a. Member of Pančevo City Council<br>b. SCTM expert in project budgeting<br>**4. Public presentation and discussion of the projects as part of the participatory budgeting project**<br>**5. Participation of Pančevo residents in the selection of a project to be implemented, as part of the local participatory budgeting project** | **1. Workshops:**<br>a. 'Multi-level governance instruments' – students and mentors<br>b. 'Formulation of research questions and topics' – students, mentors, Mayor, consultants<br>c. 'Problems and potentials of local community development' –students and mentors<br>d. 'Discussion of development ideas and project concepts' – students, mentors, consultants<br>e. 'Project integration: Assessment of alignment, complementarity, and interdependence' –students and mentors<br>**2. Collaboration in the selection of students' projects for presentation to residents of Pančevo** | **1. Professional events:**<br>a. International Urban Planners Exhibition 2016<br>b. International Landscape Architecture Exhibition 2017(first prize)<br>c. National Salon of Architecture 2017<br>**2. Submitted application** for national best regional development ideas competition<br>**3. Collaboration between City of Pančevo and FA** on the Participatory Budgeting Project for 2016<br>**4. Project admitted in the category of 'New technical solution applied at the national level'**<br>**5. Agreement on collaboration in teaching between City of Pančevo and FA in 2017** |

TABLE 4.2 IUPs Process Framework

## 5 Conclusions

Since students were engaged in real-life projects and the local context, they communicated with a range of experts, local politicians, NGO representatives, and citizens, as well as amongst themselves, in order to meet the complex demands of integrated urban development planning and contextualised urban governance. The final IUPs demonstrate a 'sophisticated exploration' of the chosen inner-city urban renewal, urban resilience and urban governance.

External evaluators have also voiced their opinions about the master's project:

"The students' projects constitute an up-to-date interpretation of a number of themes – cultural heritage, quality of life, local economic development, good governance, green mobility, intensive land use, capacity-building, regeneration, innovation [...] adjusted to the local context" (Nikezić, 2015, p. 5).

"An interdisciplinary approach can be seen in the students' works, albeit with a recognisable foundation of architectural and urban planning theory and practice, and where social, political, economic, and environmental dimensions of the assignment are clearly defined through the spatial aspect" (Đokić, 2015, p. 11).

In practice, the implementation of IUPs depends on a number of factors. It demands capacity and better understanding, interaction between various developmental sectors, and, particularly significantly,

formal support through the legal framework. There have recently been encouraging developments at the national level that indicate progress may be possible here as well. The draft of *Serbian Planning System Law*, proposed in 2016, defines the IUP as a policy instrument (Čolić, Milovanović Rodić, & Maruna, 2017). In addition, in May 2017, the Ministry of Construction, Transportation and Infrastructure announced the creation of a *National Sustainable and Integrated Urban Development Policy* (Radosavljević, Čolić, Mueller, Milić, & Trkulja, 2017) which is also envisaged to be implemented by means of IUPs.

The IUP as a new instrument for effective urban governance can introduce a more sustainable and resilient urban policy in Serbia. The results presented in this chapter show that a programme conceived in such a way can play a major part in further enhancing the quality of the Integrated Urbanism master's programme as it contributes to improving the level of academic knowledge and developing the professional competences of future planners, relying as it does so on up-to-date concepts, verified by using practical examples.

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PART 2

# Resources

# Resource Efficiency and Resilience in Urban Settlements _

## Two Complementary Approaches Toward Sustainability

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ABSTRACT **The built environment is a specific historical result of social and political processes, based on the transformation of natural resources. The demand for these resources has increased dramatically in the last decades, leading to unprecedented levels of pressure on the environment and ecosystem services. Most of the flows of resources are toward urban agglomerations, which thrive thanks to enormous inward streams of supplies and thanks to the hinterland where they dissipate or dispose of wastes. There is an urgent need to increase the efficiency with which urban areas use natural resources, while at the same time understanding the critical interconnections and interdependencies between energy and material flows, thus reducing cities' exposure to risks.**

**The chapter provides a review of notions and strategies around the concepts of 'resource efficiency' and of 'resilience' and describes related case studies. Some common areas of action between the two concepts are shown, as well as potential contradictions and conflicts. Analysing and understanding the common ground between these two concepts can help to find a balance between the need to reduce the pressure on resources and the need to enable urban settlements to withstand and endure threats. The insights found at the interface of these concepts can help meet broader sustainability goals.**

KEYWORDS natural resources, urban metabolism, resilience, resource efficiency, transdisciplinarity

TOC

# 1 Introduction

The survival and material wellbeing of human communities depend upon the use of natural resources that are "both the raw materials necessary for most human activities as well as the different environmental media, which sustain life on our planet" (EC, 2003, p. 6). Natural resources are used to create and operate the built environment in which people live. Their basic functions are to provide mineral ores, combustibles, and biomass for the production of goods and services, and to receive, dissipate, or clean the waste originating from man's activities - through air, water, and biologically active land - reintroducing it into the cycle (EC, 2002).

On a global scale, the consumption of resources is constantly on the rise. Estimates indicate that between 1970 and 2015 the amount of materials globally extracted and used has increased by three times (UN-Environment, 2016), water withdrawal has doubled (Wada, de Graaf, & van Beek, 2016) and the proportion of land used for human activities has increased by 10% in the same period (Turner, Lambin, & Reenberg, 2007). Between 2015 and 2050 the world population is estimated to grow by 33%. This increase, together with the constant economic growth, in a business-as-usual scenario, is likely to dramatically raise the already high pressure on the environment and on the demand for resources (Krausmann, Fischer-Kowalski, Schandl, & Eisenmenger, 2008; UN-Environment, 2012a): the material extraction will double, food and water demands will increase by more than 50%, and global energy consumption by 30% (UN-Environment, 2016; Alexandratos & Bruinsma, 2012; OECD, 2013; EIA, 2017).

The Earth's resources are being exploited with an intensity that increasingly exceeds the capacity of its systems to absorb the waste and to neutralise negative environmental impacts (UN-Environment, 2016), and the effects of this excessive exploitation are visible at a global level. While on a local scale, communities have long been aware that their actions can have an impact on the local environmental systems, it's only in the last few decades that there has been clear evidence that local activities can cumulatively have a global impact and affect the atmospheric, geological, hydrological, and biological processes of the planet. The most recognised changes are the rise in global temperatures, the acidification of the oceans, and the increase in the number of world's areas subjected to water stress (UN-Environment, 2012).

The scientific community is warning that an ever-increasing human pressure on natural resources will lead to an irreversible alteration of the state of relative stability in which the planet has been for the last 10,000 years, possibly causing extreme environmental changes and leading the planet to less favourable conditions for human development (Rockström et al. 2009). The latest global agreements on the control of the impact of human activities on the environment, such as the climate conference *COP 21* in Paris, have moved towards building a 'safe operating space for humanity' (Steffen et al., 2015) in accordance with the Earth's biophysical limits, within which man can continue

to develop for generations to come (UN-Environment, 2016). There is no unanimous agreement on the thresholds that should define this space, and even less on what actions should be undertaken to remain safely within them, but there's a growing awareness among researchers, policy makers, and supra-national institutions of the fact that urban regions are, and will be in the future, the key point of this topic (UN-Environment, 2016).

Urban settlements occupy only about 2% of the world's land, but host most of its population and account for about 75% of the world's consumption of natural resources, having a significant impact on resource availability and ecosystems even in areas that are far beyond urban boundaries (Dodman, Diep, & Colenbrander, 2017). Global sustainability is therefore highly influenced by the way we manage the flows of resources through cities, and by their use, consumption, and disposal (Ferrão & Fernández, 2013).

Reducing cities' use of resources to address the threats of environmental changes and of resource scarcity is crucial for global sustainability. Reducing consumption, restoring the built environment, and decoupling urban development from the use of resources are among the main and most urgent challenges in urban development (Swilling, Robinson, Marvin, & Hodson, 2013). But that alone is not enough: due to the concentration of people, infrastructures, and economic activities in cities, they are also greatly susceptible to a range of hazards (Resilience Alliance, 2007) and therefore they should also seek ways of reducing their "vulnerability, build resilience and responsiveness to natural and human-made hazards and foster adaptation to climate change" (UN, 2017, p. 19).

The second section of this chapter analyses how the demand of resources in urban settlements can be assessed and managed, and it introduces the concepts of 'resource efficiency' and of 'resilience'. Although these concepts are often considered separately, this chapter underlines the connections between the two, as integrating the two agendas can lead to a more comprehensive approach to pushing for a broader sustainable development (Dodman et al., 2017).

According to Ferrão & Fernández (2013), the use of natural resources in cities is devoted to the following sets of urban activities: the provision of habitable space and the movement of goods and people (i.e. respectively the built environment and transportation); and the provision of goods and services - especially air, water, food, fuels, and waste removal. According to this scheme, the third section of this chapter deals with built environment and mobility. By analysing strategies that aim to provide a more efficient and resilient built environment and related case studies, it addresses the issues of a more sustainable urban form, introducing the concepts of 'green infrastructures' and of 'sustainable mobility' (Abdelaal, 2015). Although the general approach of the chapter is to consider natural resources as mutually dependent, and thus their analysis is not totally compartmentalised, the resources considered in this section are mainly soil, fuel, and environmental

media. The fourth section more specifically addresses water, energy, food, and waste removal. It provides examples of resource efficient arrangements, showing how these activities can enhance the resilience of the urban environment.

# 2 Resources and Metabolism of Cities

## 2.1 Classification of Resources

The term 'natural resources' - which combines the concept of wealth with that of nature - is used to describe any physical component that constitutes the Earth and has a function to satisfy the material or cultural needs of a community, both in the present and in the future. The inventory of natural resources changes over time, and aspects of nature previously neglected or unknown may gain the attribute of 'resources' after technological improvements or changes in human needs (Mureddu, 1997).

In resource economics, a general distinction is usually made between renewable and non-renewable resources (WTO, 2010). Renewable resources - e.g. solar energy, wind energy, agricultural lands, forests, air, and water - are characterised by the fact that they can be replenished. In a sense, most natural resources are renewable, the only thing that differentiates them is the length of time it takes for them to be replenished. While some fish can reproduce by the millions each year, it takes millions of years for biomass to be transformed into oil by geological processes (EC, 2002). Therefore, non-renewable resources - e.g. fossil fuels and mineral ores - are those resources that do not renew themselves within the human timeframe and will, through extraction, be depleted in the long run (de Zeeuw, 2000).

A popular and widely shared definition of 'sustainable development' describes it as a "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987, p. 16). In this sense, the relationship between sustainable development and non-renewable resources seems to be a contradiction, since non-renewable resources exist in the earth in finite quantities and so every unit consumed today reduces their overall availability in the future. However, according to Le Blanc and Kjollerstrom (2008), this analysis is not accurate. For example, in the case of minerals, technological innovations may find "ways to renew the supply of minerals through advances in exploration techniques, extraction processes, recycling, and substitution" (Nooten, 2007, p. 37). In addition, non-renewable resources are necessary for the economic wellbeing of our societies; if revenues from non-renewable resources are reinvested in social, economic, and environmental activities, then non-renewable resources can contribute to guaranteeing the capacity of future generations to enjoy the same or a better standard of living (Green & Blatner, 2015).

## 2.2 Regeneration of Resources

The term exhaustible is sometimes used as a synonym for non-renewable, but it has to be said that some renewable resources may also run out if the consumption rate exceeds the natural system's capacity to regenerate them. The Ecological Footprint (EF) is a popular renewable resource accounting tool developed by Rees and Wackernagel (1996), that is used to measure the extent to which a population is exploiting natural resources faster than they can be regenerated. It indicates how much biologically productive area - whether it be land or water - "a population would require to produce on a sustainable basis the renewable resources it consumes, and to absorb the waste it generates" (Schaefer, Luksch, Steinbach, Cabeca & Hanauer, 2006, p. 5). EF is usually presented together with biocapacity (BC), which measures the quantity of a biologically productive surface available in the city or region the relative population lives in. Both are calculated on the basis of the same unit of measurement - global hectares - and the subtraction between the EF of a population and the BC of a city, or a region, tells us if the population's needs exceed that area's biological capacity to produce goods and to clean pollutants. In the world, there are ecological reserves whose biocapacity exceeds the EF of their populations, while there are also areas in which the deficit is enormous. The latter are characterised by high population density, huge demand for resources, and little intrinsic biocapacity.

Urban settlements fit well within this description. Almost the entire global consuming class - i.e. segments of the population with enough income to buy not only basic necessities but also discretionary goods and services - concentrates in urban areas (Dobbs & Remes, 2013). At the same time, as the capacity of a site to generate resources decreases with the increase in the density of the built surface, cities have usually little biocapacity (Ferrão & Fernández, 2013), as shown in Figure 2.1, which highlights the correlation between urban density and the productive capacity of the land. Wealthy cities prosper by largely relying on natural resources located in areas outside their boundaries, whose extension is much wider than the spaces that such cities physically occupy. For example, Greater London is reported to rely on a productive area 300 times larger than the actual urban area, which is approximately twice the size of the United Kingdom (Petrić, 2004).

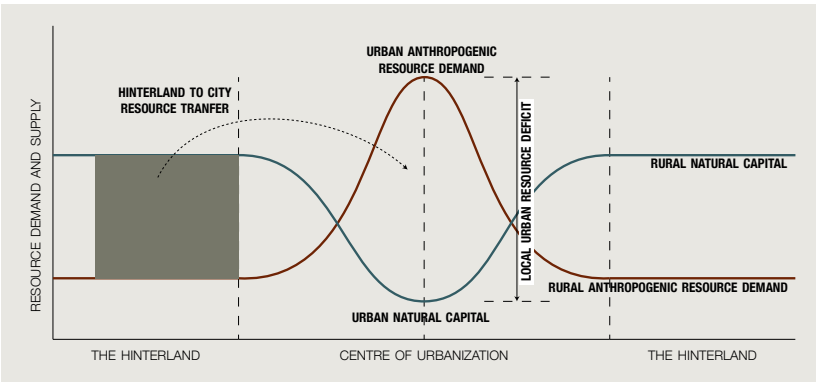


FIG. 2.1 Relationship between urban density and the productive capacity of land. Based on Ferrão and Fernández (2013). *(Image by author, 2017)*

As cities grow, they require ever greater quantities of food, material commodities, and energy from their surrounding areas (Rees, 1999). From a historical perspective, these areas were initially local, but they have become progressively regional, national and, ultimately, global (Lee, Quinn & Rogers, 2016). Lewis Mumford, in *The natural history of urbanization* (1956), argues that, from the Neolithic period up to the 19th century, the size of urban areas - in terms of both population and spatial area - "could not grow beyond the limit of their local water supply and their local food sources. (...) Cities like Rome, which drew mainly on the distant granaries of Africa and the Near East, (...) were exceptions down to the nineteenth century" (Mumford, 1956, p. 389). For a long time, urban areas were mostly powered by biomass, whose characteristic - low energy density - sets limits for the distance from which goods could be transported. In addition, the maximum amount of biomass that could be produced per unit of land was limited, as was the number of people who could be nourished and heated by it. The advent of energy sources that were characterised by a much higher energy density - fossil fuels - together with the technologies to use them efficiently, increased productivity in agriculture and manufacturing and allowed the energy cost of long-distance transport to decrease. Consequently, urban settlements experienced an unparalleled expansion, as well as an exponential increase in the inward flows of natural resources, which were used to build and operate infrastructures and buildings, to allow a high level of mobility of goods and of people, and to guarantee to the citizens a higher standard of living (Krausmann, et al., 2008).

## 2.3 Urban Metabolism

The way natural resources are used by urban societies is the subject of study of an emerging discipline called 'urban metabolism'. There is no commonly agreed definition of the term, but it generally refers to the exchange processes whereby cities transform streams of resources into useful energy, physical structures, and waste (Decker, 2000).

The concept of 'metabolism' draws from an analogy with the metabolic processes of organisms and it has been used since the 19th century to describe the interaction between society and environment (Fischer-Kowalski, 1997). Karl Marx theorised a rupture in this metabolic interaction originating from industrial production and the growing division between cities and countryside (Foster, 1999). The starting point of his idea of 'metabolic rift' was the recognition of the fact that "food and fiber, containing the elementary constituents of the soil, were being shipped long distances in a one-way movement from country to city", causing the loss of the nutrients in the soil, which had to be replaced by fertilisers (Foster, 2013, p. 17). "Whole industries for making artificial fertilizer would arise to address this rift - in turn causing further metabolic rifts elsewhere" (Wark, 2015, p. 12). This example can be easily applied to contemporary urban settlements, which depend on natural resources that come from all around the globe and which can't return waste products to the place where the resources were extracted, thus making it impossible for the cycle to renew itself.

In recent years, the idea that urban areas operate as metabolic systems, and that production and consumption patterns in cities can be modelled as flows of materials, energy, people, information, and power, resulted in the rethinking of how the relations between society and nature shape urban phenomena (Broto, Allen, & Rapoport, 2012). The disciplines committed to urban metabolism are inherently multidisciplinary, therefore there are significant overlaps in the interests of scholars coming from different areas, but it is still possible to identify different slants and specific approaches (Broto et al., 2012; Zhang, 2013; Musango, Currie, & Robinson, 2017). According to Ferrão & Fernández (2013), the current methods and tools of urban metabolism have been primarily originated and promoted within 'Industrial Ecology', the disciplinary field studying the interactions between industrial systems and the environment (Graedel, 1994). Here the metabolism of a city is understood as "the sum total of the technical and socioeconomic processes that occur in cities, resulting in growth, production of energy, and elimination of waste" (Kennedy, Cuddihy, & Engel-Yan, 2008, p. 44). From this perspective, emphasis is given to the fact that urban systems are mainly linear reactors: their metabolism consists of taking energy and materials from elsewhere and transforming them into buildings, infrastructures, and waste, which are rapidly discarded (Girardet, 2000; Brunner, 2007). Instead, cities should shift from a linear to a circular model of metabolism, wherein waste can be reintroduced into the system to become inputs (Ferrão & Fernández, 2013). The Industrial Ecology approach to urban metabolism aims to assess and quantify the flows and stocks of resources, and thus identify alternative ways in which a more efficient use of resources can be achieved (Musango et al., 2017). Resource efficiency can be defined as "the ratio of services generated from resources to resource input" (Fertner & Große, 2016, p. 68); therefore, using resources more efficiently means "create more with less, delivering greater value with less input, using resources in a sustainable way and minimising their impacts on the environment" (EEA, 2015a, p. 20).

Another approach to urban metabolism originated from the field of 'Urban Ecology', which the journal 'Nature' defines as "the study of ecological processes in urban environments" (Nature, n.d.). This perspective understands the city as a dynamic, complex, and adaptive ecosystem "embedded in a larger system, and thus employs the concept of metabolism to describe the interactions between subsystems within an urban region" (Broto et al., 2012, p. 853). Rather than adjusting urban metabolic flows to idealised models, the main focus of this approach is to understand how to achieve resilience to changes and shocks that will impact such a dynamic system (Broto et al., 2012). According to Alberti, Marzluff, Shulenberger, and Bradley (2003, p. 1170), urban resilience can be defined as "the degree to which cities tolerate alteration before reorganizing around a new set of structures and processes" and that depends on how effectively a city can simultaneously maintain ecosystem and human functions (Resilience Alliance, 2007). In this case, the concept of resilience goes beyond the recovery from specific disasters and refers to the resilience of the urban settlement to all kinds of disturbances, including unpredictable ones (Newton & Doherty,

2014). According to Tyler and Moench (2012), the characteristics of a resilient urban system are:

- Flexibility: i.e. the ability to perform essential tasks under many conditions through the interplay of evolution and adaptation;
- Diversity: i.e. the ability to meet a given need in multiple ways and to physically distribute key assets and functions so that they are not all simultaneously affected by a disturbance event;
- Redundancy: i.e. a characteristic that, according to da Silva & Morera (2014, p.5), "refers to spare capacity purposively created to accommodate disruption due to extreme pressures, surges in demand or an external event";
- Modularity: i.e. being composed of smaller functional units that are interconnected and can replace each other if one, or even many, fail;
- Safe failure: i.e. the ability to absorb sudden shocks with minimum damage and avoiding cascading impacts across systems.

## 2.4 Differences and Analogies Between the Concepts of Resource Efficiency and Urban Resilience

The concepts of 'resource efficiency' and of 'urban resilience' described earlier were both considered to be of key importance at the *Third United Nations Conference on Housing and Sustainable Urban Development - Habitat III* (UN, 2017). Indeed, without huge increases in resource efficiency in cities, the current consumption patterns cannot be sustained (Resilience Alliance, 2007). At the same time, due to rapid urbanisation and a greater global connectedness, cities are the places where the security and wellbeing of people are mostly at risk, therefore the efforts on building resilience should be focused on them (Coaffee & Lee, 2016). The two concepts have different strategies and tools and may come into conflict. For example, the above-mentioned may help cities to be more resilient to shocks and stresses, but it may also be regarded as an inefficient use of resources (Santos Cruz, Costa, Ávila de Sousa, & Pinho, 2012). At the same time, there are also overlapping methods: for example, improving resource efficiency by reducing, re-using, and recycling waste can help overcome resource constraints that may result from internal or external limiting factors (Dodman et al., 2017).

In the case studies presented below, a certain number of areas of action are shown where the concepts of resource efficiency and resilience converge, with the common goal of achieving a broader long-term sustainable city development and reducing pressure on natural resources.

# 3 Efficient and Resilient Built Environment and Transportation

## 3.1 Urban Form

The urban form and the arrangement of land use are strongly related to the consumption of resources: they are directly connected to how efficiently water, energy, and soil are used (Santos Cruz et al., 2012), and alternative urban patterns have different effects on resilience (Alberti & Marzluff, 2004). Urban development affects the local provision of food and environmental services, fragments and isolates the remaining areas (Fertner & Große, 2016), disrupts hydrological systems - e.g. through the increase of impervious surface coverage (Arnold & Gibbons, 1996) - and modifies energy consumption, especially in the transportation and space heating/cooling sectors (Doherty, Nakanishi, Bai, & Meyers, 2009).

In the last decades, there has been a lively debate on the definition of the most sustainable urban form (Frey, 1999; Jenks, Burton & Williams, 2005), which has been often associated with the compactness of urban fabric (Jabareen, 2006; Schwarz, 2010). In fact, proponents of higher urban density claim that compact and close developments reduce land consumption, preserve the open space, increase accessibility to local services and jobs - thus reducing the use of cars - and promote a more intense and efficient use of infrastructures (OECD, 2012). In addition, some specific system configurations, such as district heating/cooling systems or Combined Heat and Power (CHP), have been deemed convenient only in dense urban areas (OECD, 2012). An example of the use of an extensive district heating network is the one in the city of Copenhagen, which serves 98% of homes (Hjøllund, Boldt, & Hendriksen, 2014).

Since 1999, a more compact urban development model has been proposed by the European Commission as a guideline for urban renewal and expansion (EC, 1999; 2007; 2010) and, in recent years, the concept has been endorsed by the United Nations (UN-Habitat, 2016). This can be understood as a response to more dispersed models of urbanisation, which have been the global trend for the last two decades (UN-Habitat, 2016).

On the other hand, some researchers state that evidence from case studies suggests a weak relationship, if any, between urban compactness and sustainability (Daneshpour & Shakibamanesh, 2011). According to Alberti (2007), the relationship between compactness and decrease of pollution and energy usage is controversial due to the difficulties of generalising the results of the studies. Santos Cruz et al. (2012, p. 65) underline that compactness and density may lead to lack of redundancy, "which, combined with diversity and modularity, enhances the resilience of a system". Indeed, landscapes made up of a combination of built and natural environment can be more resilient than areas of either abundant and well-connected natural environment or of

extensive sprawl, since neither of the two can simultaneously support human and natural functions (Alberti & Marzluff, 2004). Therefore, improving the ecological connections and melding them with urban form offer the chance to create a more sustainable and resilient space for both humans and natural ecosystems (Lafortezza, Davies, Sanesi, & Konijnendijk, 2013).

A conceptual framework within which this linkage is enhanced is the Green Infrastructure (GI), which emerged as a complement to conventional 'gray infrastructures'. The European Commission (2013a, p. 7) defines GI as planned "networks of natural and semi-natural areas designed and managed to deliver a wide range of services" such as: the improvement of air quality by reducing nitrogen dioxide and particulate matter; the absorption of storm water to reduce the likelihood of sewer system overflows; and the cooling of the surrounding built areas through evapotranspiration and the shading of buildings and other surfaces (Meerow & Newell, 2017).

According to Amati and Taylor (2010), GI can also be used to limit cities' spatial growth, complementing the 'green belt', an already widely adopted urban planning tool. This, first implemented in London in 1935, is a ring of countryside which prevents urban sprawl by surrounding the city with a 'belt' of undeveloped land. Merging green belts with a network of green infrastructures can provide a lot of benefits (Amati & Taylor, 2010), as in the case of the Toronto Greenbelt, which has been developed since 2005 to circumscribe the urbanised region around the city. The accompanying Places to Grow plan for the same region (placestogrow.ca), states that "conservation can only be allowed if growth is also supported" (Wekerle, Sandberg, Gilbert & Binstock, 2007, p. 28), and therefore multifunctional activities, such as water taking, water purification, forestry, and biomass and aggregate extraction, are allowed throughout the protected countryside. Basically, the Toronto Greenbelt acts both as a physical boundary preventing urban sprawl and as a green infrastructure providing a sustainable context for future growth in the region (Amati & Taylor, 2010).

The main principle of GIs is to protect and improve natural systems by integrating these infrastructures into urban planning and development, and therefore also into mobility strategies (Smaniotto Costa, 2014). In fact, GIs have often been linked to the concept of 'sustainable mobility' (Schäffler & Swilling, 2013). An example of this are the *Corridors of Freedom*, which are currently being developed in Johannesburg, South Africa. This project is included in the *Growth and Development Strategy 2040* masterplan, consisting of an integrated plan for infrastructure, housing, and transportation systems (City of Johannesburg, 2011). One of the key goals of the corridors is to connect - through public transport systems - the sprawled, low-density settlements at the fringe of the city to the central area, thus providing access to jobs and economic opportunities in the inner city to marginalised communities living in the peri-urban areas (Young, 2015). In the *Corridors of Freedom,* bus and passenger rails will be aligned with an urban green infrastructure network, including linear parks, urban forests, and wetlands, that

will provide the space for both ecological and economic functions, such as storm water processing and production of bio-energy and food. This programme has been devised as a "new hybrid urbanism" that "recognizes the importance of the existing open space system as the basis of an emergent new public realm which must not be a passive or a benignly naturalistic place. It should be green and living" (Young, 2015, p. 409).

## 3.2 Sustainable Urban Mobility

Achieving sustainability in urban transport and reducing the use of cars for commuting are important goals for the European Union. Current mobility patterns in cities account for 23% of greenhouse emissions from transport at community level, and European cities are exposed to such high concentrations of pollutants and particulate matters that many of them struggle to meet the European standards for air quality (EC, 2013b). Nonetheless, "with their high population densities and high share of short-distance trips, there is a greater potential for cities to move towards low-carbon transport than for the transport system as a whole, through the development of walking, cycling, public transport" (EC, 2013b, p. 1). In 2014, the European Union published the guidelines to develop a *Sustainable Urban Mobility Plan* (SUMP), which is intended as a new planning concept to address urban mobility issues in a more comprehensive way (EC, 2014). This new concept calls for citizens and stakeholders' involvement, for coordination between different levels of authorities, and for a trans-sectoral approach to planning. The sectors that should be coordinated within the plan include: transport, land use, environment, economic development, social policy, health, and energy (EC, 2014). A more comprehensive approach to planning was also invoked by Lam & Head (2012), who stated that transport should not be implemented by itself but in conjunction with other strategies, in order to develop sustainable urban mobility schemes while pushing for a broader sustainable development goals.

In Europe, cycling is becoming more and more popular and, in some cases, an integral part of urban mobility and infrastructure design (EP, 2015). Many case studies about bike mobility plans have been published in the European urban mobility observatory (eltis.org). For example, the website assesses the continuous progresses made by the city of Copenhagen towards the goal of creating a more liveable city and reaching carbon neutrality by 2025, through cycling as a highly prioritised political tool. On average, from 2008 to 2010, 36% of the trips to work or to educational institutions in Copenhagen were made by bicycle, and the goal is to reach 50% by 2025 (City of Copenhagen, 2012).

In London, despite the presence of a well-established public transport system, cycling is a growing trend: between 2000 and 2015, the number of daily cycling journeys increased by 230% (Transport for London, 2015). This was the result of urban policies that aim to improve this means of transport through some innovations, including a new bike rental scheme and the construction of eight *Cycle Superhighways*

to create continuous cycle routes from outer London and across central London (Dix & Seagriff, 2012). In 2013, in line with the efforts of the public administration to increase bike commuting, Exterior Architecture, Foster + Partners and Space Syntax proposed *SkyCycle* as a new approach to cycling in London. *SkyCycle* is a bikeway that uses the space above the existing suburban railway corridors, providing 220 km of car-free cycle routes accessible from over 200 entrance points (fosterandpartners.com/projects/skycycle). A similar project has been recently developed in Xiamen (China), where the design firm DISSING+WEITLING has built the world's longest suspended bike lane. The aerial cycle way is a 4.8 m wide four-lane carriageway, stretching for 7.6 km with 11 exits connecting it to six public transport hubs. As shown in Figure 3.1, much of the pathway is beneath the elevated road used by the city's rapid transit bus line, thus providing shelter on rainy days and easier accessibility for commuters (Piciocchi, 2017).

FIG. 3.1 Xiamen Bicycle Skyway designed by DISSING+WEITLING architecture *(Image by Ma Weiwei, 2016)*

The use of spaces previously developed for transport infrastructure - which may be either active or not in use - is in line with the aforementioned goal of limiting land taking. Several projects have been developed over former railroads. For example, the celebrated *High Line* is a linear park that recycles a portion of the former New York Central Railroad on the West Side of Manhattan. Designed by Diller and Scofidio in 2009, it led to the redevelopment of the neighbourhood of Chelsea (Cataldi, Kelley, Kuzmich, Maier-Rothe, & Tang, 2012). Another example is the *Promenade Plantée* in Paris, a 4.7 km parkway designed over the former tracks of the Vincennes railway line by Vergely and Mathieux in 1993 (Heathcott, 2013).

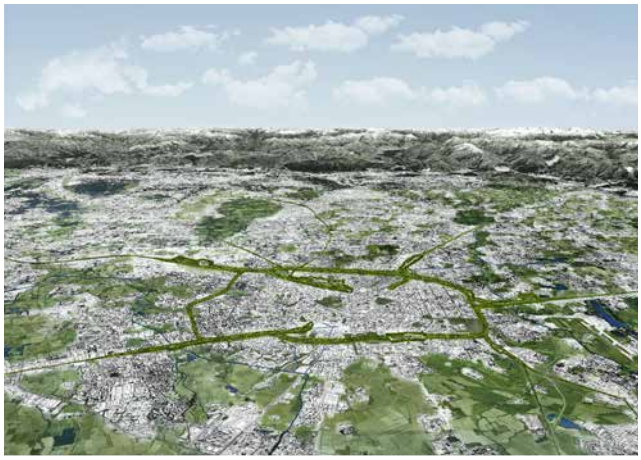

FIG. 3.2 Fiume Verde: aerial view *(Image by Stefano Boeri Architetti, 2017)*

FIG. 3.3 Fiume Verde: view of the park *(Image by Stefano Boeri Architetti, 2017)*

In Italy, the *Green River* project, recently proposed by Stefano Boeri, is based on the repurposing of the unused railway freight terminals in the city centre of Milan (https://www.stefanoboeriarchitetti.net/it/portfolios/un-fiume-verde-per-milano). The idea is to build a continuous system of pathways and parks along 37 km of former rails, now fallen into disuse (Figure 3.2). The project will include a public transport line connected to the Milan rail network as well as cycle lanes and footpaths. Along the *Green River* bends, high density urban edges are planned, hosting both private and social housing, residences for students, workspaces, and crafts and cultural services (Figure 3.3). The new buildings will be served by a district geothermal infrastructure consisting of a circular water network that carries groundwater extracted at the rail yards and then delivers it to each household. This technical solution will contribute to achieving the goal of reducing carbon emissions from heating, while, at the same time, limiting the trend of increasing groundwater levels, that has been observed in Milan since the '90s and that resulted in flooding in some areas of the city. The project also includes planting more than 200,000 trees, which will greatly benefit the urban environment through their annual absorption of 50,000 tons of $CO_2$ (Italia Nostra, 2017).

# 4 Efficiency and Resilience in the Provision of Goods and Services

As seen before, resource efficiency and decoupling of the economic growth from the increasing resource use and from the environmental impact are two major European and global goals (UN- Environment, 2011; EC, 2011). However, some scholars argue that this is "good, but not good enough" (Haberl, Fischer-Kowalski, Krausmann, Martinez-Alier, & Winiwarter, 2009, p. 9), since decoupling does not necessarily imply a reduction in resource consumption in absolute terms as long as economic growth continues (Fertner & Große, 2016). Actually, global resource use during the entire 20$^{th}$ century rose "at a substantially lower pace than the world economy. Thus resource decoupling has already taken place 'spontaneously' rather than as a result of policy intention" (UN-Environment 2011, p. 11). Nonetheless, resource consumption in absolute terms has been steadily increasing (Krausmann, Gingrich, Eisenmenger, Erb, Haberl & Fischer-Kowalski, 2009). For example, the use of renewable energy - which is meant to be a way to lower the use of fossil fuels and to reduce $CO_2$ emissions - is rising and so is the proportion of renewables in the global energy mix, but the total amount of energy being produced from fossil fuels is rising too (EIA, 2017). Therefore, renewables are not replacing fossil fuels, they are just being used concomitantly, as noted by Rufo Quintavalle (2017).

Efforts to reach an absolute decoupling should be promoted, but to achieve this result "'end-of-pipe' solutions, generally used to solve environmental urban problems, are no longer sufficient. There is a need for an integrated approach and better coordination among sectoral policies, levels and scales" (EEA 2015a, p. 23). This approach has recently been applied to urban development projects, for example in the design of the Hammarby Sjostad, a district of Stockholm located in a former industrial waterfront area (Solly, 2016). The most interesting part of this project is the *Hammarby Model* (Bancheva, 2014), a systems integration scheme that aims at optimising existing systems of consumption and production by connecting them together to create synergies and reuse waste. Environmental and infrastructural core plans for this model have been jointly developed by three infrastructure companies of the city: Stockholm Energi, the city's energy company; Stockholm Vatten, the company that provides integrated water management all over Stockholm; and Skafab, the city's waste recycling company. The municipality asked these companies to co-operate, thus forcing them to find cross-sectoral solutions and to innovate not only in designing a new integrated solution for the district, but also in finding new working methods (Iveroth, Vernay, Mulder, & Brandt, 2013). In the *Hammarby Model*, as shown in Figure 4.1, organic waste is converted into biogas and fertiliser to produce biofuel, while combustible waste is used to provide the district with electricity and heating, and both are transported by an automated underground vacuum waste transportation system. The waste incineration plant provides part of the electricity that is consumed by the households and also powers the wastewater treatment plant, which treats the sewage. Digestion is used to extract biogas from the sewage sludge and the residue solids

are then used to fertilise (Iveroth et al., 2013). This model of system integration shows how it is possible for different sectors to collaborate, aiming to achieve a better resource efficiency and to close the flow loop within a circular metabolism concept.

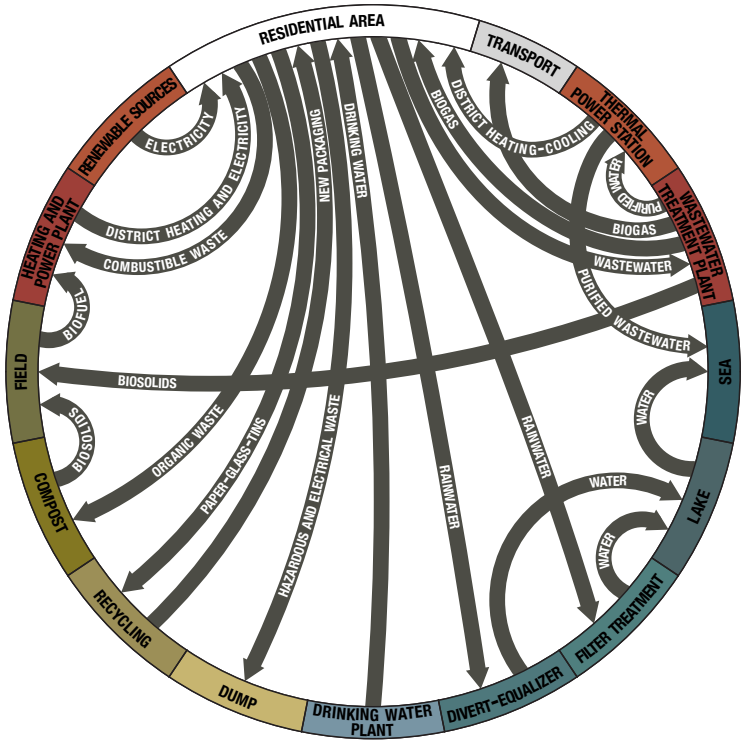


FIG. 4.1 The Hammarby Model. Based on Iveroth et al. (2013) *(Image by author)*

According to Coutard and Rutherford (2011), the *Hammarby Model* is an example of a new concept of infrastructure, namely the 'decentralized systems', that surpass the 'large technical systems' scheme, and are believed to be more sustainable and to reduce certain vulnerabilities and risks. An example is the programme under development in the New York metropolitan area for the design and construction of alternative power generation and distribution systems. The programme is part of a wider plan to build *A stronger, more resilient New York* (City of New York, 2013), which is an upgrade of the *plaNY* masterplan, sought by the administration after the catastrophic climatic events of recent years, and in particular after Hurricane Sandy, that struck the city in 2012, caused 43 deaths, flooded some areas of the city, and caused the interruption of the electric service for over 2 million people for almost two days (City of New York, 2013). The programme provides for the creation of several microgrid systems capable of providing electricity to hazardous areas and strategic city services. Microgrids are small-scale electricity production and distribution systems that can work either connected or disconnected from the main network, in what is known as 'island mode' (Prehoda, Schelly, & Pearce, 2017). They can be powered by a mix of energy sources, including photovoltaic panels, cogeneration systems, and more traditional power plants (Cohen, Eimicke, & Miller,

2015). During the Hurricane Sandy, some experimental installations proved to be effective, succeeding in providing electricity to some groups of buildings despite the widespread outages of central power plants (Van Nostrand, 2015). This helped to strengthen the idea of spreading similar systems in other areas of the city. Ten pilot projects have been recently financed and are currently under development. In the same metropolitan area - on the other side of the Hudson River - the *New Jersey TransitGrid* is under development. This is a project designed to power some strategic segments of the rail transport network. Here, the microgrids will allow transport to continue even during hurricanes or in case of network failure because the rail system will be powered by a number of decentralised production units that will use solar power, combined heat and power and fuel cells, and they will be located in transit stations, maintenance facilities, and bus garages (https://tinyurl.com/y76vmwx5).

Decentralised systems for other key resources have been proposed: for example, for the management of the urban water cycle. A leading example in integrated water cycle management through a mix of dispersed systems is the case of Singapore. Singapore, due to specific geographic conditions, does not have natural freshwater resources, and therefore efforts have been made to ensure its water security. The policies implemented to achieve this result include the minimisation of the householders' demand, the reuse of wastewater and the water supply through a mix of different sources (Irvine, Chua, & Eikass, 2014). This is in line with the 'urban harvest approach' proposed by Agudelo-Vera, Mels, Keesman and Rijnaarts (2012). According to the authors, cities should minimise their demands by stimulating changes in human behaviour and by technology implementation (demand minimisation); close the loop of urban cycles by reusing waste (output minimisation); and get the remaining resources from multiple sources in the adjacent areas (multi-sourcing). Singapore's water management approach provides for demand minimisation at multiple levels: at end user level - with awareness-raising campaigns and pricing policies; at product level - through the mandatory use of water saving devices; and at building level - through a water efficient building certification programme (Kiang, 2008). Water reclamation is achieved through *NEWater*, which is the largest wastewater reuse infrastructure in the world. It consists of five plants that depurate sewage providing water for non-potable uses. They are able to fulfil up to 40% of the city's current water needs and, by 2060, they are expected to meet up to 55% of Singapore's future water demand (The World Bank, 2006). Finally, the supply of water relies on several sources: the import by ship from the Johor river in Malaysia; the desalination of seawater in two reverse osmosis plants; and the collection of rain water. Rain water is collected on green and built areas of Singapore, accounting for 2/3 of its total land, and then channelled into 17 reservoirs. The recently-built biggest reservoir - the Marina Basin - is separated from the sea by a 350m wide dam, which also acts as a tidal barrier, preventing the sea from flooding the adjacent low-lying areas in the city centre. In addition to providing a way of harvesting rain and keeping seawater out, the Marina Basin is also an attraction for tourists and citizens (Khoo, 2009). Singapore's urban water system is a

leading example of the so-called Total Water Management, an approach that "examines urban water systems in a more interconnected manner, focusing on reducing water demands, increasing water recycling and reuse, creating water supply assets from storm-water management, matching water quality to end-use needs, and achieving environmental goals through multi-purpose, multi-benefit infrastructure" (EPA, 2012, p. 3). Water security is achieved through an interplay of horizontal, cross-sectoral integration and vertical collaboration across different levels of governance.

In the presented case studies, the importance of an integrated approach to resource management based on greater efficiency has been underlined - i.e. the reuse of waste and the use of renewable energy - as well as an approach based on the reduction of urban systems' vulnerability - i.e. through decentralisation, modularity, and diversity. Another aspect to consider is the interdependence between resources in urban areas that can cause problems if their interactions are not understood and properly managed (Dodman et al., 2017). For example, in recent years, several studies have highlighted the cause-effect relationship between water and energy. In this context, it has been observed that energy is needed for the production of water and that water, in many cases, is required for energy production. If one sector fails, the other will suffer (Kenway, Lant, Priestley, & Daniels, 2011; Jägerskog, Clausen, Holmgren, & Lexén, 2014). This relationship can make cities more vulnerable since, for example, an interruption in the energy supply may consequently cause shortages in water delivery. Therefore, a comprehensive approach that considers broader influences and cross-sectoral impacts should be promoted (WWAP, 2014).

In 2011, the World Economic Forum introduced the concept of water-energy-food nexus to promote the inseparable links between these resources in order to provide basic and universal rights (Biggs et al., 2015). It has been noted that food production, transport, consumption, and disposal are responsible for over 70% of global freshwater use, about 24-50% of global $CO_2$ emissions (Schmidt & Merciai, 2014) and, in Europe, of 25% of total energy use (Monforti-Ferrario & Pascua, 2015). On an urban scale, Goldstein, Birkved, Fernández, and Hauschild (2016) analysed the metabolism of 100 cities and found that, in the reviewed sample, the urban food demand was typically the third largest source of mass flows - after water and fuels - and of carbon footprint, and generally the largest driver of urban ecological footprints. The authors also observed that food production - based on fossil fuels to increase productivity and to allow transport from long distances - had shifted well beyond municipal borders, making citizens unaware of the impact resulting from their 'foodprint'.

FIG. 4.2 Jellyfish Barge: view of the greenhouse installed in Milan, developed by Pnat, 2015 *(Photo by Matteo de Mayda, 2015)*

In the past decade, developed nations have seen a renaissance of urban agriculture and local food systems, namely networks of food production and consumption that operate at close distance and involve fewer intermediate steps between the producer and the final consumer (Martinez, Hand & Da Pra, 2010). The practice of producing food in and around urban areas is considered as a way to reduce the environmental impact of food demand, especially regarding limiting $CO_2$ emissions due to food storage and transport (Goldstein, Hauschild, Fernández & Birkved, 2016) and, at the same time, to reduce cities' vulnerability, since producing food in small scattered units helps to diminish the risks associated with a national or a global supply chain - such as disruptions in the supply or rising prices (Ackerman et al. 2014). From a historical perspective, Maltz (2015) explains the role of local food systems to provide resilience to urban areas during the two World Wars, arguing that in the US and the UK the 'Victory Gardens' and the 'War Gardens' - the practice of producing food in small and dispersed

spaces - "changed national food systems for the duration of the wars and created a lasting model of food resilience" (Maltz, 2015, p. 400).

However, to overcome the scarcity of large surfaces suitable for agriculture purposes in the city, many current solutions for urban agriculture improve crop productivity by using energy intensive technologies, such as artificial lights and air conditioning. An environmental life cycle assessment survey conducted among six different urban farms showed that the high-yield production of tomatoes and lettuce in heated greenhouses in the city of Boston had potentially higher environmental burdens than conventional methods in terms of $CO_2$ emissions and non-renewable resource depletion, due to the high energy inputs (Goldstein, Hauschild, Fernández, & Birkved, 2016). Louis Albright (2012) calculated that crops cultivated indoor with full artificial lights - i.e. in the so called 'plant factories' - can embed 2-8 tons of $CO_2$e per ton of produce, which is 3 to 10 times the carbon embedded in vegetables imported to New York from abroad.

A novel project to grow vegetables near the final consumer without impacting on water and energy resources is the Jellyfish Barge, a self-sufficient buoyant greenhouse that derives the fresh water, the electricity and the cooling it needs from the underlying body of water and from solar power (Studio TAMassociati, 2016) (Figure 4.2).

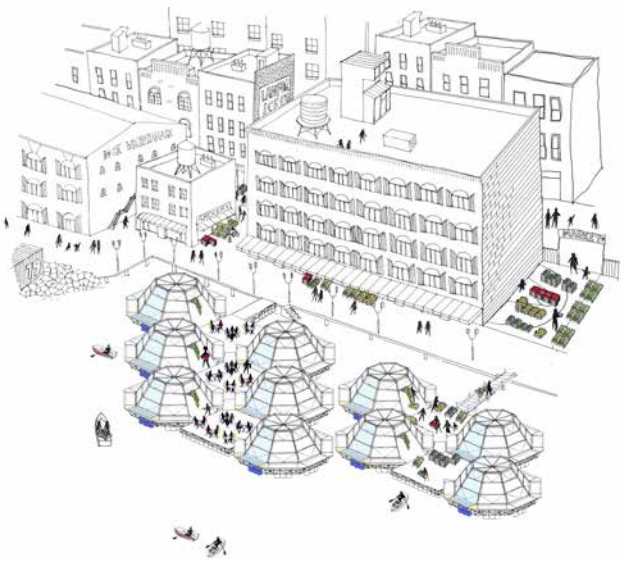

FIG. 4.3 Jellyfish Barge: view of an installation composed by multiple modules flanked together, developed by Pnat, 2015 *(Drawing by Cristiana Favretto, 2015)*

It is a cultivation facility that produces 8-10 tons of vegetables per year, which is enough to guarantee daily nutrition for about 75 people. The water needed is extracted from the body of water on which the greenhouse floats, whether it be salt, brackish, or polluted water, using a technology called 'solar distillation' (Papapetrou, Wieghaus, & Biercamp, 2010). The internal environment of the greenhouse is cooled/warmed by the same water. This radically cuts energy use, and therefore only a small photovoltaic system (800w) is needed to provide the little amount of electricity required. The project - developed by the

Pnat team at the University of Florence (www.pnat.net) - includes a platform for setting up a weekly farmers' market or organising didactic activities: a space open to the public that allows a direct relationship between farmers and citizens. Figure 4.3 shows that many modules can be flanked together to create rural archipelagos where it's possible to produce, sell, and consume fresh fruits and vegetables.

## 5 Conclusions

The ever-growing urban demand for natural resources produces significant environmental impacts that go well beyond the cities' boundaries, endangering the ability of the planet to replenish resources and to absorb waste, and, in general, to provide a safe space for human development (Rockström et al, 2009). To mitigate these adverse impacts, it is strategic to use resources more efficiently, not only disconnecting their use from economic growth and from social well-being, but also reducing resource consumption in absolute terms (Swilling, Robinson, Marvin, & Hodson, 2013). At the same time, cities are hotspots of vulnerability: population growth, rapid urbanisation, and climate change put urban settlements under unprecedented risks. Therefore, there is a pressing need to strengthen local capacities in order to better protect human, economic, and natural assets and to recover quickly from any plausible hazards (Resilience Alliance, 2007).

In the case studies presented, some common areas of action between the concepts of resource efficiency and resilience are shown. The two concepts may be conflicting, but there are also significant overlaps. For example, waste recycling can contribute to achieving greater resource efficiency and at the same time make urban areas more resilient, since it reduces cities' dependency on the systems that provide resources (Dodman et al., 2017). On the other hand, green infrastructures can be an efficient way to increase resilience to a wide range of threats, including flooding and seasonal heat waves (Meerow & Newell, 2017). Researchers agree on the fact that cities should be able to increase their resource efficiency and their resilience against threats, but there are few comparative studies analysing the two approaches simultaneously. The 'marriage' of these two concepts, has the potential to improve the understanding of how urban areas can simultaneously reduce their pressure on natural resource and make the urban environment less vulnerable to various types of risks, in order to meet broader sustainability targets. To achieve this goal, efforts to overcome the traditional differences in terms of "narratives, metaphors, and tools for understanding and shaping urban development" that distinguish the two concepts should be promoted (Dodman et al., 2017, p. 3).

Moreover, it clearly emerges from the above case studies that there is a need to establish inter-sectoral dialogue among disciplines that normally do not speak to one another. For example, the development of the *Hammarby Model* was made possible only through a new working method that brought experts in water, energy, and waste to work together.

On the contrary, the underestimation of the energy implications of food production can lead to the promotion of solutions that can create negative environmental impacts. Finally, trans-disciplinary approaches are essential to capture the complexity of Green Infrastructures, whose effectiveness lie in the composite interaction between built and natural environments.

But, who will take care of the design of these hybrid structures? Which professionals will coordinate the interweaving of such different sectors? Which scholars will translate the language of one discipline into that of another and build the platform where different knowledge streams can merge?

An intriguing metaphor for this problem has been elaborated by the duo of New York artists and designers Levin and Sims with a work called "The Free Universal Construction Kit" (Free Art and Technology [F.A.T.] Lab & Sy-Lab, 2012). It is a work composed of a series of 80 pieces that allow complete compatibility between ten popular construction games for children, such as Lego, Duplo, and Fischertechnik. By constructing an interface that allows each piece to engage with the others, the designers let elements belonging to different constructive, morphological, and functional logics to communicate. Similarly, disciplines around architecture and urban planning should work to enable interoperability between different fields and create a space where different kinds of knowledge and practice might meet. "The insights found at the interface of these disciplines will provide valuable material for alternative multi-scalar design strategies" (Mostafavi & Doherty, 2010, p. 22) and open up new avenues for design disciplines to drive urban renewal.

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# Innovative Approaches to Waste Reduction, Reuse and Recycling within an Integrated Urban Planning Concept

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ABSTRACT **Municipal solid waste is generated through the activities of every economic sector. In the 20th century, the usual methods of waste management were landfilling and incineration. European theory and practice in the past 20 years has recognised new concepts and approaches in Municipal Solid Waste Management (MSWM). Based on EU directives and national laws, many European countries have already established a Zero Waste concept, with the aim of shifting the current MSWM practices towards sustainable natural cycles, whereby almost all discarded materials become resources for others to use. The Zero Waste concept involves re-use, recycling, and waste reduction and its ultimate goal is the nullification of all waste produced in a specific area.**

**Unfortunately, not all European countries have managed to achieve this goal yet. Most of them have reached the milestone of 40-60% waste recycling (according to the statistics of European Environmental Agency, while others are still in the initial stages).**

**This chapter will describe the step-by-step implementation of innovative approaches to waste reduction, reuse, and recycling, using the case study of the municipality of New Belgrade in Serbia. The Serbian context is of particular interest, since almost none of the EU policies on waste reduction have been implemented. Therefore, the chapter will provide a model-approach to efficient MSWM in accordance with recent EU practices, directives, and laws. The model described is of interest to other municipalities that have not yet developed a strategy for sustainable waste management.**

KEYWORDS Municipal Solid Waste Management (MSWM), MSW mode, urban planning, recycling, Serbian cities

# 1 Introduction

Over the past 30 years, due to accelerated population growth and, with it, an increasing amount of waste, there has been a growing need for larger waste disposal areas, or for defining alternative methods for solid waste disposal and treatment (reuse, recycling, reduction of waste, and incineration). The problem of inadequate municipal solid waste management (MSWM) solutions creates various adverse effects that are manifested within ecological (increase in pollution), economic (use of quality agricultural, buildable, or forest land for landfills), technological (irrational and uneconomical management of solid waste), and social frameworks (increase in the degree of dissatisfaction among the stakeholders) (Dorvil, 2007). As a result of all of these problems, social awareness of the negative impacts of inadequate solid waste management is also rising. Those impacts are cumulative and have long-term negative effects on citizens, which may also be empirically determined in all settlements. An increasing number of theoretical studies in the domain of environmental planning (Al-Khatib et al., 2007; McDougall, White, Franke, & Hindle, 2003) are directed towards finding adequate MSWM systems and waste planning methods, which are primarily used in big urban centres. More recent methodologies in spatial and urban planning propose a new approach to researching the problem of MSWM (in the domain of defining the location and means of its elimination) in urban areas (Khajuria, Matsui, & Machimura, 2011; Motlagh & Sayadi, 2015; Rada, Ragazzi & Fedrizzi, 2013; Worrell & Vesilind, 2012). Recent research in the field of waste management (Al-Khatib, Arafat, Daoud & Shwahneh, 2009; Al-Khatib, Kontogianni, Abu Nabaa, lshami & Al-Sari', 2015; Diaz, 2009; Rybaczewska-Blazejowska, 2014) shows that the inclusion of the social aspects of this problem is necessary, through an appreciation of the affinities, behaviours, and interests of the local population as a high-ranking criterion in the selection of a method and location for eliminating waste.

On the other hand, in recent years, the Zero Waste concept has become common among the EU member countries as the newest paradigm in MSWM, because it sets a clear direction for reducing waste to the highest possible degree, and encourages a philosophical shift towards considering the elimination of waste as one of the ultimate human goals. The Zero Waste concept is based on reducing, reusing, and recycling, or converting the resources to a level of 90% or more by the year 2025 (set by UN), and disposing of only inert residual waste (Zaman & Lehmann, 2011).

Unfortunately, this goal has not yet been achieved by many European countries, having in mind that the percentage of recycled waste is 40 -70% (Eurostat, n.d.).

Countries such as Serbia, Bulgaria, Romania (i.e. predominantly Western Balkan countries) are at the very beginning of MSWM. Their concept of the waste management is based on technologically weaker ways of managing waste (e.g. landfilling, incineration), or sometimes more environmentally friendly - such as composting (Hristovski,

Olson, Hild, Peterson & Burge, 2007; Hadjijeva-Zaharieva, Dimitrova & Buyle-Bodin, 2003).

Serbian cities emerge as being particularly important for this research theme because they have implemented almost none of the waste reduction concepts. The only waste management system applied and considered in Waste Management Strategy of the Republic of Serbia from 2010 to 2019 (Government of Serbia, 2010) is the disposal of waste at unsanitary disposal sites. Within the research (Nenkovic, 2007; Nenkovic-Riznic, 2011) on the possibility of introducing a system of waste management in Serbian cities, a model approach was set up for managing waste based on the current theory, practice, and legislation that is implemented in the European Union. This model, as part a of a wider interdisciplinary study (Nenković-Riznić, 2011; Nenković-Riznić, Marić & Pucar, 2016), can also serve as strategic guidance for the implementation of the concept of advanced waste management in other Western Balkan countries, as well as in countries with similar ecological problems. This model could help in developing sustainable solutions for waste management in existing or newly planned urban areas.

## 2 Theoretical, Technical and Legislative Overviews of MSW Management in Europe

### 2.1 Theoretical Overview

Although waste disposal is only one of the waste management methods that is used less frequently in recent European and world practice, it is still the only method of eliminating waste in the urban areas of developing countries (Bleck & Wettberg, 2012; Guerrero, Maas, & Hogland, 2013; Marshall & Farahbakhsh, 2013; Nenković-Riznić, 2011; Troschinetz & Mihelcic, 2009). Recent research in the area of waste management (Al-Khatib et al., 2015; Guerrero et al., 2013; Diaz, 2009) shows that the methods of eliminating waste are changing structurally, from the most used one up until now – landfilling – all the way to processing (recycling) and re-use, in accordance with the basic principles of sustainable development.

The method of MSWM does not depend solely on the type of settlement, but rather it is conditioned by the number of inhabitants, their age and employment, the amount of waste generated, and its composition, as well as the social circumstances, local economic conditions, and, to a great extent, the geographical characteristics of an area (Al-Khatib et al., 2007; Dorvil, 2007; Henry, Yongsheng, & Jun, 2006; Tchobanoglous, Theisen, & Vigil, 1993; Tchobalnoglous & Kreith, 2002). In this regard, the justification for selecting a particular method of waste treatment must take into account all of the above parameters. All of the recent theoretical assumptions emphasise the benefits of recycling over landfilling, and can be identified in a number of practical examples,

both in developing and in European countries (Al-Khatib et al., 2007; Bleck & Wettberg, 2012; Guerrero et al., 2013; Khajuria et al., 2011).

It is not rational to even consider developing a recycling system in a particular area if, above all, there is no interest in it by the local population, and if there is not a large enough quantity of waste to be treated (Tchobanoglous, et al. 1993). Evidence for this hypothesis should be sought primarily in economic and social planning, which state that irrational planning that does not include the affinities and behaviour patterns of the local population could lead to the realisation of projects that may even be economically viable at a given time, but are simultaneously environmentally and socially unacceptable (De la Barra, 1995).

On the other hand, this problem is directly connected to the theory of decision making through verification and selection of the best, i.e. the most adequate methods/strategies for the MSWM, in accordance with the *in situ* conditions and criteria (by means of multicriteria analysis). In addition to the economic, geographical, and ecological parameters, this should also include social criteria: the affinities, habits, and behaviour patterns of the local residents.

Bearing in mind the multidisciplinary nature of this problem, there is a necessity for theoretical verification through various scientific and theoretical disciplines. The use of one-sided research that does not include inter- and multidisciplinary knowledge would result in the formation of a deterministic position, the results of which would not be relevant enough in terms of selecting an adequate method/strategy for eliminating municipal waste in urban areas of developing countries. Having a planning approach to the problem, which includes a range of theoretical and empirical facts from different disciplines, could establish a unique method for defining a strategic approach for managing municipal waste in the cities of developing countries. All of these discussions, founded on contemporary planning, sociological, psychological, economic, environmental, and technological approaches, as well as on decision-making theories (Matthias, Guipponi & Ostendorf, 2007), represent a basis for the research, verification, and development of a model for sustainable waste management in urban areas.

## 2.2 Sustainable Waste Management

**Waste minimisation and the prevention of waste**

Research on waste management on a global level (Pongratz, 2002), indicates that the reduction of waste 'at source' is the most desirable of all the options. According to Riemer and Kristoffersen (1999), the minimisation of waste consists of three elements: preventing and/or reducing the generation of waste at source; improving the quality of the waste generated, such as reducing the hazard; and encouraging reuse, recycling, and recovery.

Waste minimisation is carried out through increasing the efficiency of production; reducing the amount of packaging material for end-products; buying 'environmentally friendly' products (that claim reduced, minimal, or no harm upon ecosystems or the environment); composting organic waste at source (e.g. in gardens); reusing different products whenever possible and so on (Nenković, 2007).

**Re-use**

The re-use of waste is one of the sustainable ways of managing waste. It is not only environmentally friendly, but also economically and socially beneficial. According to Pongratz (2002, p. 32) there are two methods of waste re-use: "One is the re-use of an artefact for the same purpose, for a second time or more, in the same form and with the same material properties (where material constantly remains in the same form for several uses). The second one is the re-use of an artefact for another, different purpose to the original one, in the same form and with the same properties of the material as at the first use".

**Recycling**

Recycling was defined as "reprocessing in a production process of the waste materials for the original purpose, or for other purposes, including organic recycling but excluding energy recovery" (European Parliament and Council, 1994, article 3 para. 7). The purpose of recycling is to conserve resources and reduce the negative impact on the environment by reducing large volumes of waste disposed of at landfills. In this regard, it should be noted that although recycling is now an environmentally justified treatment of municipal waste, its sustainable management does require the expenditure of additional energy. It is a closed circular system, antagonistic to the linear flow system which is practised by many underdeveloped, and a few developed, countries in the management of municipal waste (Nenković-Riznić, 2011; Troschinetz & Mihelcic, 2009).

**Composting**

Organic waste, such as food leftovers and garden waste, is reduced and recycled by means of composting (McDougall et al., 2003). Composting is the process by which organic waste is converted into fertiliser or humus by encouraging the biological process of decomposition under controlled conditions. Regardless of whether the composting takes place in gardens within households or in large plants, it has many advantages: it reduces the amount of waste in sanitary landfills; it enriches the soil, reduces erosion, helps protect biodiversity, enables healthier plant growth, and reduces the use of artificial fertilisers and pesticides.

**Zero Waste concept**

According to the definition by the Zero Waste International Alliance (ZWIA, 2009, para. 2), "Zero waste is a goal that is ethical, economical, efficient, and visionary, to guide people in changing their lifestyles and practices to emulate sustainable natural cycles, where all discarded materials are designed to become resources for others to use".

Although difficult to achieve, this system of waste management has been partially implemented in some northern European countries (Belgium, Sweden, Norway), where it has been applied more or less successfully for a number of years.

There are a number of theoretical discrepancies that accompany this concept concerning whether Zero Waste applies to Zero Waste generation or Zero Waste disposal. This concept requires a fundamental change in the existing legislation, strategic commitment at the level of European countries, and changes in the awareness of population in relation to waste management. Some countries, like Scotland, have already established a Zero Waste national plan with the aim of decreasing waste by up to 70% until 2025 (Scottish Government, 2010). Although the Zero Waste concept is one of the major European objectives in the field of environmental planning, this concept will only be realised in a systemic way in the years to come.

## 2.3 European Legislation in the Field of Waste Management – An Overview

In order to determine the appropriate methods for treating waste it is necessary to have an overview of the legislation in this field as it is implemented in European Union countries, which directly correlates with the existing political framework. Since, globally, waste management is regulated by similar legislative frameworks, more attention will be given here to the European law in this area. The issue of planning for the management of municipal waste and how to eliminate it is treated in the EU by two types of legislative frameworks: the legal framework that discusses the principles and methods of waste treatment, as well as the mechanisms, rights, and responsibilities of investors in the processes of managing municipal waste; and the legal framework concerning spatial and urban planning, municipal activities, local government, and regional development. Besides these basic legal frameworks, it is necessary to take into consideration the general planning framework in solving this problem, since it directly affects aspects of the physical structure of the problem and represents the development support for developing a methodology of waste management (Nenković-Riznić, 2011). The basic EU legislative framework that ensures a legal foundation for the treatment of municipal waste includes three categories:

- the EU directives on waste and hazardous waste: Directive 2008/89/EC and Directive 91/689/EEC with Regulation (EC) No 166/2006;
- the EU directives on waste treatment processes: Directive 1999/31/EC on the landfill of waste, and
- the EU directives on specific waste streams: Directive 86/278/EEC on the use of secondary fertilisers in agriculture and European Parliament and Council Directive 94/62/EC on packaging and packaging waste
- the EU directive on the assessment of the effects of particular plans and programmes on the environment (Directive 2001/42/EC).

## 3 Methodology for Developing a Model for Sustainable MSW Management

The Zero Waste concept is still far from realistic application. Taking into account the fact that, in the European Union, the average quantity of recycled waste, according to the statistics from the European Environment Agency (EEA, 2013), is around 39%, which is a significant improvement compared to the last decade of the 20th century. The countries with the largest average quantity of recycled waste (in relation to the total volume deposited) are Austria 63%; Germany 62%; Belgium 58%; Switzerland and Netherlands 51%. On the other hand, the lowest percentage of recycled material in SEE countries is recorded in Croatia, Romania, and Bulgaria (members of the EU), and Bosnia and Herzegovina, Montenegro, Serbia, and Former Yugoslav Republic of Macedonia (outside the EU). All of the above countries have a percentage of recycled waste below 1%.

These data speak predominantly about the degree of application of the existing strategic and legal frameworks in the Western Balkan countries, as well as the degree of development of environmental awareness among all parties interested in the process of waste management (the population, state and local governments, businesses, NGOs, etc.).

Given the fact that in Western Balkan countries all of the EU directives (or their derivatives in non-EU countries, through individual laws that are harmonised with legislation from the EU directives) are in effect, the question remains: how it is possible to ensure their implementation and thereby increase the level of recycling? Although there is a clearly defined set of previously mentioned directives that oblige EU member and non-member countries to apply the principles of environmentally sound management of waste, in practice, in the Western Balkan countries, this system is mostly limited to the disposal and incineration of waste without prior processing and/or the utilisation of any energy produced (Hadjeva-Zaharieva et al., 2003; Hristovski et al., 2007; Vaccari, DiBella, Vitali & Collivignarell., 2013; Vego, Kučar-Dragičević & Koprivanac, 2008).

The reason for this is usually the inadequately defined responsibilities of the state and local government for the implementation of a system of rational waste management, as well as the absence of economic and ecological incentives which would raise the interest of citizens in recycling procedures.

Consequently, in the Western Balkan countries, it is necessary to develop a strategy for an integrated and sustainable waste management system that could systemically solve the problem of irrational landfilling and allow the consistent implementation of existing laws (harmonised with EU directives).

## 3.1 Existing and Newly Adapted Methodologies for the Implementation of Integrated MSW Management

Recent theoreticians and researchers state that municipal waste management must take society into account, i.e. the community of citizens, and that institutions at a local, as well as national level, must implement strategies for achieving the goal of reducing waste, with the full participation of citizens (Al-Khatib et al., 2009; Cecere, Mancinelli & Mazzanti, 2014; McDougall et al., 2003; O`Connell, 2011; Rybaczewska-Blazejowska, 2014; Tchobanoglous et al., 1993).

In order to achieve the above objectives, Nenkovic (2007, p. 399) has proposed a methodology that "includes the development of databases on citizens' preferences on the basis of which it is possible to determine: the most suitable and environmentally sound methods of waste disposal, the target groups, the affinities of citizens, the capacity of waste treatment plants, and similar". These data on preferences should also be supplemented with questions which can be of importance for the active involvement of the population in these processes (age group, gender structure, and others, since different groups react differently in the waste management process and generate different types of waste) (Nenković, 2007). Establishing a database of preferences, habits etc. is the main task of local authorities, the coordinators of strategies at the national and local level in order to achieve a coherent system of waste management. This practice must directly correlate with the practice of urban planning, which will, in the initial planning phases, directly facilitate adequate consideration of the existing land use and incorporation of MSW management plants in a particular space.

Once the database on preferences and habits of the local citizens is formed, it is possible to develop a local strategy for waste management with the aim to reduce waste in specific areas (re-use, recycling, waste to energy, etc.) according to the affinities of the local population (Tchobanoglous et al., 1993). Waste management planning represents the next stage in developing a model for waste management. Tchobanoglous et al. (1993) and, later, Williams (2014) claim that waste management planning is the process by which the needs of the population and the community in terms of MSWM are quantified and evaluated (basic needs on waste treatment, their habits etc.), and then the process of evaluating the alternatives for waste management treatment is carried out by the planners and the optimal options are defined. The MSMW planning involves collecting information on citizen's habits, needs, potential location for MSW, evaluating it, presenting the data obtained, evaluating potential alternative solutions, and proposing the optimal one for best MSW practice.

Waste management plans are carried out by applying the selected waste management solutions to meet the needs of specific locations. Participation of experts from various fields, investors, residents, and relevant institutions in the preparation, development, implementation, and monitoring of waste management plans are crucial for their

successful delivery. Together they can influence the development of the final waste management plan.

Consideration of MSWM in urban planning is one of the main pillars of an efficient and fully functional city and is of major importance. Some examples of best practice in this field around Europe are the following: Hammarby Sjostad in Stockholm, a former brownfield site, which is now a sustainable community with reduced environmental impact (Ignatieva, 2014); Vathorst near Amersfoort, an eco-town that demonstrates the benefits of proactive approach and public participation in planning (PRP, URBED and Design for Homes, 2008); Hafencity Hamburg, a former brownfield area, now a sustainable community; Kronsberg near Hanover, a legacy of EXPO 2000, an eco-city that has achieved big savings in energy consumption, soil conservation, and waste reduction (PRP et al., 2008).

Since urban planning directly enters the decision-making process and the allocation of financial resources for projects, it has a strategic and political significance. Urban planning seeks to identify the potential and possibilities of different areas and proposes the way in which they can be used.

The needs of the citizens, in relation to specific MSWM treatments, are represented by their response to questions concerning the costs of waste disposal. These actions will be provided in terms of waste processing by the investor or a local utility company, and environmental protection. An eventual increase in the above needs may depend on the social standard of the residents, institutions, and commercial activities in the urban areas etc. (Garnetta, Cooperb, Longhursta, Judea, & Tyrrela, 2017).

Some European countries have developed frameworks and approaches for public participation, e.g. Germany, Italy, and United Kingdom, through the involvement of citizens in the planning process via websites, e-governance etc. (EIPP, 2009; Evans & Reid, 2013).

Besides the citizens involvement, decisions of local governance and the political activity of NGOs are the key moments in the cycle of decision-making regarding the choice of waste management methods. Planners consider alternative waste management solutions and present them to the local authorities and communities. Ideally, they jointly arrive at the optimal solution for a given area. In this regard, it is of great importance to enable participation of local residents through different public participation activities - education, questionnaires, surveys etc. to avoid NIMBY (not in my backyard) syndrome (Mazzanti & Zoboli, 2008). Such activities assist in avoiding potential negative outcomes of the waste management plan implementation.

All stakeholders should be identified and consulted in the decision-making process, and should be enabled to contribute to the development of waste management strategies and local waste management initiatives (Nenković, 2007).

## 3.2 Examples of the Development of Strategies for Waste Recycling

Back in 1992, the United States Environmental Protection Agency (EPA, 1992,) defined the stages of implementing a recycling programme/ strategy in countries where landfilling was the only waste management solution. This strategy could be hugely important in the Western Balkan countries, where almost none of the new technologies in waste management have been adopted. This strategy has been successfully implemented in USA and in all EU countries.

In USA, a basic recycling strategy has been integrated in several programmes, e.g. MDS (multifamily dwellings recycling) and was successfully implemented in California, Florida, New Jersey, Minnesota, Washington, New York, Michigan etc. (EPA, 1999). Europe has a shorter tradition in recycling - according to Jacobsen and Kristoffersen (2002), the most successful case studies on waste recycling and minimisation practices in Europe have been developed in Austria (minimisation of the landfilling of biodegradable municipal waste through recycling), Denmark (recycling), Germany (minimisation of packaging waste through recycling), Sweden and Netherlands (through recycling programmes for organic household waste) and UK (through a waste minimisation programme).

A waste recycling project for a specific area requires prior preparation and a detailed action plan that is implemented in several phases (EPA, 1992). These are:

- planning the method for and the location of waste collection;
- educating the population to enable active participation in solving the problem of irrational municipal waste disposal in residential areas (Williams, 2014);
- estimating local quantities of residential waste;
- setting realistic objectives regarding which materials from the total amount of waste will be recycled;
- evaluating the programme; and
- implementing the programme.

# 4 Implementation of a Waste Management Model in Serbia

Serbia was chosen as a pilot project for the testing of a model to introduce a waste management system in the Western Balkan countries, primarily because it does not have an adequate system for managing waste. In addition, all stakeholders in Serbia are relatively poorly acquainted with the comparative advantages of different waste management options. Bearing that in mind, from 2007 until the present, ongoing research has been conducted on the territory of Serbia (Nenković, 2007; Nenković-Riznić & Josimović, 2012).

Although the Serbian legislative system is fully harmonised with European directives (law on waste management, strategy on waste management in Serbia 2010-2019, set of rules on package and packaging waste, landfill locations, recycling etc.), almost none of the strategic policies and legal requirements have been implemented. In addition, there is no such information on citizens' awareness of environmental protection, thus the need arose to survey the population on these questions.

In this ongoing research (Nenković, 2007; Nenković-Riznić, 2011), the attitudes of New Belgrade residents were identified, as a representative residential municipality, not only of Serbia, but of the Western Balkans, regarding the location of a future recycling plant in their immediate vicinity. New Belgrade, with 200 skyscrapers and 600 residential building blocks, is the largest urban municipality in the Balkans, and has an average percentage share of certain types of waste in the territory of the Western Balkans (Nenković, 2007). During a single day the citizens of New Belgrade create around 169.66 tons of waste: (organic 38%; glass 25%; paper 7%; plastic 4%; and others; according to the statistics of PUC City sanitation of Belgrade, 2007-2017). These data directly indicate an estimation of the dimensions of buildings for processing waste, as well as the production line inside the building in the introduction of a recycling programme. The total amount of waste generated in this Belgrade municipality is deposited in the unsanitary municipal landfill.

The initial survey of the local residents, which was the part of the bigger research project conducted by the author (Nenković, 2007), was carried out at 3 specific points in New Belgrade on a sample of about 400 residents. Its purpose, as a form of research, was to determine the attitudes of citizens on the potential location of waste treatment facilities in New Belgrade, with the aim of defining the most appropriate ways of eliminating waste. The form of the survey was determined on the basis of previous research in this field (Manchester, Nova Gorica, Sydney Nova Scotia, London, and others) (Williams, 2003; Greater Manchester MWMS Final Draft, 2003). The survey was preceded by a short introductory training, which included an explanation of the needs and benefits of primary waste selection and the necessity of locating plants in their immediate vicinity via a targeted *in-situ* campaign.

The survey (Nenković, 2007; Nenković-Riznić, 2011) was designed as a closed multiple choice questionnaire. In addition to general questions, on the age of the respondents, their familiarity with ways of processing waste, and the amount of household waste generated, the survey contained a set of questions that determined the respondents' level of knowledge about specific problems that can occur as a result of choosing different methods of evacuating waste. The survey results showed that there is a direct relationship between the degree of participation in the survey and the age of the respondents (younger people are more concerned with waste management), that the average amount of waste generated is directly proportional to the economic status of the respondents (people with higher income generate more

waste), and that in New Belgrade (as was also evident in other Serbian cities) almost 100% of municipal waste is not sorted by type. The survey results also revealed that more education by the media and members of the local government is necessary to increase the awareness of the population and initiate their involvement in the implementation of waste management programmes. In addition, the results have shown that citizens are generally not familiar with the systems of subsidising or punitive policy. Finally, and most importantly, the survey results showed that the citizens believe that the location of recycling facilities within residential areas, with rigorous measures to protect the environment, and the participation of representatives from the local residents and local interest groups in decision making, is the most adequate method of managing waste. These conclusions can only be conditional, given the fact that the research was conducted on a relatively small sample of 300 surveyed citizens (Nenković, 2007; Nenković-Riznić, 2011). After carrying out the survey, the preparation and implementation of regional and local waste management plans is necessary, through which the locations of plants for the evacuation of waste would be more accurately defined. On the basis of the given data from the survey, the local administration, together with planners, can define the general objectives (according to point 'd' in EPA, 1992) of the procedures for defining the system of waste management, which make up part of the local strategies and plans for managing waste. These strategic documents would serve as general guidelines for preparing lower order urban plans (general regulation plan, detailed regulation plan, urban design projects, preliminary design projects, building permit design etc.), which would, in addition to the urban conditions for constructing plants for the evacuation of waste, also define the network of locations for the primary selection and collection of waste.

This research has been carried out for ten years with the occasional updating of data with the aim of defining new strategies in waste management in New Belgrade. However, keeping in mind that the data do not change annually, the 2007 survey can serve as a basis for setting the model and conducting the local waste management plan.

The main benefits of involving the citizens in the decision-making process on waste management are that their contribution ensures the success of the proposed projects. This gives legitimacy to the decisions made by the governance bodies or agencies and gains the trust of the local population, which demonstrates the initial hypothesis on the importance of involving all stakeholders in the process of deciding on the placement of facilities in a residential area.

## 5 Conclusions

Calling on international theoretical considerations and experience in countries that have the same or similar level of development as Serbia, a unique strategy for the implementation of new methods of eliminating waste in an urban setting was established. The strategy has not yet been adopted by the local authorities, but it was proposed to the city council in 2014.

Since it is virtually impossible to define a theoretical model for waste management that would correspond to the requirements and conditions of each city in SEE (or even parts of a city), in addition to the above-mentioned phases of implementation (EPA, 1992), it is necessary to determine the factors that may be either the *spiritus movens* or limiting factors that are peculiar to their particular environment.

Taking into account that no local strategy is universal, but that each city is an individual unit with different internal structures (infra and supra), demographic and social characteristics, and ultimately local customs, it is essential to find criteria for defining the method and location for managing waste. With this method it should be possible to set up a bespoke strategy for the city under consideration. Only in this way can the consensus of all stakeholders be achieved within a residential area, without negative environmental, economic or social implications.

The study case of New Belgrade suggests that a proposed waste management solution (which represents an alternative to the traditional treatment of municipal waste in an urban area -depositing, incineration, and unhygienic treatment) can be achieved only through full public participation.

There are several basic recommendations for the successful inclusion of citizens, experts, investors and non-governmental organisations in decision making processes on MSW management in urban areas. One of these is the formation of a relevant legislative framework that would allow legally based methods of participation for all stakeholders at each stage of planning and decision making. This action is followed by defining all the rights and responsibilities of each individual participant in the process (through procedures at the local level, regardless of whether they are individuals or social groups). After this stage, a scientifically based process of education should be established, which, in addition to defining the advantages and disadvantages of implementing a particular project, would include general concepts in the field of waste management. And finally, the last stage of public participation is the facilitation of easier access to planning documentation in the later stages of planning, as well as the provision of the opportunity for consultation before initiating the formal procedure for issuing the urban planning documentation necessary for construction, as well as in the processes that precede this procedure. Local and national Serbian planning policies could be easily adapted to the innovative approaches to waste reduction, reuse, and recycling, since the relevant Serbian legislation and strategies are fully harmonised with European

directives. The main goal of this process should be the achievement of the full implementation of existing strategic guidelines and rules, governed by policymakers at the national and local levels.

All of the above recommendations can be applied in other less complex urban situations and forms that could result in initial social disapproval in the absence of consistent attitudes among members of different interest groups.

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# Spatial Dimension of Flood Risk

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ABSTRACT **In order to more successfully prevent the occurrence of floods and to mitigate their negative impact and numerous consequences, the Flood Risk Management (FRM) approach has been adopted in many European countries. Risk identification and assessment are the initial activities within the framework of FRM. This chapter analyses flood risk assessment from the supra-national to the individual buildings scale, describes different relevant assessment methods, and discusses the interconnectedness of flood risks at different spatial levels. Urban flood risk assessment is recognised in this chapter as being particularly complex, due to the variety of present factors, interrelations between physical and human components in the urban environment, and interrelations with other spatial levels in terms of floods. By analysing different scales of urban flood risks, it has been argued that further work in the development of risk assessment methodologies is especially necessary at the neighbourhood level, having regarded the significance of this spatial scale for successful flood management.**

KEYWORDS flood risk, assessment, mapping, spatial scale, urban areas

# 1 Introduction

The flood, defined as "temporary covering of water and land not normally covered by water" (European Commission, 2007, Article 2), represents one of the most common manifestations of natural phenomena with often significant consequences and negative effects on the human environment. It is expected that, in the future, flood occurrence will increase due to climate change manifestations (such as extreme precipitation, sea level rise, and the rapid melting of snow), land use changes, continual transformation of natural into built environments, and numerous other human activities, technological failures, and the combination of all these factors. In recent years, in order to prevent the occurrence of floods more successfully and to mitigate their negative impact and numerous direct and cascading consequences, the Flood Risk Management (FRM) approach has been adopted in the political agenda in many European countries.

"Flood risk management (FRM) aims to reduce the likelihood and/or the impact of floods" (Simonović, 2012, p. 14). At the same time, FRM is about learning to live with flood risks, i.e. learning to "accept some degree of risk in return for the benefits to be derived from using land subject to flood risk" (Yoshiaki & Porter, 2012, p. 62). In wider terms, flood risk managment aims "to achieve the right balance between the economic, social and environmental dimensions of flood risk reduction, both today and into the future" (Klijn, 2009, p. 11), and therefore is directly related to sustainable development and the promotion of "the long-term health of associate ecosystems, societies and economies" (Sayers et al., 2013, p. 6).

In general, the FRM procedure can be described by four sets of activities represented in the form of circular process (Fig. 1.1).

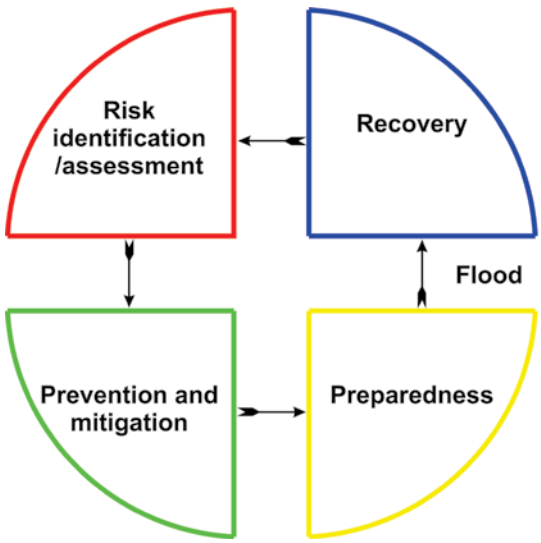


FIG. 1.1 Key groups of activities of flood risk management *(Image by author)*

The first group of activities – *risk identification and assessment* – relates to the recognition and monitoring of the flood risks and includes: collection and analyses of data in different formats and obtained from different sources; development of databases; assessments of hazards, vulnerability and exposure; integrated flood risk assessment; presentation and dissemination of assessment results; development of different flood risk-related maps, and others. All subsequent flood risk management procedures and measures, such as the identification and implementation of structural and non-structural protective measures, building the preparedness for future flood events, or drafting the recovery plans, are informed by the flood risk analysis results. At the same time, risk assessment also informs and is informed by some other fields such as land use planning, basin management, environmental management, or stakeholders' engagement, etc. Both flood risk assessment and flood risk management together belong to the wider Integrated Flood Management (IFM) approach.

The spatial dimension of flood risk has been recognised as one of the main challenges in flood risk assessment, besides "temporal dimension of flood risk and adaptation", "new means to describe the occurrence of flood hazards", and "definition of flood risk – from one to several hazards" (Åström, Arnbjerg-Nielsen, Madsen, Rosbjerg, & Friis-Hansen, 2015, p. 4). Considering flood risk as a necessary basis of flood management, this chapter analyses specificities regarding flood risk assessment from the supra-national to the individual buildings scale and describes the interconnectedness of flood risk at different spatial levels. Urban flood risk assessment has been recognised in this chapter as particularly complex, due to the variety of present factors, interrelations between physical and human components in the urban environment, and interrelations with other spatial levels as they relate to floods.

## 2 Flood Risk

Since the beginning of the 21st century, Europe has been affected by a series of massive flood events. In August 2002, heavy rainfall triggered flood waves along large river systems and caused the death of 110 people in parts of Austria, the Czech Republic, and Germany (Risk Management Solutions, 2003). In the late spring and summer of 2007, a series of extreme rainfall events in England and Wales caused the occurrence of a number of major flood episodes that led to 14 fatalities and affected over 55,000 homes and 6,000 businesses (Marsh & Hannaford, 2007). In 2012, the floods in Krasnodar Krai in southwest Russia, that occurred as a result of the equivalent of five months of rain falling overnight, caused 114 deaths and adversely affected about 30,000 people (Hays, 2013). In May 2014, massive rainfall affected the territory of the Republic of Serbia and caused the rapid and huge rise of the level of water in several large rivers. The catchment of the river Sava was the most heavily affected. Consequently, three immediate effects followed: sudden flooding that led to the destruction of houses, bridges,

FIG. 2.1 The town of Obrenovac in Serbia, which was heavily affected by flooding in May 2014 *(Image by Vesna Urošević, 2014)*

and parts of roads; high-intensity flooding of urban (Fig. 2.1) and rural settlements; and increased flow of underground water that activated landslides. The floods caused 51 deaths and affected about 1.6 million people throughout 38 municipalities in the Republic of Serbia, of which about 32,000 were evacuated during the flooding events (Kern, Vučković Krčmar, Toro, & Jeremić, 2014). Other floods occurred in Athens in 2017 (Smith, 2017), and in France, Germany, and Spain in 2016 (EM-DAT: The Emergency Events Database, n.d).

In the period from 1973-2002, floods caused a total of 264 disasters in Europe, each with at least 10 deaths, affecting at least 100 people, and requiring national or international assistance (Hoyois, & Guha-Sapir, 2003), while the total number of registered floods in Europe in the period between 1990-2016 was 493 (Source: EM-DAT: The Emergency Events Database, n.d.). The ueven temporal distribution of floods and the increasing number of flooding events in recent times (Nones, 2017) indicate that, despite flood protection measures, the probability of the occurrence of floods is increasing. In order to prevent or mitigate negative flood impacts, it is necessary to consider the experience from past flooding events, and to carry out the analysis of *risk* regarding future flood occurrence and impact.

Risk can be defined through its three main determinants: hazard, vulnerability, and exposure (Roaf, Crichton, & Nicol, 2009). When a hazard does not have a negative impact on the human environment, it cannot be considered that it will lead to a disaster, where the value of risk in this case equals zero to minimum (Kron, 2005; Bell, Greene,

Fisher, & Baum, 2005; Armenakis, Du, Natesan, Persad, & Zhang, 2017). In the built environment, the risk of floods increases due to the hazards originating from human activities (such as land use changes, land surface sealing, occupation of flood plains for new developments and reduction of retention areas, weak engineering practice at various spatial scales in the built environment, etc.), climate change manifestations, and some other natural processes (like the natural erosion of river channels).

"An element at risk of being harmed is the more vulnerable, the more it is exposed to a hazard and the more it is susceptible to its forces and impacts" (Messner & Meyer, 2005, p. 3). In general, vulnerability is higher in those areas in which floods did not occur in the past, but are probable in the future, i.e. in those areas where previous flooding events did not result in learned lessons (Blanksby, 2012). Vulnerability to floods also increases when the built environment is subjected to changes that are not systemically verified or controlled, when flood control systems and mechanisms are not established or properly maintained, as well as when a social vulnerability is high (for various reasons). Besides hazards and vulnerability, the potential damage caused by flooding also depends on the exposure characteristics of an area. These characteristics can be represented in a number of ways, from land-use type, to buildings and assets, to the number of people residing or working in potentially affected areas (Poussin et al., 2012).

To determine the risk of floods for a human environment, different spatial scales need to be assessed, from supra-national to the level of individual buildings.

## 2.1 Flood Risk Assessment

As explained in the previous section, and shown in Fig. 1.1, flood risk management activities are implemented within the cyclical, continuous process, following the initial flood risk assessment activity. Therefore, the activities within the flood risk management cycle primarily depend on introductory assessments of flooding events and their consequences. On the other hand, the actualisation of the assessment of the risk of floods and of their consequences depends on the availability of different types of data and the specific needs that inform the assessment procedure. For example, the scope, and details and methods that are used during the assessment carried out by local flood risk management teams are different from the assessment methodology and assessment scope set for national teams. To effectively explain these differences, de Moel et al. (2015) have established the flood risk assessment hierarchy from supra-national, to macro (national), to meso (regional), to micro (local) scale.

Monitoring the data on precipitation, water flows, and the formation of long sequences of data are necessary for hydrologic calculations and the preparation of hydrologic models, which precede the successful implementation of flood protection measures. In cases in which there

is an insufficient sequence of data, different models can be used, from hydro-meteorological, to prognostic, to river basin models, to hydrological, and to stochastic models that enable generating multiple variables (water flows, precipitation) from multiple sites (Marković, Plavšić, Ilich, & Ilić, 2015).

At any spatial scale, flood risk assessment starts with the development of adequate hydrological models. On the basis of obtained results, the maps representing flood hazards are made, and, subsequently, the parameters regarding vulnerable population and assets, possible damages, etc. are defined. According to the probability of different flooding events, for defined time periods, as well as the corresponding damage, flood risk diagrams can be drawn; e.g., rivers stage-damage relationships diagram developed by Shaw (1994, p. 471).

Flood hazard maps are followed by the design of flood risk maps. While maps of threats indicate geographical areas that may be affected by flooding, depending on applied scenarios, flood risk maps provide information on potential damaging consequences of those scenarios for the same geographical areas. Here, all elements that are at the risk of flooding in a certain area (referred to as flood risk receptors) should be identified, and the types of impacts should be defined. Nonetheless, this is a very complex task that includes many influences and uncertainties, such as the number of inhabitants, the impact of floods on social and economic spheres, etc., and thus requires the use of data from different sources (e.g., spatial plans, statistical databases, etc.). Usually, flood risk is represented in maps as low, medium and high risk by using different colours of graphical presentation.

In the design process of the maps of flood hazards and flood risks at least three different scenarios are considered. The first scenario deals with high probability floods and return periods ranging from 10 to 50 years. The second scenario considers medium probability floods and a recurrence interval of 100 years. In the third scenario, low probability extreme events and long recurrence periods of 500, to 1,000, to even 10,000 years, as well as the potential floods caused by damages to dams and embankments, that correspond to mentioned return periods, are examined. According to the hydraulic calculations, flood hazard maps are drawn for every given scenario in such a way as to present borders of flooded areas and water levels, by using different graphical representations.

# 3 Flood Risk at Large Spatial Scales

## 3.1 Supra-National Level

At the supra-national level, flood maps are usually not very detailed, and their resolution ranges from 1-10 km. Here, the global models for flood hazard assessment can be used, and the consequences of floods are presented by the gross domestic product loss or the size of the affected population. Flood risk assessment at the supra-national level also allows for the monitoring of the effects of climate change and population growth.

Supra-national flood risk management is coordinated by international organisations and bodies, such as the United Nations, the World Bank or the European Commission. For managing and monitoring the large rivers whose basins are spread over the territory of several countries, different international collaboration agreements have been made and organisations have been established to manage flood risks.

The United Nations (1991) document, *Mitigating natural disasters: Phenomena, Effects and Options - A Manual for Policy Makers and Planners,* is the pioneering international strategy that provides guidelines for the implementation of three main groups of activities, including: risk assessment, planning and decision making, and effective implementation of strategies for risk reduction. The strategy was launched following the designation of the first International Decade for Natural Disasters Reduction 1990-1999 by the United Nations General Assembly. In that period, the *Yokohama Strategy and Plan of Action for a Safer World* (1994) was adopted, as well as the *Guidelines for Natural Disaster Prevention, Preparedness and Mitigation*. In 1999, the United Nations Office for Disaster Risk Reduction (UNISDR) was established to facilitate the implementation of the *Disaster Risk Reduction Strategy*. Later, the UNISDR brought the *Hyogo Framework for Action 2005-2015* (UNISDR, 2005), the *Guidelines for National Platforms for Disaster Risk Reduction* (UNISDR, 2007), and the *Sendai Framework for Disaster Risk Reduction 2015-2030* (UNISDR, 2015).

In the European Union, *Flood Directive* (European Commission, 2007) deepened the flood risk management approach and set three types of activities to be undertaken by the member states by the year 2015:

- preliminary flood risk assessment (Fig. 3.1), where the goal is to assess the level of flood risk in every water basin district or unit of management, and to select those areas for which flood mapping and risk management plans will be developed;
- flood mapping that includes the development of flood hazard maps according to three scenarios for floods with low, medium, and high probability, as well as the development of flood risk maps that present the potential adverse consequences according to the taken scenarios.

According to the EU Flood Directive, both flood hazard and flood risk maps should be revised every six years;

– development of flood risk management plans, with indicated objectives for concerned areas and the measures foreseen to reach these objectives (European Commission, 2007).

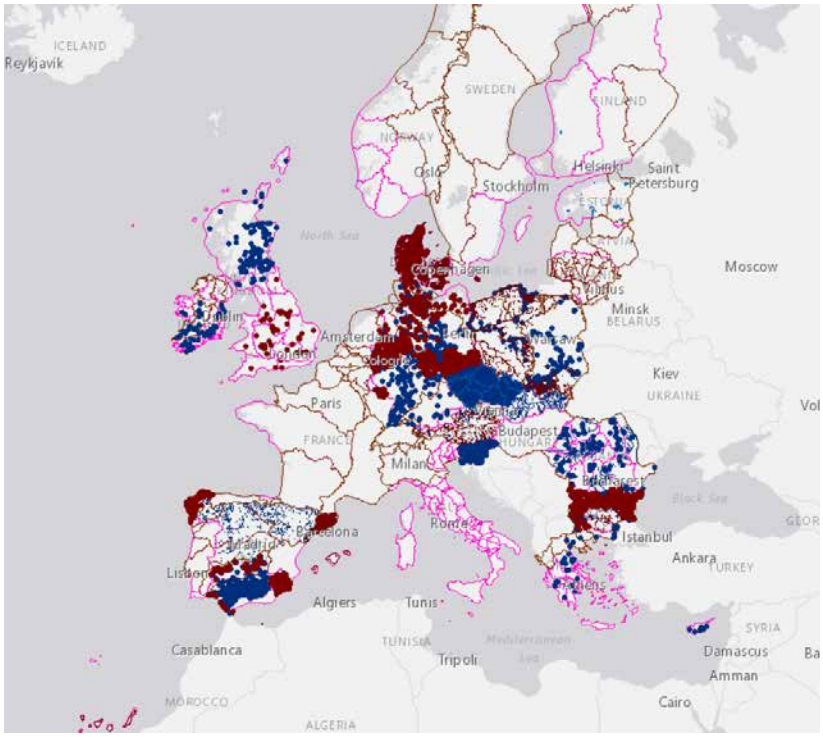


FIG. 3.1 Preliminary flood risk assessment in Europe *(Image by European Environment Agency, 2018)*

Following the completion of the first cycle of implementation of the EU Floods Directive, Nones (2017) carried out an analysis of the results of implementation in eight European countries and noted that, when it comes to the consideration of flood risks, there exist notable area-specific and methodology-related differences. This situation is explained by the absence of standardised nomenclature or agreed practices for flood mapping at global, regional, and sometimes even national scales, requiring stronger collaboration between authorities at different levels, from local to international (Nones, 2017). In addition, there is a need to continuously embody the latest scientific findings into the flood risk management strategies in order to reduce the uncertainty regarding risk factors, as well as to raise the level of flood awareness at all administrative levels and in society as a whole (Nones, 2017).

Despite the noted inconsistencies and the need for further advancement, different European countries and regions have made significant progress in contemporary flood risk management to date.

## 3.2 National Level

According to de Moel et al. (2015), flood risk assessment at the national level can be driven by different goals. In the US, for example, the primary objective is to determine the boundaries of the national insurance programme, while in the UK the objective is to warn the public about the risks, and to define the total risk to which the country is exposed (de Moel et al., 2015). Because of the great number of floods, the priorities in flood risk management in Spain are assigned to "optimizing the available resources in such a way as to obtain the greatest benefits in terms of risk reduction" (Martínez, 2015, p. 7). On the other hand, the main reasons for risk mapping in the Netherlands are the assessment of climate change impact and the facilitation of decision-making regarding the risk management strategies. In addition, actual Dutch flood risk management policy aims to enable additional protection in those areas in which a large number of victims, failures in critical infrastructure, or major economic and environmental damages potentially occur (Ministry of Infrastructure and the Environment & Ministry of Economic Affairs, 2014). In the Republic of Serbia, the *National Disaster Risk Management Program* was presented following the massive flooding events that affected the country in the spring of 2014, in which numerous serious consequences clearly demonstrated a need for the systemic redefinition of the existing concept of flood management. The Action Plan for the implementation of the aforementioned program (for the period 2016-2020) was released in 2016 (Vlada Republike Srbije, 2016). Here, the concept of risk management is based on six components for disaster risk management, and flood risk management represents its integral part. The National Program makes institutional capacity building a top priority and a precondition for successful risk management, followed by the identification and monitoring of the risks.

The resolution of risk maps intended for national spatial level ranges from 100m to 1km. The models used to determine national risk maps are usually two-dimensional hydraulic models with certain simplifications. National risk maps, in addition to the flood risks, also provide an insight into climate change effects and population growth.

## 3.3 Regional Level

Usually, risk assessment maps for regional levels are made for the entire watercourse network and the recurrent period of 100 years (e.g. Fig. 3.2). Both stochastic models that consider spatial dependence between different measurement spots and the precipitation-rainfall models with climatic scenario data can be used for that purpose. Flood risk assessment at the regional level is used to check the effects of the undertaken measures or for studying future development according to the different scenarios of climate change. The resolution of regional risk assessment maps ranges from 25 to 100 metres.

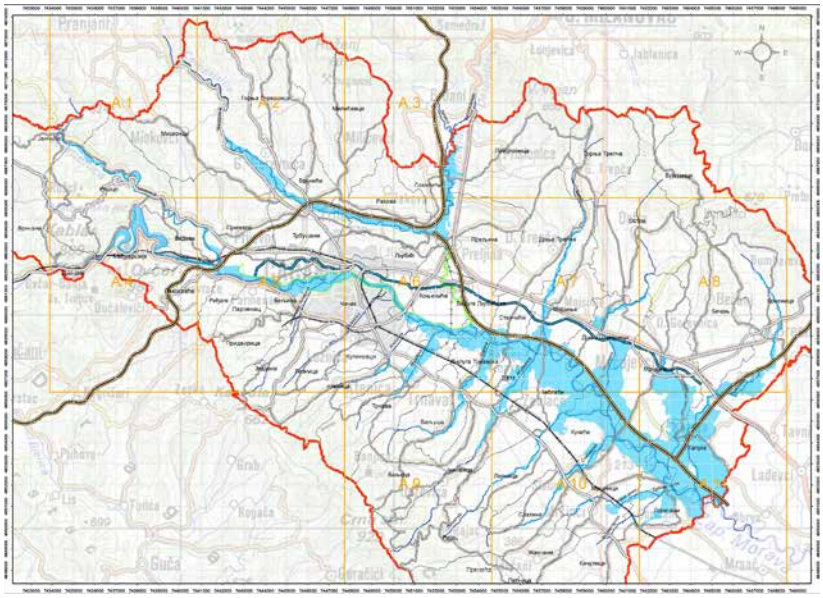

FIG. 3.2 Atlas of threats from large watercourse in the territory of Čačak, for the recurrent period of 100 years *(Image by Jovanović et al., 2014)*

## 4 Urban Flood Risks

Flood occurrence is, above all, related to extreme meteorological and hydrological events. Nevertheless, the floods in urban areas can also occur as a consequence of storms, or tsunamis, and/or due to a range of human activities, such as land conversion, land surface sealing, building in floodplains, inadequate sizing and maintenance of sewage and drainage systems, etc. In urban areas, where risks to people and properties are greatest, flood risk management should be aligned to all types of flooding and the interactions between them (Blanksby, 2012).

Flood risk assessment on an urban scale is based on data regarding terrain configuration, existing hydrological constructions, land use, infrastructures, buildings, etc. and their position. The provision of detailed information at this level is important because local flood hazard maps and flood risk maps (e.g. Fig. 4.1 and Fig. 4.2) inform flood risk management and urban development. During the assessment, detailed hydraulic models are used to obtain information regarding the depth of water, the velocity, and the duration of the flooding event. In addition, the objects that can be affected by flooding are considered, thereby allowing for precise estimation of the potential damage for every single element. The resolution of urban risk assessment maps ranges from 1 to 25 metres.

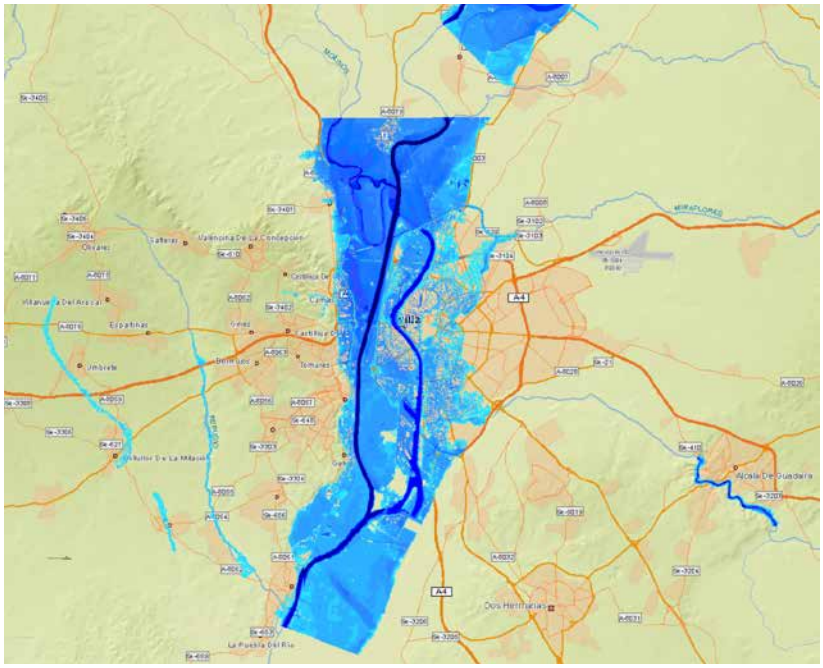

FIG. 4.1 Map of hazard from fluvial flooding over a recurrent period of 500 years, City of Sevilla *(Image by Sistema Nacional de Cartografía de Zonas Inundables (SNCZI) – Inventario de presas y embalses (IPE), 2018)*

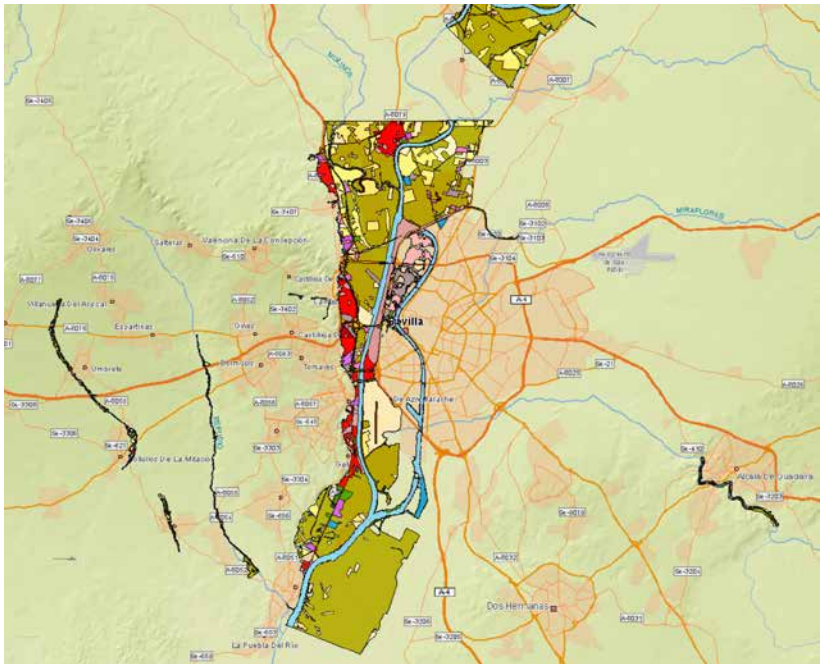

FIG. 4.2 Map of risk from fluvial flooding for the economic activity over a recurrent period of 100 years, City of Sevilla *(Image by Sistema Nacional de Cartografía de Zonas Inundables (SNCZI) – Inventario de presas y embalses (IPE), 2018)*

Jha, Bloch, and Lamond (2012) have illustrated the approach to urban flood risk management by distinguishing between catchment, city, neighbourhood, and building scales. Similarly, Escarameia and Stone (2013, p. 22) have argued that, when considering urban flood risk, it is necessary to observe flooding as "multi-(spatial) level interacting systems which are made up of various components that act as input-output units, including positive or negative feedback loops". Flood management measures differ between the levels of observed urban systems, and only when an integrated approach to all levels has been established, a full effect of flood risk management plan can be accomplished.

As a flood wave can be formed at a certain distance from the urban area, it is necessary to first consider the flood risks from the catchment, and, in that way, to tackle the flood problem closer to its core (Jha et al., 2012). In the framework of integrated flood risk management, the analyses related to the river and water catchment may also extend to regional, national, or supra-national scale.

In the assessment of the risk from floods on urban level, Armenakis et al. (2017, p. 2) have argued that the risk maps are not sufficient to define the risks, and that it is necessary to develop an approach "for the determination of location-based risk indices due to flooding by integrating flood maps, socio-economic parameters, and impact on infrastructure and services". Such an observation confirms the relevance of integrating urban planning and design measures with the flood management, and furthermore the necessity to include other stakeholders in this process, from citizens to local policy makers and different institutions. Similarly, Ran and Nedovic-Budic (2016) have proposed a conceptual framework for spatially integrated policies. According to these authors, the territorial integration between spatial planning (SP) and flood risk management "focuses on consistency (horizontal integration) and alignment among spatial scales (vertical integration)" (Ran & Nedovic-Budic, 2016, p. 71). The key issues that need to be addressed in territorial integration relates to finding the ways of "sharing and exchanging information among neighbouring jurisdictions and overlapping jurisdictions because the SP spatial hierarchy differs from that of FRM" and checking "the consistency and conflict among spatial policy levels" (Ran & Nedovic-Budic, 2016, p. 71).

An integrated approach to flood risk management is further connected with the resilience approach. According to Mileti (1999, p. 32-33), "local resiliency with regard to disasters means that a locale is able to withstand an extreme natural event without suffering devastating losses, damage, diminished productivity, or quality of life and without a large amount of assistance from outside of community". A resilient city, as argued by Godschalk (2003), implies a sustainable framework consisting of physical systems and human communities. It also refers to a territorial entity whose components are able to not only resist, but also to adapt to surprises and changes in regular conditions. In contemporary terms, resistance to floods is, for this reason, combined with the adaptability of the built environment, primarily of its human component. Accordingly, the approach of 'protecting from the water/floods' has evolved into the approach of 'living with the water/floods'.

Therefore, the assessment of the risk of floods in urban areas should also include the assessment of community coping capacity, community vulnerability, community hazard, etc. To that end, different methodologies to measure the aspects of resilience of communities to the floods, such as socioeconomic characteristics, social activity dynamics, experience and perception regarding floods, flood management knowledge, etc. have been proposed (e.g., Bell & Blashki, 2013; Kablan, Dongo, & Coulibaly, 2017; Roder, Sofia, Wu, & Tarolli, 2017).

## 4.1 Neighbourhood Scale

Neighbourhoods represent one of the community components in the network of resilient cities. Although bottom-up initiatives can be used to shape flood management strategies and policy development (Zevenbergen, Veerbeek, Gersonius, & Van Herk, 2008), flood risk assessment at the neighbourhood level has not been given sufficient attention to-date, and a "clear integration between flood resilience and urban design practices at the neighbourhood level has yet to be established" (Serre, Barroca, Balsells, & Becue, 2016, para. 5). The relevance of assessing the flood risks at the neighbourhood level is underpinned by the fact that not all parts of a city are subjected to the equal vulnerability and exposure to the floods (Ojikpong, Ekeng, Obongha, & Emri, 2016; Armenakis et al., 2017). In disadvantaged neighbourhoods and in those areas that are subjected to more intensive climate change manifestations, the assessment of flood risks is an objective priority.

Nevertheless, some efforts have been made to develop methods and tools that would support flood risk assessment at this urban scale. De Risi et al. (2013) have presented an integrated modular probabilistic methodology for predicting flooding risks in a Geographical Information System (GIS) framework. Using the example of informal settlements, the authors have tested the methodology where the determination of risks starts from the definition of rainfall probability curves (climate modelling), continues through the development of flood hazard maps (hydrographic basin modelling), to fragility (vulnerability) of a settlement portfolio (structural modelling), and to the final development of risk maps (De Risi et al., 2013). In addition, the utilisation of GIS systems has been proposed to examine the social vulnerability assessment of flood risk (Fernandez, Mourato, & Moreira, 2016), while Sy et al. (2016) have demonstrated the relevance of a participatory approach in mapping and collecting information on flooding from the local population (participatory-GIS).

In another recent study, Serre et al. (2016) presented a method for assessing urban neighbourhoods' resilience to flooding by integrating flood risks with urban regeneration planning. The results from this research reveal that a number of urban design measures involving transportation infrastructure, land use (open public spaces), and buildings can be used to improve neighbourhood's resistance, absorption, and recovery capacities.

## 4.2 Building Scale

At the scale of a building, risk assessment relates to existing buildings, where the primary goal is to reduce possible negative consequences, and to new buildings, where the goal of assessment is to achieve flood resilience (Bowker, Escarameia, & Tagg, 2007). According to Escarameia and Stone (2013), in both cases, special attention should be assigned to the so-called hotspot buildings that enable community

functioning, and to smart shelter structures that provide a survival place for flood victims.

In the case of existing buildings, risk assessment refers to the assessment of exposure and vulnerability of the building structure. Here, characteristics such as the applied structural system, quality of construction, and materials used are particularly relevant, especially in the case where evacuation is not planned. In addition, for evacuation purposes, the existence and position of exit gates and routes are important. All mentioned building features are assessed in relation to the parameters of the intensity of floods (depth, velocity, and duration of the flood event). To assess the risk of floods to individual buildings, different methods such as orthophotos, sample surveys, laboratory tests (De Risi et al., 2013) etc. can be used. The results aim to provide information regarding potential damage and negative effects on people, i.e. to inform the protective measures.

Flood risk assessment for new buildings is largely informed by the risk from floods at the location in which a proposed building will be constructed. The aim is to determine different design measures that range from wet proofing, to dry proofing, to raising or moving structures, to floating and amphibious structures (Escarameia & Stone, 2013), etc.

## 5 Conclusions

Flood risk management is an approach adopted in most countries of the European Union and is at the process of adoption in candidate countries. Although based on common procedure and measures defined by the *European Floods Directive* (European Commission, 2007), the approach is largely dependent on national and regional conditions and regulations. As floods often affect several neighbouring countries, the development of cross-border collaboration is vital for successful flood risk management at any spatial scale.

Understanding the risk from floods represents a prerequisite for successful risk management and its integration into a systemic resilience approach. This work has shown that the flood risk is assessed using various data and methods that correspond to the assessment needs and the level of detail required for a specific spatial scale. Nevertheless, the risks from floods at different spatial scales are narrowly interconnected, and the complexity of causal relations is best visible at the urban scale. By analysing different scales of urban flood risks, it has been concluded that further work in the development of risk assessment methodologies is especially necessary for the level of a neighbourhood, having regarded the significance of this spatial scale for successful flood management.

In order to prevent the occurrence of flood-related disasters in human environments, it is equally necessary to simultaneously assess flood risk at different spatial scales, and to cover different scales and aspects

of the planning and design of those environments. Furthermore, the assessment of flood risk determinants in human environments relates to both physical structures and community components. Within the approach of resilience, this means that the assessment of the human component and its adaptive capacity is equally significant as the assessment of the characteristics of urban infrastructure, characteristic of individual buildings, etc. All of the aforementioned issues result in greatly complex flood risk assessment processes and require a profound coordination and deep engagement of different stakeholders in assessment procedures, again at different spatial scales.

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# Integrated Approach to Flood Management

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ABSTRACT **Floods are considered to be the biggest of all natural disasters. Rapid urbanisation, economic and social development, climate change and its variability have all altered the hydrological cycle and, within that process, made our communities more prone to flooding. Flood management implies a set of engineering works and non-structural strategies for protection, prevention and mitigation of risk and damage that floods pose to settlements and human lives. Traditional flood protection measures are more focused on managing the safety of the inhabitants in floodable areas. In urban settlements, they are primarily orientated to water collection and conveyance by using the 'as fast as possible' principle. In the light of increasingly prominent climate change and climate variability, traditional flood protection measures need constant upgrading i.e. higher dykes and deeper channels. The chapter focuses on the concept of Integrated Flood Management (IFM), which combines flood mitigation and risk management by considering several key principles such as: water cycle management; the interrelationship between land use and flood protection; the consideration of the various socio-economic, environmental, and governance hazards; and the engagement of all relevant stakeholders in the decision-making process. The general IFM concept is presented together with the most common structural and non-structural measures and solutions. Flood protection challenges and inputs necessary for a successful IFM implementation are discussed. Recent examples of IFM best practices are reviewed, highlighting the role of spatial planning integration in flood management as a promising process that leads towards a sustainable and resilient built environment.**

KEYWORDS flood, flood protection measures, integrated flood management, urban drainage system

# 1 Introduction

Floods are some of the greatest challenges for sustainable development. Approximately 70% of global disasters are linked to hydrometeorological events (WMO, 2009b). Of all natural disasters in Europe, such as earthquakes, landslides, epidemics, floods, droughts, etc., 34% come from floods causing 37% of total damages and making over 57% of affected people homeless (CRED, 2017). The Centre for Research on the Epidemiology of Disasters (CRED, 2017) reports that 63% of all floods occurred in the past 16 years (2000-2016), while the remaining 37% happened in the 20$^{th}$ century. A rapid increase in flood occurrence, which may be associated with rapid urbanisation and climate change, started around the 1950s.

By definition, flood is an uncontrolled overflow of water (rivers, lakes, coastal waters, urban waters, etc.) that covers, for a specific period of time, land that is usually dry (Cambridge Dictionary, n.d.). Flood duration may range from several hours to several weeks, depending on flood cause, on the general condition of the flooded area, and the degree of development and urbanisation (Douben & Ratnayake, 2006).

According to their origin, floods are classified as either a natural disaster (caused by unfavourable weather conditions) or an anthropogenic disaster (caused by human activity).

Depending on the place of occurrence, floods can be rural or urban. Urban areas are typically more vulnerable to floods i.e. less able to resist the hazard or to respond when disaster has occurred (UNISDR, 2004) due to the high numbers of people and building density.

Rural (basin) floods are usually provoked by heavy and/or long-lasting rainfall events, snow melting or by slow development of flood flows due to the exceeding of the natural pathways' capacity (riverine flood type). Poor catchment conditions, such as deforestation and/or mining, increase potential of runoff generation and are a common cause of rural flooding. Other causes of rural floods may be the inadequate design or poor maintenance of the flood protection system, dam failures, landslides, obstructions of the flood way such as bridges, culverts, etc.

Urban floods can be induced by prolonged or heavy precipitation events or by snow melting, but also by brief torrential rain that exceeds the capacity of the urban drainage system. Other conditions that can increase flood occurrence in urban areas are inadequate design and poor maintenance of drainage system elements, failure of the city protection dykes or river inflow into the drainage system during river high waters.

In sprawling areas (EEA, 2006) floods can be both rural and urban. This is due to the specificity of these types of settlements, which represent the spread of urbanisation into the rural landscape.

Management of floods should be a legal obligation and every country should have a flood management plan and strategy. Traditional flood

protection measures address the problem with the focus on safety; to secure a certain area from flooding using probability of flood occurrence as a safety factor.

The chapter presents a different approach that has emerged in recent years, which combines and integrates various aspects (environmental, ecological, social, economic, climatic, technical, and institutional) contributing to the development of a more comprehensive and sustainable flood management strategy.

Integrated Flood Management (IFM) implies a holistic view of the phenomena and adopts the best, optimised combination of structural and non-structural strategies to cover all aspects of flood 'timeline': preparedness; prevention; protection; recovery; and adaptation of strategies in new versions of management plans considering previous flooding experience and the lessons learned. Mitigation and non-structural flood protection measures tend to be very efficient long-term and a more sustainable solution. However, structural measures for flood protection are, and will be, an important element for both existing and new developments. The best management practice for basin and urban flood protection is a wise combination of measures that work along with nature and enhance the landscape functionality, amenity, and provide multi-functional benefits.

Flood management is subjected to a number of challenges that need to be addressed in its process such as securing lives, rapid urbanisation, and climate change. With the IFM approach, each of these challenges is addressed as a multi-objective task. The consequences of rapid urbanisation are mitigated by sustainable flood protection measures mimicking the natural hydrological cycle; the population's safety is increased by raising public awareness and preparedness together with a series of structural measures; resilient flood protection measures can cope with climate change by being able to adapt to variability, etc. These challenges are discussed in Section 2.

The concept of IFM is presented in Section 3, while the most common structural and non-structural measures, traditional and nature-based solutions promoted within IFM are presented in Section 4.

An efficient IFM implementation requires an efficient governance within the several decision-making levels (governmental, public, technical, and managerial). Clear institutional functions and roles, coordination between local, regional, national, and international levels within river basins and a multi-disciplinary approach are important prerequisites for a successful IFM development. Integrating IFM into urban planning and vice versa is especially important. Land-use planning can enhance flood mitigation in flood-prone areas by regulating land utilisation, built areas, and location of infrastructures. The aspects of effective implementation of IFM are presented in Section 5.

The recent flood management examples and best practices are reviewed and discussed in Section 6.

# 2 Flood Protection Challenges

## 2.1 Rapid Urbanisation

Progressive urbanisation considerably increases the risk of flooding due to the impermeability of the expanding soil and territory fragmentation. Urbanised areas interrupt the natural hydrological cycle by changing compartmentalisation of hydrological components. For example, impervious areas obstruct natural groundwater recharge, evaporation and transpiration processes are changed due to decrease of natural (vegetative) land and increase of artificial materials (concrete), and change in land cover increases runoff coefficient that yields more runoff. Beside this, urbanisation leads to poorer ecological conditions, water quality, and habitat.

Usually, floodplains are very convenient areas for living due to their favourable location and fertile soil provided by the rivers. On the other hand, vulnerability and risks for people, property, and crops in floodplains are very high and must be properly addressed. The safer solution would be to reserve floodplains for rivers only. However, this is not always possible due to limited space in highly packed urban areas and the fact that the existing developments cannot be simply removed. In this case, various methods of flood relief may be applied, such as early flood warning systems and flood recovery measures.

However, negative impacts of population growth in cities particularly affect less developed countries, where the urbanisation process is poorly planned. The weak economic status of some inhabitants prevents them from moving to less exposed land, leading to the development of unplanned settlements in floodplains, usually occupied by a poor population. Dense urban areas occupying floodplains leave no space for water during flood events (Jha, Bloch, & Lamond, 2012). In addition to other changing conditions, i.e. increased flood risk due to climate change, vulnerability becomes very high.

Flood risks from increasing urbanisation may be reduced by implementing IFM. Some measures within the IFM approach may reduce the peak runoff and improve water quality; for example: incorporating green roofs on top of buildings, using permeable pavements and parking lots, building green infrastructure for collection and conveyance of stormwater, etc.

## 2.2 Climate Change

Climate change is an ongoing process and should be addressed globally. However, 'local' measures are both desirable and necessary. Various climate models like UKMO-HadCM3, GISS-ER, CGCM3, CNRM-CM3 and many others (Randall et al., 2007) particularly at continental and larger scales. Confidence in these estimates is higher for some climate variables (e.g., temperature try to predict the future change

of climate variables, such as precipitation height and temperatures, in order to prepare the population for such a change. However, besides preparedness, prevention is crucial, but it is not always given adequate attention.

According to the Intergovernmental Panel on Climate Change (IPCC, 2014), the future temperature increase is likely to be between 0.3-4.8°C, depending on the climate scenario used. While the change in the amount of precipitation is not uniform globally, even in regions with decreases in precipitation, the expected overall frequency and rainfall intensity is likely to increase. At the same time, IPCC expects the seawater level to rise by 26 cm by 2065 and 50 cm by the end of the 21st century. This increases the potential for lowland inundation and coastal flooding, apart from many other related problems (coastal erosion, altered tidal regime, etc.).

Climate change is a major source of uncertainty in terms of the common assumption that design flows will remain the same in the future, and that the present flood protection engineering works would withstand the future hydrological regime. On the other hand, individual climate projections are uncertain due to various Global Circulation Models (GCM), downscaling techniques, difficulty in predicting future population and socio-economic growth, etc. The World Meteorological Organization (WMO, 2009a) proposes two potential actions to deal with these uncertainties: (1) the adoption of adaptation measures that do not depend on precise projections of e.g. river flow and (2) the adoption of strong management measures. The same document states that waiting for a less uncertain assessment is an 'irresponsible strategy'; adaptation measures should be implemented because climate change is already taking place. For example, design flood calculations that incorporate projected river runoff increase or decrease due to climate change depend on precise runoff projections. Design for floods will show a necessary design runoff change, i.e. an increase by a particular percentage. However, it is highly unlikely that a full range of expected changes would be included due to the unrealistically high costs, which cannot be justified with the benefits of such a solution. The IFM adaptive management, which changes actions and plans according to outcomes from the established knowledge base that deals with scientific uncertainties and optimised best combination of strategies that provides sustainability and resilience to expected changes (WMO, 2009a), may offer a solution to this problem.

## 2.3 Illusion of the Absolute Flood Safety

Achieving absolute flood protection is an illusion (Kundzewicz, 1999). Kundzewicz & Takeuchi (1999, p. 417) stated that "a more disaster-conscious society needs to be built with better preparedness and safe-fail (safe in failure) rather than unrealistic, fail-safe (safe from failure) design of flood defences". 'Living with floods' implies a more flexible adaptive and realistic approach since absolute protection is not

technically feasible or environmentally possible (European Commission, 2010; Kundzewicz & Takeuchi, 1999; Manojlovic & Pasche, 2008)

The traditional flood protection approach assumed constant hydrological variables and fixed design flood value according to corresponding design standards. However, fixed flood protection measures are not always appropriate. An adequate combination of structural and non-structural flood protection measures, together with damage mitigation measures, is included in the IFM approach. For instance, a set of flood control systems might be combined with flood insurance programmes, as well as with actions aimed to raise the public awareness about the risks run by households located in flood-prone areas. However, traditional flood protection structures such as dykes, floodwalls, or bypass channels will be always necessary for the protection of the existing settlements; at least until they are entirely converted into sustainable and resilient 'water sensitive environments' (Anđelković, 2001; WMO, 2009b).

## 3 Concept of Integrated Flood Management (IFM)

Various definitions of IFM presented in the literature are almost always connected with the concept of sustainability (Kundzewicz, 1999; WMO, 2009a). In order to achieve efficient flood management, the IFM approach ensures the protection and development of natural ecosystems by integrating various aspects of other planning sectors (i.e. land use, environmental, landscape, etc.).

The IFM concept combines water and land resources development at the scale of the river basin. It derives its principles from the Integrated Water Resources Management (IWRM) approach, presented in the Dublin Statement on Water and Sustainable Development (ICWE, 1992) and at the Earth Summit in Rio (UNCED, 1992). At these meetings, the IWRM approach was recognised as a necessity within the concept of sustainability (WMO, 2009b), as well as at many subsequent meetings, of which the most notable is the 2002 World Summit on Sustainable Development held in Johannesburg (WSSD, 2002).

Sustainable development, defined as development that fulfils the needs of present generation without compromising those of future generations (WCED, 1987), should be the goal of all flood management plans.

According to WMO (2009b), there are six key elements to be addressed by an IFM plan:

- managing water cycle as a whole;
- integrating land and water management;
- managing risk and uncertainty;
- adopting the best combination of flood protection measures and options;
- ensuring participatory approach;
- integrating hazard management approach.

*Managing water cycle as a whole.* The hydrological cycle is a natural process of the cycle of water on the Earth. It comprises a balanced equation of water inputs such as snow, rainfall, dew, hoarfrost, and water outputs like evaporation, transpiration, infiltration, interception, and percolation. An important part of the cycle, infiltration, is mostly disturbed in urbanised areas due to land cover changes (i.e. from permeable natural covers to impermeable surfaces). IFM seeks the best way to manage the land phase of the cycle by restoring groundwater recharges through various nature-based solutions.

*Integration of land use and water management* is a crucial IFM element because the hydrological response to precipitation depends heavily on soil/surface characteristics. Information, knowledge exchange, and teamwork within these two planning activities may yield multiple benefits by integrating successful flood protection measures and creating appealing multifunctional landscapes.

*Managing risk and uncertainty* is a part of every development and management process. However, this is especially exacerbated in flood management due to climate change and the fact that the scale of future hydrological conditions cannot be predicted with certainty. 'Living with floods' facilitates flood risk management by providing information and research on flood occurrence and by increasing preparedness and flood awareness. As argued in this section, those measures may mitigate flood risk along with post-flood non-structural measures.

A valid IFM strategy/plan seeks to *adopt the best possible combination of flood prevention and protection measures*. This goal is usually achieved through an optimisation process that requires extensive knowledge about climate, the basin characteristics and specific conditions in the region, and previous experience. In this process, building professional capacities in the field of flood management (e.g. in hydrology, hydraulics), as well as in socio-economics, policy development, and regulation, plays an important part in the IFM implementation.

*The participatory approach* means involvement in the decision-making process of all relevant stakeholders such as residents, planners, and policy makers. However, the coordination between all parties at national, river basin, and local levels is one of the IFM challenges that needs to be addressed in particular.

Flood associated hazards need to be addressed through *integrated flood hazard management.* This means aggregation of measures dealing with all possible hazards such as landslides, storm surges, dam breaks or dykes failure, rather than treating them one at a time. This approach usually demands that IFM is a part of the broader risk management activity.

## 4 Flood Protection Measures

Over the centuries, various (usually structural) measures have been undertaken to protect settlements from flooding. Traditional and conventional measures address water quantity and, to some extent, water quality problems. Growing demands and the consequent challenges of rapid development require a more adaptive, sustainable, and resilient approach not only strictly related to water aspects, but also relating to ecology in terms of the quality of the landscape, and to the interaction of all the socio-economic sectors involved (Chocat et al., 2007).

This approach could substantially reduce the exposure and vulnerability of the population, and the built environment, to floods. Flood protection measures can no longer be considered the only interventions applied to a specific territory but need to be integrated into a variety of planning actions.

Traditional flood protection measures are implemented through structural solutions such as conveyance canals or river diversion structures, multifunctional reservoirs, urban drainage systems, dykes along the river, etc.

Nature Based Solutions (NBS) (Božović et al., 2015) combine various structural options for managing urbanisation and climate change problems in a more sustainable way. Depending on the locations in which NBS are planned and realised, this approach is named differently:

- The Centre for Neighborhood Technology (CNT, 2011, p.1) states that *Green Infrastructure (GI)* is "a network of decentralized stormwater management solutions such as green roofs, trees, rain gardens and permeable pavement that can capture and infiltrate rain where it falls, thus reducing stormwater runoff and improving the health of surrounding waterways";

- *Sustainable Drainage Systems (SuDS)* have gradually been designed and developed over the past 20 years in the UK to minimise the impact of urban surface waters on new and existing developments (Woods-Ballard et al., 2015) and maximise benefits (water quality and quantity, facilities and biodiversity) from surface water management;

- *Low Impact Development (LID)* is an approach developed in North America and Canada (US EPA, 2017), similar to GI networks, aiming to preserve, restore, and create green spaces;

- *Best Management Practice (BMP)*, also developed in North America and Canada, is mostly oriented to water pollution control besides other benefits (water quantity control, amenity, etc.) (US EPA, 1993);

- As a broader, macro-scale concept, *Water Sensitive Urban Design (WSUD)* represents a holistic approach to the planning and design of urban development (BMT WBM Pty Ltd, 2009; Moreton Bay

Waterways, Catchments Patrnerships & WBM Oceanics and Ecological Engineering, 2006);

– *Low Impact Urban Design and Development (LIUDD)* is an approach adopted in New Zealand that combines low impact development and water sensitive design (Puddephatt & Heslop, 2007; van Roon & van Roon, 2005). It is a synthesis of a number of approaches: LID; Conservation sub-divisions (CSD); Integrated Catchment Management (ICM); and Sustainable Building/Green Architecture (SB/GA).

All these principles and methods aim to minimise the impact of urbanisation on nature, mimic natural (pre-development) hydrological cycle, improve amenity and urban living conditions, solve flood and water scarcity problems, and provide better adaptability to climate changes and other stresses on natural resources.

## 4.1 River Engineering and Structural Flood Protection Measures

Traditional flood protection measures entail engineering works on river courses and floodplains to protect settlements from flooding (Ghosh, 1997). As absolute protection is not possible, engineering works are made to decrease the risk of flooding and susceptibility to flood damage as much as possible.

Flood risk assessment is usually calculated using the concept of the 'return period' (*T*) or 'probability of occurrence' (*P*). *T* is a time interval, usually expressed in years, in which a maximum runoff (estimated from the historical flood data sample) is expected to occur at least once. This analysis is based on statistics and probability theory and for the extreme flood events *T* is equal to the reciprocal value of *P*.

For flood defence design, a common *T* value is assigned to each structure, which defines the degree of protection needed for that specific asset. For example, the most used *T* values are 10, 20, 100, and 1,000 years, depending on the asset (5-10 years for drainage systems, 100 years for dykes, 1,000 years for dam evacuation systems, etc.) (Chow, Maidment, & Mays, 1988). According to the return period assigned, based on the statistical analysis of the observed flood sample data, the design flow is evaluated and further used for that specific design.

The uncertainty of the calculated design flow lies, among other things, in the calculation methodology, i.e. the flood frequency estimation method used; the uncertainty of parameter estimation for a particular method; and the uncertainty of the observed data length and quality (Kjeldsen, Lamb, & Blazkova, 2014), as well as in weather unpredictability. For instance, new extreme events such as floods that occurred in Bosnia and Herzegovina and in Serbia in 2014, significantly changed statistical values of historical flood data (a 100 year return period design flow became 50 years or less). Consequently, in such cases, structural flood protection measures should be redesigned or

improved to better respond to the changed conditions. This approach often leads to the adoption of expensive and unsustainable measures (Maksimovic et al., 2015).

The various structural flood protection measures can be grouped into five main lines of intervention:

- conveyance systems or measures to decrease capacity;
- flood storage systems for runoff volume attenuation;
- drainage systems for urban runoff management;
- systems that separate water from population;
- emergency measures.

*Conveyance systems*. River flooding occurs when runoff exceeds riverbed capacity so that the excessive volume is discharged over the banks to the surrounding land. Measures used to increase river capacity are: channel cleaning to decrease flow resistance, channel deepening/ widening, and diversions (bypass channels) for peak volume relief. By changing the river capacity, the natural morphology and ecological river regime are usually disrupted and, over time, may tend to shift the problem downstream or upstream. Among conveyance systems, bypass channels are a good solution for runoff distribution, although these interventions are not always possible due to specific on-site conditions.

*Flood storage systems* include various types of reservoirs, accumulations and other similar spaces and devices provided to accept and attenuate the flood volume. Different types of dams, embankments and retention basins provide water storage as an integral part of the overall flood protection system. The storage capacity changes the dynamics and quantities of water rising and water outflow by decreasing and postponing the time of peak flow (Fig. 3.1), which is very favourable for the downstream areas.

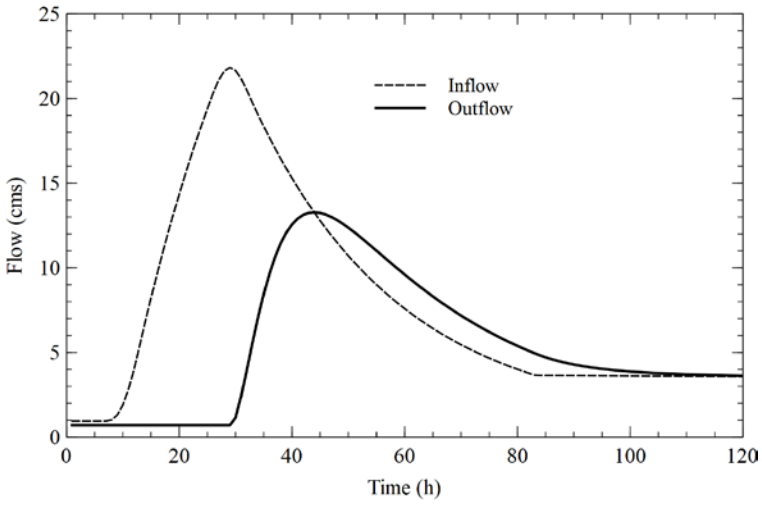


FIG. 4.1 Hydrograph transformation in accumulation *(Image by author)*

Urban *drainage systems* constitute an essential infrastructure of the urban space, often part of the underground utilities. Therefore, their

proper functioning is very important. It consists of the inlet devices that accept stormwater close to its origin and direct it to the underground system of pipes. The traditional urban drainage system collects and conveys urban waters as quickly as possible by using primarily structural measures i.e. pipes, gutters, curbs, culverts, etc. Such a system is not easily adaptable in case of extreme events as it is very costly to increase the water capacity that can be safely drained off by the system. Moreover, this type of intervention does not eliminate future flooding issues because it lacks sufficient flexibility to adapt to plausible change (Zhou, 2014).

*Separation systems*. Dykes are linear constructions, artificial barriers that carry water away from the land and stop the flooding of lower areas. The dimensions of dykes depend on the design flow determined for a specific river (or other water body) and hold only for that specific design flow. Further improvement of this protection system is usually very expensive and requires large construction works. However, if appropriately planned, it remains one of the most effective security measures, especially in urbanised areas. With the same purpose as dykes and embankments, floodwalls are vertical barriers constructed using solid, impermeable materials in the immediate vicinity of the water (river, sea). Floodwalls are usually located on riverbeds and quays (wharfs), preventing excess river flow from reaching urban areas. This flood protection solution may be very useful, especially if it is constructed to be mobile. Appropriate land use and building regulations can also contribute to the protection of the population living in floodable areas (Jha et al., 2012; Tucci, 2007). For example, zoning helps to identify flood-prone areas and their risk of flooding; building regulations in floodplains allow development under special conditions that provide flood resistance (elevated building, buildings without cellars, coating with waterproof building materials inside and out), etc.

*Emergency systems*. In extraordinary events, flood protection measures may fail. In this case, in order to protect living areas and mitigate damage, emergency measures are necessary. The most common intervention is the deployment of sandbags and temporary/mobile flood barriers that prevent floods from overtopping dykes or retention basins. The evacuation of people usually takes place, along with the strengthening of the existing defence structures (WMO, 2011). In these cases, prevention measures such as the alertness of the population and the availability of information play important roles alongside the implementation of emergency measures (Lendering, Jonkman, & Kok, 2015; Molinari, Ballio, & Menoni, 2013)

## 4.2 Sustainable and Resilient Flood Protection Measures

The need for an integrated approach to flood protection was recognised a few decades ago (UNCED, 1992, ICWE 1992). The shortcomings of traditionally used protection systems motivated an alternative approach for managing floods that would be more sustainable and resilient. Consequently, nature based solutions started to be developed and

implemented worldwide, as already discussed in the introduction of this section. A combination of flood protection structural elements and various non-structural prevention measures (i.e. building regulations and appropriate land use planning, relocation of buildings out of flood-prone areas, suitable design of inundation areas, early warning systems, preparedness for and awareness of floods, flood insurance, etc.) provides the optimal flood protection. In the group of alternative, nature-based structural measures, several solutions are described here: excessive runoff management at the source of origin, (i.e. individual object or location), replacement of pipe drainage systems with green solutions, storage and infiltration facilities for collection, attenuation, infiltration and treatment of storm water. Each system described here successfully solves the problem of excess water, while at the same time each represents a part of nature and natural water flows without disturbing hydrological cycle. These flood protection systems, together with non-structural options, briefly discussed at the end of this section, meet the majority of the IFM key principles listed in Section 3.

**Source control systems**

Source control measures are structural solutions for solving a 'problem' at its source. Some of the measures are green roofs, rainwater harvesting, proprietary infiltration, and treatment systems. These facilities are not typical flood protection elements such as traditional structural measures but may substantially contribute to decreasing peak runoff and peak volumes especially in cases of small rainfall events (Woods-Ballard et al., 2015).

*Green roofs* or vegetated roofs of buildings have a certain potential to decrease the peak runoff if properly designed and connected on site with other elements of an urban drainage system. According to Beyerlein, Brascher, & White (2005), a typical green roof with 20 cm of topsoil may reduce the runoff and storage by 20%. Besides rainfall volume control, these elements may contribute to the improvement of the urban ecosystem and landscape as well as of the conditions of urban life in general.

*Blue roofs* are designed to store water during rainfall events. These roofs have a higher storage capacity than the green solution, and hence blue roofs are a more suitable flood control solution.

*Rainwater harvesting systems* are components that collect water from impermeable surfaces such as roofs, parking, and other paved surfaces and reuse it for various purposes, such as toilet flushing, gardening, etc. and/or for groundwater and river base flow recharge through infiltration.

By combining the described facilities, a significant decrease of flood peak and runoff can be achieved.

**Green infrastructures as drainage systems**

Traditional urban drainage systems work on the principle of collecting rainwater and conveying it in the shortest amount of time. Green

infrastructure can represent a multi-functional and more sustainable alternative. Sustainable urban drainage options as alternatives to traditional conveyance elements (i.e. pipes) comprise filter strips, filter drains, and swales (Woods Ballard et al., 2015).

*Filter strips* are vegetated, mildly sloped elements used to slow down the runoff and provide settling and filtering of the suspended solids it carries, as well as eventually infiltrating one part of its volume depending on site conditions. As a pre-treatment, they are normally used in combination with other elements, such as infiltration or storage systems. Filter strips are usually inserted along streets and highways.

*Filter drains* are linear shallow trenches filled with porous material for faster drainage. A perforated drainage pipe is placed onto the base of the trench to collect and convey stormwater to the downstream drainage system. This system is usually placed along the edges of highways to enable the sub-base layer drainage (Ellis, Chocat, Fujita, Rauch, & Marsalek, 2004).

*Swales* are vegetated channels that, similar to filter strips, slow down, store, attenuate, and convey stormwater. As swales have the capability of trapping sediment and silt, they have a certain degree of pre-treatment potential.

These elements can reduce runoff peaks and volumes by over 50%, depending on specific site conditions and event size (Ashley, Nowell, Gersonius, & Walker, 2011; Garcia-Serrana, Gulliver, & Nieber, 2016; Topalović, 2009).

**Storage facilities**

Storage facilities are active protection measures suitable for rainwater and riverine floods (Urbonas & Stahre, 1993). Their general purpose is to collect peak flood volume and attenuate it for a period of time. The collected water is released slowly and is infiltrated or treated and then used for different purposes (water reuse systems). Some sustainable storage facilities are bio-retention swales; rain gardens; pervious pavements and parking lots equipped with underlying storage devices; attenuation storage tanks; detention basins; and wetlands and ponds. The storage effect of vegetation and soil in these facilities, ground depressions, and wetlands, has an important mitigating effect, especially in minor and medium-scale floods.

Besides controlling water runoff peaks and volumes, *bioretention systems,* shallow depressions vegetated with certain grass and plants species, act as primary purifiers of polluted water. Moreover, these elements may contribute to the improvement of the environmental microclimate conditions, increase the biodiversity and attractiveness of the urban landscape.

*Rain gardens* are downsized bioretention systems for storing and treating only small portions of the stormwater from a single site, such as roof or parking lot. Due to their size, they are less engineered than

bioretention swales (Woods Ballard et al., 2015), but the possibility for their installation is generally bigger.

*Pervious pavements and parking lots* are constructed with underground storage/retention tanks where collected runoff can be slowly released to a drainage system or downstream element. Storage capacity is designed according to the specific probability of the occurrence of runoff (e.g. once in 10 years). There are different types of pervious pavements and parking areas, such as concrete elements with small openings for percolation or concrete elements combined with grass.

*Attenuation storage tanks* cannot be considered as parts of a green infrastructure. Rather, they are a component of highly engineered systems constructed with various types of pipes or geocellular storage blocks. Each element in these modular systems can store a certain amount of water which, when exceeded, will travel to the next element. The number of elements and overall tank capacity depends on the runoff that needs to be stored to effectively reduce the risk of flooding. The main advantage is the ease of assembly. Expanding, or shrinking, the storage capacity by adding or removing individual elements generally does not affect the built environment, nor the activities taking place on the surface.

In these underground structures, stored water is released in a controlled manner, infiltrates the surrounding soil, or is reused.

*Detention basins* are vegetated depressions designed for storage and attenuation of the excess water during the flood events. Between one event and another, they are dry and serve for other purposes (parks, playgrounds, etc.). For that reason, special attention should be paid to their adequate design. Detention basins are usually used in locations where infiltration is not recommended for some reason (i.e. groundwater pollution). Apart from the stormwater quantity control, water quality control is provided through the settling of sediment, silt, and some pollutants.

*Wetlands and ponds* are storage systems permanently filled with water but with additional free volume to accept a certain amount of stormwater. The biological removal of pollutants and suspended solids is provided through the selection of vegetation planted in these pools. Therefore, both wetlands and ponds attenuate and treat stormwater, thus providing great ecological benefit, wild habitat, and amenity.

**Infiltration systems**

Infiltration systems are specially constructed to enable groundwater and river baseflow recharge by infiltrating collected water. They are soakaways, infiltration trenches, infiltration blankets, or basins (Woods Ballard et al., 2015). Each of these elements uses the same principle of infiltration, whereas differences lie in the shape of the elements, which can be linear (trenches and soakaways) and flat surfaces (blankets), or curved for water retention.

*Soakaways* are manhole-like pits filled with porous material for temporary water storage, before its infiltration into the adjacent soil. Depending on the on-site situation, a pre-treatment facility to improve water quality before it infiltrates the ground is usually installed prior the construction of soakaways.

*Infiltration trenches* are linear elements usually aligned along roads or parking lots. Their water collection principle is similar to that of a conventional culvert system, but with a significant difference: instead of conveying all the stormwater to the closed drainage system, from where it goes to the recipient (usually rivers, lakes etc.), the collected water infiltrates the lower layers specifically designed for soakage and groundwater recharge.

*Infiltration blankets* are shallow infiltration surfaces usually placed beneath larger urban flat surfaces such as parking lots, playgrounds, sport fields, etc. Stormwater disperses within the blanket through a perforated pipe system connected to a drainage system. The main advantage of these systems is unhindered land use above blankets.

*Infiltration basins* are specially shaped and usually vegetated depressions in which stormwater is released from a drainage system and stored for the period needed to infiltrate the adjacent soil. Therefore, it is very important to determine the basin location according to the soil infiltration capability. Similarly to detention basins, infiltration basins can host parks, playgrounds and other recreational facilities. For this reason, it is important that the water can flow away as fast as possible.

**Non-structural options**

Non-structural options mainly tackle the processes of flood mitigation and flood recovery. Flood preparedness combines a series of plans and strategies for raising public awareness of flood risk, its consequences, and actions to be performed before and during the event. Various forms of training, exercises, and public information measures may also be conducted (Anđelković, 2001).

*Emergency response measures* are a part of the public information and regulatory (policy and organisational) management based on a mobilisation and disaster plan, including coordinated flood fighting units during the event.

*Flood recovery measures* also include non-structural flood protection options, i.e. flood insurance that allows property owners to be compensated for the losses incurred during floods.

*Rehabilitation measures* aim to restore life conditions before a flood event takes place. They can be prepared and organised in advance (having a prepared plan in order to speed up the process of recovery).

A combination of the above measures with a proper set of area-specific and tailor-made structural measures coordinated over all relevant sectors provides a good integral flood management practice.

## 5 Integrated Flood Management Implementation

A successful IFM implementation requires several inputs at governmental, public, technical and management levels. Clear institutional roles and functions are necessary to provide objective and straightforward policies together with accompanying regulations and legislation based on the IFM practice strategies. An efficient flood risk management policy should consider both low and high probability flood events and include the participation of stakeholders and residents in the decision-making process.

According to Ran & Nedovic-Budic (2016), including flood protection in spatial planning requires the integration of (i) territory (consistency across boundaries and integration of relevant information from different sectors), (ii) governmental policy (consolidation of information from different stakeholders and tools for decision support and analysis) and (iii) institutions (joint platform for the exchange of information, knowledge and interest). Land use planning in flood-prone areas contributes to flood mitigation by allocating spaces and facilities that can withstand floods (The World Bank, 2017). However, in order to secure the successful integration of an adopted flood strategy into spatial planning, clear policy, regulations, and legislation must be defined.

A river basin is a dynamic complex system that involves water, soil, sediment, pollutants, and nutrients (WMO, 2009b). In hydrological science, it is well known that uncontrolled deforestation alters natural surface runoff regime due to change in land cover resistance (runoff coefficient). This change increases not only the river runoff but also sediment deposits, which directly influence hydraulic regime i.e. decreases river flow capacity (McCuen, 1998). Urbanised areas with their increased impermeable surfaces could drastically alter even relatively small parts of catchment conditions in the basin. Road networks could function as dams by blocking and diverting natural waterways. Therefore, since the response of a basin to rainfall (rainfall-runoff relationship) can be affected by human activity, an integrated approach, harmonised on the basin level and coordinated at local, regional, national and international levels is a crucial requirement for efficient IFM implementation.

According to WMO (2009b), 90% of the world's population live in countries whose river basins are transnational. This is common because rivers have always been natural boundaries between states and regions. Therefore, the coordination between countries at a basin scale is necessary. In practice, international commissions are formed to coordinate policy, strategy, and the implementation of IFM at the basin level. For example, the International Sava River Basin Commission aims to establish the international regime of navigation, sustainable water management, and prevention or limitation of hazards (droughts, floods) within the Sava River Basin. The International Commission for the Protection of the Danube River is a transnational body that aims to safeguard Danube River resources for the future generations, establish

and maintain a healthy (unpolluted) and sustainable river system, and establish damage-free floods.

Another practical example of coordination at a basin scale is the establishment of the River Contracts (RC); i.e. inter-institutional agreements that allow the adoption of a shared set of regulations within an integrated strategy for water resources management and river basin recovery (Guerra, 2013). These contracts support concerted initiatives and active participation of all local/territorial actors (Scaduto, 2016). They are voluntary strategic and negotiated planning instruments that pursue the protection, correct management of water resources, and enhancement of the river territories, together with the safeguard from the hydraulic risk, contributing to local development. The first river contract was signed in France for the river Thur in 1983. The importance of this instrument for river basin management and for spatial/urban planning was globally recognised in the Second World Water Forum held in The Hague in 2000.

For integration and coordination across different sectors, the full participation of community-based institutions is necessary. In such a process, it is very important to develop a shared IFM strategy at the basin level with full participation, decision making, and implementation by local institutions. On the other hand, local and community capacity building is necessary to meet the IFM requirements.

The sharing and management of information is also a precondition for an efficient IFM approach (WMO, 2009a). For example, the transboundary exchange of flood data is necessary for the implementation of a flood preparedness plan for downstream regions.

An efficient IFM strategy can be achieved if various sectors are involved in the decision-making process. A multi-disciplinary approach entails the collaboration of all interested parties, with a focus on obtaining multi-dimensional results (i.e. results that satisfy all participants) of the decision process. This would firstly integrate spatial planning, landscape design and flood management (European Commission, 2010; Jackish, Zehe, Samaniego, & Singh, 2014; McBain, Wilkes, & Retter, 2010; Ran & Nedović-Budić, 2016; Sayers et al., 2013; Tucci, 2007; The World Bank, 2017)

During the implementation of adopted IFM measures, monitoring, evaluation, and incorporation of the acquired knowledge is a very important part of the process. Decisions based on knowledge and experience will serve as an instrument for dealing with uncertainties involved in flood management and risk assessment. This 'adaptive management' enhances the current practice whenever new knowledge and data are obtained. Learning from the differences between the expected and real outcomes changes plans and actions accordingly (WMO, 2009b).

# 6 Best Practices on Flood Prevention and Protection

## 6.1 German Approach

In Germany, following flood disasters in the Elbe River Basin in 2002, the existing flood management model shifted towards IFM. Analysis of the flood management system in light of the later floods showed that incomplete or missing flood warning systems, poor maintenance of flood structures, lack of risk awareness, and inadequate response were the main weaknesses (DKKV, 2004). In the same document, the German Committee for Disaster Reduction (DKKV) highlighted three key elements of flood management:

- emergency response that should limit adverse effects of the flooding;
- recovery actions taken after the event for repairing damage and re-establishing the pre-event living standard;
- risk reduction through flood control measures to prevent inundation and adapted use of flood-prone areas.

Following those key findings, several preventive measures for the future IFM were proposed. The most effective measure for decreasing flood damage is the preservation of flood-prone areas that have not yet been built on. Alternatively, in flood-prone, largely built up areas, several preventive building design and management measures may be applied (elevated building configuration, buildings without cellars, permanent or mobile barriers, building usage adopted to flooding i.e. low value of utilisation in the endangered floors, coating with waterproof building material inside and out, etc.).

Other risk reduction measures examples are through financial instruments, such as insurance of the assets or flood fund, as well as non-financial tools such as establishment of the basis of common measures to minimise damage before the next event.

For the purpose of reduction of flooding volumes, several measures are envisaged. In the floodplains, more space for water is necessary in order to provide natural retention. Reforestation of arable land is conducted for the improvement of water retention capability and decrease of the runoff coefficient. Where appropriate, adaptive agricultural practices (i.e. growing particular crops that decrease runoff or are capable of retaining more water) on flood plains is planned in order to diminish flood hazards. All these measures can help during small to middle-size flood events, while for large events additional solutions must be applied, i.e. dams as a technical (traditional) measure for controlled water retention.

Early flood warning systems are recognised as important instruments for risk reduction. The prompt information that the proper functioning of this system can provide, ensures the successful application of emergency measures such as population evacuation and the heightening of floodwalls.

Despite the implementation of many of these measures, the biggest flood in hydrological terms for the last 60 years occurred in Germany in 2013. Even though flood damage was considerably lower (around €7 billion in comparison to €11 billion in 2002), the 2013 flood was more severe than the 2002 event (Thieken et al., 2016). This event constituted a further benchmark for post-evaluation of flood management changes implemented after the 2002 flood, revealing substantial flaws and required improvements, for example, the necessity to better connect flood hazards to spatial planning and urban development policies; to promote more comprehensive preparedness and mitigation measures within the properties and to adopt a more effective emergency system.

## 6.2 Making Room for the Rivers – Dutch Approach

The implementation of the *Room for the River Programme* (Ruimte voor de rivier, n.d.) started in 2007 and ended in 2015 by restoring the riverine natural floodplain in order to protect inhabited areas at risk.

Due to the fact that more than the 55% of Netherlands, one of the most densely populated countries on Earth, lies on floodplains, huge dykes prevent flooding by the major rivers. In addition, a complicated system of drainage ditches, canals, and pumping stations keep the lower parts dry for settlements and agriculture.

A growing awareness of the challenges posed by climate change influenced the Netherlands authorities to change the flood control strategy by giving more space to the river flooding rather than continuing to raise the level of dams. According to the *Room for the River Programme,* dozens of dykes have been moved back inland. The idea is to lower and broaden floodplains, build diversion channels, and provide temporary water storage areas while creating biodiversity, aesthetic, and recreational values.

'Making room for river' includes several actions that aim to provide more retention for increasing flood volumes (Zevenbergen et al., 2013). Floodplains are excavated to make new parallel channels for collection and conveyance of excess water. Temporary storage facilities are built where site conditions allow. Dykes are relocated inland, or strengthened where provision of room for rivers was not possible. To increase runoff capacity, riverbeds are deepened and all obstacles/ objects along rivers are removed.

*Room for the River* is considered an exceptional programme because it brings together water management, spatial planning, and landscape design.

The evaluation of this integral approach showed that five main items are essential for its effective implementation (Zevenbergen et al., 2013):

– a clear vision for integrated flood protection;

- the accounting for multiple interests within the flood management process;
- a multi-level governance;
- design freedom in planning process;
- and adaptive management principles.

The programme's main goals are (a) flood protection – the reduction of the probability of flooding; (b) creation of the new or restoration of the old landscapes to increase their environmental value, (c) establishment of a multi-level governance aimed at strengthening the collaboration between national, regional, and local administrations.

## 6.3 Making Space for Water – UK Approach

In 2004, the UK Government published the *Making Space for Water* consultation document (DEFRA, 2004) as an answer to the severe flood events that occurred in 1998 and 2000.

In the context of increasing flood events and the need for adaptation to climate change, *Making Space for Water* aims to minimise the threat to people and properties from floods and to provide better and more sustainable environmental, social, and economic conditions through a comprehensive, integrated, and forward-looking approach.

The main principles within the new strategy (DEFRA, 2005) concern the integration of adaptive measures to climate change in the entire flood management process; the promotion of education, information, and flooding awareness-raising activities; and the integration of flood risk management in land use planning.

Concrete improvement solutions concern both rural (e.g. improving wetlands), urban (e.g. improving drainage system), and coastal (e.g. reshaping the coastal line) environments, aiming to increase or restore their ecological services and, at the same time, to deal with floods, coastal erosion, and other threats.

The possibilities for the restoration of natural defences aimed at decreasing and slowing down the flood runoff have been tested on various areas in different years. Encouraging results (Pilkington, Walker, Maskill, Allott, & Evans, 2012) anchored this idea within the *Making Space for Water* programme so that nature harnessing for flood defence, along with the exposure to floods reduction measures and living with floods principle form the main pillars of this approach.

## 6.4 Integral Urban Drainage Management – Blue Green Dream

The increase of impermeable surfaces in urban areas has a great impact on the natural environment and leads to a series of consequences. Waterproofing reduces the runoff to the subsoil layers that decreases

the natural water table and generally alters the hydrological cycle. As the surface runoff increases, it generates a larger load on urban drainage systems causing floods during increased precipitation. This load often exceeds the maximum amount of stormwater that can be accepted by existing urban drainage systems, thus demanding costly interventions to increase its capacity.

This problem cannot be easily handled by conventional urban drainage systems. The *Blue Green Dream* project (BGD) developed by Imperial College London and funded by Climate-KIC (EIT) combines the best of the Nature Based Solutions (NBS) to achieve urban sustainability and climate change resilience (Božović et al., 2015). The BGD endeavours to develop a new planning system to increase urban resilience and decrease vulnerability to the negative effects of climate change and extreme weather conditions. The focus is on interactions between urban water infrastructures (i.e. urban drainage systems) and green infrastructures, additionally combined with other relevant urban ecosystems.

Dealing with this challenge implies achieving three main objectives:

- strategic spatial and urban planning;
- unification of communal services in the area of urban water systems, green areas and other urban ecosystems (water, food, energy, heat islands, air quality);
- efficiency of resource usage.

The achievement of those goals entails the abandoning of individual solutions and embracing integral, multidisciplinary planning and design with optimisation of interactions between urban ecosystems (urban solutions, green infrastructure, renewable energy, water cycle, pollution, building solutions). With this approach, multiple benefits may be obtained such as increased urban resilience to droughts and floods; reduced water and air pollution and reduced risk of heat waves; better health and comfort in cities; increased building energy efficiency; increased biodiversity and urban agriculture and improved general quality of life. Many BGD solutions serve the above goals: retentions/accumulations; detention basins; constructed wetlands and biofilters; green areas that decrease the surface runoff; infiltration systems with treatment possibility; green roofs and green walls; water reuse systems; green streets for cooling and water retention and treatment; permeable parking lots and pedestrian areas; systems for increasing the energy efficiency of buildings (shading) and systems for decreasing air pollution and noise levels with vegetated panels.

In 2015, the United Nations Development Programme Bosnia and Herzegovina (UNDP BiH) started the project *Interactions of Flood Management and Innovative Spatial Planning* as a strategy for mitigation of climate change impact.

Within the framework of this project, the BGD principles have been used in the feasibility studies for two towns that were severely exposed to floods in the last decade: Srbac and Jajce. The BGD concept application

was developed by Professor Čedo Maksimović from the Imperial College London. In the pilot project (Maksimović et al., 2015) for Srbac, a sports hall was renovated using EPA's Storm Water Management Model (US EPA, n.d.). The renovation, which was based on BGD, includes a green roof, rain harvesting system, and porous pavement for the existing car park (occupying only 20% of the overall asphalted area around the building), with the addition of vegetated infiltration trenches on the downstream side and routing the runoff from impermeable to permeable areas. The renovation substantially changed the appearance of the building and its surroundings (Fig. 3.1), while the stormwater runoff from this site, directed to a conventional drainage system, decreased by 88%.


FIG. 6.1 BGD reconstruction of the sports hall in Srbac *(Image by UNDP, 2015)*

In the municipality of Jajce, which was affected by severe flooding events from the Rika River, there is a plan to provide a multifunctional accumulation system for storing flood volume while simultaneously providing recreational and tourist facilities. Depending on the accumulation technical solution (dam height), the downstream runoff may be decreased by up to 65% and thereby will provide safer living conditions in the downstream settlement of Rika.

## 6.5 Best Practices Comparison and Discussion

The aforementioned flood management programmes represent good examples of the shift from traditional flood protection towards more flood resilient solutions. Generally, this approach can be called 'risk-based approach' or 'risk management' since the used strategies aim to reduce overall flood risk (de Moel, van Alphen, & Aerts, 2009) the EU has adopted a new Directive (2007/60/EC. However, these programmes reflect the IFM approach and cover some (or all) of the five flood management goals: prevention, protection, mitigation, preparation, and recovery.

The four programmes consider the integration between spatial/urban planning, ecological/landscape design, and flood prevention/protection

measures as a prerequisite for their implementation. While in the German approach this is mainly oriented toward 'clearing' floodplains to reduce flood risk by reducing exposure, the Dutch approach envisages recreational, touristic, amenity, and other services within spaces anticipated for excess water.

In the UK's and BGD's approaches, the integration between spatial planning and flood defence measures, includes not only floodplains but the whole region, involving infrastructures and upper parts of the basin where substantial flood defence/prevention measures can be placed (e.g. accumulations, reforestation, etc.).

The BGD strategy deals with all consequences of climate change (such as heat or cold waves, extreme winds, etc.).

Non-structural measures are the least represented in the Dutch approach. The flood management still relies mainly on engineering works with one of the highest design return periods in the world (from 1/2500 to 1/10000) (Bubeck et al., 2015). The *Room for the Rivers* programme introduces the integration of the engineering works (expanding floodplains) with nature conservation and the provision for other uses of floodplains in dry periods (e.g. recreational, touristic, aesthetic). The underuse of non-structural measures is probably because of the high structural protection level developed over the last 800 years and the fact that flood probability is usually low (Klijn, Asselman, & Van Der Most, 2010), contrary to the level of awareness of the hydraulic risk by the population, which is very high.

Conversely, the German approach potentiates non-structural measures, especially for flood preparedness and recovery (early warning system, insurance). However, for large events, flood management still relies on structural works such as high dykes and large accumulation basins. In this regard, the UK approach is very similar to the German one.

The main difference is that usual flood protection measures are replaced with strategies to restore urbanised areas in order to mimic the natural runoff condition (i.e. natural hydrological cycle) and maximise natural flood protection systems. The *Making Space for Water* approach relies less on traditional structural measures and more on their sustainable alternatives, which are described in section 4.2. Similarly, the BDG approach comprises additional multifunctional elements leading to more sustainable solutions (e.g. by reusing excess floodwater to deal with other urban system problems).

## 7 Conclusions

Flooding is one of the greatest natural hazards that affect the global population. In the last 16 years, flood occurrence in Europe has doubled due to rapid urbanisation and climate change.

Floods are usually caused by heavy rainfall and torrential storms. Some of them occur due to anthropogenic causes such as dams or a dyke failure. Urban floods may be a result of poor drainage system design, maintenance, or lack of adaptability to changes.

Traditional flood protection measures mainly deal with the safety of people and protection of resources. The reliability of engineering works for flood protection started to be challenged by climate change and the consequences of human activities in areas that are considered as well-protected. This led to the reconsideration of the existing flood management approach in many countries (Bubeck et al., 2015) in favour of more sustainable and resilient solutions. While still necessary, traditional measures cannot provide absolute protection and need to be amended to achieve more flexible flood protection and mitigation solutions, water quality improvement, amenity, and improvement of overall living conditions.

Integrated Flood Management (IFM) provides a holistic approach that combine structural and non-structural strategies and, therefore, covers all aspects on the flood 'timeline': preparedness; prevention; protection; mitigation; recovery; and post-flood updating. Mitigation and non-structural flood protection measures tend to be more efficient and long-term sustainable solutions. However, structural solutions for flood protection remain very useful, especially for existing settlements.

Several important key actions define a successful IFM programme: managing the hydrological cycle; integrating spatial planning and flood management; managing risks and uncertainties; adopting the best combination of flood protection strategies and measures; ensuring a participatory and multi-hazard approach.

Land use planning can enhance flood mitigation in flood-prone areas by regulating locations, uses, and structural measures. This plays a central role in flood management due to several important reasons: land use type has a significant effect in runoff generation that defines flood magnitude; the implementation of flood protection structural measures has to be incorporated into land use planning process for current and future developments; susceptibility to damage can be reduced through land use regulations (e.g. land use in floodplains). Moreover, the integration of flood protection measures in urban plans should provide multi-functionality along with amenity and appealing landscapes.

The successful implementation of IFM programmes requires clear institutional roles and functions, coordination at all levels of authority within the basin, coordination between sectors, a multi-disciplinary approach, information sharing and management, upgrading of IFM according to knowledge base development, and changing conditions within river basins.

Flooding is a natural component of the hydrological cycle. However, the frequency of their occurrence increased significantly due to

changes of climate and land use. The problem is further enlarged with the poor management of territories and resources located in risk zones. Unfortunately, in many cases, it is only after large floods and associated hazards that flood management is prioritised in the political agenda of governments and local administrations. However, risks and consequences of floods can be diminished through good flood management that follows the principles of IFM presented in this paper, which will no doubt continue to be improved and developed in the future.

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PART 3

# Territories

# Transformations of Urban Fabric and Resilience Building

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ABSTRACT **In several parts of the world, global flows of capital are triggering rapid transformations of the urban fabric and the rural hinterlands. The effects of real-estate acquisitions by foreign investors and market-driven development can be witnessed with the emergence of regenerated city districts and the urbanisation of city fringe areas. The chapter explores some of the non-market oriented development patterns needed to support sustainable urban transformations. The objective is to reconsider urban development driven by an ecologically conscious approach which could lead to a resilient urban fabric. The networks binding together urban and rural settlement spaces is highlighted. Interrelations facilitate exchanges of resources, capital, and information. Such networks establish an underlying system that supports the cohesion of urban and rural communities. Urban growth, limited to mainly the development of real estate investments, does not deliver resilient and people-friendly built environments. Instead, urban development objectives need to include sustainable resource management, support for biodiversity, and develop food production capabilities. Given the global issues such as climate change and massive human migration towards cities, the capacity to adapt to environmental pressures becomes vital. To replace short-term growth objectives with long-term sustainability agendas, behavioural changes incentivised by ecological compensation schemes are considered.**

KEYWORDS urban transformations, networks, development objectives, ecology, resilience

# 1 Introduction

The growing awareness of urban development driven by short-term economic growth objectives is a serious issue being discussed in several disciplines (Bloom, Canning, & Fink, 2008): urbanisation processes since the 1944 *Bretton Woods Agreements* on new currency management systems (Van Dormael, 1978); the internationalisation of post-industrial capitalism; the end of the Cold War (Frank & Gills, 1996); and the globalisation of financial markets have gradually influenced the characteristics of metropolitan city development.

In the 1980s, the idea of globalisation began to be used to describe exchanges of goods, services capital, and information transcending national boundaries (IMF, 2008). Cities have become the 'command centres' (Sassen, 1991) for multinational corporations attracting international talent and foreign direct investments. According to the economists David Dollar and Aart Kraay (2004), globalisation has helped to reduce poverty and income inequality. Their study shows that during the 1990s, in the countries that embraced globalisation, the per capita income increased three-and-a-half times faster than in countries that did not rapidly adapt to a globalised economic system (IMF, 2008).

While a liberalised global economy has lifted millions of people out of extreme poverty, critics of globalisation highlight the fact that an internationally integrated economy benefits the independently wealthy while the salaries of all income groups do not increase significantly (Chatham House, 2015). Some of the negative impacts are the exploitation of a low-income workforce by multinational firms in underdeveloped countries. In parallel, employment opportunities in developed nations are being eroded by employing low paid workers in emerging economies.

This chapter draws on discussions and research findings from on-the-topic literature, synthesising the discourse on global issues affecting resilience in territories and urban transformations taking place. Section 2 introduces the causes of global issues affecting society, the environment, and the economy. It discusses some of the international capacity-building for resilient cities that is taking place. Section 3 describes how rapid, uncoordinated urbanisation impacts the environment. This section explains the idea of ecology and space as capital to be protected. Section 4 handles the changes taking place in food production systems, and adaptations of agricultural settlements. Section 5 presents possible directions for biodiversity preservation. Section 6 unfolds the more responsible use of depleting ecological capital. Finally, section 7 explains how multi-functionality in ecological and social networks may contribute to the building of resilience in territories, and the transformations of urban fabric.

## 2 Contextualisation

The 2008 global financial crisis (Patomaki, 2009) has increased the public awareness of the fragility of the international networks of transnational investment transactions and the banking systems. On the one hand, the internationalisation of emerging markets can support the development of poorer nations; on the other hand, the interdependence of markets can cause damages to developing economies during a slow-down of the global economy. The phenomenon of an accelerated integration of global markets calls into question the underlying principles driving short-term economic growth objectives, and the long-term sustainability of urban development projects.

The urbanisation processes that overemphasise the development of new super-prime residential developments seek to attract foreign capital from the wealthy of the globalised economy. This trend has negative impacts on low- and middle-income communities in cities. Urgent concerns are the inadequate preservation of environmental resources in urbanised areas, potential risks of a global food price crisis (Headey & Fan, 2010), and the protection of habitat for biodiversity. The narrow focus on land use for property development does not take into account environmental pressures of future climate change, flood risk, soil erosion, and pollution. The making of cities, which takes into consideration adaptive capacities for an unanticipated crisis such as human migration, variable economic cycles, and the effects of climate change on the environment, have now become an urgent aspect for sustainable urbanisation.

The geographer and political economist David Harvey (2014, para.6), states that "Urbanization has increasingly constituted a primary site of endless capital accumulation that visits its own forms of barbarism and violence on whole populations in the name of profit. Urbanization has become the centre of overwhelming economic activity on a planetary scale never before seen in human history".

His words describe the acute imbalance in development priorities, which drive the current urbanisation pattern. Harvey points at the Chinese experience which has dominated the urbanisation process for the past thirty years. Examples of real estate development in cities such as Dubai, London, and Mumbai indicate similar trends. The ever-growing expansion of mega-cities, swallowing peri-urban and rural areas for the purpose of economic growth, is expelling communities (Sassen, 2014), reducing sites for food production, and deteriorating the habitat for biodiversity.

Accordingly, adverse urban phenomena leave territories in a state of crisis (Bianchetti, Cogato Lanza, Kercuku, Sampieri, & Voghera, 2015). It causes dissatisfaction to communities (Harvey, 2014) struggling to maintain dignified livelihoods in overdeveloped cities. Evidently, the long-term future recovery of 'territories in crisis' would suggest the need for an overhaul of the urban development pattern. A paradigm shift based on human values and sustainable priorities for development

are being proposed at policy level by emerging global superpowers as China. Although the concept of a sustainable city has a longer tradition in western urban theory (Grober, 2012), it is still a relatively recent concept adopted in the Chinese urbanisation policy (Wang, Hui, Choguill, & Jia, 2015). In similar ways, global issues are affecting urban areas in different continents regardless of the maturity of a national economy. Measures designed to implement behavioural change and sustainability-oriented urbanisation policies are gradually being embraced in emerging economies such as Africa (Messerli & Messerli, 2008), where urbanisation may be a relatively recent phenomenon.

While issues transcending national boundaries persist, each geographic region has specific circumstances for which particular resilience strategies are being developed as part of national policies and international cross-border agreements (EC, 2017; Gualini, 2003). Given the complex interconnectedness and interdependencies of cities, new analytical and thinking skills for future urban innovation are necessary, as well as an integrative approach to urban planning. In the midst of the intricate networks interwoven with agricultural land mosaics, ecological landscapes, parts of urban fabric, dispersed forms of human settlements, and uncultivated land, it is increasingly challenging to analyse the multiple layers of ecologies and land uses that have an impact on territories.

## 2.1 Causes, Issues and Capacity Building

The identification of the causes for environmental and social distress in cities can only be accomplished with a multi-disciplinary team of specialists. Deep research into the underlying network and systemic features for a particular territory suggests the need for a case-by-case methodology for analysis. Comparison of innovative strategies and ideas applied in different countries are important steps toward assessing the feasibility and resilience of building projects. Capacity building and international transfer of knowledge is being promoted by organisations such as the Rockefeller Foundation with the *100 Resilient Cities* movement. Exchanges of information and insights are rapidly adding to this body of knowledge internationally. Replacing the destructive objectives driving urban development with green and socially responsible agendas becomes a key purpose for long-lasting city transformations.

Moreover, the embedding of new cross-border ecological corridors between city and countryside for enhancing territorial resilience and productivity must be explored. Certainly, a comprehensive understanding of the negative and positive externalities affecting the integrity of territories is essential. A critical part of an ecology-restructuring endeavour is to identify the causes of the regional transformations that are taking place (Milman & Short, 2008). Resilience appraisals may help to better understand the strengths and weaknesses of a territory in distress. By addressing the vulnerabilities of settlements (Rodin, 2014), higher degrees of resilience could be achieved. The rebuilding

of ecological continuities by remediating and opening up environmental corridors may play a vital role. This could be achieved, for example, through the extension of the edges of hedgerows and green amenity strips of land along transportation networks at the transitional zones between urban and rural areas, to amplify the benefits of ecosystem functions for settlements and biodiversity (Forman & Baudry, 1984).

The overhauling of distressed settlements into productive territories is a rapidly growing research field (Nelson, 2009). Fundamental to the aim for the longevity and resilience of settlements is the need for the perpetual adaptation of the survival tactics, and livelihood strategies, of communities. Further sustainable use of resources and the protection of the environment from external pressures must be stressed as the necessary future direction. Human activities and migration, in a web of global economic transactions, are creating new challenges for the adaptive capacities of cities. As societies, economic cycles, and global systems of exploitation evolve over time, in parallel, the tactics for improving resilience and adaptive capacities need to evolve. Correspondingly, the adaptations rely on state-of-the-art ingenuity in social innovation, science, and environmental technologies (Preston, 2012). For instance, the transition from fossil fuel consumption to clean energy consumption in existing family dwellings may be an adaptation of settlements.

## 2.2 Concepts and Rationalisations

The ever-expanding urbanisation process worldwide is faced with the challenges of creating equal opportunities for all people, and the competition over limited resources. The following paragraphs outline some of the recurring discussions found in scholarly and policy research. While urban theories that describe urbanisation processes are helpful in understanding the complex phenomena, they are not absolute theorisations in the current chapter. In distinct cultural and academic traditions, differentiation of seasoned research interests may be found. Recurring themes of the ongoing urbanisation processes are the 'global' nature of the phenomenon, the increasing study of 'network' formations, and the relationships of 'urban-to-rural' areas.

In various research publications, the current processes of urbanisation are discussed under the rubric of the *Urban Age* (Burdett & Nowak, 2011) which is partly concerned with the population growth globally and migration of people into mega-city regions. While this trend has lifted millions of people out of poverty, it has also caused an uneven development of urban agglomerations, the countryside, and the 'in-between' territories. Rapid urban expansions cause pollution to environmental resources and disruptions to ecosystem services (The Worldwatch Institute, 2016). At the global scale, the urbanisation activities that transcend state-territorial boundaries are also being studied and theorised as the phenomenon of a planetary urbanisation process (Brenner, 2014).

Propelled by internationalisation, the immaterial flows of capital, information and specialist experts are forming networks of exchanges and knowledge ecologies (Bathelt, Malmberg, & Maskell, 2004). Such global flows of knowledge have little or, in some cases, no relationship to settlement spaces or the environment. The detachment of globalised economic activities from territories leaves some communities behind - in terms of development and progress. This is causing social, economic, and environmental degradation of settlements.

In some cities, high-density urban development may contribute to sustainability by sharing common urban infrastructures, avoiding the duplication of expensive investments, rationalising the land-use and improving employment opportunities. Nonetheless, the negative externalities of densely developed urban areas are becoming an extreme problem for municipalities. The formation of dispersed settlements in urban areas, inadequate access to green amenity resources of nature, pollution, and spread of pathogens in high population neighbourhoods are some of the issues found in over-developed metropolitan areas.

In contrast to advocates of high density urban development, a long tradition of research into dispersed networks of urban fabric is gaining attention. The 'diffused city' (Indovina, 1990) which conceptualises an urban fabric of low-density settlements at the territorial scale represents an alternative and plausible form of urbanity.

The artificial boundary between urban and rural fabric is being redefined by a shift to an urban-rural continuum (Eppler, Fritsche, & Laaks, 2015) discourse of territories. The concept of the *Horizontal Metropolis* (Secchi & Viganò, 2013) is capitalising on the benefits of a dispersed urban fabric, environmental networks, and connectivity. In this particular type of urbanity, metropolitan and agricultural activities occur simultaneously. The binaries of the urban and rural are dissolved - while emphasising horizontally organised settlements, 'porosity' (referrring to the idea of accessibility in urban space and the removal of spatial segregations), and ecological infrastructure. It is conceived to enable a more sustainable approach to urbanisation and the building of environmental resilience. The provision of ecological resilience may, for example, mean the allowance of a spare capacity of river networks to be able to cope with the potential risk of flooding.

## 3 Uncoordinated Urbanisation of City-Territories and Impacts on the Environment

The *Sustainable Development Goals* (SDGs) for 2030 were adopted in 2015 by the United Nations. Eight of the official seventeen goals directly address environmental, inequality, and wellbeing concerns. The sustainability goal topics include poverty eradication, health, clean water, clean energy, sustainable cities, climate action, life in water, and life on land. The seventeenth goal emphasises the need to cooperate globally. "A successful sustainable development agenda

requires partnerships between governments, the private sector and civil society. These inclusive partnerships built upon principles and values, a shared vision, and shared goals that place people and the planet at the centre, are needed." (UN, 2015, p. 26).

Greater cross-border cooperation, necessary for larger-scale regional urbanisation projects, would be in line with the SDGs for 2030. The speed of urbanisation results in uncoordinated development, distortions in economic cycles, and demographic instability. The steep decline of community resilience is an issue found in several metropolitan settlements globally (Wallace & Wallace, 2008). The inadequate preparation for potential disasters in urban agglomerations is a serious slow-burning stress (Button & Schuller, 2016; Rodin, 2014). It is a systemic issue likely to compromise the social cohesion and ecological stability in growing cities. In order to pre-empt social unrest, and to give support to distressed communities, the sharing of environmental resources, and reforms to the urbanisation pattern, need to be urgently implemented.

## 3.1 Evolving Nature of Urbanisation and Emerging Issues

The phenomenon of urbanization itself is highly adaptive to socio-economic, political and geographic conditions (Lambin & Meyfroidt, 2010). General characteristics of its occurrence are described below.

In its broadest sense, urbanisation is characterised by the extension of urban built-up areas and the migration of people from rural to urban areas (Wang, Garg, Smith & Tao, 2016). Nevertheless, each geographic region may experience urbanisation at a different speed, with different sets of issues, and it may be conditioned by local circumstances in space and time. Equally, it can be an evolution through adoption of urban behaviour by a rural population (Keeble & Tyler, 1995). For example, farmers may be utilising online retailing platforms to distribute organic agricultural produce to buyers living in metropolitan areas. In parallel, further stages of this movement can be a 'reurbanization' - which supports the redevelopment of land and retrofitting of buildings within cities. Other developments include the process of 'suburbanization', initiating the growth of settlements at the outer boundaries of cities (Carlino, 1985). Alternatively, the idea of 'counter-urbanization' suggests that people move from inner urban areas to rural areas and villages outside of cities (Hyun, 2010).

New, evolving types of urbanisation processes will create as yet unknown challenges. To engender better and more democratic forms of urbanities, the rethinking and new rationalisations of territories are needed. The global economic slow-down and state of environmental crisis urges the definition of new urban questions (Secchi, 2010). The escalating social-dualisation, the need to decarbonise energy generation, and the potential impacts of climate change create new problems for urban practitioners and policy makers. Solutions to these issues require flexibility, innovation, and insight.

Given the unavoidable global population growth expected in the next twenty to thirty years, major urban transformations need to be responsibly managed. Influencing such territorial transformations for the better should be a shared responsibility of society. Concerted efforts should benefit future generations. Deep systemic changes are taking place in the way that people choose to live and in how cities function (Lorek & Vergragt, 2015). Some of the changes comprise the transition from fossil fuel to clean energy consumption, and the idea of developing data-driven or 'smart-cities' to optimise the use of energy resources. For example, the use of Information and Communication Technologies (ICT) in rural, dispersed settlements outside of the main urban centres has a gradual, positive effect on the social and economic network support offered to developing territories. Evidently, this process of transformation opens up choices to adopt metropolitan ways of life outside of the larger urban agglomerations.

## 3.2 Ecological and Spatial Capital

New urban paradigms for a sustainable co-existence, resilient cities and community wellbeing are emerging. Liveability will not only be a result of accumulating capital and assets. More importantly, ecological, spatial capital and the ability to accommodate change will be determining factors. Resilience will be contingent on belonging to social support systems, people-to-people relationships, social capital (Secchi, 2006), and the ecological stability in new urbanised areas.

In other words, a crucial part for creating people-oriented and socially just urban development (Pieterse, 2013) is the provision of access to the environment, space and the equal right for all citizen to participate in urban life (Harvey, 2003). People suffering spatial injustice in territories (Soja, 1996) are often socially and economically marginalised. The accumulation of land and appropriation of environmental resources (Rulli, Saviori, & D'Odorico, 2013) by real estate investors create divisions between formal and informal urban developments. Processes such as natural resource extraction and land grabs become mechanisms for excluding people from different socio-economic or cultural backgrounds. The spatial strategies of segregation and integration (Secchi, 2010; Soja, 1996) are most evident in mega-cities. Some examples are the development of gated communities for the wealthy, or the forming of informal communities for people with no legal rights for settling in cities. Competing global cities seek to attract foreign capital into high-end residential developments (Wu, 2001). As a consequence, this development drives lower income and socially marginalised communities into peri-urban areas. Ultimately, people are forced to live in less desirable areas, away from their places of employment and the centres of economic activity.

Spatial capital is closely interrelated to the access to environmental capital (Blaschke, 2006). The quintessential resources such as daylight, air, water, open green space, farm land, and forestry are becoming scarce assets in highly urbanised areas (Sander & Zhao, 2015). Due to

the inadequate provision of environmental infrastructure in built-up areas, the absorption of pollutants, heat island effects, and urban ventilation become compromised.

For rural territories and the hinterlands, the eco-system services are a critical environmental capital. The environment provides indispensable environmental carrying capacities for both the countryside and metropolitan areas. To perpetuate life in cities, intrinsic environmental resources need to be protected from exploitation and overuse in the hinterlands. Uncoordinated urbanisation processes, human migration, and population growth impede on the environmental carrying capacities of eco-systems. The expansion of mega-city agglomerations need to be reorganised in a way to avoid unintended, irreversible consequences to the environment.

## 4 Adapting Urban Territories for Self-Sufficient Food Production and Transformations of Agricultural Settlements

The 2007/2008 food price crisis has highlighted the relevance of innovation in food production for territories (Sonnino & Beynon, 2015). Food security is recognised as a critical component of resilience building for settlements (Barthel & Isendahl, 2013) and urban transformation projects by governments, planners and design professionals. The expansion of urban areas is causing a reduction of land dedicated to agricultural activities. Additional negative aspects are the deterioration of soil for farming (McMichael, 2014) and a disconnection of communities with sites of food production (Turner, 2011).

Recent innovations in urban renewal projects attempt to reintroduce food production into cities, for instance by using green roof areas for growing vegetables (Specht et al., 2014). Giving the opportunity to households to carry out their own farming activities in cities helps to alleviate the burden of food insecurity for urban administrations. Supporting urban communities to take up agricultural activities plays a critical role in a wider sustainability agenda in metropolitan areas. Derelict urban plots and abandoned buildings are being utilised for farming (Tornaghi, 2014), as found in community rehabilitation projects by municipal administration, trapped in a decline of former industrial activities (Mah, 2012). Detroit is an example of a city in which communities reintroduce farming activities, due to the decline of the automobile industry (Daskalakis, Waldheim & Young, 2002). The rebuilding of livelihood strategies and greater control over food provision through farming could be ways to increase food security.

In parallel, there is a growing trend in which people living in cities are trying to reconnect with the rural hinterland (Sonnino & Beynon, 2015). New communication technologies enable greater optimisation and precision farming (Finn & Donovan, 2016) to be adopted by agricultural communities. Innovations in food production methods in rural areas

can occur at multiple levels. Larger scale community-wide agricultural consolidation and modernisation projects try to upscale agricultural production to achieve higher levels of efficiency. In other cases, urbanites with specialist ICT skills enter into subcontracted relationships with local farmers to disseminate the know-how to apply adaptive farming decisions based on data from soil, weather forecasts, the tracking of volatile commodity prices and market opportunities (Akhtar, Tse, Khan, & Rao-Nicholson, 2016). Better optimisation of farming can help to reduce financial losses and lift rural communities out of poverty (Bulte, Lipper, Stringer, & Zilberman, 2008). The innovations and the updating of food production practices bring about positive transformations in rural and urban areas.

## 5 Emerging Practices for Biodiversity Preservation

The urbanisation of nature reserves, if not planned carefully, diminishes the habitat for biodiversity sustenance. The preservation of ecosystem services, in which biodiversity can be nurtured and maintained, calls for a development approach in which the integrity of key ecological, topographical, and geographical features in territories will not be compromised by urbanisation (de Groot, van der Perk, Chiesura & Marguliew, 2000). The restoration of original ecosystem services plays an equally important role in mitigating further loss of biodiversity.

For instance, in densely developed urban centres, the mimicking of ecosystem service functions (Pedersen Zari, 2016) in the built environment could be achieved by retrofitting urban paving into permeable surfaces, utilising building envelopes for vertical greening, and installing vegetation substrates on roof surfaces (Oberndorfer et al., 2007). The recreation of eco-systems within developed settlements would be designed to attract vanishing and new species into cities to increase the density of biodiversity. Absorbing agricultural activities in cities may contribute to a diversification of farming produce and greening of the environment (Viljoen & Bohn, 2014). A sustainable transformation and renewal of urban fabric may be accomplished by avoiding the creation of boundaries between built environment and natural ecologies such as forests, hydrological systems, or agricultural land.

Urban renewal visions such as the *Greening of Detroit* mission, founded by Elizabeth Gordon Sachs in 1989, take the initiative to restore the arboricultural infrastructure in the city. Furthermore, a richer range of biodiversity species in flora and fauna may be promoted (Steffen, Grinevald, Crutzen, & McNeill, 2011) by the blending of biological ecologies, wild life, and ecologies of the anthropocene (Ellis, 2011). In other words, the recycling of land cultivated by human beings and the mixing of different uses of land may create diverse habitats for people and biodiversity. Projects such as the Manhattan *High Line* park and the *Garden by the Bay* in Singapore are paradigms for the creation of liveable environments for biodiversity (McDonnell & MacGregor-Fors, 2016). A diverse range of visions for more balanced

transformations of cities are being tried by designers, communities, and city administrations. Projects that look at restoring health and wellbeing for people, ecology, and wildlife may have a higher likelihood of becoming resilient environments.

City projects that do not consider the preservation of ecological capital for future generations may benefit from the advice by specialists in ecology (Hull, 2008). Next generation sustainability-driven ideas for the making of cities need to take into account resource conservation and eco-urbanisation (Wang, Deng & Wong, 2016). Projects impacting the ecology and settlements would consider an effective allocation of resources (Agrawal, 2001) to achieve long-term sustainability goals. Some examples are the investment into clean sources of energy, such as wind and solar power. By pursuing development, the inevitability of consuming environmental capital needs to be supplemented by giving back ecological infrastructure in territories which are deprived of ecological resources. This would imply the construction of new urban landscapes which can provide ecosystem services to cities (Andersson et al., 2014). Planning new urbanisation and economic corridors in remote, disadvantaged territories is unavoidable for sustainable development and poverty eradication. New linkages of urbanisation corridors need to act as platforms in which productive settlements can emerge and co-exist with ecology.

## 6 Responsible Use of Environmental Resources

Facing the issue of resource scarcity, new ideas on sharing ecological resources in disadvantaged territories are crucial in avoiding the full exhaustion of environmental space capacities (Burgess, 2000). Natural resource extraction, causing the full depletion of environmental capital, needs to be reconsidered. More efficient use of resources would require an approach based on sharing ecological resource, minimisation of waste, and the avoidance of overuse (Miller, 1995). Ecologically responsible resource extraction by businesses and communities can be influenced by society, policies, and education. Changes to consumption pattern in society start with adopting an environmentally significant behaviour of individuals (Stern, 2000). Larger scale systemic adjustments to induce an eco-centred economy require government interventions and international collaboration (Hubert, 2002).

New policies and eco-credit trading systems are emerging in an attempt to influence resource consumption (Saeed, 2004). Environmental credit systems are being tested to curb further pollution to air, water, soil, and to try to mitigate climate change (Poveda, 2011). Some of the measures are the establishment of sustainability point systems for businesses and individual households (Zeidan, Boechat & Fleury, 2015). Eco-credit systems, such as the EPA's air emissions trading program, allow businesses to offset emissions of pollutants by acquiring credits from more eco-friendly entities. Environmental policy frameworks protecting poor territories from resource extraction and

the environmental degradation caused by wealthier cities require regulation by environmental protection laws. Some of the known credit incentive systems are carbon, water, and land-use credit trading schemes (Muradian, Corbera, Pascual, Kosoy, & May, 2010). A further monetisation of sustainability-credits and environmental resources as water, clean air, and soil may help to raise awareness of the global issue of ecological resource depletion.

Additionally, programmes that are designed to guide organisations and people to adopt eco-friendly behaviour require further development. Environmental protection laws would need to be in place for pollution fines and penalties to be higher (Freeman et al., 1992) than the cost of installing decontamination facilities. In this way, an incremental transition to an environmentally responsible use of resources would be adopted by the industries and by society. Payments for ecological services and eco-compensation schemes (Zhang, Bennett, Kannan & Jin, 2010) are gradually being incorporated into national development policies in China, for example. Key standpoints are based on the idea that anyone who ruins the environment also needs to rehabilitate it; further, anyone who contaminates the environment should compensate for it financially (MEP, 2007; Zhang, Bennett, Kannan, & Jin, 2010).

Partly due to the increasing amount of solid waste produced in larger cities, territories outside the larger urban agglomerations will need to allocate reserves and sources of income for the reinstatement of health, welfare, and environmental remediation. Lower-income, economically-deprived territories struggle to fund adequate regeneration, infrastructure upgrading, and territorial reconstruction projects (Roberts, Sykes, & Granger, 2016). In order to counteract this vicious circle, resource protection programmes, policies, and environmental protection credit systems need to be incentivised. Rural territories will need to take measures to protect their environmental capital from uncontrolled overuse and contamination by pollution from intensive farming and more industrialised territories. This may be achieved through the establishment of more carefully considered interdependencies and reciprocal relationships between urbanised areas and rural territories. Policies imposing taxes on resource extraction and environmental pollution could generate funds and reduce further damage to the ecology (Freeman et al., 1992).

## 7 Multi-Functionality of Ecological and Community Networks

An innovative use of environmental, spatial, and social capital may be achieved by collaborative consumption in community networks. Compelled by economic constraints, a collaborative approach to consumption (Hamari, Sjöklint & Ukkonen, 2015), reuse, and recovery suggests a more responsible way of utilising resources. The concept of the circular economy implies a closed loop use of resources, in which resources are shared and reused (Stahel, 2016). Implicit in the idea of a

sharing economy are efficiency and optimised industrial processes that would minimise the waste of natural assets (Graedel, 1995). To avoid an unnecessary depletion of still natural rural wilderness, the conservation of habitat, reduction of industrial waste discharge, and pollution must be prioritised. People-to-people collaborations and social networks (Brecher, Childs & Cutler, 1993) can play a strategic role in collectively protecting the environment. For instance, agricultural towns in China, where communities collectively own and cultivate land, are one example for such networks (Wang, Garg, Smith & Tao, 2016).

To enhance the resilience of disadvantaged territories, it is necessary to understand the potentials of multi-functionality embedded in ecological and community networks. The idea of multi-functionality in networks is derived from the concept of multifunctional landscapes (Brandt & Vejre, 2004). As such, landscapes can carry agricultural activities, forestry, embedded social structures, wildlife, renewable energy, recreation, transport, and defence related functional capacities. Inherent characteristics and the strength in an ecological-social nexus need to be found. This would help increase the benefit from the positive multiplying effects of social-ecological networks.

For the multi-functional networks to become an enabling platform for community liveability and wellbeing, collaboration and sharing are key aspects for resilience building. The embedded supporting networks could constitute an underlying matrix of interactions, flows of goods, information, and resources triggering sustainable urban transformations. For territories that may have few natural resources, new multi-functional networks may be introduced as part of a sustainable development project. In other resource rich territories, some of the opportunities in networks may need to be rediscovered or revitalised by, for instance, considering new functional combinations (Hoffmann, Probst & Christinck, 2007).

Due to disintegrations of ecology, land, and communities as a result of city growth, a strategic reinstatement of continuities in ecosystem services and social networks with resilience attributes could be reinforced. A mutually favourable community where the environment, welfare support, and information sharing are actualised in multiple different ways may cater for a future-proof diversification.

The five key categories (Pérez-Soba et al., 2008) related to the multi-functionality of networks are described below. Relevant systems of production include the provision of food, clean energy, and materials. The environmental assets are air, water, soil, habitat for biodiversity, and land use. Possible economic opportunities are the diversification of income, creation of employment, as well as remote retailing, services, and online trading of agricultural produce. Social support and welfare benefits that can be enabled are health and wellbeing, housing, education, elderly-care, governance and administration, culture, and traditions. Some of the eco-system services potentials are the absorption of pollution, climate regulation, eco-system stability, flexibility, and recreation (Brandt & Vejre, 2004).

The idea of simultaneous functions of networks envisions combining physical and immaterial exchanges derived from social and ecological linkages in territories and rural areas. In its broadest sense, further elaboration of the concept of multi-functional networks gives scope to build in and improve the resilience (Young, 2010) of distressed settlements in crisis.

Caused by changing environmental conditions, the adaptive capacities (Preston, 2012) of territories to environmental pressures become an integral part of the ongoing urbanisation processes. Smart coping strategies that utilise cutting edge technologies and scientific advancements may become the drivers for resilient urban fabrics. To enable a rapid adaptation to environmental pressures, the sharing of information between communities and territories is central to maintaining sustainable livelihoods. Integrated networks of agricultural and urban communities can collaborate on the information gathering process from Big Data platforms. Greater precision in predicting potential environmental stresses is critical for transitioning to accurate environmental data collection and adaptive resilience strategies. Future urbanisation processes, which take into account potential ecological risks, could also adequately prepare for a shock absorbing capacity for unanticipated environmental stresses.

## 8 Conclusions

Disequilibria between city-territories emerge out of the unequal access to environmental resources, information that can improve livelihoods, and social connectivity. Uneven development between territories (Haughton, 1997) can be transformed by embedding multi-functional networks. Urban-rural transactional interdependencies necessitate a restructuring into transformative relationships (Peterson, 2009). In other words, relationships, which not only exchange resources, services, and information, can also make improvements to people's lives. Adjustments to the interdependencies could enhance the productive potential of territories for preparing sustainable environments. More equitable dependencies between wealthy and poor settlements will need to include ecological considerations to secure the health, wellbeing, and longevity of territories, while protecting ecological habitats.

The potentials for redefining networks from exploitative relationships to sharing transformational exchanges between underdeveloped and developed territories are not fully explored and thus, require more research. Implementation of policies that promote behavioural change, in line with the UN *Sustainable Development Goals* for 2030, commence at the level of people-to-people interactions. Linkages forming a web between human settlements and ecological habitat must be designed to be multi-functional – to support biodiversity, productivity, and the resilience of territories. The networks binding together ecological, urban, and industrial corridors would, because of their multi-functionality, be

able to adapt to changing circumstances and possible environmental disasters such as flooding or soil erosion due to wind.

The notion of resilience is being used in many disciplines including psychology, sociology, the environmental sciences, and urban studies (Southwick, Bonanno, Masten, Panter-Brick & Yehuda, 2014). Research has shown that several ecological systems can have a multiplicity of balanced conditions with varying degrees of system durability before disintegration occurs due to shocks (May, 1977). The idea of resilience being an attribute consisting of combined adaptive capacities (Quinlan, Berbés-Blázquez, Haider & Peterson, 2015) implies a multitude of strength properties needed to sustain resilience. The instrumental role of synthesised ecological, virtual, and social networks in preparing for emergent urban phenomena and challenges lies in their ability to maintain malleability and therefore, establishing improved stabilities. A sustainable transformation of urban fabric and ecology may go hand-in-hand with the building up of adaptive capacities and the resilience for several different types of human endeavours.

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# Land Use and Master Planning under the Pressure of Informal City Growth _

## Case Study of Belgrade

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ABSTRACT **Sustainable land use and integrative, comprehensive, and implementable master planning remain some of the most important aspects of sustainable urban planning today. At the same time, one of the most challenging tasks for the cities of developing countries is managing informal city growth. Bearing in mind these conditions and challenges, significant both in theory and in practice, the chapter focuses on their mutual influence and impacts in international and Western Balkans context, as well as in the Serbian capital. The aim of the review is to bring attention to the actual problem of unregulated informal settlements in Serbia and Belgrade, while suggesting the means and measures for its treatment within sustainable land use planning.**

**The chapter gives insight into the importance, actuality, and general characteristics and challenges of sustainable land use planning, as well as the general overview of the growing informal settlements in developing countries and in the Western Balkans. The core of the research describes the main characteristics of Belgrade's land use planning on the one hand, and the growth of informal settlements on the other, seen as parallel, sometimes excluding, sometimes supporting processes, over the last four decades and their impact on the city development.**

**The chapter concludes by offering the answers to the following research questions: what is the relation between the informal city growth and land use/master planning? What kind of effects do unregulated developments have on land use and master planning and vice versa? Finally – what are the feasible, sustainable solutions within the contexts of both Belgrade and Serbia?**

KEYWORDS sustainable land use, master planning, informal city growth, city development

## 1 Introduction

Sustainable development, a paradigm of planning practice and theory for more than four decades, has grown beyond environmental concerns, giving importance to economic and social dimensions and including the political, institutional, and governance dimension in the concept (World Bank Institute, 2012). Sustainable, responsive, and locally sensitive urban planning has a key role in achieving social, economic, and environmental goals and can contribute to solving a variety of urban issues (Abbot, 2002). Urban planning today faces numerous and emerging challenges, such as rapid urbanisation, managing city growth and informal settlements, climate change, huge demographic pressures and poverty, energy demands, lack of adequate infrastructure, and others (Mitrović & Antonić, 2013b). The old models and methods of urban planning need to change constantly in order to be ready to adapt to the new role and to react to the growing problems in the cities (World Bank Institute, 2010). There is no other option for sustainable urban and land use planning, but to consistently apply sound planning principles and up-to-date development guidelines to ensure the effectiveness of policies (UN-Habitat, 2009).

The Western Balkan countries, which have experienced economic and societal transition, face far more challenges to achieve the vision of overall sustainability, due to limited governance capacity for planning and development and a low level of implementation, which lead to the increase of informal settlements in peri-urban areas (Huchzermeyer & Karam, 2006; Tsenkova, 2011; UN-Habitat, 2009).

According to the *Future Policy Directions* of the *Global Report on Human Settlements 2009: Planning Sustainable Cities* (UN-Habitat, 2009), the reformed urban planning systems must be shaped by, and responsive to, the contexts from which they arise, as there is no single model of an urban planning system that can be universally applied. Aiming to achieve a spatially coherent territory and balanced development, planning has to take into consideration various regional, urban, and local situations (Mitković, Mitrović, Djekić, Mitković, & Nikolić, 2016). In order to combat the above challenges, the study on *Sustainable Urban Land Use Planning – Land Use and Infrastructure* (World Bank Institute, 2012) recommends the following: (a) the sustainable land use should apply the principle of centripetal development and the compactness of the city territory, followed by a rational traffic network; (b) the development of urban sub-centres, supported by the mass transport; (c) an approach that is sensitive to the needs of the lower income housing or informal housing; (d) providing green networks and introducing urban agriculture, adapted to the specificities of the city. Such measures would have a positive impact on the local climate and environment, climate change adaptation, social and health benefits, and land value increase.

Unequivocally, urban planning must recognise the important role of the informal sector and ensure that urban planning systems respond positively and proactively to this phenomenon, including through

legislation (UN-Habitat, 2009). In order to effectively respond to informal urban growth, the revised urban and land use planning model should: (a) recognise the positive role played by urban informal development, including pursuing alternative solutions such as regularisation and upgrading of the informally developed areas; (b) consider revisions to policies, laws, and regulations to facilitate the informal sector, which could include the use of planning tools, such as land readjustment and provision of basic local infrastructure; (c) strengthen the effectiveness of planning and regulatory systems on the basis of more realistic standards, including collaboration with the informal sector in order to manage public space and provide services.

The dynamic urbanisation processes influence both physical and functional changes and this refers especially to cities in the Western Balkans, where significant social and environmental complications can be found in their peri-urban surroundings (Ravetz, Fertner, & Sick Nielsen, 2013). Informal settlements in post-socialist South-East Europe have grown significantly, shaping large parts of the urban landscape (Hamilton, Dimitrovska Andrews & Pichler-Milanovic, 2005).

The countries of the Western Balkans, like other European post-socialist countries, have undergone a turbulent period of political, economic, and societal transition. Basically, the transition has involved new systems of government based on the democratic political environment; new legal and institutional frameworks; new economic order; new rules of social integration; and new policy choices for the privatisation and redistribution of public assets (Harloe, 1996; Andrusz, Harloe & Szelenyi, 1996).

Rapid economic and social differentiation resulting in escalating unemployment, degradation in living standards, and growing social problems are the characteristics of the post-socialist urban economies. The new conditions have brought on many social risks, such as high levels of unemployment, risks for vulnerable groups, polarisation between social groups, and growth of the informal sector. According to Tsenkova (2008), post-socialist cities faced a serious challenge to sustain the value of their existing, predominantly massive, collective housing stock because of social differentiation and poverty, former collective management, and the disappearance of state-funded housing programmes. These challenges were reflected in the declining inner-city neighbourhoods, as well as in peri-urban areas with informal settlements.

Unlike in Western cities, where the ring of urban sprawls emerged as a consequence of the gentrification of the inner city, preferences of the residents, and higher mobility, the growth of the urban sprawls in post-socialist cities is less uniform and is characterised by a high level of informal housing. Hence, the informal settlements have become a socially acceptable response to an urban crisis in the provision of affordable housing (Tsenkova, 2008; 2013). The informal economy (such as informal house construction, the growth of informal services, etc.) went hand in hand with informal housing, though they did not fully overlap. As a large part of the transitional market development has

taken place with no planning intervention, planning has also become irrelevant in the rapidly expanding 'wild areas' of the city sprawls (Tsenkova, 2008; 2013).

Though Serbia has a lot in common with the general dynamics of transition in post-socialist cities, it is by no means a typical case of a post-socialist country, as it was particularly heavy in societal dynamics and scope (Vujošević & Nedović-Budić, 2006); the economic crisis was deeper than elsewhere in Eastern Europe and political stability was side-tracked by a civil war, the refugee crisis, and a prolonged institutional and regulatory vacuum (Tsenkova, 2012). The current situation in Serbia, considering the overall economic and urban development, is a result of the previous condition of transition recession, accompanied by the global financial crash (Zeković, Vujošević, & Maričić, 2015b).

Although the topic of informal city growth has been part of a great number of urban studies since the 1970s (de Soto, 2003), the planning systems still did not find a way to cope with this alternative urban growth. Generally, the process of urban expansion should not only be seen as a negative change, but also as one with positive impacts. Furthermore, cities experiencing informal peri-urban growth, especially those in the Western Balkans, should improve the governance capacity, develop basic infrastructure, and invest in overall renewal and rehabilitation, all in parallel with the process of making land-use plans for the expansion of cities. In the current stage of socio-economic transition in the Western Balkans, local governments are under pressure to tackle the sensitive nature of informal settlements, but local master plans do not always accept the presence of informal construction, thus having little or no impact when there is no will nor institutional capacity to address this problem.

While the main principles of sustainable urban development, derived from the international legislation, practice, and theoretical framework have been rooted in almost every urban planning document in Serbia, the implementation and substantial link to the local situation have not been fully achieved. This situation is most noticeable in areas of informal settlements on the outskirts of major cities, and especially in Belgrade, which is under the greatest pressure of urban growth (Mitrović & Antonić, 2014).

Even though this phenomenon of informal settlements in Belgrade has been analysed in a number of studies, there is no exact data regarding the number of housing units or the surface they cover. The older estimations claim that there were more than 150,000 units, covering more than 45% of the total housing area in Belgrade (Petovar, 2003), but the numbers are growing significantly every year (Mitrović, & Antonić, 2013b). Such great expansion surely urges prompt and flexible planning action.

This chapter focuses on the large informal settlements in Belgrade, containing the majority of the informal buildings and consisting mostly of housing units that people have built for their own needs. It does not

refer to Roma or other special social/ethnic groups' settlements, nor to illegal constructions that were built for commercial purposes.

The aim of this review is to bring attention to the actual problem of unregulated informal settlements while suggesting the means and measures for its treatment within the sustainable land use planning in Serbia and in Belgrade. Specific research questions are as follows: What is the relation between informal city growth on one hand and land use and master planning on the other? What are the impacts of informal settlements in cities with regard to land use and master planning? What are the feasible, sustainable solutions in Belgrade and Serbian context for these types of habitation?

## 2 Belgrade City Development, Land Use and Master Planning

Belgrade, the capital of Serbia and former Yugoslavia grew rapidly during the period of socialism from 1945 until the 1990s. It grew continually, both demographically and spatially, over the several decades after WWII, due to the processes of urbanisation and industrialisation. The housing policy at the time was mostly based on the mass housing settlements in the areas outside the city core, which resulted in the significant growth of city area and unbalanced population distribution (Tosics, 2005). The urban construction land was state-owned, and the housing was almost exclusively provided by state-owned companies (Tsenkova & Nedović-Budić, 2006). These complex socio-political and economic circumstances, therefore, had been encouraging the formation of these informal settlements since the 1970s (Mitrović, Ralević, & Antonić, 2014).

While the 1990s brought the process of transition to most socialist countries in Eastern Europe (Tosics, 2005), the same processes developed in Serbia a decade later, followed by a negative impact - extreme economic crises, high poverty among most of the Serbian inhabitants, and negative trends regarding slower growth and lack of maintenance in the cities' development. Due to the conditions of the public building sector (Vujović & Petrović, 2007) and high market prices of housing in Belgrade, many citizens and migrants have acquired accommodation in the informal sprawls.

The socio-political and economic context by the end of the 20$^{th}$ and beginning of the 21$^{st}$ century largely shaped the framework for master and land use planning in Serbia and consequently in its capital (Zeković, Vujošević & Maričić, 2015b). Urban planning, policy, and regulatory responses have been diverse, reacting to specific and often dramatic conditions: political democratisation, the reintroduction of market principles, massive privatisation, commercialisation (Tsenkova & Nedović-Budić, 2006) and massive informal growth, especially in Belgrade.

Still, the pace of societal changes was not followed adequately by the transformation of the planning system and the improvement of urban plans. The changing of the planning practice was steered by a mixture of old habits, few institutional innovations, and the social, economic, and political turbulence of the transitional period (Vujošević & Nedović-Budić, 2006). In the conditions of the undeveloped market and neo-liberal economy, former public planning institutions, having lost their previous role to protect the public interest, have presented a traditional rigid planning model, deterministic and inflexible, with fixed land use parameters and regulations (Djordjević & Dabović, 2009). While the intention of the planning principles, goals, and overall strategy was in line with the contemporary trends, the outcome of the plans – planning solutions and implementation – were poor. The most visible evidence is an enormous urban expansion of the peri-urban zones of Belgrade, which was led only by the market and fell outside of the planning regulation and instruments (Živanović Miljković, Crnčević, & Marić, 2012).

The described contextual framework in post-socialist Serbia illustrates the complexities of spatial regularisation and urban land use planning that are still unable to fully adapt and transform to the new conditions.

## 2.1 Land Use and Master Planning of Belgrade from 1970s until Today

This subsection presents the analysis of general and land use planning development in Belgrade over the several decades since the informal settlements started to emerge up to the present day. The relatively long history of general planning in Serbia and former Yugoslavia spans continuously from the early 1950s up to the present days. The structure and focus of general plans, which were predominantly land use plans, were changing over time, trying to keep up with the socio-political and economic changes (Vujošević & Nedić-Budić, 2006), but did not always succeed. Following the situation in Serbia, we can assume that with every passing decade, general plans were implemented less and were less tied to the (then) actual spatial conditions and trends. Divergent trends were expressed through the absurd situation that general plans did not register the actual local situation and the planning solutions did not treat emerging informal settlements, as if they did not exist. During the period of transition in Serbia, the approach to the planning treatment of the flourishing, expanded, and numerous informal settlements has slightly changed. The processes of urban sprawl growth and suburbanisation have marked the land use changes in Serbian cities, especially in Belgrade's metropolitan area, causing strong spatial and environmental impacts (Zeković et al., 2015a).


FIG. 2.1 Belgrade Master Plan, 1972 *(Image by Urban Planning Institute of Belgrade, 1972. Reprinted with permission)*

After the Belgrade Master Plan was created in 1972 (Fig. 2.1) (Urban Planning Institute of Belgrade, 1972), some of the first informal settlements on the outskirts of the city were built, one of them being Kaludjerica, currently one of the largest informal settlements in Europe (Žerjav, 2009). This plan was shaped by the ideology of the former regime, but at the same time was modern and in line with current global trends, incorporating the idea of 'a city within a sea of greenery' (Urban Planning Institute of Belgrade, 2008). Unfortunately, the then present informal settlements were treated like they did not exist, which can most clearly be illustrated by the fact that the area of Kaludjerica was planned as a location for a golf course (Žerjav, 2009).

The Belgrade Master Plan from 1985 (Urban Planning Institute of Belgrade, 1985) was completed at a time when the number and extent of informal settlements had already grown considerably. The city outskirts were now identified as suitable locations for creating new mid to high-density neighbourhoods, more popularly called 'satellite settlements'. This proved to be a great expense, mostly with regard to the cost of the new infrastructure networks that had to be created in order to meet the needs of these later built areas. While the plan had many virtues, like a very detailed and well worked out transportation system, the peri-urban settlements were not being properly treated, and the existing informal housing areas were completely ignored.

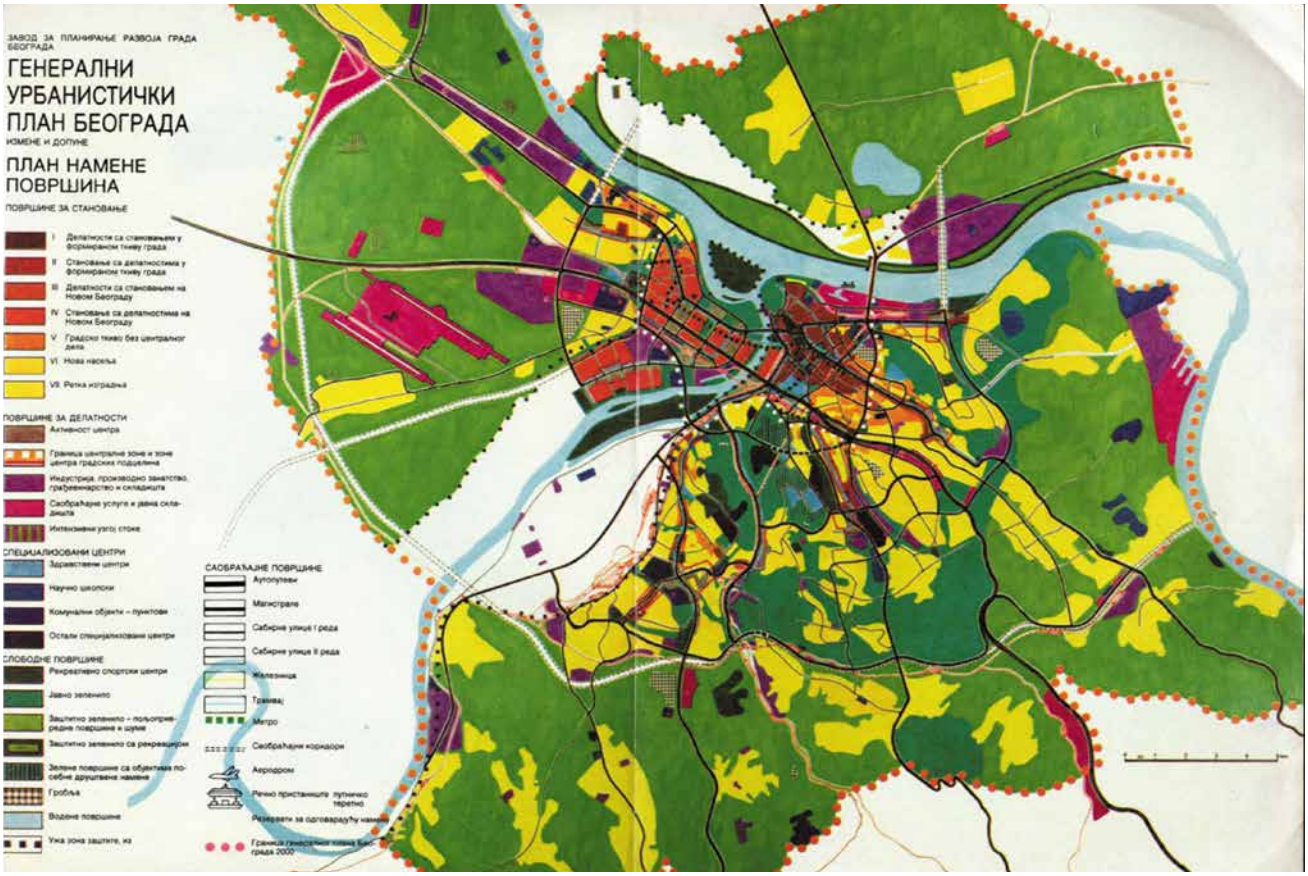


FIG. 2.2 Master Plan of Belgrade 1985 *(Image by Urban Planning Institute of Belgrade, 1985. Reprinted with permission)*

The *Belgrade Master Plan 2021* (Republic Agency for Spatial Planning, 2003) was the first effort in accurately mapping the peri-urban settlements in Belgrade. The main aim of this plan was to create a more flexible and dynamic environment, which would support the existing conditions. This long-awaited plan had the difficult task of standing as a conceptual and strategic, but also as an operative plan to some extent. That ambition resulted in well formulated and chosen goals, which were not fully implemented in the planning rules and graphic representations. Namely, the plan seemed to be focused on treating smaller locations, without providing a fully comprehensive spatial concept.

One of the aims of the plan from 2003 was to regulate, the now-acknowledged, informal settlement areas of the city, integrating them into the future picture within the added subdivision of 'housing in suburban settlements'. It also included strategies to urbanise, legalise, and improve these settlements, granting a limited expansion (Djukić & Stupar, 2009). On the other hand, Zeković et al. (2015a) claim that the land regulation in the Belgrade master plan from 2003 demonstrated the traditional administrative approach, thus creating a reason for further illegal building and sprawl.

Unfortunately, probably due to the general lack of official information, this master plan did not entirely reflect the existing situation of the informal settlements. Namely, although around 30 informal settlements were recognised and mapped, their full size was not adequately presented.

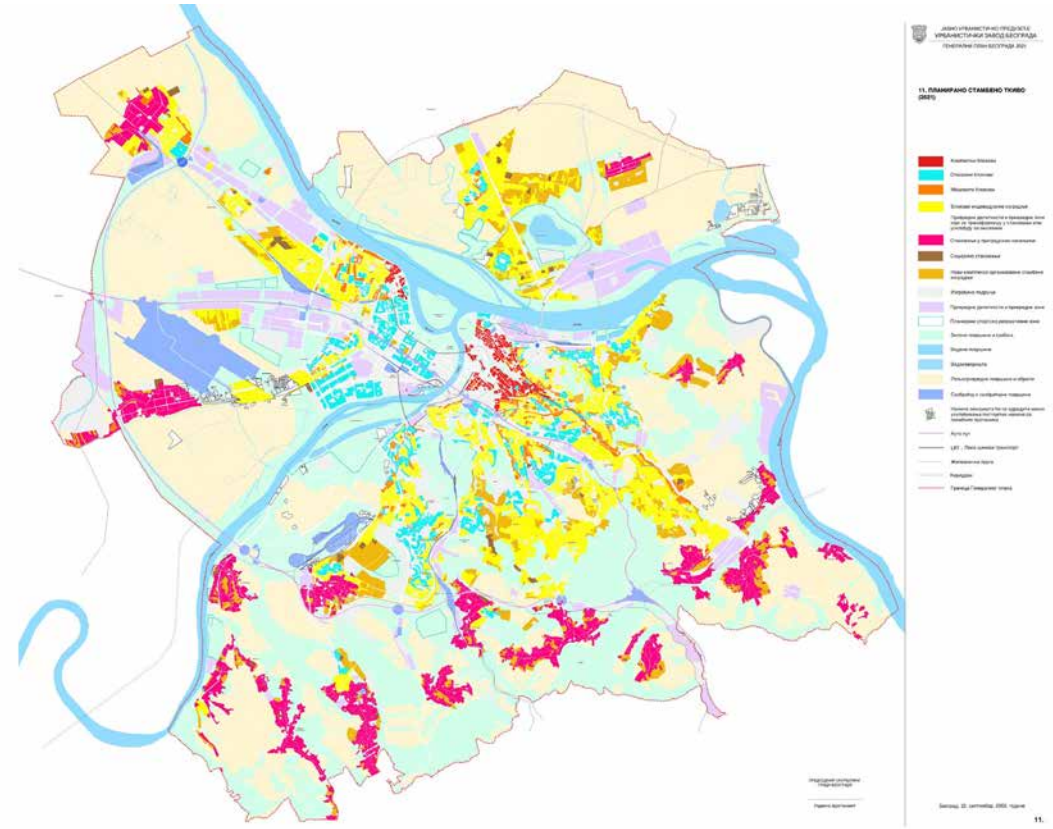

FIG. 2.3 'Planned residential areas (2021)' from the Master Plan of Belgrade 2021 *(Image by Republic Agency for Spatial Planning, 2003)*

The main difference between the previous plans and the new Belgrade Master Plan from 2016 (Belgrade Land Development Public Agency, 2016a) is the further interest in regulating the outskirts of the city, which is now mostly done by introducing new commercial and industrial areas and decreasing the number of agricultural zones within the city limits. Furthermore, the new plan introduced a new zoning of Belgrade, in order to better regulate the process of creating adequate and comprehensive local *Plans of General Regulation* for each zone, following the obligation defined by the national *Law on Planning and Construction* (Republic of Serbia, 2014). Compared to the master plan from 2003, this plan did not offer a better treatment of the Belgrade informal housing, although it included realistic areas of informal settlements based on more precise information. Additionally, the master plan from 2016 did not offer the much-needed strategy for the urban renewal of the informal settlements. Instead, it accepted the approach of 'legalisation through regulatory plans' that was already in practice.

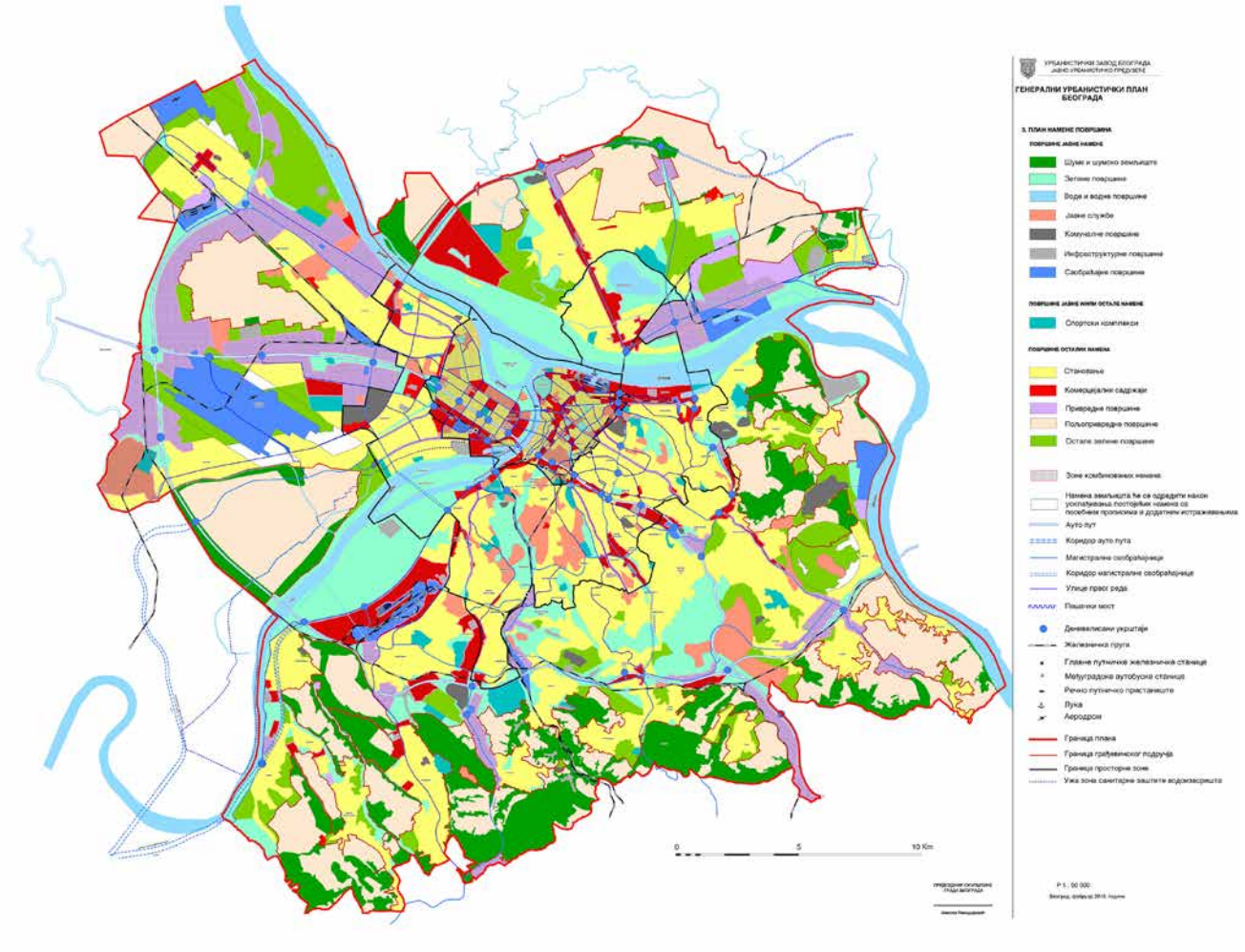


FIG. 2.4 Master Plan of Belgrade 2016 *(Image by Belgrade Land Development Public Agency, 2016)*

## 2.2 The Impact of the Lack of Urban Plans for Suburbs in Belgrade

The lack of proper documentation and plans in the suburban areas of Belgrade is mostly the result of the former planning and governmental policies which, even though aware of the situation, 'turned a blind eye' towards the growth of informal settlements. This has led to the current state where it is approximated that almost 44% of housing areas in Belgrade are taken up by informal housing (Mitrović & Antonić, 2013a), which underlines the urgency of the issue and the need for creating a comprehensive urban strategy.

After the enactment of the Belgrade Master Plan in 2003, the process of creating regulatory plans for the areas of illegal construction started, with the exceptions of Zemun and Surčin. From 2003 to 2009, several general regulation plans concerning some of the informal settlements were enacted (for some parts of Karaburma settlement) or decisions were made for their development (like the ones for Vinča, Kaludjerica, Leštane, and Boleč settlements). Several detailed regulation plans were also made during this period, encompassing parts of Bele Vode

within Žarkovo, Karaburma, Altina, and Jajinci settlements. According to the content analysis of documents and plans, the years that followed up until 2016 were mostly marked by the enactment of several detailed regulation plans for neglected areas of informal settlements in Belgrade, like in Mali Mokri Lug and Višnjica settlements in 2011, parts of Železnik and Mirijevo in 2013, as well as parts of settlements Veliki Mokri Lug and Zemun in the later years (2015).

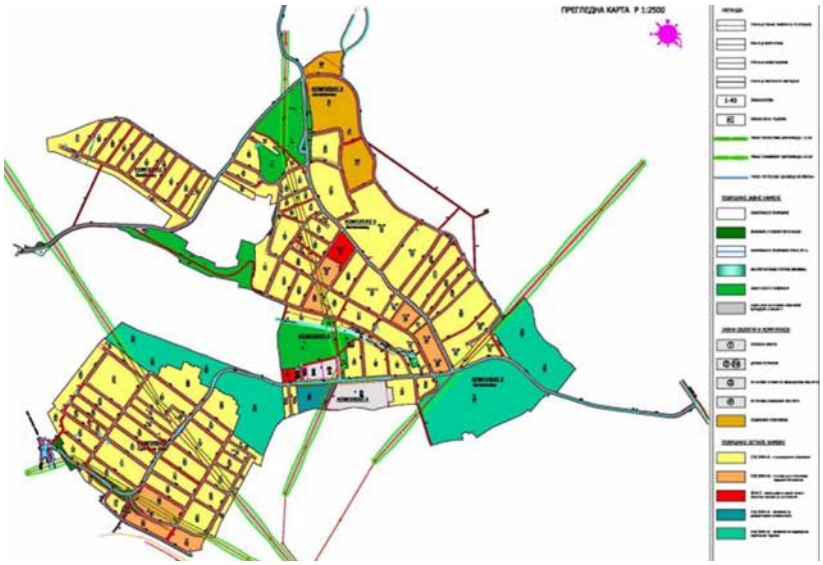

FIG. 2.5 General Regulation Plan for a part of the territory of Rakovica municipality 'Jalezovac – Sunčev Breg' *(Image by Urban Planning Institute of Belgrade, 2011)*

By contrast, some plans finished in this period did not acknowledge the informal settlements (though encompassed the areas in their vicinity) such as parts of Krnjača, Lešće, Zemun, and outskirts of Ledine settlements that were unfortunately left out the aforementioned detailed regulation plans. One of more interesting examples of general regulation plans was the one designed in 2011 for the informal settlement of Jelezovac – Sunčani Breg, located in the southern part of Belgrade, in the Rakovica municipality. This residential area is relatively new and has been under construction since 2000. Jelezovac is an interesting example since most of the owners have applied for a legislation and took the initiative in order to start the development of a regulatory plan, back in 2005, later participating in the planning process undertaken in cooperation with the local community (Simeunčević Radulović, Mitrović, Ralević & Djurović, 2013; Mitrović, et al., 2014).

After the zoning of Belgrade in 2016, the process of creating plans for the never treated informal settlements became much faster and most of them have been adopted, according to the fact that the plans for some of the biggest informal settlements in Belgrade, such as Borča and Krnjača (within the Municipality of Palilula), were recently finished for the first time. Unfortunately, the General Regulation Plan for Kaludjerica informal settlement, one of the biggest and oldest in the Western Balkans (Mojović & Ferenček, 2011), is still being developed, which could be by far the most challenging task for master and regulatory planning in Belgrade today.

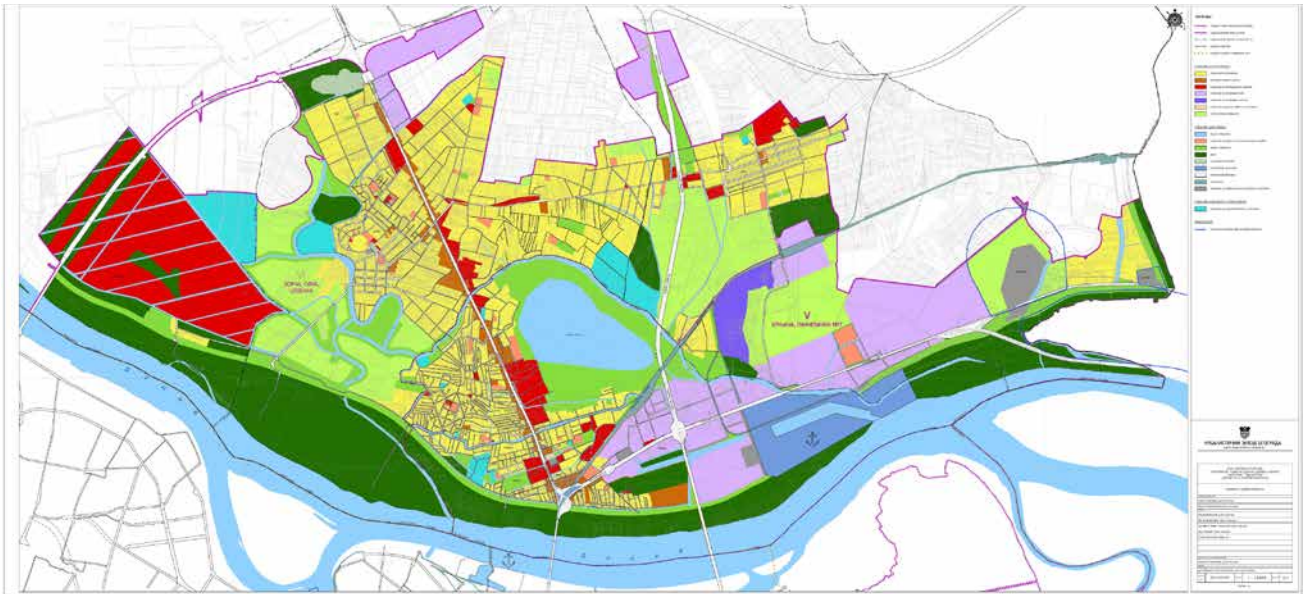

FIG. 2.6 General Regulation Plan – City of Belgrade (parts V and VI, Municipality of Palilula) *(Image by Belgrade Land Development Public Agency, 2016)*

## 2.3 From a Non-Acknowledging to Embracing Policy in Belgrade Urban Plans

The planning solutions presented in regulatory plans are various and of different quality. Some are produced with significant care for the needs of the inhabitants, as well as for the urban context. The others represent mere legalisation - the adoption of the present state of the settlements, with minor positive changes such as improvements of traffic and other infrastructure, or inclusion of basic services. Generally, the new regulatory plans do not treat the informal settlements in an integrative way, lacking the planning for small business or public spaces.

The analysis of the master and regulatory plans for Belgrade shows the evolution of the idea of recognition and treatment of the informal settlements. Since the first informal settlements appeared, Belgrade's urban plans, following the official politics of that time, did not take them into consideration. The focus of the plans was the desired future picture of the city rather than a complex and integrated study of feasible solutions for the present problems and potentials. As the settlements grew over time, so too did the idea of their acknowledgement. This was partly because the informal settlements have taken almost half of the housing area in Belgrade (Mitrović & Antonić, 2013b), but also in order to gain more reliable and precise information about their size.

Although the idea of urban renewal was supported by the master plan from 2003 onwards (through general and detailed regulatory plans), it was not explicitly stipulated through respective measures (Zeković et al., 2015a); rather, it has offered incomplete and short-term 'planning remedies'.

As the citizens' awareness of 'informal settlements' grew considerably over time, their influence on planning solutions for the informal settle-

ment areas was a positive step forward. Unfortunately, the pressure created by these citizens was not always followed by adequate responses or solutions.

The analysis of the master planning in Belgrade regarding informal settlements shows that master plans, as only one of the instruments for their regulation and urban renewal, could not and cannot compensate for the lack of proper policies, legislative framework, and other means for regulating the current and potential future informal settlements. So far, informal settlements in plans are only seen as illegal construction which should, if possible, be included in the legalisation framework.

As the awareness of the volume of the informal settlements in Serbia has grown over time, there has been almost continual activity regarding legislative framework, from 1993 to the present day. During this period, according to the analysis of documents (laws and by-laws), one by-law for Belgrade, and eight laws and amendments to the laws regarding legalisation of informal settlements (laws on planning and construction and laws on legalisation) were enacted. All of these legal acts had the intention to prevent further illegal building and to provide the conditions that would enable the legalisation of the existing buildings. According to authors' content analysis of aforementioned laws, the older documents did not define penalties for those who might build illegally in the future, while the more recent laws treat illegal construction as a criminal act, followed by the appropriate penalties. Even such drastic measures did not prevent the expansion of the illegal growth of informal settlements. As the implementation of regulations was low, the informal settlements continued to grow significantly. There were various reasons for such a situation. Firstly, the national planning and governing bodies did not have the accurate information on the size and number of the settlements, let alone on the number of buildings, so they have mainly relied on estimations. The Ministry of Construction, Traffic and Infrastructure of the Republic of Serbia (2017a) have estimated that there were 1.5 million illegal buildings in 2015, while by 2017 the number had grown to more than 1.6 million. Secondly, after 2003, every law regarding the legalisation of informal settlements contained legal provisions, which referred to the postponing of its implementation (Mitrović, 2016). Thirdly, the inspection bodies did not have the adequate capacity to prevent new informal growth (The Ministry of Construction, Traffic and Infrastructure of the Republic of Serbia, 2017b). Furthermore, rampant corruption went hand in hand with the informal sector, thus supporting it. The fact that less than 1% of the total number of illegal buildings in Serbia has been demolished proves the low efficiency of the implementation of regulations (Mitrović & Antonić, 2013c). Lastly, it is important to emphasise the symbolic penalties and fees for the illegal construction of houses. From 2014, the idea was to have all illegally built buildings registered by the Cadastre, regardless of their status and practically free of charge (The Ministry of Construction, Traffic and Infrastructure of the Republic of Serbia, 2017c). While this was a positive step towards completing the information about the number of illegally built buildings, it also indirectly discouraged the submission of applications for planning permissions for new buildings. Judging by the

implementation of the legislation, it is easily noticeable that informal settlements are not treated adequately, with a unique approach, therefore proving more of an encouragement than a restriction for informal city growth. However, it is expected that the new national *Law on Legalisation* (Republic of Serbia, 2015) would give more concrete and effective results regarding the legalisation of informal settlements, as it was for the first time declared as public interest. On the other hand, the widespread urban sprawls within Belgrade borders, and close to them, are also the result of inadequate planning instruments, such as urban zoning, building rules, land-use regulations, and metropolitan regulations on urban structures (Zeković et al., 2015b).

The specific Serbian circumstances regarding the enormous growth of the informal settlements were related to the: (a) unclear and non-transparent legal framework and planning procedures; (b) vague possibilities of inclusion of all social groups regarding social rights (i.e. basic housing) and participation in planning process; (c) unclear relations between the public interest, social housing, and informal housing; (d) corruption related to the land use conversion, public interest protection, etc.; (e) failing legalisation processes, without visible positive effects, and (f) traditional urban plans as rigid and incomplete instruments of the process of legalisation, without the substantial elements of urban renewal. Finally, Belgrade planning procedures were complicated, non-transparent, and slow, so they additionally discouraged the private legal building initiative. All these reasons have led to a new spread of the informal growth of housing.

# 3 Growth of Informal Settlements in Belgrade

## 3.1 History of Informal Settlements in Serbia and Belgrade

Serbia shares the destiny of many developing countries in terms of facing the problem of the uncontrolled and undesirable urban growth, which are not treated by adequate integrated development policies and plans (Mitrović & Antonić, 2013c). These problems can be associated mostly to the lack of housing policies for vulnerable socio-economic groups and migrants from neighbouring countries. Consequently, Serbian capital Belgrade had to, and still has to, cope with the excessive demographic influx, which again is reflected by its growing informal suburban areas (Mitrović, Ralević & Antonić, 2014).

There are several phases as well as many reasons regarding the genesis and growth of the informal settlements in Serbia and Belgrade. The privatisation of capital, impoverishment of the population, confusing housing policy during the transition period, lack of social housing policy, unadjusted legal framework, corruption, and the overall decline of the standard of living are just some of the key causes of the formation of informal settlements.

During the socialist period in former Yugoslavia, up to 27% of the Serbian population lived in Belgrade. Furthermore, the rigid state housing policy was predominantly based on mass collective housing and did not leave much space for individual housing in large cities. The control of technocratic planning practice, resource deficit, no adequate political support, and the conflict of informal employment and settlement with political and bureaucratic ideas for the modern city were reflected in the insufficient impact of planning systems (Žerjav, 2009). As a response to the socialist government's inadequate housing production, the trend of informal housing has emerged in this period and has led to a cautious relaxation of the rigid regime of state construction, and later, to flagrant flouting of the administrative and legal restrictions and the explosion of its volume (ETH Studio Basel, 2012).

The next phase is related to the specific trends and characteristics of the 1990s. Belgrade grew in the 1990s, but its growth was largely restricted to the residential sector, while industry, commerce, and the public sector stagnated to an alarming extent (ETH Studio Basel, 2012). The armed conflict and huge specific migrations to Serbia have created a new demographic pressure, which was mostly absorbed in Belgrade – namely, the influx of circa 200,000 refugees from all over the region who have moved to Belgrade (Commissariat for Refugees and Migration of the Republic of Serbia, 2008). The further demographic growth of Belgrade has put an enormous pressure on the city in relation to employment and housing (Mitrović & Antonić, 2013c). Although formal politics was aimed at preventing the further spread of informal settlements, it has actually tolerated the emerging 'informal social housing policy'. A closer look at these trends reveals that the city's transformation during the '90s reflects and magnifies tensions that shape developments worldwide, offering a sort of case study of a city caught between tradition and globalisation. Belgrade development processes, at the end of the 20$^{th}$ and the beginning of the 21$^{st}$ century, were characterised by some authors as the 'instability of the formal' and the 'stability of the informal' (ETH Studio Basel, 2012). Belgrade's transformation is also seen as a conflict between the failing project of the modern city and the rampant growth of an informal city (ETH Studio Basel, 2012).

The third period, from 2000 onwards, is defined as the period of transition and the impact of the political, societal, and economic changes, which again had the informal housing growth as one of the results. Firstly, as the public sector was weakened significantly, the institutions were undeveloped and unable to adapt to the new situation. Secondly, the legal framework was rigid and rooted in the former period, without clear means for its implementation. The limitedness of the public sector prevented it from defining the appropriate social housing policy and meeting the needs of the population for social housing. According to Zeković et al. (2015a), the urban land regulation in Belgrade, demonstrating a traditional administrative approach, was a key reason for massive illegal building and sprawl.

## 3.2 Belgrade Informal Settlements Today

Belgrade's informal settlements are almost evenly spread over the city's peri-urban territory. There are approximately 30 settlements which vary in size, position, density, spatial-physical, and other characteristics. In Belgrade, extensive informal settlements have occupied large peripheral, mostly former forest and agricultural areas and the surroundings of some of the main highway corridors (Belgrade-Novi Sad, Belgrade-Zagreb), routes to Zemun, Batajnica, Smederevo, Zrenjanin, Ibar, and the airport, etc. The infrastructure-driven urban sprawl is evident along new industrial, commercial, and mixed peri-urban zones (Zeković et al. 2015b), but also around the wider, built up areas. Informal settlements in Belgrade make up more than 44% of the total housing areas (Mitrović & Antonić, 2013a), and 7.1% of the total surface area within Belgrade metropolitan borders.

The following analysis and research were done using the method of field and primary sources research.

The spatial distribution shows that the largest informal settlements are situated in the North-East and Southern Belgrade outskirts and along the left bank of the Danube (such as Borča, Krnjača, Kaludjerica), while the smaller ones are scattered throughout the city periphery and around the borders of Belgrade. Housing dominates land use, with around 90% of the total surface area of the informal settlements. There is also a significant share of retail, services, and other commercial activities and these non-residential land uses are mainly concentrated along the main traffic corridors (Mitrović & Antonić, 2013a). Most of the informal settlements have quite a decent amount of green areas within the individual housing plots, while public green spaces are scarcer. Public spaces, as well as public services (such as schools, children's day-care, and health facilities, etc.) are some of the greatest issues for the inhabitants of informal settlements, as no public services were planned beforehand, thus being spontaneously and unevenly distributed or not present at all. Hence, the citizens of informal settlements are forced to travel to the neighbouring parts of the city in order to fulfil some of their basic needs. This problem has also added to traffic jams along the inadequate existing streets within and in the vicinity of the informal settlements (Mitrović & Antonić, 2013c; Simeunčević Radulović et al., 2013).

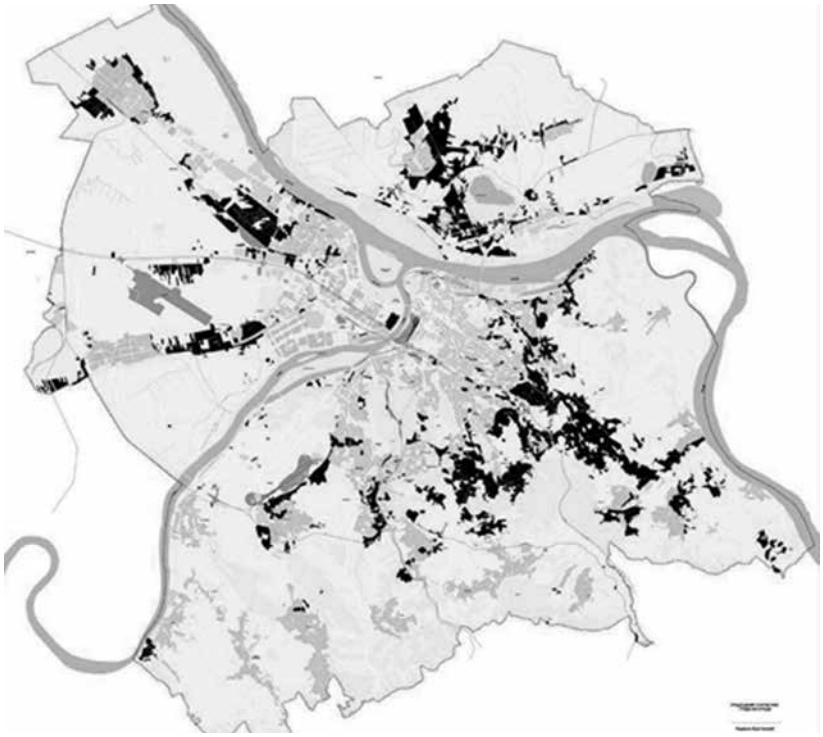

FIG. 3.1 Distribution of informal settlements in Belgrade, according to Belgrade Master Plan 2021.Dark areas present informal settlements (*Image by Mitrović, Ralević & Antonić, 2014*)

The street matrix is irregular and incomplete, while the streets are irregular, usually narrow, and insufficient to meet the needs of the citizens. Generally, the matrix is more regular in flat terrain (exceptions being Borča and Krnjača) and irregular in hilly areas, like in the Southern and South-Eastern parts of Belgrade. Street regulation could prove to be one of the biggest challenges in the future because of the problems of low safety, lack of the space for the infrastructure equipment and the need for the demolition of houses facing streets. Infrastructure is also a major issue; it varies from very poor to basic, with the electrical network being the only exception. Water supply lacks in some parts, while sewage and drainage systems usually do not exist.

Many settlements are built on potential landslide areas, which could threaten their stability. With potential negative impacts of climate change, such as floods and landslides, this situation could worsen in the future.

Blocks (built up areas) and housing plots within the settlements vary in size and shape, often being irregular and insufficient for the needs of single-family houses. As a result of their spontaneous nature and the lack of regulation, the houses are often located very close to each other and badly oriented (Mitrović & Antonić, 2013a). The general density and distribution of buildings within the settlements varies, depending on the nature of the settlement and time of its formation. There is an emerging pattern where the density of buildings is higher towards and alongside the main or transit roads, usually the ones that preceded the settlement.

The characteristics of houses in the informal settlements of Belgrade are similar to some other settlements in the Western Balkans but quite different from the informal building in the 'Global South'. The buildings

are made from solid materials, such as concrete and brick, meaning they are, in most cases, permanent and suitable for a multi-generational use, although built without any plan. There are usually no clear stylistic characteristics nor reflections of traditional Serbian housing.

It is safe to say that informal settlements in Belgrade, in a great number of cases, have the potential for urban renewal and transformation in terms of land use, while the improvement of the traffic and other infrastructure, as well as potential development of public spaces would be possible in some cases and would require more investment.

## 4 Conclusions and Recommendations

The informal settlements of Belgrade are rather specific, according to the aforementioned characteristics considering the overall context, and social and economic state, but also regarding their spatial features. Belgrade's informal settlements show great diversity in size, urban structure, and quality of buildings.

According to the in-depth analysis presented in this research, it can be concluded that land use and master planning correlates to the informal housing formations and characteristics. Land use areas designated in the master plans of Belgrade have not proven to be fully implementable without proper instruments or without adequate housing (especially social housing) policy, effective legal framework, developed institutions, and political will. Since the informally built areas continue to flourish speedily by the borders of master plans, they create a growing pressure on master and regulatory planning, making them embrace new buildings and adjust the future land use and traffic infrastructure according to the needs of new informal residents. The most vulnerable land use areas, such as agricultural land, green belts and the like, are endangered and subject to transformation. Still, there is room for improvement of these relations within a comprehensive urban renewal strategy.

The impacts of the growth of informal settlements on the development of Belgrade are complex and significant, though predominantly not positive. In terms of usage of urban construction land, conversion of the arable land or protective green areas, it is not a sustainable trend, as the informal settlements cover large areas and tend to spread. Additionally, the growth of informal settlements is economically unsustainable as it creates a demand for huge investments in relation to the need for new traffic and communal infrastructure. On the other hand, in the sense of social visibility of informal residents, bottom-up initiatives, and lessening the demand for social housing, it is a positive trend. A wide range of informal development in Belgrade could be explained by understanding the economic impact of these settlements and facilities. The cost of informal buildings is up to 50% lower than the cost of new, legally constructed ones.

The analysis showed that the predominant framework regarding informal settlements in Serbia today is related either to their demolition or to the process of legalisation. It is fair to say that there are sporadic attempts at integrating them into the wider planning context and into the process of urban renewal. The growth of the informal settlements is definitely an irreversible process that cannot be easily stopped, and in that sense, it deserves special attention and a revision of actual policies. However, a solution for the integration of informal areas demands a comprehensive, multidisciplinary approach. Of course, it is not always possible to legalise or integrate all informal settlements because they are located in strategic or inadequate locations (along main roads or infrastructure corridors, by a river bank, threatened by floods or landslides, etc.).

The idea of preventing the future expansion of informal settlements requires an adequate social housing policy, along with a set of different measures that would make future housing affordable. This goal is best achieved through appropriate land policy and the revision of complex regulations on planning and construction standards and administrative procedures, in accordance with the premises of the sustainable development – social, economic, and environmental development. The old urban planning patterns should be revised and readjusted so to become more strategic, flexible, locally sensitive and implementable, as well as more bottom-up oriented instead of being top-down and state-oriented (Mitrović & Antonić, 2013a). It is crucial to move the focus from the traditional, centralised, top-down approaches, including but not limited to the compulsory policy tools, like planning and zoning (Zeković et al., 2015a), to the principles of planning that would include the following qualifiers: pro-active, flexible, indicative, adaptive, inclusive, monitored, and evaluation-and-feedback-based. Instead of implementing sectoral strategies and solutions, it is necessary to adopt an integrated approach to solving problems of informal settlements by considering spatial, social, economic, political, financial and environmental context.

The removal of informal settlements is not only an abandoned approach, but it is also not socially feasible. Therefore, a 'step by step' approach via embracing integration rather than exclusion is far better and more applicable. Cutting informal growth of settlements in a surgical manner during the economic and transitional crisis is neither possible nor wise. It is necessary to abandon the perception of the informal settlements as invisible and outside-the-law, and accept the assets of this unconventional way of habitation. In other words, it is necessary to change the perspective and conventional way of thinking of the problem.

The treatment of the informal settlements should be related to the local characteristics and cultural and social background and other relevant aspects. This can include the understanding of the informal settlements in the context of affordable housing, but also through different approaches and concepts, such as eco-town, urban farming, urban village, to name just a few. The process of upgrading informal settlements has to be done with the active participation of local

residents, respecting their initiatives, needs, and constraints. Based on the comprehensive research of informal settlements in Belgrade, and by acknowledging their values, such as a decent provision of greenery, sufficient size of dwellings and housing plots etc., as opposed to the prevailing absolute criticism, could lead to more implementable solutions. Urban renewal should be a process that runs in parallel to the raising of awareness of civil rights of the inhabitants of informal settlements, as well as their social inclusion and participation. The model of urban upgrading should be chosen carefully, bearing in mind the potentials and constraints of the specific areas, and should be adjusted to the local context and people. The recommendations and suggestions for improvement of informal urban areas in Belgrade should reflect the idea of an integrative and realistic approach and should include the following:

- Exploration of the possibilities of upgrading the informal settlements so that they achieve the newly defined standards of social/affordable housing;

- Adoption of special urban planning regulations including urban upgrading principles and indicators that would comply with a lower standard and 'softer' criteria than the ones defined for the rest of the city territory;

- Development of special fiscal instruments exclusively for these city areas;

- Through the model of urban consolidation, new public spaces should be designated for common use and as places for communication and interaction of all social and age groups;

- Enable the cooperation between the public and private sector for pro viding sufficient public services in already dense areas;

- Provision of local regulation support that would be locally sensitive and ready-to-use within a short time. This would include incentives for owners who are willing to upgrade their houses to meet social housing standards regarding infrastructure, energy efficiency, etc. Wise governance instead of governing as a way of implementing institutional instruments could result in balanced land use planning and inner-city growth, reducing the practice of spreading and widening of the city territory. Working proactively on new ideas that are appropriate to Belgrade's informal settlements, Belgrade could become a pilot area for research and implementation of new models, alternative institutional arrangements and cooperative forms, supported by university research.

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# Spatial Policies and Resilient Urban-Rural Communities _

## An Italian Case Study with Some Research Guidelines

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ABSTRACT **After a prolonged uncoupling of cities from their surrounding countryside, brought about by the productivist paradigm, moves toward reintegration are increasingly noticeable in local policies and practices. This also applies to the most recent European agendas for sustainable urban development, where agriculture has been officially recognised as a producer of ecosystem services and a strategic resource for the creation of green infrastructure networks in densely inhabited environments. In this way, the challenge of integrating it in spatial planning, and in its toolkit, is now on the table.**

**But what does 'urban-rural' policy-making mean, in practical and organisational terms? While scholars increasingly agree that an adaptive and multi-actor governance is more effective than a classic governmental approach in the management of complex socio-ecological systems, in the particular case of those involving farming as an economic activity it becomes almost necessary. The basic reason for this is that stakeholders are bound by mutual dependence, since key resources such as rights over land, political power, technical skills, and innovation capacity are unequally distributed among them. Farmers are therefore prompted to reject a passive role in the policy-making process, which in turn requires additional social knowledge on the part of all actors, in order to accept such an advancement fully.**

**The case of *Parco Agricolo Sud (South Agricultural Park)* in Milan, Italy, confirms this scenario by providing an interesting 'resilience story' of local peasantry and, in parallel, a view on the transition from a classic zoning-based and state-led land protection model to a less sectoral and more participatory approach. It is an example of how the active engagement of farmers can help public policies, preserving the common good in difficult circumstances and giving rise to alternative planning approaches. This is a 'lesson from Milan', which may inspire research in contexts where open spaces around cities are threatened, and inclusion in the decision-making process is a goal that remains to be achieved.**

KEYWORDS urban-rural governance; land use-policy; agricultural parks; ecosystem services; resilient spaces

# 1 Introduction

Agriculture has always created a dilemma for urban planning. Within it, land plays a more structural role than in any other economic sector, as a fundamental factor of production, and, yet, in modern times, spatial planning practice has dealt with it quite uncomfortably (Ciriacy-Wantrup, 1964; Amati, 2008; Paradis, Cieszewska, Tóth, & Šuklje-Erjavec, 2016). Accurate analysis of the rural fabric has been generally overlooked, and agriculture itself mistreated and excluded from regional development strategies, hence privileging urban-industrial uses, its almost 'genetic' rival (Ciriacy-Wantrup, 1964). Moreover, property developers are a strong economic constituency and often lobby the public administration for liberalising the land use policy, as in the case of Milan (Broz, 2017).

However, while a tendency to separate urban from rural still exists worldwide (Ajl, 2014), a move toward re-integration is increasingly noticeable in European public agendas and research programmes (Lohrberg, Lička, Scazzosi, & Timpe, 2016). Urban and peri-urban agriculture, in particular, is gradually upgraded from 'wasteland' to a strategic resource when sustainable development of cities is at stake, due to its potential capacity to contain sprawl and supply communities with 'ecosystem services'. This term refers to the multiple benefits provided by ecosystems to the population in terms of primary goods production, food security, natural resource regulation, public health, education, landscape and cultural heritage preservation, etc. (Millennium Ecosystem Assessment, 2005).

Within European policy experience, an important testbed for involving agriculture in regional development agendas has been that of the LEADER programme framework and related Local Action Groups. These and other comparable tools have proved very useful in promoting integrated development action in peri-urban rather than just rural areas, thanks particularly to equity in the representation of governmental and other societal stakeholders (OECD, 2013).

Nevertheless, a more significant recognition of cultivated areas (and especially peri-urban and intra-urban ones) as a potentially strategic element for the sustainability of spatial policies has come with the introduction of new notions in spatial and urban planning terminology, among which is that of 'green infrastructures'. This term has a very wide application, but it generally designates open spaces and the natural capital they embed when adequately planned in order to reduce fragmentation, improve biodiversity, and enhance the action of ecosystem services. The network-like arrangement of such green infrastructures, and their fundamental role in sustaining the welfare of human settlements, also explain why we call them 'infrastructures' (EC, 2013). Farmlands – especially where multifunctional farming is involved – are thus fully admissible in the category of green infrastructures. In this way, the challenge of integrating agriculture in town planning as an equally important land use has been officially recognised (Lohrberg et al., 2016).

For several reasons, however, this aim is still far from being achieved. For instance, policy habits and tools are relatively inert if compared to rapid ongoing social change in this sphere (Folke, Hahn, Olsson, & Norberg, 2005). In addition, a cultural acceptance of rural leftovers within the urban fabric is not yet to be taken for granted, since an enduring modernist ideology still portrays them as pockets of economic backwardness facing social extinction (van der Ploeg, 2008). While marginalising a rural point of view on territorial, societal, and economic development issues, this frame negatively affects any institutional attempt to foster a closer relationship between urban and farming-related functions, e.g. in developing countries (Ajl, 2014). Due to the traditional detachment of the agricultural sphere from that of spatial planning, farmers themselves are not familiar with its logic and some form of mediation may be needed in order to make participatory decision-making processes effective (Paradis et al., 2016).

The *Parco Agricolo Sud (South Agricultural Park)* case study in Milan is briefly reported at the end of this chapter, in order to help to focus on these issues. The story shows a switch from a 'greenbelt' model – barely functioning in its aim of preserving and enhancing the local urban countryside through spatial plans only – toward a heterogeneous governance mosaic in which top-down and bottom-up approaches intertwine. The overall process coincides with a resilience dynamic on the part of the rural-urban community and its ecosystem, along with cultural changes, tool innovation and a democratisation of policy-making. Local farmers have thus managed to emerge from marginality and establish a resource-exchange relationship as a fully empowered actor with both the community and local authorities.

## 2 Engaging Rural-Urban Stakeholders in Local Governance Frameworks

Coexistence between agricultural and urban-industrial functions is becoming more and more common all around the world. Besides making it particularly difficult to identify actual urban-rural borders (Ajl, 2014), this also contributes to the growing complexity of socio-ecological systems that now require an approach based on adaptive and multi-actor governance patterns, seen as more effective than classical top-down schemes (Folke et al., 2005).

Among others, the following elements are considered particularly important for policies addressing sustainability:

- an integration of social and ecological scientific contributions (Ostrom, 2009);
- the development of shared understanding models between governmental and scientific communities (Newell & Proust, 2012);
- the enhancement of lay knowledge, besides professional and scientific ones, and a surmounting of a sectoral approach by intersectional policies (Prové, Kemper, Loudiyi, Mumenthaler, & Nikolaidou, 2016).

In fact, while including a wider range of stakeholders in the policy-making process is strongly suggested in the case of various socio-ecological systems, it becomes almost essential when urban or peri-urban farmlands are concerned. This is largely because among other types of information required is a farming-related and often place-based knowledge, usually in the hands of farmers or other societal actors rather than public officials. In addition, the juridical recognition of ecosystem services, which agriculture can provide to the urban system, also implies an acknowledgment that such services must somehow be paid for (Lin, Philpott, & Jha, 2015).

More generally, stakeholders engaged in urban agriculture or environmental actions in these contexts are often bound by ties of mutual dependence, due to the heterogeneous distribution of resources and the consequent need to exchange them (Fig. 2.1). The government holds financial and legal power, but in most cases, cannot provide innovation, for which it largely relies on civil entities as non-profit 'pioneers' and, to a minor extent, on the market (Healey, 2012). On the other hand, civil movements often need some help from professional farmers in terms of expertise and both groups depend on some kind of support from the public sector: legitimation at first and, more specifically, land grants, planning protection schemes, and other benefits related to particular partnership schemes. Land grants can prove particularly strategic, since free plots near or within the city are often publicly owned and can easily be lent (granted) to single farmers and NGOs, in order to overcome the unaffordability of the urban land market (Lohrberg et al., 2016).

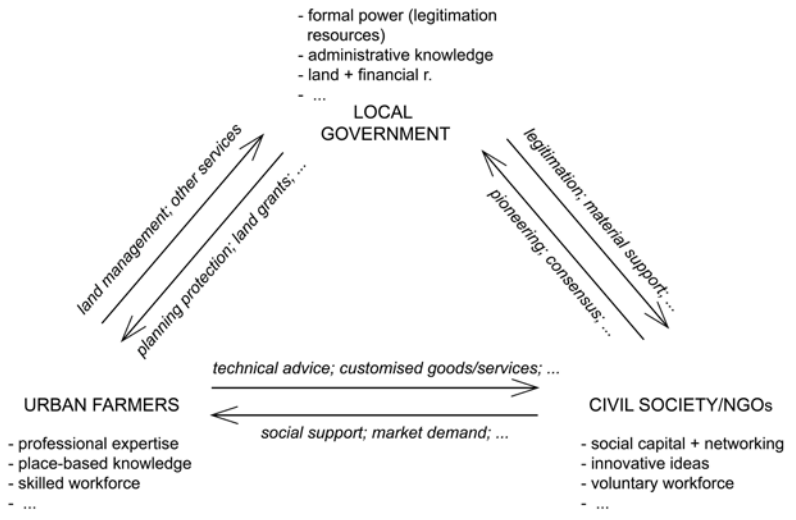


FIG. 2.1 A simplified pattern of resource-exchange between stakeholders *(Image by author)*

Besides turning it into a necessity, mutual dependence also complicates our reflection on multi-actor policy-making and its start-up dynamics in particular, which we can scarcely envisage in the form of a one-sided 'public engagement'. In fact, initiatives that recover an urban-rural relationship – as in other relatively new policy areas – are, in most cases, ascribable to bottom-up experimentation by NGOs and farmers, while governmental strategies usually follow societal dynamism rather than

inducing it (Healey, 2012). A telling example comes from the development of informal supply networks, fostered by ethical consumerism and the increasing interest for 'local' products (Forno & Ceccarini, 2006). Local stakeholders long for some form of material support by institutions, but at the same time they tend to be protective of their projects and fear incorporation into new schemes as a potential loss of authorship over them, or a devaluation of their underlying ideals (Prové et al., 2016).

Claims for self-determination are even stronger when it comes to professional farming, particularly when aimed at agroecology and sustainable methods. In this case, the will to maximise production autonomy and an almost exclusive control over particular kinds of knowledge resources jointly result in a reluctance to accept a policy-taking position within the decision-making process (van der Ploeg, 2008). This is one of the reasons why farmers increasingly strive not only for participation, but for a shared leadership with public authorities in land, landscape, and resource management.

In the light of all this, we may easily understand how important and, at the same time, how problematic it can be to tackle the urban-rural issue by means of inclusiveness and multilevel partnerships. Public support is crucial in legitimating social practices and raising their impact to a significant level for society, but at the same time it is necessarily embedded in resource exchange and "mutual adjustment" (Lindblom, 1965). In many cases, little more than enabling and sponsoring tasks are expected from the government, but the latter might nevertheless ask other stakeholders to reposition their objectives, in order to maximise the public interest of the overall programme, or adapt the programme itself to particular expectations to enforce reciprocal allegiance (Lindblom, 1965).

## 2.1 Social Learning and Reframing as a Prerequisite for Partnership Success

While mutual dependence encourages the formation of partnerships, partisan problem setting and possible unfamiliarity with each other's background or vocabulary (e.g. farmers with planners (Paradis et al., 2016)) tend to threaten their stability, and particularly trust and commitment as their constitutive elements (Sol, Beers, & Wals, 2013). The consequent unpredictability of policy processes has led to increased attention being paid by scholars to aspects such as social learning and reframing. That is, a change in the subjective representation of a policy problem by participants holding different perspectives and interests, which allows some form of agreement to be reached (Schön & Rein, 1994).

The relevance of social learning in facilitating the decision-making process has also been confirmed in regional development projects that try to engage farmers, as in one case in Westerkwartier, Netherlands (Sol et al., 2013). If one considers the extended marginalisation of peasant categories within 20$^{th}$ century economic, demographic, and

urban growth processes, which forged enduring social imaginaries and policy tools, which are still in use (van der Ploeg, 2008), it is not surprising that an overall reframing capacity should be urgently needed for 21st century agendas.

This concept will be indirectly addressed in the paragraph devoted to our Italian case study. The forthcoming section will view the coexistence of top-down and bottom-up patterns within the overall panorama of urban-rural governance, a part of which is represented by the fairly heterogeneous category known as 'agricultural parks'.

## 3 Belts, Parks, Infrastructures: Peri-Urban Governance Beyond Planning

Actual management models in rural-urban policies vary greatly and have varied over the course of time. According to a 'historical' perspective, one can summarily select three indicative historical 'prototypes': greenbelts, agricultural parks, and green infrastructures. The passage from one to another marks a general trend from a classic, state-led approach to a more horizontal management approach, in which a strictly rural issue is more easily tackled.

Greenbelts were first conceived in London in 1935, but were in fact revalued as a planning tool in the 1960s, in order to discipline the then-booming urban growth in European and other western cities. A sprawl-containment priority determined the clear supremacy of governmental bodies exercising their ordinary planning and control functions and the neglect of a genuine interest in agriculture itself (Amati, 2008).

Agriculture was indeed reevaluated through subsequent experiments, such as those ascribable to the nebulous category of agricultural parks, starting with the pioneer-project of *Parco Agricolo Sud* in Milan, first conceived in 1974. Farmers were not given much attention in the decision-making process, in this case, but a policy issue was nevertheless created, thus paving the way for further societal claims and possible reforms (Broz, 2017).

Rather than being a successor to greenbelts, the notion of an agricultural park is also one of the progenitors of green infrastructures, in the sense that a will to restore a symbiosis between city and countryside, to integrate agriculture with other purposes, and to boost its environmental potential is maintained. However, as well as multifunctional, accessible, and transversal to rural and urban contexts, green infrastructures are also multi-scalar and do not fit into enclosed perimeters, a difference that denotes a completely different planning approach (Amati, 2008).

In fact, its entire evolution is largely associated with multifaceted reframing dynamics, starting from a different attitude toward (peri)urban farming. The societal costs of its loss are now of public concern, while they were not until a few decades ago (Freilich & Peshoff, 1997), and

the intersecting of urban and rural practices is increasingly accepted to the point of assuming the idea of 'agricultural' parks within the city. Many farmers themselves were initially sceptical, but awareness of the benefits deriving from inclusion in an 'urban' sphere and from contact with visitors has grown in parallel with the increasing appreciation of agricultural by-products by city dwellers (Broz, 2017).

The emergence of multifunctional agriculture thus favours the advancement of its operators to active and competitive urban stakeholders and that of agriculture itself to a 'material' for the making of town plans, albeit with some significant obstacles deriving from the deeply grounded tradition of single-purpose land use zoning (Timpe, Cieszewska, Supuka, & Toth, 2016).

At the same time, the switch to an 'infrastructure' metaphor as an alternative to 'belts' or 'parks' reveals an increased confidence that policy makers have in contemporary urbanity as a ubiquitous and borderless phenomenon (Lefèbvre, 1968), which, in practice, leads to an additional demand for innovative planning tools and approaches. Other possible models thus further overshadow the comprehensive planning paradigm, in which a single policy instrument was meant to tackle a broad range of topics within a long-term horizon. Such models tend to promote cross-sectoral synergies and to entrust safeguarding not to restrictions alone, but to incentives, awareness-raising campaigns, and other strategies as well (COE, 2008).

What is more important is that the acknowledgement of both the inadequacy of merely zoning-based land preservation approaches and the recognition of functional and social (other than just spatial) values of the urban countryside are potentially opening up the plan-making arena to non-governmental stakeholders (Timpe et al., 2016).

More specifically, while urban farmers are no longer just a decided-for category, public engagement is also prescribed for apparently mere technical matters such as the creation of green infrastructures. Both scholars and policy makers increasingly admit that lifting such policy issues out of a strictly departmental perimeter and fitting them into an exchange framework (between city and agriculture, public and private actors, etc.) allows the build-up of awareness, shared interests, and consensus (Folke et al., 2005; COE, 2008), which is recognised in itself as the key pre-condition for an enduring defence of urban-rural contexts (OECD, 2013). Urban agriculture can play a similar fundamental role in bridging the gap between biodiversity policies and wider society, due to its expanding popularity (Timpe et al., 2016).

## 4 Top-Down or Bottom-Up? About Urban-Rural Policy Making Forms

Multi-actor frameworks are more necessary than optional in the management of peri-urban ecosystems, but this does not imply that a strong role by the government is diminished, nor that it should diminish, since public legitimation is still vital in any case. In fact, what we observe is an area characterised by adaptive governance where some kind of exchange (as previously noted) and consequent synergies between institutional, entrepreneurial, and civic stakeholders are a requisite for success. A strict dichotomy between bottom-up and top-down forms is outclassed, the actual balance between these two elements depending on several context-related factors, e.g. the involved land surface and the general objectives. For instance, an institutional engagement is far more decisive in regional-scale projects aiming at land preservation than in particular initiatives that focus only on agricultural practices (Prové et al., 2016).

Prové et al. (2016) describe four typical formats of relationships between governmental, market, and civil society actors, ranging between 'pure' top-down and bottom-up patterns:

- the local government may instigate, steer and manage an initiative altogether, and possibly capitalise volunteer workforce (1st governance typology);
- it may launch and finance the project while opting for public engagement and take other actors as equal partners (2nd);
- it may provide an enabling support to private or nongovernmental initiatives with high social or environmental value (3rd);
- finally, certain bottom-up initiatives might not require nor desire any public intervention (4th).

This model can prove very useful in analysing urban-rural governance partnerships and its reliability is generally confirmed when we look at the European panorama of policies or actions (Lohrberg et al., 2016). The same classification can possibly be employed to study some individual, particularly complex, and long-running projects in their temporal metamorphosis, as in the case of *Parco Agricolo Sud* in Milan. As we will see, the evolution of this policy has been in a step with the progressive emancipation of the local peasantry.

## 5 The Parco Sud Case Study in Milan

The *Parco Agricolo Sud Milano* (P.A.S.M. or informally *Parco Sud*) is a regional-scale rural and partly natural area covering the exceptionally fertile plains south of Milan and partly brushing its metropolitan core. Its surface amounts to 46,300 hectares of land and encompasses 61 municipalities, among which is the city of Milan (http://www.cittametropolitana.mi.it/parco_agricolo_sud_milano/). The overall policy-making process has been decades long. The first

public and technical debates date back to 1974 and some bottom-up experimentations were carried out during the 1980s, fostered by the increasingly popular environmentalist movement with its constructive struggle against the excessive power of local real estate tycoons and their close connections with the local government (http://www.assparcosud.org/chi-siamo.html; Broz, 2017). The area (Fig. 5.1) was finally put under a protection regime in 1990 via the Lombardy Regional Law no. 24 (Regione Lombardia, 2007). It was only ten years later, however, that its general planning framework (*Piano Territoriale di Coordinamento*) was adopted (Provincia di Milano, 2000).

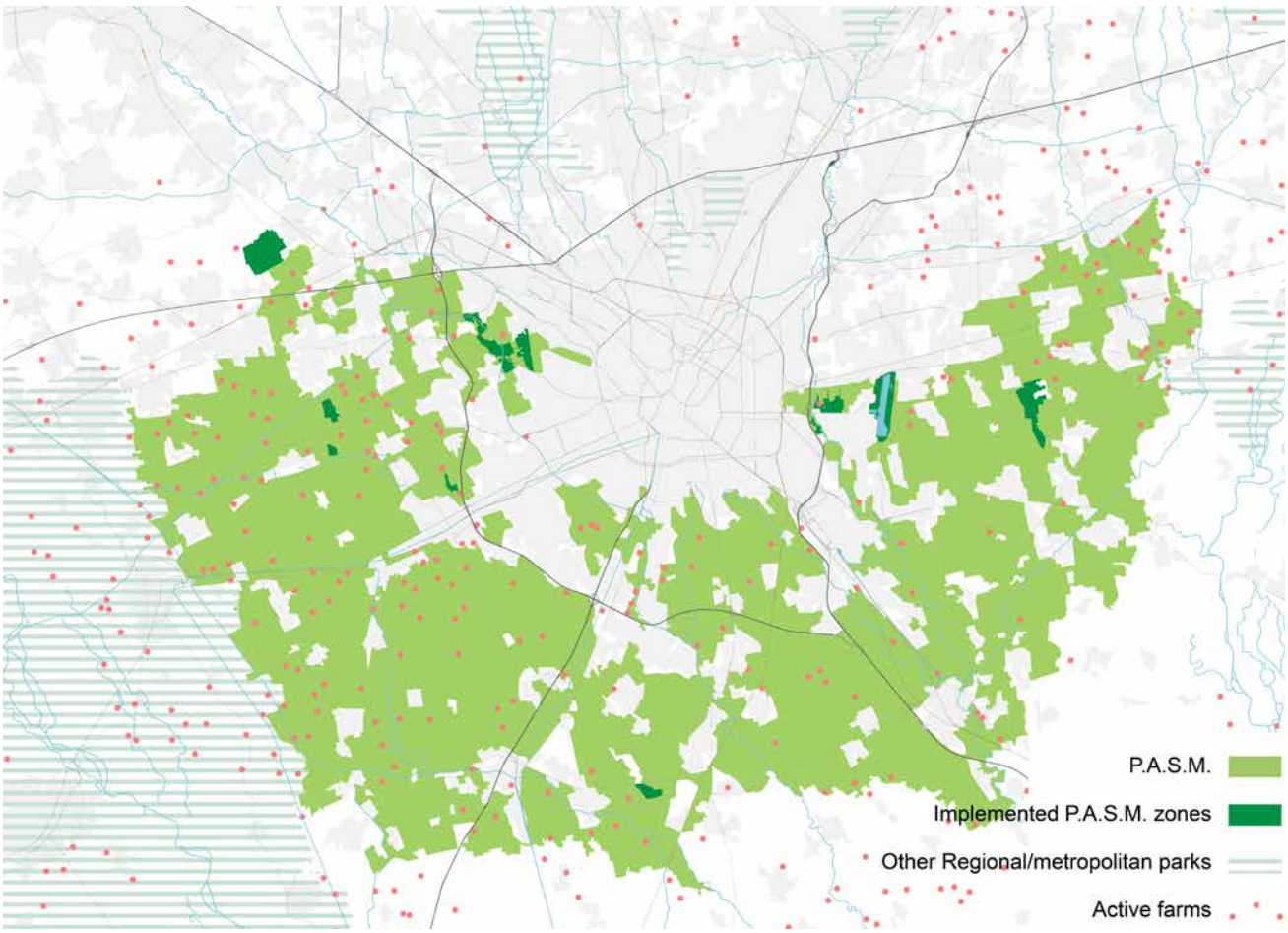


FIG. 5.1 *Parco Sud* and the metropolitan area of Milan in 1990 *(Image by author)*

The overall project ambitiously foresaw that the Province of Milan (the actual leading body) would encourage a gradual restoration of the local environment and the historical landscape by firmly regulating the behaviour of farmers, while also incentivising leisure uses by means of structural and infrastructural investments (Ferraresi & Rossi, 1993).

The idea of a greenbelt converting into a 'rural' park with agriculture as its main educational, recreational, and connective element was very innovative at that time, so that 'Parco Sud' soon became an internationally renowned case study and source of inspiration for

similar entities that were later established all around the continent (Lohrberg et al. 2016).

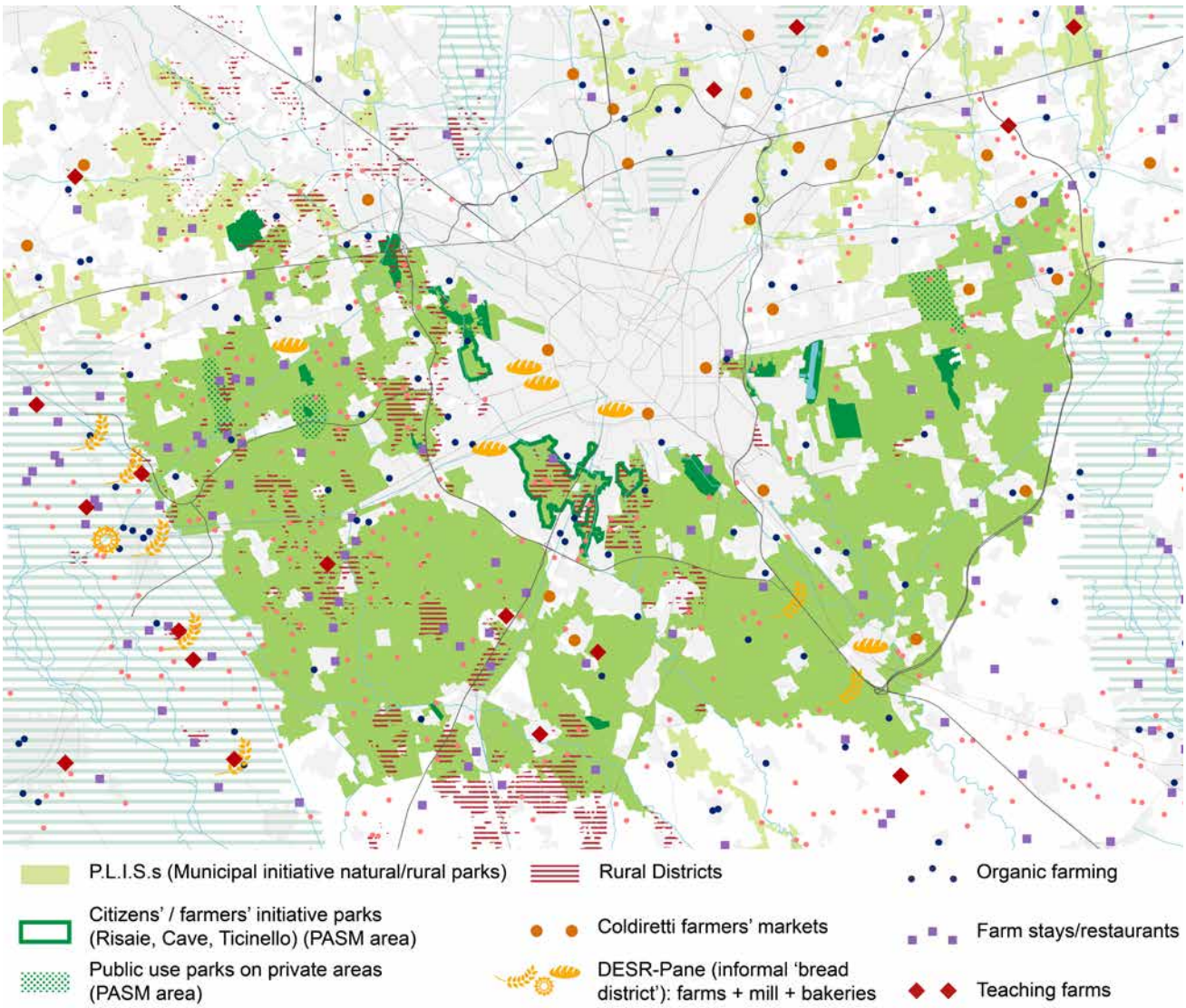


FIG. 5.2 Urban-rural policies and practices in Milan, 2016 *(Image by author)*

In practical implementation terms, however, it is far from being a 'success story'. A constant lack of public funding minimised any tangible results, while the political nature of the P.A.S.M. administrative body determined a politicisation of the process itself, deeply undermining the challenge of counteracting urban pressures as a major cause for the neglect of peri-urban landscapes (Senes, Toccolini, Ferrario, Lafortezza, & Dal Sasso, 2008). This has proved particularly true in the urban-rural direct contact zones, where building industry appetites overwhelmed any collective aspirations for an active enhancement of open spaces. For instance, local Urban Belt Regulation Plans (*Piani di Cintura Urbana*) were drafted but, significantly, never adopted (Vescovi, 2012).

However, starting from the early 2000s, a whole geography of experimental practices and locally based initiatives has been overlapping

with P.A.S.M.'s largely unrealised predictions, partly collected within an extra-institutional 'Rural and Fair Economy District' involving more or less the same territory (http://www.desrparcosudmilano.it/). A large part of these initiatives are connected with a societal rediscovery of rural traditions or a 'new peasantries' dimension (van der Ploeg, 2008); most importantly, they are independent of the formal authorship of the Park and often of any other public policy frameworks. They still tend to be labelled, or label themselves, *Parco Sud*, which is why we refer to them as a 'parallel' *Parco Sud* (Fig. 5.2).

The informal has made way for a more structured and institutionalised arrangement over the last decade, starting with an increasing public support of the parallel park (e.g. through the promotion of farmers' markets by several municipalities). This has developed alongside an increasingly important engagement on the part of NGOs and local farmers, which has, in some cases, resulted in the co-leadership of public-private projects and participation in spatial planning decision-making processes. A very important advancement has come with the constitution of four local 'Rural Districts' (*Distretti Agricoli/Rurali*) between 2010 and 2012 (http://www.agricity.it/distretti-agricoli/), following a 2001 national law that introduced this innovative tool as a combination of a business consortium structure, spatial development visioning, and public-private cooperation (Toccaceli, 2015).

In 2015, the four Districts, together with the main local and regional governmental authorities, signed a Framework Agreement for Spatial Development named *Milano Metropoli Rurale*, by virtue of which the emerging Milanese farming 'establishment' aims at asserting itself as a leading representative in several policy fields (landscape, water management etc.) (http://www.milanometropolirurale.regione.lombardia.it/). Some of the existing P.A.S.M. objectives have thus been reinforced through a more up-to-date 'ecosystem service' categorisation and a multi-actor partnership model, while some additional ones – such as the design of a locally based Food Policy, which is actually a response to already ongoing informal dynamics – have been added to the agenda (http://www.milanurbanfoodpolicypact.org/).

The surfacing of new scenarios has stimulated a series of reform proposals for the old P.A.S.M., now considered to be too bureaucratic, and some suggest it should evolve in a more adaptive governance-like direction (Vescovi, 2012).

## 5.1 Evolving Partnership Models

What we notice throughout these developments is that all those typologies that make up the interpretative model outlined in section 4 are reflected by the various policy geometries that emerged during the *Parco Sud* process (Fig. 5.3).

The official Park in its first and still existing incarnation perfectly accords with the top-down pattern recalled by the 1st governance

typology. By contrast (and almost deliberately, one might say), what has been defined in this article as the 'parallel' *Parco Sud* initially fits into the purely bottom-up model, then shifting from the 4th to the 3rd type by virtue of an increasing legitimation by the public sector. A hybrid situation between the 2nd and 3rd pattern exists when describing Rural Districts and the *Metropoli Rurale* framework, while the future *Parco Agricolo Sud* will probably be of the second type, once possibly reformed.

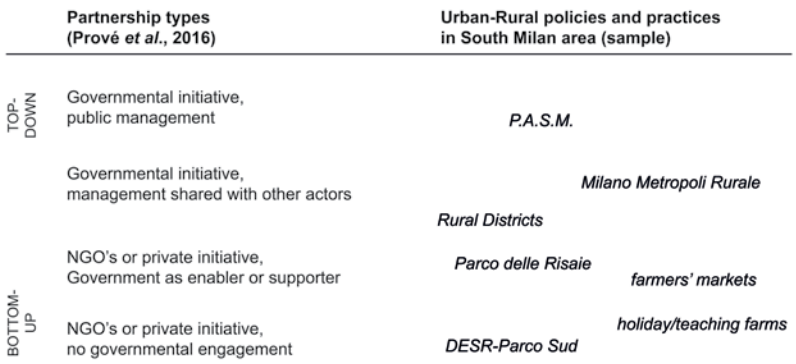


FIG. 5.3 Urban-rural governance framework in Milan and its classifications *(Image by author)*

This convergence towards the centre seems to confirm both the general tendency towards greater collaboration between local authorities, civil society, and farming stakeholders (Prové et al., 2016), and the need for a multi-actor partnership approach in order to make urban-rural policies effective.

But what is particularly interesting in the case of Milan is the promotion of peri-urban farmers from almost complete social invisibility to a growing operational role, to the level of policy leadership. In order to understand more deeply how such a reversal has come about, we should first return to the original struggle against urbanisation on the part of the local peasantry, and for survival on both social and economic levels.

## 5.2 Resilience and Empowerment of South Milan Farmers

As we have already mentioned, social conflict and controversy over land development choices have played major roles in the policy process. These can be seen in at least three ways:

- as the main catalyst of collective action for the defence of threatened open spaces;
- as the sociological explanation for the present South Milan landscape;
- as a factor that has contributed to shaping the identity of contemporary '*Parco Sud*' farmers, starting from stimulating self-awareness among local peasants.

In the latter case, it is important to stress that those farmers who actually participate in the current peri-urban governance framework of

Milan fall into a new category of local civil society, which is difficult to quantify or to describe in its internal differentiation. We can refer to it approximately as a minority, albeit a very significant one on a qualitative level, since it represents the latest product of a long-term co-evolutionary process (Broz, 2017). The process may be summarised in four main phases, each one characterised by particular forms of interaction between farmers, other stakeholders, and external circumstances.

The first phase (1960s – early 1970s) came with the fulfilment of the industrialist paradigm, which submitted the rural fabric around Milan to two pressures, one from overwhelming urban growth, the other as a consequence of the massive mechanisation of agriculture. Both factors favoured an ideological de-legitimation of peasant elements persisting inside a then booming urban society. In the face of such pressures, most farmers responded by either abandoning the land-holding (usually only rented) or trying to adapt to the new mass-production mode. However, some of them resorted to already available input (family labour, existing fixed capital, well-known traditional methods) in order to maximise autonomy in the face of market forces. This 'resistance through traditionalism' was particularly evident inland in the urban fringes, where considerable uncertainty discouraged long-term costly investments.

The second period (1970s – 1980s) was marked by an initial move away from individual resistance toward collective strategies and widening alliances. Green movements carried out an important role in mediating and supporting the interests of farmers in this phase. On the urban fringes, a peculiar peasant-environmentalist-inhabitant axis (quickly merging into the *Associazione per il Parco Sud Milano*) began to organise parties and luncheons inside the *cascine* as a pro-park campaign aimed to turn the stigmatised urban countryside into a resource for the under-equipped mass-housing neighbourhoods and to protect farmers in case of intimidations or evacuation attempts by property owners. Social gatherings are still employed nowadays as an awareness-raising tool (Fig. 5.4).

FIG. 5.4 South Milan: social gathering in an urban *cascina (Image by author)*

Nevertheless, the final incorporation of P.A.S.M. in 1990 turned out to be relatively disappointing for farmers. In the third phase, the process was actually hindered by their chronic lack of trust and a slight antipathy toward the Park administration, which was perceived as barely effective in preventing land consumption and as an interference in the freedom of farming activities by means of landscape restrictions and other bureaucracy.

This stagnating panorama has changed since 2000, however. In the final phase of the process (still ongoing) several new elements have favoured the participation of suburban farmers in urban-rural policy making, although this is in large part outside the institutional perimeter of P.A.S.M. Among these factors, we may list the development of social capital as a result of previous alliances and a combination of broader socio-cultural circumstances, such as:

- professionalisation and social turnover within the sector;
- revaluation of the face-to-face relationship between (urban) consumers and farmers;
- the availability of new generation rural policy tools more open to planning concepts;
- the increased familiarity of farming organisations (like CIA and Coldiretti) with spatial planning approaches.

## 6 Conclusions

The disappearance of traditional urban-rural borders favours new forms of integration between cities and agriculture. A collective recognition of the ability of multifunctional farming to produce ecosystem services increases mutual dependence between urban and rural stakeholders, which in turn requires multi-actor partnerships to integrate classic top-down approaches. More and more reluctant to positions as policy-takers, farmers can finally aspire to participate in decision-making processes, and urban planning itself is facing a reframing challenge in order to include agriculture among its materials, after long-term marginalisation. This is why 'ordinary' safeguard devices, such as green-belts and agricultural parks, also need to be updated and completed by additional policy tools within an emerging adaptive governance scenario, so as to permit participation and a broader consensus on new sustainable development tasks.

While confirming this general scenario, the South Milan experience can teach us other valuable lessons.

For instance, it suggests that the human and spatial components of the urban countryside are inseparable. When the former emerges from social and cultural invisibility, the latter follows. This is why *Parco Sud* emerged from imprecision and became a recognised resource for the city, once farmers actively took on the challenge of re-establishing an urban-rural relationship. No top-down action since then has ever reached the critical mass necessary to generate a new spatial identity

that is capable of defending itself against urban growth forces. This also makes us appreciate a certain degree of autonomy on the part of some resilient 'socio-ecological environments' in preserving the common good in difficult circumstances.

Secondly, it nevertheless appears that the wish of farmers to join urban-rural policies and 'agricultural park' agendas is not to be taken for granted, since it is often linked to long-term sociocultural processes and to the will to resist in a difficult environment, factors which have to be taken into account by policy makers and researchers. In the case analysed here, a struggle against land consumption, and for production autonomy and social emancipation together, has brought a formerly marginalised peasantry to sufficient empowerment and self-identification as an 'urban' community to allow its inclusion in the governance network.

Finally, participation also depends on actual interest in participating, which, in the case of farmers, partly coincides with economic opportunity and a measure of protection by the State. In Milan, a real turning point that allowed them to surmount a pure decision-taker position came with the final conquest of what used to be almost a privilege of property developers. That is, resources to be exchanged with the public, among which is a symbolic capital provided by the increasing societal appreciation of urban agriculture and its benefits. Innovative policy frameworks such as Rural Districts enable a rewarding system for ecosystem services that allows some form of reciprocity, the absence of which in the original top-down P.A.S.M. approach partly explains its ineffectiveness.

So, how capable are governmental institutions of understanding the social and cultural demands informing bottom-up instances for a 'rural-urban' policy? How willing or prepared are they to actively consider such instances? And does a significant bottom-up movement actually exist, or should it be stimulated? These are three basic research questions worth tackling for those willing to investigate the peri-urban agriculture issue in contexts where open spaces around cities remain a threatened resource and where inclusion in the decision-making process is still at stake.

## Glossary

**Adaptive governance** is a concept deriving from institutional theory and focuses "on the evolution of formal and informal institutions for the management and use of shared assets, such as common pool natural resources and environmental assets that provide ecosystem services". It is applied to wide social learning and collective choice processes, such as "collective choices about the scope and structure of institutions that govern lower level choices by individuals and organizations." (Hatfield-Dodds, Nelson, & Cook, 2007, p. 1).

**Agricultural park** or **rural park** is a safeguarded area whose land use and landscape are predominantly characterised by agriculture. This label can be applied to very different cases, in terms of dimension, location, functional mix, type of production, governance characteristics or other factors. The predominant task of an a.p. can also vary from just safeguarding a pre-existing rural environment to actively fostering agricultural practices, typically in the more recent examples where multifunctional farming is also promoted (Timpe et al., 2016).

***Cascina*** is the characteristic multi-family rural building in the Lombard Po Valley. The same term may also refer to the production unit as a whole. Land-holdings in South Milan are predominantly rented: tenant farmers are the absolute majority and actual property owners are mostly private. In the municipality of Milan however, 550 out of 2,910 hectares of arable land and 60 of the 117 active farms are still owned by the city (ISTAT, 2010). This has allowed the town administration to extend the duration of agrarian rents and to closely cooperate with the DAM rural district (consorziodam.com).

**Legitimation**, according to Benson's definition (1975), corresponds to the formal recognition of a private entity/category as a deliverer of public interest services. The deliverer is consequently provided with instrumental benefits: tax exemption, funding, favourable zoning regulations, etc. For instance, a private farmer meeting some particular requirements may obtain privileged access to land rental on publicly owned plots in the name of public interest (as in the case of *Milano Metropoli Rurale*). The right to legitimise somebody and to concede such advantage is held by (local) public institutions in the form of "authority" or "legitimation resources" (Benson, 1975, p. 229). Legitimation resources and economic resources, and the interaction between those who hold them, are decisive for carrying out public policy programs in a democratic system based on market economy.

**Multifunctional farming** allows the production of additional goods other than food and fibre, unlike conventional (or industrial) farming. Ecosystem services are included, as well as some other benefits for society such as rural employment. Being more sustainable, multifunctional agriculture is often incentivised through public policies. A valuable insight into this issue is provided by van der Ploeg (2008).

**Peri-urban agriculture** concerns those areas at the edge of the city, while 'urban' (or 'intra-urban') agriculture manifests itself within the

urban fabric. This basic distinction could be sufficient, but there may be some others. As it appears from a recent research report (Lohrberg et al., 2016), the former usually involves larger and less fragmented farmlands and, as a consequence, it tends to be professional rather than recreational. Its peri-urban location normally affects farming business in two opposite ways: on the one hand it threatens it (due to a constant rural-to-urban transition perspective), while on the other, it is, nowadays, also perceived as an opportunity, due to a growing interest in local products and nearby rural amenities by urban dwellers.

**Policy-takers** is a category widely employed (not only in scholarly works) generally referring to those who benefit, or are supposed to benefit, from public interventions or programmes without participating in their definition. In this chapter, we use this term to highlight a passive or scarcely influent role. Nevertheless, a rigid 'makers/takers' dichotomy is criticised by several authors, among them H. Bang (2005).

**Reframing** literally means a change of **frame**, a much more deeply-rooted structure than a mere 'representation'. According to D. Schön, policy positions rest on "frames" or "underlying structures of belief, perception, and appreciation" (Schön & Rein, 1994, p. 23). Frames are undeclared and taken for granted, and divergences between them are at the origin of policy controversies.

**Social imaginary** is a concept that sociologists employ to refer to how a particular society imagines itself according to its own cultural system, legislation, and state arrangement in a given historical period (Taylor, 2004).

**Social learning** refers, in this context, to dynamics in which participants produce fresh knowledge and possibly change their point of view while interacting with each other (Sol, Beers, & Wals, 2013, pp. 36-37). In this case, as in other cases, policy studies have borrowed some views from social behaviour theories, with the aim of better understanding what affects progress and innovation within public policy processes.

**Socio-ecological system** (or **social-ecological system**) is a concept that scholars often prefer to 'ecosystem', in order to overcome an arbitrary separation between 'social' and 'ecological' and to include human practices and structures (e.g. institutional) in the study of ecology. As Ostrom notes (2009), such a perspective may also help social and natural science findings to be organised within a common analysis framework and to jointly orientate the build-up of public policy agendas.

**Symbolic capital** is a form of capital deriving from respect and recognition by a particular society, which confers a legitimate power (within the same society) to those who hold it. The concept of symbolic capital is widely used in sociology and was introduced by Pierre Bourdieu (1984).

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