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Role of Ecosystem Services in Enabling Rural-Urban Synergies

A European Perspective

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ISSN 1572-7742 ISSN 1875-1210 (electronic)
Landscape Series
ISBN 978-3-031-98152-4 ISBN 978-3-031-98153-1 (eBook)
https://doi.org/10.1007/978-3-031-98153-1

Wageningen University This book is funded by the ROBUST project, as part of the Horizon 2020 Framework Programme of the European Union under Grant Agreement no. 727988. The information and views set out in this publication are those of the author(s) and do not necessarily reflect the official opinion of the European Union.

This Springer imprint is published by the registered company Springer Nature Switzerland AG
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

Acknowledgements

The editors would like to express sincere thanks to the Scientific Coordinator of the ROBUST European Horizon Research and Innovation project, Professor Han Wiskerke, of Wageningen University. Under his leadership, all the project partners created a vibrant research community that generated profound and fruitful discussions around rural-urban linkages and synergies, and in particular on ecosystem services, and many of whom became co-authors of this book. We are very grateful to Alexia Rouby, Policy Coordinator at the European Commission and ROBUST's calm and professional project officer, for her guidance and patience.

Furthermore, we would like to acknowledge all experts and institutions that participated in workshops, in the living labs, responded to surveys and, in one way or another, contributed with expert technical inputs or fundamental perspectives over five years of the project.

We extend gratitude to the scientists and experts who gave their time so generously as anonymous reviewers for the chapters in this volume.

Additional thanks are due to Marie Steytler of the University of Newcastle School of Natural and Environmental Sciences and Harry Batchelor of Leeds University School of Earth and Environment for their help in compiling early manuscript drafts.

Rural-Urban Outlooks: Unlocking Synergies (ROBUST)

ROBUST received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 727988.

The content of this publication does not reflect the official opinion of the European Union. Responsibility for the information and views expressed therein lies entirely with the author(s).

About This Book

This open access book elaborates on the role Ecosystem Services play in relation to establishing, and enhancing, rural-urban synergies. It draws on the concept of Ecosystem Services (ESS) as the ecological characteristics, functions or processes that directly or indirectly contribute to human well-being, that is, the benefits that people derive from functioning ecosystems. The body of empirical and theoretical research that supports the various contributions in this book was developed in the context of the project H2020 ROBUST—Rural-Urban Outlooks: Unlocking Synergies (GA: 727988). The project was structured in five Communities of Practice (CoP), as groups of researchers sharing a common thematic interest. One of these CoP was dedicated to investigating how ESS can unlock synergies across rural and urban territories. Strategic approaches to integrate ESS in spatial planning were developed, associating ESS use and delivery to planning instruments and governance models at multiple scales. The approach assumes the engagement of multiple actors both as users of ESS alongside their position as planners, regulators, land owners or other types of decision-making roles, to explore how ESS enhances rural-urban synergies. The purpose behind the spatial synergies is to ensure balance in the supply and demand of ESS. Consequently, we have searched for instruments and innovative governance models that connect public policy, market interests and science and technology, to stimulate alternative practices and policy-integrated goals that enable resilience and social well-being. Ultimately, our purpose has been to generate transition processes that recognise socio-ecological systems as inclusive of new ESS-based societal values and leading rural-urban synergies. In other words, the inclusion of socio-ecological systems within ESS is a condition for human well-being. Theoretical investigation in five core themes and its implementation in six different living laboratories form the more substantive content of this book. The book applies only to European living labs that reveal diverse local contexts but which are linked within a similar EU policy framework. Even so, the European experience can illuminate similar practical and academic efforts outside European boundaries. In addition, ESS is analysed in the context of its integration with other relevant themes in a cross-sectoral perspective. The routine integration of socio-ecological systems within spatial planning and development processes is still in its

infancy in many countries, and this book offers both examples and recommendations for extending integration through the lens of ESS. Overall, the purpose of this book is to communicate the multiple and constructive roles played by ESS in strengthening rural-urban synergies, using multiple lenses, looking particularly into challenges and merits of interventions, and into different imaginative forms of making such an abstract concept more concrete, operational and recognized by stakeholders in the field.

Contents

Chapter 1
Introduction

Maria Rosario Partidario, Daniel Keech, and Isabel Loupa-Ramos

Abstract This chapter introduces the rationale and motivation for the book. It highlights the European research project ROBUST *(Rural-Urban Outlooks: Unlocking Synergies)* within which all the investigation that supports the chapters in this book was conducted. It briefly describes the architecture, the themes and the systemic approach to rural-urban linkages and synergies within the ROBUST project. Finally, the structure of the book is described and a brief summary of each chapter is provided.

Keywords Ecosystem services · Rural-urban linkages · Rural-urban synergies · ROBUST research project

1.1 Ecosystems Services and Rural-Urban Synergies in ROBUST

Ecosystem Services (ESS) was one of the five core research topics in the ROBUST European Horizon Research and Innovation project. Over 5 years, from 2016 to 2021, ESS framed discussions about enhancing rural-urban links and potential synergies (https://www.rural-urban.eu). The importance of ESS in ROBUST *(Rural-Urban Outlooks: Unlocking Synergies)* was a recognition of ESS role in political, social and economic territorial development. Among rural sociologists and economists, geographers, engineers and governance specialists, ESS was not initially a theme expected to gain significance in rural-urban discussions. However, right from the project's conceptualization, ESS gained relevance along with the other four

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M. R. Partidario et al. (eds.), *Role of Ecosystem Services in Enabling Rural-Urban Synergies*, Landscape Series 20, https://doi.org/10.1007/978-3-031-98153-1_1

research topics: new business models and labour markets, public infrastructures and social services, sustainable food systems and cultural connections.

These five core research topics became ROBUST's five Communities of Practice (CoP), established to represent functional relations between rural and urban spatial realities. Evolving discussions confirmed the multi-dimensional nature of ESS related themes, the transversal relationship with the other CoP themes, and the variable types of the outcomes, combining to enhance rural-urban synergies, as the chapters in this book intend to show.

An initial activity of the ROBUST CoP ESS was the development of a joint agenda around five key themes (see Chap. 2). The opportunity to share preliminary results motivated the participation of the CoP ESS research team at the Ecosystem Services Partnership (ESP) Conference in Hannover in October 2019, where a dedicated session on the subject of ESS and rural-urban synergies was held. Commissioning editors at Springer invited the CoP ESS team to propose a book which would represent the CoP ESS research outcomes in ROBUST. Indeed, the literature is relatively sparse in relation to ESS in the context of spatial territorial planning perspectives, and even more limited in exploring the potential for creating synergies between rural and urban spheres. This book is a contribution to such discussions.

This introductory chapter now follows with a description of the ROBUST architecture. This is necessary to enable the understanding of the conceptual and methodological context within which ESS is presented as a function for creating or enabling rural-urban synergies. This is followed by a brief synopsis to introduce the contents of the book.

1.2 ROBUST's Architecture: Living Labs and Communities of Practice

ROBUST, which ran from 2016 to 2021, is the acronym for a European Horizon Research and Innovation project called *Rural-Urban Outlooks: Unlocking Synergies*. In geographical scope, it covered 11 countries in a partnership of 24 members. ROBUST's objectives were transdisciplinary, that is, researchers and practitioners worked together to plan and implement change, and new knowledge was created combining scientific and lay knowledge. The key aim of ROBUST was to strengthen rural-urban linkages and devise governance innovations which promote rural-urban synergies.

This co-productive approach is a crucial characteristic of the ROBUST design. To facilitate transdisciplinary aims, a living lab methodology was adopted. Living labs (LLs) are place-based, iterative experiments (Ballon & Schuurmann, 2015; Voytenko et al., 2016) which operate in real time to try to identify and test solutions. LLs are by now well-known and widely examined in the literature on sustainable transitions, especially in the urban sphere, where they have been applied to find

neighbourhood and community innovations. Indeed, a European Network of Living Labs (ENoLL https://enoll.org/) was established in 2008 to facilitate horizontal learning from this complex but promising methodology.

In ROBUST, a new emphasis was envisaged. Because the LLs were focused on place-specific governance innovations, each LL was coordinated as a collaboration between a research organisation (for data collection and analysis) and a municipal or regional organisation (to implement tested governance innovations).

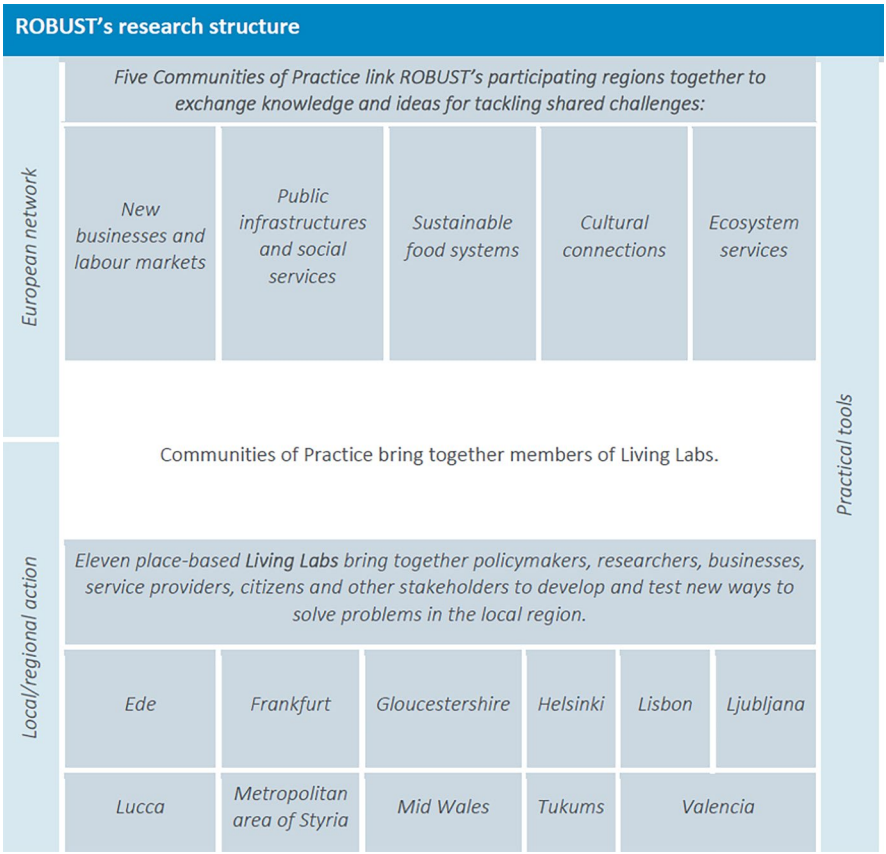
Table 1.1 below provides an overview of the 11 LLs and shows the pairs of local partners who co-ordinated each LL. The partnership was completed by two overarching partners with project-wide remits.

To facilitate the sharing, exchange and comparison of experiences, findings and solutions between different LLs, ROBUST also created five thematic Communities of Practice (CoP), organised according to five categories of functional rural-urban relations as outlined (see Table 1.2, below). A CoP refers to a group or network of people who share a common interest, practice, concern, problems or passions (Wenger et al., 2002; Barston & Tusting, 2005). By participating in a CoP people

Table 1.1 Living labs in ROBUST

Living Lab (country)	Partners	
	Research	City/Municipal/Regional
Ede (Netherlands)	Wageningen University	Ede Municipality
Frankfurt Rhein-Main (Germany)	PRAC—Policy Research and Consultancy	Regional Authority Frankfurt-Rhein-Main
Gloucestershire (UK)	Countryside and Community Research Institute, University of Gloucestershire	Gloucestershire County Council
Helsinki (Finland)	Natural Resources Institute, Finland	City of Helsinki
Lisbon Metropolitan Area (Portugal)	Instituto Superior Técnico, University of Lisbon	Lisbon Regional Coordination and Development Commission
Ljubljana (Slovenia)	Oikos Developing Consultancy	Ljubljana Regional Development Agency
Lucca (Italy)	University of Pisa	Province of Lucca
Mid Wales (UK)	Aberystwyth University	Welsh Local Government Association
Styria (Austria)	Federal Institute for Less Favoured and Mountainous Areas	Regional Management of the Metropolitan Area of Styria
Tukums (Latvia)	Baltic Studies Centre	Tukums Municipality
Valencia (Spain)	University of Valencia	Regional Government of Valencia
2 Project-wide partners responsible for knowledge exchange and policy development		
ICLEI—Local Governments for Sustainability (learning dissemination, publicity)	PURPLE—Peri-Urban Regions Platform Europe (policy)	

Table 1.2 ROBUST's research structure—living lab and CoP networking



learn through involvement in (inter-)action, communication, and negotiation (Barston & Tusting, 2005). Based on regular interactions (face-to-face as well as online) the participants may discover new ways of seeing the world, and learn collectively how to better address or deal with the issue at stake by recruiting a shared repertoire of resources and practices. This volume presents, in many respects, the collective repertoire of the CoP for Ecosystem Services.

Each LL was encouraged to prioritise three of the five functional rural-urban relations to focus on in their areas. Those choosing the same themes thus formed a CoP.

The potential of transdisciplinary (TD) research for tackling sustainability challenges at different scales and in different contexts is increasingly recognised (Jahn et al., 2012; Lang et al., 2012; Scholz & Steiner, 2015a, b; Wickson et al., 2006). Acknowledging these potential benefits, ROBUST was designed according to the principles of transdisciplinary (TD) research, which include the joint definition of the challenges to be addressed and of the overall research plan (research and

practice partners cooperate at the project design phase), as well as the joint implementation of the research. This method of working helps to achieve outcomes that satisfy actors from both science and practice, and that will contribute to a process of change. Moreover, in line with the TD literature, fostering co-learning and reflexivity and encouraging flexibility in the ongoing work were central to the ROBUST approach (at both the living lab and CoP level).

Living labs are one common way of working in a TD fashion. They bring actors from science, policy and practice together. ROBUST combined this approach with CoPs, the latter as a mechanism to generate and broker co-learning across and between living labs. The CoPs are less about local context and more about identifying common learning, in terms of lessons and issues at a thematic (or functional) level to support rural-urban synergies. This constitutes an important relationship between the Living Labs and the CoP. As per the living lab process, each CoP worked according to three key CoP characteristics (see Wenger, 1998, 2000), namely:

- Mutual engagement (innovation agenda and communication strategy);
- Joint enterprise (common issues for the group to work on together); and
- Shared repertoire (common learning and joint resources co-produced by each CoP).

Table 1.2 shows the ROBUST research structure of the eleven living labs and the five CoPs. Five living labs collaborated in the CoP of Ecosystem Services which included Lisbon, Frankfurt, Ede, Gloucestershire and Lucca.

1.3 About This Book

The aim of this book is to take stock of the prolific amount of research findings, collected as part of ROBUST, on the role of ESS in establishing rural-urban linkages, and enhancing subsequent synergies. The identification and exploration of such synergies is a particular aspect that has not been explored in the literature of ESS, or spatial planning, both in rural or in urban domains. As such this book represents a significant contribution to the existing literature and we hope it will further stimulate the identification and implementation of ideas and applications of ESS in practice, concerning rural-urban synergies.

The starting point for this book was the synergistic capacities of ESS explored, developed and tested, in five living labs. These cases help to show how ESS can offer significant support for the idea of the continuity of territory, contradicting the conventional divide between urban and rural spaces. Five core themes were adopted to explore the relevant functions whereby ESS could lead to rural-urban synergies. These were:

1. Circular Farming engaging ESS in rural urban synergies
2. Community Partnerships engaging ESS in rural urban synergies
3. Mapping ESS supply and demand for rural urban synergies

Table 1.3 CoP ESS research and innovation agenda (RIA) priorities

1. How ESS might reinforce rural-urban relations?
2. How can multiple ESS be prioritised or balanced in a particular region, which of them are key, and are they equally important?
3. How do different communities use ESS, what ESS indicators are useful?
4. What governance and planning models and better practices (public and private) enable the delivery of ESS?
5. What participatory measures help to engage people with ESS uses (e.g. gardening, bird watching, among others)?
6. How do we discuss the unknowns of ESS (i.e. account for uncertainty) as a result of climate change, rural population dynamics, land use changes over time, among others?

4. Multi-scale planning for ESS in rural urban synergies
5. Payment and compensation schemes for ESS in rural urban synergies

These five themes reflected the way in which research and practice partners in the CoP ESS translated the ESS conceptual model that is shared in Fig. 2.6 of Chap. 2. The various chapters in this volume address these topics but also other cross sectoral themes. Table 1.3 shares the research and innovation priorities that assisted the community of practice (CoP) dedicated to ESS in the ROBUST project.

The book is structured in three main parts: first the core research themes in ESS for rural-urban synergies are set out, addressing theoretical contributions of research teams in the CoP ESS, and including four of the five themes above. The second part of the book presents emerging topics resulting from operationalising ESS in practice, effectively the outcome of collaborations between research and practice partners developing ESS applications in their living labs. The third part of the book considers the cross-cutting, horizontal issues which reveal the debates across and between CoPs (in other words, between the CoP ESS and the other four CoP in ROBUST), and where additional value was brought to endorsing ESS in rural-urban synergies.

Each chapter in the three parts, plus the conceptual Chap. 2, were blind peer-reviewed by a duo of internal (ROBUST research colleagues) and external reviewers, who were independent European academics with ESS expertise and not connected to ROBUST.

1.4 Synopsis of Chapters

The first Part, on core research themes in ESS for rural-urban synergies, covers the issues of assessment and mapping of ESS in territorial planning, multi-scale and multi-level planning for rural-urban synergies, the role of community partnerships in the provision of ESS and finally the theme of payments for ESS (PES) and the potential PES have on creating synergies in rural-urban connections. In particular payments for ESS remains an important and still underdeveloped concern. In

Chap. 3 Rovai and colleagues consider ESS assessment in landscape and spatial planning, reviewing methodological approaches, challenges and the role of experts in delivering assessments, using case-studies to illustrate the assessment and the mapping in three living labs: Lucca, Lisbon and Frankfurt. In Chapt. 4 Partidário and colleagues address the use of multi-scale planning, and multi-level planning to enhance rural-urban synergies based on ESS, identifying main gaps in the existing science-policy analysis. They conclude by re-emphasising the relevance of multi-scale and level considerations of ESS within spatial planning. In Chap. 5 Galli and colleagues investigate community partnerships as individuals organised for collaborative action that manage ecosystems to deliver services. The authors review several cases to illustrate such actions in living labs in Italy, in the Netherlands, in Germany and in England. They also highlight which ESS appear more commonly in community initiatives, review the governance of such partnerships in terms of their organisation and funding, and identify which rural-urban synergies were stimulated by such partnerships. Finally in Chap. 6 Keech and colleagues examine rural-urban synergies in the context of land and water management interventions and how these are promoted by PES. In reviewing the PES literature, the authors draw on 10 European case studies and find that the most successful PES schemes are cross-sectoral, multi-scalar in their impacts and represent a correction of prevailing market relations linked to subsidy dependencies.

The second Part of the book reflects on the emerging topics resulting from putting ESS into practice. Five chapters share results of engagement between research and practice partners developing ESS applications in their living labs. Chpater 7 is a unique chapter in this volume, written by an experienced planning professional responsible for spatial planning in the FrankfurtRheinMain region of Germany. The chapter reveals the rural-urban dualism as a basis for the application of ESS in German spatial planning, which appears to adhere to territorial binaries—the urban as a place for living and working, the rural as a location of agriculture and nature. By addressing the concept of inner and outer space, quite unique to the German system, and illustrated in FrankfurtRheinMain, Henke supports the protection of rural areas as substantial suppliers of ESS from urbanisation. In Chap. 8 Loupa-Ramos and colleagues provide an example of how green infrastructures, integrated in the municipal spatial planning (municipal master planning) in Setúbal, Portugal, represent the continuous supply of ESS in the territory. ESS, in fact, ensure the linkage between rural and urban territories and facilitate spatial synergies. In Chap. 9 Dax and colleagues address cultural ESS in the context of multi-local living (MLL), which in itself represents a form of rural-urban interaction. A contrasting analysis is conducted in Finland and in Austria where different cultural backgrounds and historically different reasons are connected to cultural ecosystem services. In Chap. 10 Keech and Blockley bring an example of regulating ESS through flood risk governance in the lower river catchment of the Severn, Britain's longest river. The chapter outlines the complexities of flood risk management in Gloucestershire, describing locally specific flood policy and protection challenges in the light of a changing climate and plans for urban expansion. Finally, Chap. 11 considers the land sparing—land sharing policies in the Netherlands and in Britain, with Oostindie and

Keech addressing contemporary ESS governance challenges and how these affect rural-urban dynamics.

The third Part reveals debates that occurred across CoPs on cross-cutting and horizontal issues, in other words, between the CoP ESS and the other four CoP in ROBUST. In Chap. 12 Knickel and colleagues relate the CoP Business models and labour market to the CoP ESS. The authors argue that ESS can be seen as assets in developing individual businesses and local economies, making lifestyles and economic systems more environmentally and socially sustainable. The authors' analysis focuses on how different kinds of value are created through ESS. The business models considered range from organic farming and regional quality labels to ecotourism and the valorisation of food heritage and green lifestyles. In Chap. 13 Vercher and Ruiz-Martinez relate the CoP on Sustainable Food Systems to CoP ESS. The authors highlight rural-urban interdependence through the ESS of food provisioning. The authors scrutinised information on specific activities, goals, innovations, governance arrangements, and actors involved in each of the food policies in the Valencia Living Lab, as well as the relationships between the emerging food policies and ESS, concluding that farmers need be better integrated in decisions that affect the delivery, support, regulation, and cultural dimensions of ESS. Finally, in Chap. 14 Goodwin-Hawkins and colleagues return to cultural ESS to relate CoP Cultural connections with CoP ESS. The authors highlight the role of cultural ESS in creating territorial human well-being benefits, going beyond the conventional idea that urban dwellers derive benefits from rural "containers" of ESS. In the chapter, the authors see rural-urban relations as a locus for cultural ESS that reveal complexity and multiplicity, interdependency and inequity. Using case studies in Italy and Wales, they highlight the potential for trade-offs, inequity and contestation, contributing to a research agenda on territorial well-being.

Besides these three parts the book includes four additional chapters, two preceding and two following these three parts. This Introduction is followed in Chap. 2 with the theoretical support for the book. In it, the editors explore the concept of ESS, the evolution of the concept, as well as the relevance of ESS in the context of socio-ecological systems, before embarking on the discussion of the functions of ESS in rural-urban connections and relationship with the ROBUST overall theoretical framework. A triple-looped conceptual framework is proposed to explore the rural-urban linkages and synergies and explain how ESS contributes to the rural-urban dynamics.

Following the three parts, a converging chapter on EU policy frameworks for ESS key policies, anchored in the overall framework of the Green Deal, create an opportunity for endorsing the existing EU policy context for ESS for rural-urban synergies. The policies are analysed in relation to being implicit or explicit (general and specific) in their handling of the three CICES categories of ecosystem services: provisioning services, regulations and maintenance services, and cultural services, and in relation to how they enable rural-urban synergies. The book closes with a concluding chapter, summarising how this volume contributes to overall knowledge on the role of ESS in creating rural-urban synergies.

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Chapter 2
Theoretical Conceptualization of ESS in Rural-Urban Synergies

Maria Rosario Partidario, Isabel Loupa-Ramos, and Daniel Keech

Abstract In this chapter, we will discuss Ecosystem Services (ESS) and how its conceptual framework has evolved during the ROBUST project to shed light on its usefulness in understanding and strengthening rural-urban synergies. Methodologically, this reflection builds on a combined review of relevant literature and cases explored within the project's Living Labs. The primary aim is to report on the process of advancing towards a theoretical conceptualization of ESS with respect to rural-urban synergies, as illustrated in the ESS multi-loop framework. This framework aims to display multiple levels of conceptualization of rural-urban synergies beyond the ROBUST project, emphasising the pivotal role of planning and governing ESS.

Keywords Ecosystem services · Rural-urban synergies · Concept of ecosystem services · Socio-ecological systems

2.1 Introduction

'Ecosystem services' (ESS) are the ecological characteristics, functions, or processes that directly or indirectly contribute to human well-being: that is, the benefits that people derive from functioning ecosystems (Costanza et al., 2017). The concept was introduced to better communicate the value of nature and natural processes to policy and decision-makers and thereby protect high value ecosystems, avoiding biodiversity loss (Daily in Marris, 2009).

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M. R. Partidario et al. (eds.), *Role of Ecosystem Services in Enabling Rural-Urban Synergies*, Landscape Series 20, https://doi.org/10.1007/978-3-031-98153-1_2

In recent years, the concepts and approaches to explain, contextualise and describe ESS have multiplied in the literature, as outlined in Sect. 2.2, below. Ultimately, the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES) synthesised the complex interactions between the natural world and human society in their conceptual framework (Fig. 2.1), widening the definition of ecosystem services as nature's contributions to people by considering them "The benefits (and occasionally losses or detriments) that people obtain from ecosystems" (Diaz et al., 2015:13).

The main elements in this framework, fully addressed in the IPBES global assessment report (IPBES, 2019), include nature and anthropogenic assets, their relationships and governance, including regulated, material and non-material contributions to people, the direct and indirect drivers of change as external factors that affect this system of relationships, the institutional and governance systems, and good quality of life and human well-being as the ultimate goal.

This chapter builds upon these scientific and policy advances and sets the theoretical conceptualization of ESS with respect to its role in establishing links between rural and urban systems, and enhancing their synergies. It draws substantially on the research work jointly developed by practitioners and researchers in the EU-funded Horizon 2020 ROBUST project on enhancing rural-urban relations. The chapter

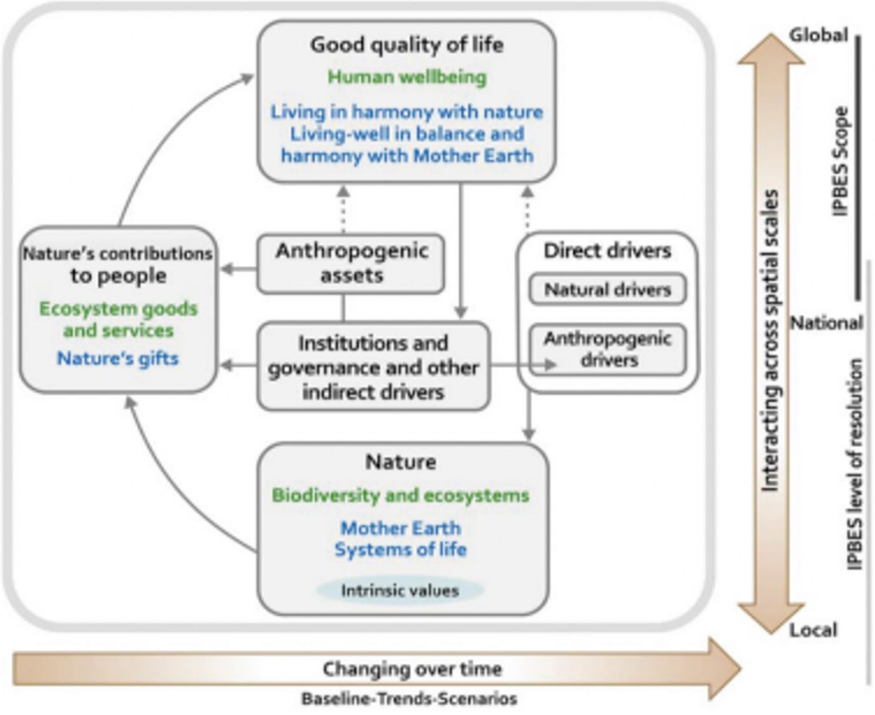

Fig. 2.1 Representing the IPBES conceptual framework (Díaz et al., 2015)

shares the evolving ESS concept within ROBUST, through (a) review of literature and of cases, (b) discussions within the Communities of Practice (CoP), and (c) the development of ROBUST's conceptual framework. Beyond setting the theoretical conceptualisation of ESS with respect to R-U synergies, leading to what has become the ESS multi-loop framework presented ahead, the chapter also shows how this process of conceptualisation has evolved over time and how and why the authors have arrived at this final framework.

The concept of ESS was adopted as a functional theme (a Community of Practice - CoP) in ROBUST because of its potential to enable rural-urban linkages and synergies, evident in the provisioning and regulating services but also in cultural and supporting or habitats services. It was a foundational research premise that ESS can establish key functional relationships in spatial and sectoral planning, contributing to a redefinition of rural-urban relations. The role of ESS in rural-urban synergies can thus be enhanced when associating ESS use and delivery to planning instruments and governance models at multiple scales.

The role of ESS in rural-urban relations is, however, still unexplored in the literature from the perspective of synergies, which are understood as mutually advantageous interactions producing a combined effect greater than the sum of their separate effects. Indeed, rural-urban relations, despite their mutual interdependence, have not been extensively explored from a synergetic point of view in general (van Leeuwen, 2015). ROBUST thus offers two departures from existing ESS perspectives. Firstly, an explicitly spatial perspective is taken which highlights rural and urban connections by examining five functional flows, of which ESS is one. Secondly, ROBUST's approach indicates the synergistic potential offered by ESS and identifies modes of governance that can enhance this potential, leading to stronger rural-urban links.

The most common approaches to the role of ESS in rural-urban relations have focused on flows—from rural to urban and vice versa—encompassing flows of goods and energy, and flows of people (Lewis et al., 2022). The understanding of flows from a territorial view point, *"as the reciprocal and repetitive flow of people, goods and financial and environmental services between specific rural, peri-urban and urban locations"*, has been used to express spatial and functional relations between urban and rural communities (Kroll et al., 2012). ESS related to food and tourism echo frequently as drivers of possible synergetic relations (e.g. Lacourt, 2015). Nevertheless, Chaps. 9 and 14 (cultural ESS) challenges this line of reasoning by highlighting the asymmetrical benefits, notably the downside to rural communities. This differentiated access to ESS by rural and urban people has been theorised by Cumming et al. (2014).

In the literature, there is an apparent common understanding that benefits exist from ESS-driven flows across urban and rural territories. Still to be explained is how these flows sustain relations that go beyond linkages (into the promotion of synergistic outcomes). Eventually, van Leeuwen's (2015) approach exploring the *"advantage of adjacencies"* might show a way to progress towards better understanding the synergic role of ESS in this context.

2.2 Updates on ESS in the Context of Socio-ecological Systems

The concept of ESS gained traction in the development of environmental research and policies, giving shape to a redesign of socio-ecological relations (Chaudhary et al., 2015). Emerging in the 1970s as *"environmental services"* (Wilson & Matthews, 1970), it was later renamed as ecosystem services in the 1980s by Ehrlich and Mooney (1983). Later, Costanza et al. (1997) set a ground-breaking advance by quantifying the value of ESS and natural capital. This seminal research enabled the competitive valuation of ESS within the assessment of externalities, helping to reinforce the tangibility of the benefits, and costs, brought to society by ESS in terms comparable to other shadow processes in cost-benefit analysis.

With the Millennium Ecosystem Assessment (MEA, 2005), the concept of ESS made its way into the policy agenda (Braat & de Groot, 2012). The MEA was the first assessment at a global level on the status of ESS worldwide, but also highlighted the effects of ecosystem changes on human well-being. The MEA also intended to set the scientific basis for the action needed to enhance the conservation and sustainable use of those systems and their contribution to human well-being.

In recent years, the literature on, and investigation of, ESS has multiplied. The definitions, classifications and applications of this concept evolved rapidly as researchers, policy makers and managers explored the benefits that ecosystems provide to people. The work developed within the international initiative The Economics of Ecosystems and Biodiversity (TEEB), the main goal of which was "to mainstream the values of biodiversity and ecosystem services into decision-making at all levels" (TEEB, 2010), has been remarkable.

In TEEB the earlier categorization of ESS advanced by the MEA was adopted, with ESS divided into four main categories: provisioning, regulating, cultural and supporting services (MEA, 2005; TEEB, 2010). All are underpinned by biodiversity and illustrate the flows of values which benefit society as a result of ecological functions.

- Provisioning ESS include all the nutritional, non-nutritional, material and energetic outputs from living systems as well as abiotic (non-living) outputs (such as provision of food, fibres and wood, fresh water).
- Regulating ESS include all the ways in which ecosystems can mediate or moderate the ambient environment and which affect human health (e.g., climate regulation, moderation of extreme events, erosion prevention or biological control).
- Cultural ESS are all the non-material and non-consumptive outputs of ecosystem (biotic and abiotic) that affect the physical and mental states of people (e.g., recreation, aesthetic pleasure, spiritual experiences).
- Supporting ESS are defined as the ecological processes and functions that are needed for the production of the previous *final* services (e.g., species habitats, pollination, maintenance of genetic diversity) (Baró et al., 2016).

Figure 2.2 illustrates a subsequent conceptualization of ESS with the cascade model defined by Haines-Young and Potschin (2010) to express the relationship between biodiversity, ecosystem services and human well-being.

The link between nature and the economy is illustrated in the cascade model, which divides socio-economic and environmental systems into two interdependent spheres. Biophysical structures and processes result in ecological functions and services which create societal benefit and economic value. Because social and economic actions place pressure on the biophysical structure of the environment, an important backflow from the socio-economic to the environmental sphere lies in the development of instruments and actions to restore it. Neither the earlier MEA/TEEB model or the cascade model make explicit spatial distinctions.

In the classification of ESS there are several interpretations of the meaning of biophysical structure, ecological functions, intermediate services and final services (Haines-Young & Potschin, 2010) (see Fig. 2.2). Because of challenges in interpreting the variety of classifications of ESS, Burkhard and Maes (2017) refer to the need to adopt a standard categorization methodology for the classification of the ESS. The Common International Classification for Ecosystem Services (CICES), initiated by the European Environment Agency in 2009, sets a landmark by creating a frame of reference for ecosystem services research (Maes et al., 2014). In the European Union, the work on Mapping and Assessment of Ecosystems and their Services (MAES) uses CICES as the framework for its work developing ESS indicators (Czúcz et al., 2018). The MAES initiative became a key tool to reach the commitment made under Action 5 (of Target 2) of the EU Biodiversity Strategy to 2020 (Maes et al., 2014). After several reviews, the latest version of the CICES (V5.1)

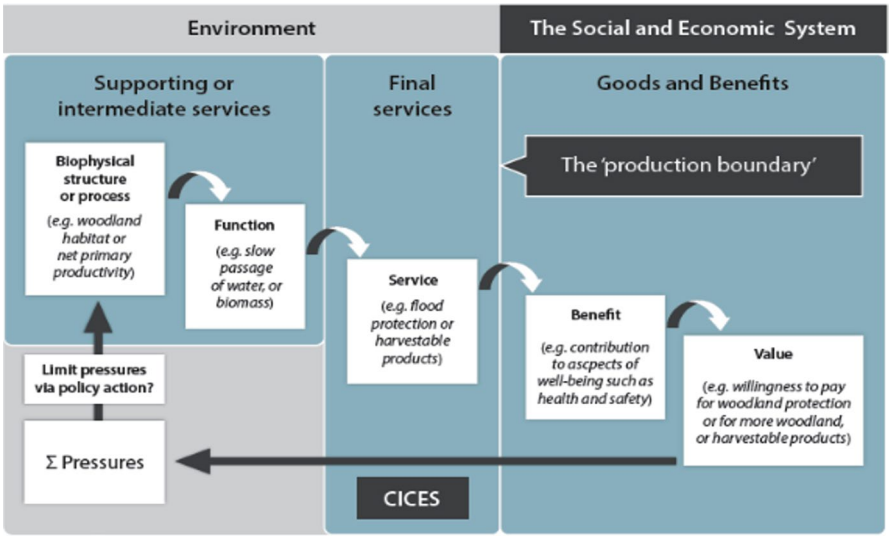

Fig. 2.2 Cascade model by Haines-Young and Potschin (2010)

was proposed in 2018 and aims to progress towards a standardisation of ESS classification.

The cascade model, represented in Fig. 2.2, provides the conceptual framework in which CICES is set. CICES classification describes ecosystem final services using a five-level hierarchy (section>division>group>class>class type), focusing on the final outputs of ecosystems that people can use in a beneficial way (Haines-Young & Potschin, 2018). It is also relevant to mention that CICES V5.1 separates biotic and abiotic factors, allowing users to select only those ESS that depend on living systems (i.e. biodiversity in its broadest sense) or to include the non-living parts of ecosystems that can also contribute to human well-being.

Research published by Constanza et al. (2017) is an important landmark that indicates work that still must be done in ESS studies. It highlights the main weaknesses of the mainstream approach to valuation, growth and development and provides recommendations for the future. Among its conclusions is the need to integrate ESS and natural capital into the mainstream economic policy to achieve a sustainable future, through a dynamic process that promotes public engagement and that aims to reach a much broader audience.

Lastly, reference is needed to the international System of Environmental-Economic Accounting (SEEA). This is a statistical framework for organising data, tracking changes in the extent and the condition of ecosystems, measuring ecosystem services and linking this information to economic and other human activity. The SEEA EA (SEEA Ecosystem Accounting), adopted by the UN Statistical Commission in March 2021, provides conceptual guidance for developing ecosystem extent, ecosystem condition and ecosystem services accounts. It presents a perspective where ecosystems and the services they provide interact as part of a natural process within a specific spatial area. A specific accounting format for ecosystems and their services in the European Union (EEA, Eurostat, 2021) has also been released.

2.3 The Conceptualization of ESS in Rural-Urban Synergies

Multiple interactive discussions with practice and research project partners in the six Living Labs (LL) inspired the findings in the CoP on ESS throughout the ROBUST project. Whether aiming towards provisioning, regulating, cultural or even supporting or habitat services, the meaning and relevance of ESS was structured using multiple lenses based on the diversity of ROBUST cases. The pluri-, inter- and trans-disciplinary nature of ESS was reflected in the eight analytical lenses represented in Fig. 2.3 which guided research to explore the potential role of ESS in promoting rural-urban structural and functional synergies. These eight lenses were identified by different partners, based on how they saw ESS playing a role in each LL in strengthening rural-urban synergies. The paragraphs below aim to summarise the scope of each of the eight analytical lenses that were further developed in the six LL through shared experiences and knowledge within this CoP.

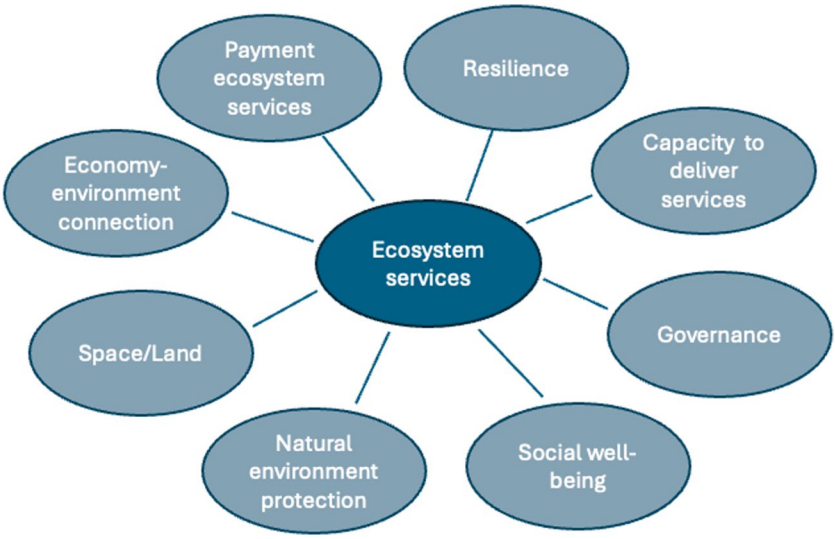

Fig. 2.3 Analytical lenses initially adopted in ROBUST to examine ESS

Capacity to offer ecosystem services: renewable energy, flood alleviation and risk management, recreational uses, carbon sequestration, waste, purification of air and water and climate change mitigation and adaptation; rural and environmental amenities; new environmental, cultural and recreational services; sustainable natural resource management, among others.

Payment for ecosystem services: remuneration for ecosystem services, the monetary compensation for stewards of ESS, as land managers, or users to maintain and promote ecosystem services.

Economy-environment connect: business opportunities; rural and urban social welfare; urban and rural green infrastructure complementarity: services from agriculture and forestry.

Social well-being: positive externalities or amenities enabled to individuals and groups, creating social capital and social cohesion rather than social exclusion.

Space/land: relates to scarcity of open space, conflicting demands for open space, i.e. often as land competition (housing with infrastructure development with natural environment protection).

Natural environment protection (biodiversity, water, distinctive landscapes)—conserving and protecting natural assets or resources (capital).

Resilience as the amount of change a system can undergo and still keep the same functions and structure, the degree to which a system is capable of self-organising; or the ability to build and increase the capacity for learning and adaptation.

Governance: rural-urban functions and local authority hierarchy; instruments and processes, related actors/players, governance arrangements; rural-urban multi-actor/player networks.

A first conceptualization of the role of ESS in rural-urban synergies is shown in Fig. 2.4. It identifies priority themes in the ROBUST cases, drawing from initial questions and challenges as CoP ESS work unfolded and materialised in the different LL contexts. This preliminary conceptual model intended to underline the need to: (a) ensure the balance between ESS supply (delivery) and demand (users); (b) seek the necessary instruments to enable such balance, including public policy, market and science and technology; (c) identify governance models to encourage alternative practices and policy-integrated goals, thus enabling resilience and social-well-being to occur. This was an early elaboration of the final conceptual framework (shown later in Fig. 2.6). Figure 2.4 maps the different dimensions that can be connected to reveal the understanding expressed in the multi-loop conceptual framework in Fig. 2.6. In short, Fig. 2.4 anticipates the role of ESS in rural-urban synergies, highlighting the importance of balancing ESS supply and demand, identifying necessary instruments and governance models, and promoting resilience and social well-being.

This initial conceptual model was then adapted to fit the ROBUST framework in which three main components play a key role in functional rural-urban linkages and synergies: new localities, smart development and network governance (Woods &

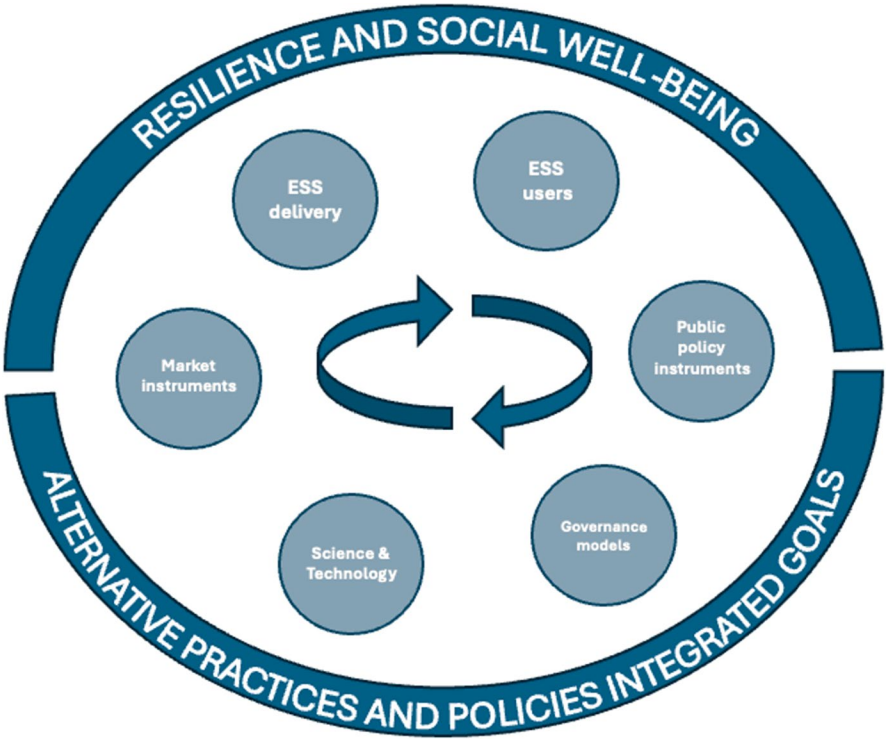

Fig. 2.4 Initial Conceptual model on the role of ESS in rural-urban synergies

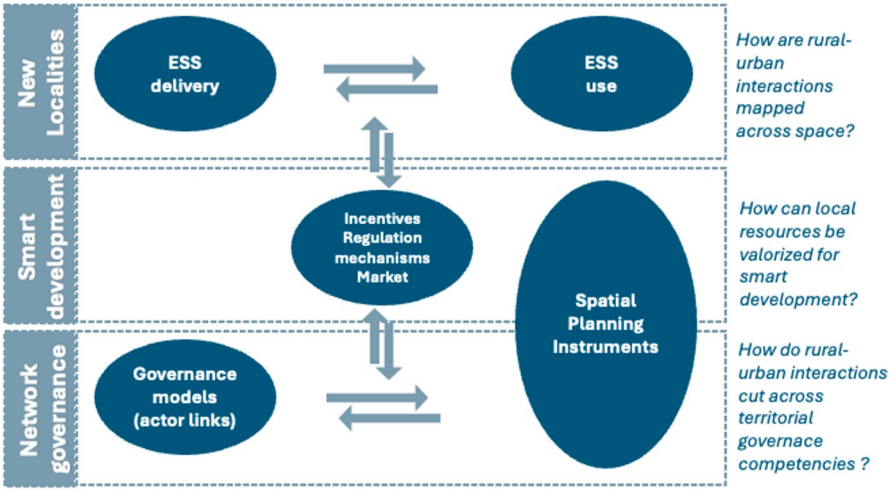

Fig. 2.5 Making ESS fit ROBUST rural-urban functional framework

Heley, 2017). Figure 2.5 represents the relationship that was established between the working concept adopted in CoP of ESS and the ROBUST framework.

ESS contribution to functional rural-urban relations was identified in CoP ESS in the following ways:

New localities ESS driven development can generate new localities engaging socio-ecological systems, relational space and flows and transactions associated with the creation of new values, perceptions and identities. Consequently, ESS driven development highlights proximate and distal rural-urban relationships, descriptions of which can be achieved through:

- Understanding the spatial planning system with a focus on its Outer Space[1] exploring how urban and rural features co-exist, overlap and compete;
- Including functional relations between urban and rural areas in the agendas of rural networks operating in the territory;
- Creating a "relational space" where it is possible to emphasise the multifunctional potential of rural, peri-urban and intra-urban areas;
- Mapping of ecosystem services based on spatial analysis (GIS) making explicit the locus of ESS delivery and use across space.

Smart development ESS highlights policy, market, sciences and technology tools to enhance socio-ecological systems, and exposes how rural-urban connectedness contributes to economic growth building, embedded in the resources of each spatial sphere. This may be achieved through:

- Reviewing policy processes;

[1] For the concepts of Outer Space and Inner Space please see Sect. 4.1.

- Providing actors/players with the (statistical and GIS) information needed to make more informed plans and decisions, and commit actors/players to this cooperation;
- Discussing the payment for ESS in the context of smart specialisation.

Network governance ESS builds upon collaborative arrangements with a cognitive reconfiguration of the territory to match ecosystem boundaries. This may be achieved through:

- Working on rural-urban synergy-building at a lower administrative level and by novel types of public-private partnerships, including cross-sectoral links (i.e. market, state, civil society);
- Expanding participatory and integrative municipal spatial planning procedures;
- Fostering community partnerships for ecosystem services provision;
- Putting in place arenas for bottom-up approaches to ESS mapping;
- Co-creating a new experimentalist rural-urban governance space.

2.4 The ESS Multi-Loop Framework

The ESS conceptual framework finally adopted is expressed through a multiple loop approach represented in Fig. 2.6. This ESS Multi-Loop framework was adapted to fit the ROBUST project, but it can also be used in other planning and policy contexts. In essence, ESS expresses a dialogue between users and services delivered within rural-urban contexts. But ESS is closely dependent on the resilience of the respective socio-ecological systems (SES) and its social well-being objectives. In a second loop, ESS users can influence the socio-ecological systems and its objectives, and consequently ESS outcomes through the application of appropriate tools including multiscale spatial policy and planning, market instruments, governance networks and science and technological tools. Placing it into a wider context in the third loop, desired socio-ecological systems are also dependent on societal values promoted by users, directly or indirectly, through the adoption of innovative multiscale spatial practices and policies that can enhance rural-urban synergies.

This framework was developed with the purpose of exploring rural-urban linkages and synergies in each LL, but it can also be replicated in other contexts. Research questions were established to guide and help materialise this framework (Table 2.1), which were used by different LL partners in exploring the ESS concept in their case studies.

The ESS research agenda priorities relevant for rural-urban synergies were then identified within the CoP and are represented in Table 2.2.

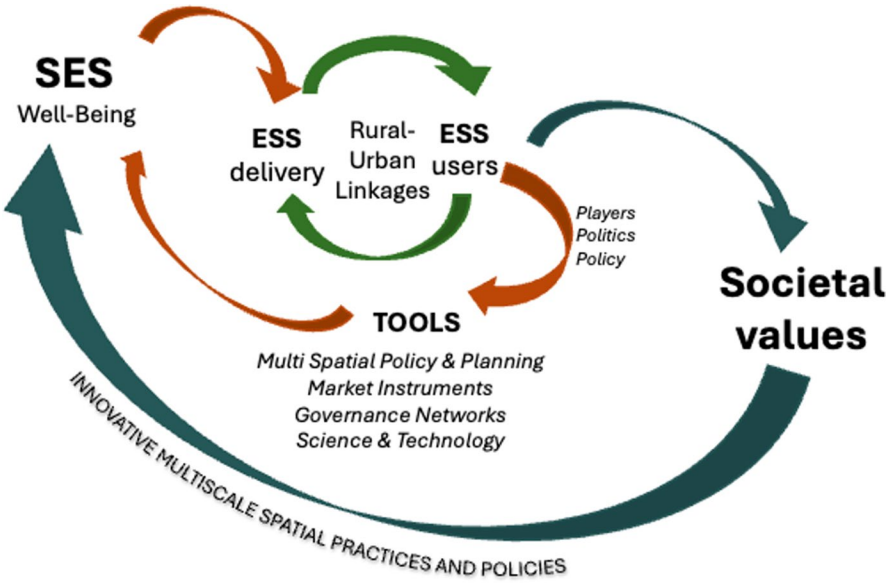

Fig. 2.6 ESS Multi-Loop framework in ROBUST

2.5 ESS and the Relevant Functions Leading Rural-Urban Synergies

Five core themes were adopted to explore the relevant functions whereby ESS could lead to rural-urban synergies. These were:

1. Circular Farming engaging ESS in rural urban synergies
2. Community Partnerships engaging ESS in rural urban synergies
3. Mapping ESS supply and demand for rural urban synergies
4. Multi-scale planning for ESS in rural urban synergies
5. Payment and compensation schemes for ESS in rural urban synergies

These five themes reflected the way research and practice partners in the CoP ESS translated the ESS conceptual model in Fig. 2.6 into their place-based applications. These show different emphases: on ESS delivery and user relationships (circular farming), on the well-being benefitting from rural-urban synergies, on ESS delivery and user relationships (community partnerships), on tools and innovative spatial planning and practices (mapping ESS, multi-scale planning and payment and compensation).

Figure 2.7 recognizes the inter-relationship of the five core themes of ESS that were investigated in the CoP ESS. It shows in particular how multi-scale planning enables the setting and integration of a policy framework; and how—by drawing on land value, devising payment and compensation schemes, and carrying out ESS

Table 2.1 Research questions to guide the application of the ESS Multi-Loop framework

ESS users:
Who are the actors or key players using ESS to enable rural-urban linkages/synergies?
Who benefits from ESS (directly or indirectly) in case of rural-urban linkages/synergies?
What are their roles? (e.g. responsibilities in government, producers, inhabitants, students/researchers)
How can ESS maps be used and interpreted? (e.g. matrix approach; monetary valuation; participatory GIS; social-cultural value)
ESS delivery:
Which ecosystems deliver which ESS that play a role in strengthening rural-urban linkages/synergies?
What is the land occupation associated with the ESS identified?
What are the conditions/quality of the ESS identified?
SES:
What are the main relationships, and dependencies, between social and ecological systems relevant in rural-urban linkages/synergies?
What conditions may stimulate, or threaten, such a balanced SES?
Tools:
What kinds of tools may enable the enhancement of SES in terms of its resilience and contributions to social well-being in the case of rural-urban linkages/synergies?
Benefits and Values:
What are the main benefits and core societal values that enable rural-urban linkages/synergies?

Table 2.2 ESS research and innovation agenda (RIA) priorities

1. How might ESS reinforce rural-urban relations?
2. How can multiple ESS be prioritised or balanced in a particular region, which are key, are they equally important?
3. How do different communities use ESS—what ESS indicators can be identified?
4. What governance models, and planning models, better practices (public and private), enable the delivery and responsible use of ESS?
5. What participatory measures help to raise awareness and engage people with ESS (gardening, birdwatching, among others)?
6. How do we discuss the unknowns of ESS (account for uncertainty) as a result of climate change, population dynamics, land use changes over time, among others?

mapping—ESS can be integrated in land use planning and also become a factor to be considered in land-take decisions. Synergistic business models can enhance the valuation of land based on ESS; this is foreseen for example in plans to harness ecological assets as commercial opportunities while recreating social and ecological capital cf. Chaps. 11 and 12. Similarly, community partnership represents a possible governance model to ensure that multiple stakeholders' values and priorities are engaged. Together synergistic business models and community partnerships (Chap. 5) facilitate networked governance approaches to decision-making, valuation and management of ESS. This can be exemplified with the value of ESS in

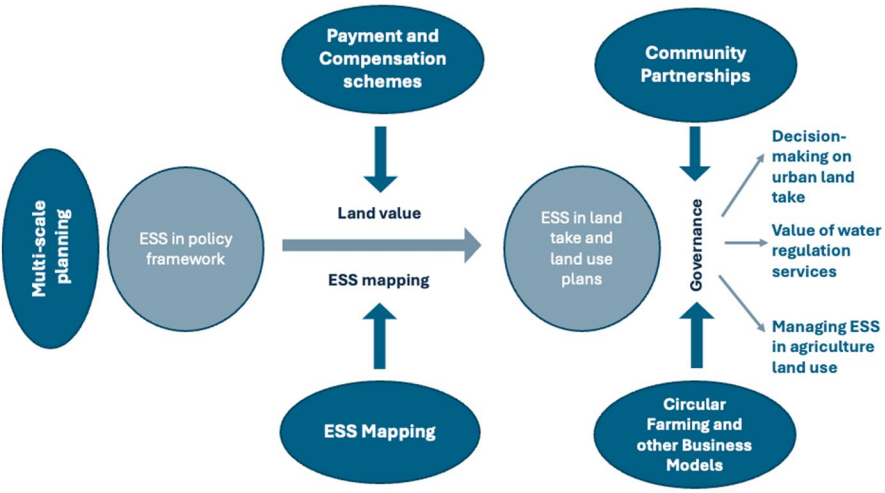

Fig. 2.7 Mapping the ESS core themes relative contributions to the rural-urban synergies research

water regulation, where these values are spatialized, and how subsequently the management of ESS in agriculture land use can be enabled through circular farming and community partnerships.

2.6 Relevance of Considering ESS in Spatial and Sectoral Planning at Different Geographical Scales—Implications for Multi-Level Governance

The research developed in ROBUST reiterates the importance of ESS as laid out in the literature and attempts to demonstrate, through the experiencing phase in ROBUST LL, that ESS can be crucial in ensuring and sharing the benefits across different types of territories (see for example in Chaps 5, 6, 8, 9 and 10). We aim in particular to emphasise that ESS serve to highlight the socio-ecological interdependence of rural and urban territories.

Improving interdependence requires better cross-sectoral (e.g. planning, economic development and resource management) policy co-ordination within territories. ESS need to be fully integrated at different scales of spatial planning—local, municipal and regional—in order to capture the cross-border reach of ESS (e.g. river catchments, landscapes, and shared public benefit). The ROBUST Living Lab approach shows potential in creating a common knowledge-base and lexicon on ESS amongst stakeholders across scales and sectors.

As suggested, since the earliest inception of the concept, ESS have been argued to provide substantial economic benefits, albeit not necessarily equally to all people.

There is still a major science-policy-practice gap that needs to be bridged to foster territorial applications. Incentives are needed in the market and public sectors to enhance green enterprise innovation in order to amplify this recognition, and consequently the enhancement of ecosystems that provide for those benefits. New forms of governance are needed that successfully involve and engage multiple urban and rural actors interactions and stimulate collective action. Contrasting to the market dimension brought up by green enterprises, spatial justice must be ensured in the inclusive access to ESS by valuing its public realm and equitable distribution of benefits (see Chaps. 9 and 14).

In essence, and drawing on the outcomes of the research developed in the CoP ESS in ROBUST, particularly in relation to the five core themes that were adopted, CoP findings can be synthesised in the following four respects.

Firstly, we recognize that rural-urban relations are fuzzy, however ESS can play a key role in constant rural-urban flows. It is helpful, therefore, to think of circular approaches in a territory in continuity. Rural-urban should be seen as a proxy for the dualism guiding land-take decisions in spatial planning, as they relate to developed land and not-yet-developed land, regardless of the areas in question being defined as rural or peri-urban.

Secondly, there is still a tendency to see rural areas as the exclusive ESS suppliers, and urban places as the exclusive ESS consumer, assuming that there is a unidirectional flow and thereby limiting the valuation of proximity services. Chapter 7 offers a practitioner's perspective on this assumption. More research and financial tools are needed to understand the optimal composition of blended (state-private) payment for ESS, for bundled ESS delivery. A vital aspect of this includes ensuring that longer-term ESS management is secured within spatial development.

Thirdly, ESS are not yet established in formal spatial planning procedures but are a crucial argument to inform decisions about land-take. The bundling of ESS will help to avoid duplication in assessment, as will the long-term monitoring of the impacts of different types of land management. Chapter 3 provides further arguments to support this and discusses the challenges in mapping and bundling ESS. To be noted however the notion of proximity if ESS delivery, as often relevant ESS (e.g. climate change regulations) can result from ESS that are not closely spatialized.

Fourthly, ESS mapping at multiple scales makes visible that ESS values are not absolute but are relative to the scale of analysis, the existing knowledge and the level of governance, thereby challenging cross-border mapping and scalar integration. There is a need for governance systems to strengthen rural-urban linkages, notably it is important to recognize the interconnection between urban and rural land managers. Rural land managers must be represented in spatial planning decision-making bodies, or consulted at the very outset of any intended interventions which demand land use change.

2.7 Conclusions

To conclude, our core learning points recognize that methodological development for ESS mapping needs to integrate multiple knowledge bases, including expert as well as traditional knowledge, while supply and demand need to be made explicit using a multiscale and multi-actor approach (as presented in Chap. 8). Further exploration of the scale-specificity of each ESS is also needed, as well as of ESS flows and the value of proximity. When bundling ESS, it is important to avoid double-counting while strengthening synergies and negotiating trade-offs. Finally, the integration of ESS in, or the connection to, multi-functional land use demands further research.

Clearly, governance arrangements are required to make decisions on ESS priorities and conflicts. There is a key role for community partnerships in setting new governance arrangements to enhance and promote ESS, as well as in taking care and preserving ESS needs. Novel governance arrangements are also needed for payments for ESS (PES), to ensure they are conducted in balanced ways to realise synergistic effects in equitable ways, while the potential of rural-urban contracts of reciprocity to enhance ESS should be further explored.

Green infrastructure (GI) needs to be valued as a tool to make ESS operational in rural-urban relations, to structure ESS flows and to contribute to practical implementation. To support this, maintenance and monitoring of interventions will be needed in the form of: (i) cross-sectoral monitoring partnerships at the initiation stage; (ii) blended and co-produced PES schemes which respond to local commercial interests and subsidies; (iii) recognition of the public realm of ESS as grounds for GI objectives and principles; and (iv) stronger and clearer regulation of long-term GI maintenance within development agreements.

Lastly, we found that the importance of spatial planning, especially in regulating urbanisation and categorising rural functions in our constituent LLs, highlighted mainly proximate rural-urban ESS relationships, such as water quality, waste cycles and landscape recreation. Other ESS, e.g. air quality, biodiversity (and its multi-level governance), and food production linked to global markets, exposed different constellations of stakeholders, governance arrangements and regulatory tools in dispersed rural-urban ESS relationships. In both cases, we were able to highlight the interdependence of rural and urban territories through ESS user-supplier relationships, also important when considering the contribution of ESS service delivery to regional economic growth.

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Part I
Core Research Themes in ESS for Rural-Urban Synergies

Chapter 3
Assessing Ecosystem Services in Rural-Urban Linkages: The Role of Mapping for Territorial Planning Purposes

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Abstract This chapter aims to explore the potential of ESS mapping to exploit rural-urban synergies in the context of spatial planning and sectoral policies. It reviews and reflects on the opportunities and challenges of mapping ecosystem services to support territorial planning, with the aim of valorising rural-urban synergies. The mapping and assessment of ESS is a promising way to evaluate the contribution that rural areas make to urban areas. The chapter discusses criteria for selecting different approaches and methods available for the assessment of ESS and explains the concept of "ESS bundles" as groups of common ESS that co-occur over time and space. It addresses the "sphere of dependency" between urban and rural areas, when it comes to rural-urban relations and provides key insights from case-studies.

Keywords Ecosystem services · Mapping · Bundling · Multi-criteria · Participatory assessment · Rural-urban links

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M. R. Partidario et al. (eds.), *Role of Ecosystem Services in Enabling Rural-Urban Synergies*, Landscape Series 20, https://doi.org/10.1007/978-3-031-98153-1_3

3.1 The Relevance of Ecosystem Services in Rural-Urban Linkages

As a result of a long-term trend towards urbanisation in industrialised countries, most of the population in Europe and worldwide is moving to cities. The heterogeneous intensity of urbanisation processes has led to different territorial development models characterised by different conditions of (in)dependency between rural and urban areas, and of Ecosystem Services (ESS).

The current climate emergency and other socio-environmental crises call for the identification of sustainable and resilient territorial development models. Rural and urban areas are economically, socially, and environmentally interlinked spaces and ESS are a key area of rural-urban linkages, where their interdependence manifests (Gebre & Gebremedhin, 2019). Urban development affects the supply and replicability of ESS over time, the latter being a fundamental condition for ensuring the well-being of both urban and rural areas. If urban models are wasteful of environmental resources, rural areas are crucial to guarantee a balanced development of the territory. For instance, soil consumption for urban transformations is having a far-reaching impact on the decrease of several ESS, such as food supply, CO_2 storage, biodiversity conservation, water provisioning with the need to expand the supply basin of these services towards rural areas. A condition for the transition towards sustainability is therefore a better understanding of the supply and demand of ESS across rural and urban areas in order to find effective governance models so that these relationships are synergistic and not unbalanced (Gebre & Gebremedhin, 2019; da Silva et al., 2017).

There is broad agreement on the importance of incorporating the concept of ESS into policy strategies and decision-making. Mapping and assessment of ESS at the landscape scale is a promising means to evaluate the contribution that rural areas make to urban areas (Kroll et al., 2012). In spatial planning, ESS assessment and mapping has been interpreted as *'a useful tool to illustrate and quantify the spatial mismatch between the supply and demand of ecosystem services which can then be used for communication and to support the decision-making process'* (Crossman et al., 2013). The concept of ESS mapping often goes together with 'bundling ESS.' ESS bundles can be defined as the '*set of ESS that repeatedly appear together across space or time, used to identify common ecosystem service tradeoffs and synergies, using spatial data'* (Raudsepp-Hearne et al., 2010).

This chapter aims to explore the potential of ESS mapping to exploit rural-urban synergies in the context of spatial planning and sectoral policies, by drawing upon the literature and selected case studies developed within the ROBUST project. ESS mapping entails the organisation of spatially explicit information (Englund et al., 2017) to support policy makers in territorial planning and, particularly, to understand the relationships between urban and rural spaces. Spatial maps are considered fundamental tools to support the governance and management of ecosystems and their services (Hauck et al., 2013).

The scope of research and application of ESS is broad: the literature highlights the challenges faced in assessing, mapping, and bundling ESS both in terms of methodological implementation and effective application in practice and decision making (see de Groot et al., 2010; Maes et al., 2012). The lack of a standardised approach is one reason that has hindered progress in this direction. The definitions of urban and rural are not consistent across territorial scales or across countries and policies (e.g., the allocation of funding under rural development policy differs from that for spatial and urban planning). This lack of coherence, which is particularly relevant for policy implementation, creates ambiguity and limits the exchange of knowledge between disciplines and localities (Salata et al., 2020; Cortinovis & Geneletti, 2018). There are a variety of mapping and modelling approaches that lead to uncertainty in the choice of methods (Englund et al., 2017), while the transfer of evaluation methodologies from one territorial context to another, without adequate contextualisation, can lead to uncertainty about the subject of the mapping (Crossman et al., 2013).

These critical issues can be seen as an opportunity to improve clarity and possibly increase the value of ESS assessment and mapping, in an area of research that is still open and evolving. The next section draws on available literature to define the concepts and appropriate methods for mapping ESS and to highlight the exchange relationships between rural and urban areas for the purposes of spatial planning decisions. Chapter 5 presents and discusses three case studies developed within the ROBUST project with reference to the mapping of ESS to improve rural-urban synergies. Chapter 6 discusses the main findings from the case studies, research gaps and policy recommendations.

3.2 Ecosystem Services Assessment across Rural and Urban Spaces

3.2.1 Defining and Assessing Ecosystem Services: Overview

The term ecosystem services, introduced by Ehrlich and Ehrlich (1981), referred to the direct and indirect contributions of natural ecosystems to human well-being (Sukhdev, 2008) and became globally understood following several seminal contributions[1] (Daily, 2013; Costanza et al., 1997, 2017; Millennium Ecosystem Assessment, 2005). Modelling and mapping approaches supported studies at different spatial and temporal scales (Kandziora et al., 2013) and are widely recognised by research and policy. In the European Union, *Mapping and Assessment of*

[1] Several theoretical and methodological studies addressed the assessment of ESS. Among the most important ones, we highlight *The Economics of Ecosystems and Biodiversity* (Sukhdev, 2008), the World Business Council for Sustainable Development (WBCSD, 2011) and the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES, 2019) started in 2012 by the United Nations.

Ecosystems and their Services was developed by MAES (2020[2]), and defined a Common International Classification of Ecosystem Services (CICES) (Haines-Young & Potschin, 2013). The CICES classification,[3] initially developed for environmental accounting purposes (see, for example, Schröter et al., 2014), has been widely adopted by the scientific community aiming at ESS evaluation. While MAES maps ESS at the European scale (Maes et al., 2013, 2020; Crossman et al., 2013), such classification is also useful for a more general systematic application of mapping and modelling ESS[4] and has been used to develop indicators to measure the supply and demand of ESS (Castro et al., 2014; von Haaren et al., 2014).

There are multiple approaches and methods available for the assessment of ESS. Busch et al. (2012) distinguish them according to three criteria:

(i) *The type of information and data available.*

Quantitative and qualitative approaches differ depending on the type of data available. Quantitative approaches consist of environmental accounting and monetary valuations. The collection of primary data for ESS valuation is often necessary, especially for land use planning, because a large amount of very detailed information is required. As a result, this can lead to some ESS and the benefits they provide for human well-being being neglected (with the likelihood that their value is underestimated), while others are overestimated. In practice, quantitative assessments allow a limited number of ESS to be analysed, provided that the available information is complete, and they are used both for research purposes and to gain deeper insights for planning. In general, quantitative assessments of multiple ESS pose the problem of data consistency and thus comparability of results.

Qualitative approaches, such as proxy methods, are more flexible and can bridge the gap of limited data availability with estimates based, for example, on in-depth interviews with experts (i.e., to explore the supply of ESS) and citizens or stakeholders (i.e., to explore demand).

(ii) *The spatial scale of the territory.*

This second criteria is closely related to the choice between a qualitative and a quantitative approach. A qualitative (or mixed) approach that combines different methods seems to be more flexible and suitable for large-scale assessments. Ordinal scales (e.g. assigning scores from −2 to +2 or from 0 to 5) can be used to compare information about different ESS based on expert judgement. The results can inform strategic policy action and identify crucial aspects for further analysis. However, if the goal is to assess the variation of ESS at the

[2] See here: https://publications.jrc.ec.europa.eu/repository/handle/JRC120383

[3] The most recent version is of January 2018, see: https://cices.eu/

[4] Busch et al. (2012) argued that it is important to develop classification systems, such as CICES, that are "geographically and hierarchically consistent" so that comparisons between regions can be made and detailed local studies can be integrated into a broader geographical understanding. CICES was used in the German study TEEB (Wüstemann et al., 2017) and in the German national ecosystem assessment, NEA-D (Albert et al., 2014) while in Belgium a more detailed classification was used for ecosystem evaluations (Turkelboom et al., 2013).

local level or to monitor its change over time, a quantitative methodology is preferable because more objective and precise data are needed to avoid errors and biases. It should be made clear that quantitative assessments are not necessarily limited to the local level, where much depends on the availability of primary data and indicators.

(iii) *The political decision to be supported by ESS assessment.*

With respect to the policy decisions that ESS assessment is intended to influence (e.g., land use planning, public investment and spending, etc.), qualitative and quantitative approaches provide different contributions. For example, a qualitative analysis may be preferable for evaluating alternative scenarios because it allows the identification of interactions and trade-offs in the provision of ESS. In contrast, a monetary assessment of individual ESS may be useful for evaluating scenarios with cost-benefit analyses or for devising systems of payment (see Chap. 6). Quantitative approaches are optimal when well-defined and (economically effective) decisions are required.

As a general rule, qualitative assessments are more suitable for informing decisions at larger scales and at an earlier stage in planning (e.g. strategic planning and policy definition). They can support choices by mitigating conflicts among stakeholders and by identifying possible shared uses of ESS. The qualitative approach enables the identification of trends, potentials and conflicts while avoiding the risk of overrelying on the data: it supports the development of a dialogue between the various stakeholders without anyone standing behind the technicalities of data.

The quantitative approach is recognised for its objectivity and supports integration into economic schemes and models (such as PES), provided the monetary valuations are reliable. When it comes to clearly localised issues, policy makers usually prefer to justify decisions on the basis of concrete cost-benefit analyses, rather than relying on the judgements of qualitative assessments. It should also be noted that quantitative assessments are usually more expensive and take longer than qualitative approaches, especially when physical and monetary data are not readily available, or when reclassification and harmonisation of already available data is required. This could lead to public decision-makers preferring qualitative approaches, given the limited duration of their electoral mandates.

In the case of multidimensional evaluation of ESS, normalisation and bundling (i.e. territorial or temporal aggregation using statistical analysis, such as clustering) can also be applied with the aim of summarising the overall value of ESS supplied and consumed per spatial unit. Normalisation and bundling can also prove valuable in highlighting the relative importance of different ESS and verifying trade-offs. According to some authors, this limits the usefulness of evaluations in decision making (Metzger et al., 2008), but according to others, this is an effective way to structure decisions in the face of complex problems (Rovai et al., 2019).

In summary, the choice of the valuation approach of ESS is closely related to the objective of the political decision, which is tied to a specific territorial scale, indicating the need to examine the quality of the available data.

3.2.2 *Ecosystem Services' Assessment in Landscape and Spatial Planning*

There are five methodological approaches to mapping ESS in landscape and spatial planning (Martinez-Harms et al., 2015; Martínez-Harms & Balvanera, 2012). The first two methods can be defined as "proxy-based" because they compensate for the lack of primary data (Maes et al., 2013) and are widely used in landscape research (Englund et al., 2017). The first approach is based on binary linkages between land cover and scores assigned to the supply and demand of different ESS, defined in studies in other territorial contexts and scales. The second approach refers to the knowledge, expertise, and experience of experts who are asked to give an opinion on the ability of some environmental variable (e.g., land use) to provide a given ESS, based on expert knowledge, with reference to a predefined scale (e.g., Burkhard et al., 2009, 2012; Grêt-Regamey et al., 2012, 2015).

The other approaches define the ability of an area to provide ESS based on explicit spatial relationships between land use, abiotic features, and consequently the specific characteristics of vegetation. These are landscape assessment methods that allow the identification of multiple ESS delivery points and improve the understanding of ecological constraints and opportunities for providing multiple ESS compared to a pure land approach. The third approach relies on indicators from the scientific literature based on studies conducted in the laboratory or, in any case, in specific contexts (Chan et al., 2006; Egoh et al., 2008; Naidoo et al., 2008; Eigenbrod et al., 2010). The fourth approach refers to methods based on the use of primary data, such as field studies (for example, Anderson et al., 2009; Raudsepp-Hearne et al., 2010). The last approach refers to methods based on quantitative regression modelling (for example, Lavorel et al., 2011).

Land Use and Land Cover (LULC) maps in combination with a "capacity matrix" are among the most widely used proxy methods (Burkhard & Maes, 2017), especially in planning. The capacity matrix method is based on the correlation between land cover/use types and their ability to provide ESS. This method was developed and widely used about ten years ago as a compromise between its ability to provide knowledge and its ease of application. The choice of assessment approach must be pragmatic, in terms of the methods and data available at a given time: this is a prerequisite for the application and implementation of the ESS concept in the practice of spatial planning decision making. As mentioned above, expert judgement is fundamental to filling data gaps (Hölzinger et al., 2013) in the field of spatial planning (see Fossey et al., 2020 for a conceptual model on ESS provided by agricultural soils). Ultimately, a "capacity matrix" can provide a good compromise between accuracy and available time/resources to provide useful information for spatial planning. Indeed, we must bear in mind that despite the considerable progress made in evaluating ESS, a widespread and accurate evaluation system is still lacking, while methods based on primary data are still extremely time and resource consuming. Another advantage of proxy and capacity matrix methods is that they are well suited for participatory evaluations because they require the involvement of experts

and other stakeholders (Campagne and Roche, 2018). The involvement of experts favours the coherence of the evaluations.[5] As for the involvement of other stakeholders, this is essential for determining the priorities to be assigned to the ESS evaluated. Among others, IPBES (2019) highlights the need for site-specific assessments that must take into account the values and priorities that local communities assign to the different ESS.

3.2.3 Rural-Urban Relations in Ecosystem Services Assessment

Rural and urban areas are interconnected spaces in many ways and the ESS approach highlights this relationship, particularly the role of rural areas in ensuring the sustainability and resilience of urban areas. The rural-urban "sphere of dependency" is characterised by a different spatial concentration of supply and demand of ESS. In comparing rural and urban areas, we assume that urban areas predominantly consume ESS and rural areas predominantly provide ESS. In the wake of globalisation processes, urban areas have become connected to distant rural areas (Balmford et al., 2008), leading to a progressive decoupling from neighbouring rural areas.

Among the most relevant ESS in this "sphere of dependency" we include:

- Water resources: pollution of surface and groundwater and increasing per capita uses reduce the availability of resources and/or increase the costs necessary for their use.
- Water regulation: an increasingly valuable service with urbanisation processes that occupy spaces pertaining to rivers and that reduce natural drainage, aggravating potential damage from floods
- Filtration capacity: the progressive reduction/destruction of wetlands reduces the ecosystem's ability to filter pollutants in water resources, increasing the eutrophication phenomena of water in watercourses.
- Food production: as cities expand, agricultural land (usually lowland and more fertile) shrinks with a reduction in local-scale supply capacities and increased environmental and social costs associated with large-scale supply systems.
- Climate and air quality regulation: rural (and peri-urban) soil is characterised by a vegetation cover that absorbs atmospheric pollution and environmental heat and, therefore, the urbanisation processes with the elimination of vegetation, determine phenomena increase of pollutants in the local atmosphere as well as increases in temperatures with the "heat island" effects, which lead to higher temperatures.

[5] For example, if the goal is to evaluate ESS based on land use, the expert can hierarchise the contribution of different land uses to the provision of the different ESS

Territorial planning decisions can benefit from the information obtained from ESS mapping, but as illustrated above, this poses multiple challenges in terms of appropriate data, scale, methodology, expert involvement, and participation of other stakeholders. Therefore, it is necessary to understand which ESS are most relevant for highlighting rural-urban linkages in order to promote potential synergies. The CICES classification provides an exhaustive list of ESS to choose from. Not all ESS need to be considered in spatial planning and in the study of urban rural linkages, depending on the (policy) objectives and scope.

We can map the synergies between urban and rural areas in the provision and consumption of ESS at different levels including, for instance, at the municipal level, where urban and rural areas are close to each other and often interpenetrate. The aim here is to raise awareness of the value of rural areas, discourage land consumption, ensure the maintenance of some regulatory services essential to the resilience of urban areas, and encourage the development of recreational and cultural services. To broaden the scope of the assessment, this could be done at the level of provinces or regions. In this context, the 'bioregion' (Fanfani, 2014; Magnaghi, 2019) is the level at which the conditions for closing loops exist (for CO_2 emissions, water resources supply, food supply, etc.) and where a complete mapping of the supply and demand of ESS is crucial. Another objective could be the development of Payment for Ecosystem Services (PES) schemes between actors and communities that bear the costs of some ESS and beneficiaries that use these services for free. Lastly, assessment could be developed at the global level, where the interdependence between urban metropolitan and rural areas can be far-reaching. For example, the impacts of coffee consumption extend over thousands of kilometres, due to the intensification and specialisation of coffee cultivation in many tropical agroecosystems with a loss of diverse ESS (Balmford et al., 2008).

Mapping ESS flows across urban and rural spaces requires the evaluation of supply and demand of ESS based on a clear methodology. Costanza (2008) propose a categorisation into five classes in relation to the sphere of influence of ESS, according to a gradient ranging from the non-near global scale to those with predominantly local impacts. Global-scale ESS are those that can transfer the benefits generated from where they are produced to where they are experienced (e.g., carbon sequestration). The ESS with local or proximal impacts depend on the spatial proximity of the ecosystem to the beneficiaries, such as vegetation that reduces noise pollution and absorbs particulate matter generated by industry or transport infrastructure. This classification is important for planners because there are some ESS where the room for manoeuvre of public decision makers is rather limited, while for others it is very large.

For ESS with local scale effects, the supply and demand can be well defined spatially (Troy & Wilson, 2007) or may require a better understanding so that "natural capital stocks and the flow of ESS can be monitored and managed at spatial and temporal scales" (Crossman et al., 2013). In terms of service flow three spatial relationship categories may be defined (Fisher et al., 2010):

- In situ: when the benefits occur in the same location where the services are provided.

- Omni-directional: when the services are provided in one location and they benefit the surrounding landscape without directional bias.
- Directional: when the service provision benefits a specific location due to ESS flow direction.

Very often, valuations do not take into account these diverse ways of providing services, but are limited to a "static" valuation tied to a specific spatial unit. To solve this problem, complex valuation models must be introduced, which, as already mentioned, require time and costs that are hardly compatible with planning.

When planning sustainable rural-urban synergies at the territorial level, it is important to define the demand and supply of ESS that a municipality wishes to maintain or improve and, consequently, to define a monitoring system to verify its evolution over time. It is also important to analyse where the potential beneficiaries are located and if and how they use the supply of ESS. The ESS concept takes an anthropocentric approach, so population density is an important indicator. However, sometimes it is not only important where people live, but also where they spend the majority of their time. In addition, specific subgroups of the population may be prioritised for some ESS (see Hölzinger et al., 2013).

Another aspect to consider is the need to aggregate supply and demand information from ESS to facilitate decision-making processes: following multi-criteria analysis models, it is possible to introduce a methodology for normalisation and aggregation of the ESS assessed in space and/or time using the *bundling* method. In this chapter, the issue of bundling is not directly addressed, but a broad analysis has been carried out by Saidi and Spray (2018), to which we refer. In their contribution, the authors point out that the term "bundle", even if used in different contexts, refers to sets of ESS with values that are coherent in space and time. In particular, their analysis shows that the aggregation of ESS is based on statistical analyses (e.g. clusters, pairwise correlation, etc.) which help identify and describe the interactions, synergies, complementarities, competition between the different ESS, on both the supply and demand sides. At the same time, the authors emphasise that the effectiveness of the identification and interpretation of the "ESS bundles" strongly depends on the structure of the initial data and also on the territorial units used. According to the authors, this issue of bundling is still a subject of research aimed at consolidating a solid methodology, suitable for the purposes of the analysis.

On a simpler but, nonetheless, effective level, an aggregated map of ESS provision may help to prioritise areas where ESS demand cannot be met locally (as "hotspots") and to identify the locations that are providing a very high value across a wide range of ESS.[6] At the same time, this approach may be useful for introducing payment systems for these ESS. This requires solid and transparent methods for

[6] Hölzinger et al. (2013) identify the double aim of mapping and bundling ESS:

• the identification of the areas of the city/territory where the demand for ecosystem services cannot be sufficiently satisfied locally called "hotspot";

• the identification of places where ecosystems require specific protection to ensure a sustainable flow of ecosystem services over time.

grouping and weighting ESS (Campagne et al., 2020; Rovai et al., 2020). In this perspective, it may be useful to focus on ESS where local management has the greatest impact on human well-being.

3.3 Mapping Ecosystem Services as Rural-Urban Relations: Insights from Case Studies

This section aims to illustrate and integrate some of the aspects discussed in the literature on mapping and bundling ESS using practical examples. The final goal is to recognise the knowledge gaps and to formulate a set of recommendations that will be discussed in the concluding sections.

We present a selection of cases where ESS mapping has been carried out by practitioners, (based on the ROBUST H2020 project). The focus is on the experience of mapping ESS in different geographical and institutional contexts to verify the interdependency relationships between urban and rural areas. The cases are located in the Province of Lucca in Italy, Lisbon in Portugal, and Frankfurt in Germany. Table 3.1 below summarises, for each case, a set of information on the objective of the mapping endeavour (i.e. the policy or planning objective that guided the mapping), the territorial scale (i.e. the focus area covered by the map), the ESS assessed (and whether there was a link to supply, demand or both), the method (proxy or others) and type of data used (primary or secondary), the role of experts and stakeholders in defining the ESS (if any), strengths and weakness.

3.3.1 Aims of the Assessments, Ecosystem Services and Territorial Scale

The three cases all share the common goal of supporting spatial planners, albeit with a slightly different focus. In the case of the inter-municipal spatial planning process carried out by the Province of Lucca (comprising five municipalities of the Lucca plain in Tuscany, Italy), the objective was to explicitly assess open agricultural land in the rural and peri-urban periphery, for its capacity to provide ESS in order to raise awareness of the importance of limiting land urbanisation (see Rovai et al., 2018, 2020). The goal was to develop specific local strategies to enhance open space, curb urban sprawl and limit the abandonment of agricultural land. The benefits of agricultural land included local food production, recreational and cultural services, as well as environmental protection and regulatory services; more specifically, the productive and protective functions can be identified as an ESS supply, while the recreational and cultural functions represent both a supply and a demand.

Table 3.1 Mapping and bundling ESS in different contexts: insights from Lucca (Italy), Lisbon (Portugal) and Frankfurt (Germany)

Mapping and bundling ESS	Lucca	Lisbon	Frankfurt
Aim	Support spatial planners of the Lucca Province to assess and visualise the value of agricultural spaces in peri-urban areas	Orienting spatial planning processes to the recovery and promotion of the use of green infrastructure in the city	Limiting land-take in the process of drafting the Regional Land Use Plan
ESS	Provisioning, ecological, cultural and recreational ESS linked to peri-urban agriculture	20 ESS, both supply and demand	Supply (from "outer" space) and demand (from "inner" space)
Territorial scale	Inter-municipal	Municipal and regional	Metropolitan region
Method	Multi-criteria analysis, GIS, expert knowledge	Land cover ("capacity") matrix based multi-method approach	Compilation of 27 ESS with 36 individual ecosystem functions and corresponding indicators
Data	A mix of secondary data from different sources (land cover data, CAP funding, quality products areas, sequestration capacity of land uses etc...)	Land cover, expert and stakeholder assessment	Land use and land cover categories
Role of experts/ stakeholders	Experts for assessment and prioritisation of criteria	Experts and stakeholders	Experts, in and beyond the Regional Authority
Strengths	Spatially localised results, the method used, which is adaptable to different scenarios	The process itself, which supports awareness raising and co-production of knowledge	A comprehensive approach to support awareness of land as a limited resource
Limits	Understanding and interpretation of the results by policy makers and citizens must be supported, decision makers values and principles are relevant for choice making	Hard to understand for non-experts, diverse expert judgement, address trade-offs	Costly process to complete, both in terms of resources and time

The mapping carried out in Lisbon aimed to promote the integration of ESS in spatial planning processes with a view to their protection and enhancement, and it was carried out both at the municipal level (i.e., the urban area) and at the regional level (i.e., the Lisbon region and the Tagus Valley). Also in this case, the issue is the settlement and transformation of the area over time, which contributed to a reduction in natural habitats and a significant increase in their fragmentation, posing a

threat to biodiversity and the other ESS essential to human society. The restoration and promotion of green infrastructure and its use as an ecologically coherent and strategically planned network was identified as a priority. A total of 20 ESS were mapped, based on the 2015 land cover map, which was later updated to the 2018 map. At regional level, both supply and demand were assessed. At the local level, primarily supply was mapped. The demand side was expressed by stakeholders only through the selection of ESS that they considered relevant for their area. An attempt to map demand was made by mapping sustainable activities (food systems and tourism) and their dependence on ecosystems.

Similarly, the Frankfurt Metropolitan Region shares the intention to inform planning decisions through the process of creating the new regional land use plan, with a focus on balancing development while limiting land take, by introducing the logic of Ecological Footprint (EFP) into the system. The assessment covers 75 cities and towns, that form the core of the Frankfurt/Rhein-Main metropolitan region and cover an area of 2500 km^2. The assessment and mapping examined the "Outer Space" (i.e., the 'undeveloped' areas), sorted by land use and land cover categories. Strong reference was made to the logic and categories of the Federal Building Code. This was contrasted with the services required by the residents of the "Inner Space" (i.e., the urban area).

3.3.2 Assessment Methodologies, Data and Role of Experts

In terms of the methods and data used, the three cases show some differences and specificities in the approach adopted for the evaluation, balancing the availability of data with the needs and ambitions of each context. In Lucca, a multidimensional assessment model based on expert knowledge and predefined scales for the ability of some environmental variables (e.g., land use) to provide specific ESS was used, using a multicriteria analytical model (Analytic Hierarchy Process, AHP) integrated with Geographic Information System (GIS). The data used have been compiled from a variety of sources depending on the subject of the ESS assessment. For example, for food production, the reference to land management through the location of land areas receiving Common Agricultural Policy (CAP) contributions has been integrated with the identification of production areas with Protected Designation of Origin and crop values (by spatialising a value proportional to profitability, e.g., from the maximum value of horticultural nursery to the minimum value of pastures and semi-natural areas). For ecological services, the spatial distribution of ecological connectivity (assigning different functional roles to soils in the ecological network), CO2 sequestration capacity (through coefficients proportional to agricultural land use, e.g., from the maximum value of orchards to the minimum value of complex particle systems), and groundwater recharge capacity through soil geopedological characterisation. For recreational and cultural services, the persistence of the historical settlement system, the topological relationship with the settlement system, and the proximity to areas of high population density were considered.

In Lisbon, the land cover matrix ('capacity') is used, a multi-method approach that integrates both scientific and practical knowledge. At the regional level, expert judgments were obtained from a multidisciplinary panel of experts, and at the local level, judgments were obtained from local actors involved in territorial management, involving 13 of the 18 municipalities of the Lisbon Metropolitan Region. In terms of data, the expertise is based on the best available scientific data on the potential of a given land cover provisioning ESS in a given territorial context. Local stakeholders rely on their knowledge of the information available in the area they manage.

In Frankfurt, starting from the established legal requirements of nature and landscape protection, the concept of ESS was taken up and supplemented with the aspect of human well-being. During the process, a comprehensive list of 27 ESS with 36 individual ecosystem functions grouped by sections and areas was created. One or more indicators were identified for each ecosystem function. For each indicator, there is a theoretical concept or classification method, as well as a list of data needed on one hand, compared to the data available in the regional database on the other (Albert et al., 2015). The data used combined land use and land cover information from GIS, including land use plan designations. A comparison of different land use scenarios was conducted. In the absence of primary data (the acquisition of which was beyond the scope of this study due to time and financial constraints), external experts identified a range of ESS and quality assessment based on Burkhard's ESS matrix (Burkhard et al., 2014).

Experts played a key role in all three cases: in Lucca, they defined the value of the criteria and attributes used and the weighting of the criteria. In Lisbon, experts defined the value for the provision and delivery of ESS using land cover proxies and their specific knowledge. In Frankfurt, experts within the Regional Authority played the leading role, and external experts with a portfolio of specialisms in ESS and German spatial planning proposed a comprehensive and manageable set of ESS functions and indicators that meet legal and procedural requirements. Only in the Portuguese case, stakeholders were asked to select relevant ESS for their areas and use a land cover proxy to assess them, based on their local knowledge.

3.3.3 Strengths and Limitations Found in Cases

The final section of the table compares a number of strengths and weaknesses of each experience, some of which relate to the method, others to the process, and some to the values that underlie and guide the assessments. The strengths are primarily in the method chosen (as shown by the spatial multi-criteria analysis model used in the case of Lucca), which avoid the aggregation of the values of the ESS, making the assessment more transparent. The spatially localised results provide an immediate and intuitive view of the assessment to identify both the areas with a greater or lesser vocation for the provision of the ESS under study and the areas requiring priority interventions for protection, remediation, etc. In addition, the

method allows a direct comparison of possible alternative scenarios, with the possibility of changing the weighting of the different criteria according to the different needs of the stakeholders.

In relation to the Lisbon case, it is interesting to note that the main value of the assessment lies in the process itself: raising stakeholder awareness of the potential of using ESS in spatial planning (and in this particular case, in green infrastructure planning). Promoting the co-production of a shared knowledge base among stakeholders on ESS approaches and tools can enable more sophisticated mapping approaches to emerge by using the spatial data available for the territories, and by using ESS to support territorial decision-making. It is expected that this process will lead to more coherent spatial planning at the metropolitan scale.

Frankfurt emphasises that the system, once fully applied, will better account for the value of 'Outer Space.' This would be a timely response to the legal requirement to consider all available information when weighing interests in planning decision-making, and ultimately helps to highlight the finite nature of land as a resource and raise awareness of the need to limit land use.

One of the weaknesses is that the methodologies are based on many technical aspects that are difficult to communicate to citizens and policy makers, making the mapping of the ESS still a very opaque process and underscoring the need to make ESS understandable to everyone. In addition, harmonising expert assessments is challenging because the views of experts in the same scientific field are sometimes quite different. Furthermore, conflicts between services provided by the same field highlight trade-offs that need to be further explored (possibly through bundling processes). Last but not least, mapping results need to be used and validated to avoid detrimental impacts that lead to increased land use. In some cases, zoning and open space values may also encourage further land consumption by decision makers when land values are low. More generally, mapping encourages thoughtful decision-making when there is widespread awareness of the need to limit land use.

Some recommendations for improving mapping processes in each context were identified. In Lucca, the development of a preparatory information base for repeated assessment was suggested to enable effective adoption of this tool in policy making, improve identification, and extend assessment to additional ESS. In addition, reviewing the understanding of the ESS maps through a participatory co-planning process was highlighted as important.

In Lisbon, progress on methodological approaches is being made primarily in the following areas: integrating expert assessments with bottom-up stakeholder assessments, using consistent existing spatial data at local and regional scales to feed ESS mapping, improving map quality, overcoming the land cover proxy, and making progress on ESS bundling procedures and conflicting objectives assessment.

In Frankfurt, key advances include developing knowledge and establishing guidelines for integrating ESS into spatial and urban planning at multiple scales and levels of governance; developing an ecosystem services-based green infrastructure network integrated into spatial and urban planning practices as the backbone for achieving an ecologically based territorial model. Practical implementation with

complete data sets and monetisation would be important. As an interim solution, the information could be incorporated into a ESS viewer, an easy-to-use GIS application that visualises ESS for user-selected portions of the region. Ultimately, the concept should be incorporated into federal regional planning legislation.

3.4 Key Lessons Learned from Case Studies

The numerous challenges facing the mapping of ESS in the context of spatial planning were confirmed by the case studies of Lucca, Lisbon and Frankfurt.

Some key lessons can be summarised as follows:

- *Improve transparency and communicability of mapping to build awareness of the importance of ESS assessment, and connect rural and urban areas*

A first aspect is the need to improve the knowledge and understanding of decision makers and citizens about the concept of ESS and about the communicability of maps. Awareness and understanding of the link between quality of life and the services provided by the ecosystem is not yet widespread. Mapping efforts are still often seen as a "black box" resulting from elaborations that are difficult to understand. ESS maps should be presented as transparently as possible to make their meaning understandable while not creating excessive expectations for using this tool to assess the sustainability of planning decisions in terms of rural-urban synergies. Mapping the flows of ESS in relation to supply and demand illustrates the link between urban and rural areas at different territorial scales.

- *Support experts to agree on a consistent assessment, and enhance citizens' recognition of the socio-cultural values of ESS*

There are many options and techniques for assessment and mapping ESS, as explained above: it is necessary to be aware of the critical aspects of the assessment and validation process, as the data used and the level of provision of ESS can be interpreted differently. For example, if a proxy method is used (e.g., capacity matrix referenced to land use), it is common for experts to make different judgments with respect to the same spatial context. Or, when primary data are used, their interpretation and translation may change with respect to the ability of territories to provide ESS. In other words, it is necessary to identify and define the most appropriate method to bring experts to consistent judgments.

Regarding the evaluations of experts whose opinions do not converge (even in the same scientific field), the harmonisation of their evaluations is very challenging. In this sense, it is necessary to better understand the reasons behind the divergences. This aspect becomes even more evident in the attempts of participatory assessment of ESS by citizens and stakeholders. It is clear that the goal is not so much to obtain a scientific assessment, but to get citizens to recognise the sociocultural value of ESS and to understand how to share these assessments.

- *Explicitly address trade-offs between the ESS to cope with divergences*

Another problem is the trade-offs between competing ESS offered in the same area. In other words, the different representations of the ESS categories do not adequately reflect the underlying trade-offs. Therefore, identifying a logical process (or method) for bundling the various ESS, thereby developing an ESS "synthesis" appropriate for the decision process, is paramount. The issue of bundling, although not addressed in depth in this chapter, is fundamental to enable the identification of interactions, synergies, complementarities, and competition between the different ESS on both the supply and demand sides, targeted towards the aim of helping public decision makers (Saidi and Spray, 2018).

- *Support the use of ESS mapping in binding spatial planning instruments*

In terms of integrating ESS mapping and assessment into planning processes as an effective tool for understanding the interdependent relationships between rural and urban areas, there is a gap between strategic (non-binding) planning and operational planning. In the former, the use of mapping the ESS is widespread, while in operational planning, ESS is rarely referred to and reference standards/thresholds that must be met/achieved are not established.

- *Support the integration of data and develop guidelines for the assessment of ESS in spatial planning*

The availability and suitability of data is less of a challenge than data redundancy, as an overwhelming amount of available environmental, economic, social and cultural data is available. The targeted selection of data deliberately to assess the ESS and avoid overlaps is a real challenge.

Ultimately, mapping the ESS is only effective if there is broad awareness of its strengths and limitations, and if the goal is clearly defined. For example, from a bioregional perspective, it is necessary to deepen the definition of criteria and levels of the ESS in order to balance supply and demand in urban and rural contexts. Whether these criteria should be based on a political or a scientific vision: the boundaries are influenced by the territorial context and the history of planning itself, among other factors. All in all, a goal to strive for could be the development of guidelines for the integration of ESS into spatial and urban planning at multiple levels. The idea should not be so much to use the ESS approach in spatial planning to "compensate" for the failures of land use planning by improving ecological connectivity and green infrastructures, but to show that the use of ESS is the basis for planning aimed at defining a truly sustainable and resilient territorial model.

3.5 Concluding Remarks

The Sustainable Development Goals (SDG 11 in particular) emphasise the importance of making cities inclusive, safe, resilient, and sustainable by implementing integrated strategies and plans for resource efficiency and climate change adaptation. This is not possible without protecting rural and peri-urban regions. Therefore, new multi-level and collaborative governance systems are needed to manage the resilience of rural-urban relationships that also provide other services that are increasingly demanded by urban communities, such as recreational and cultural services related to rural areas. The knowledge and mapping of ESS supply and demand is fundamental in the current context to regulate the sustainability of both urban and rural development, and in this sense the methods described and discussed in this chapter may prove to be an indispensable tool.

The cases presented in this chapter have illustrated the objectives, the methodologies and the data used for ESS assessment, the involvement of expert and other stakeholders' knowledge, the strengths, and the weaknesses of the process of assessing and mapping the supply and demand of ESS in different contexts, all with the aim of supporting territorial planning processes in better valuing the space and resources they are intended to affect.

Mapping ESS for land use planning purposes must necessarily take into account the tensions between urban and rural areas, since the land use planner is usually faced with the problem of how, to what extent, and where to expand the urban area, and this expansion affects the surrounding rural area. This land consumption leads to a conflict between public and private interests, between the increase of land rents and the loss of ESS. Rural and urban areas are interconnected in many ways, and the ESS approach highlights this relationship, particularly the role of rural areas in supporting the sustainability and resilience of urban areas. Indeed, urban development would be unthinkable without a rural area that provides essential tangible and intangible goods and services, such as food, water, raw materials, CO2 sequestration, etc. Urban areas do not function in isolation, but in a "sphere of dependency" on surrounding areas and their ecosystems, and the degradation of these ecosystems leads to a loss of ESS, which will sooner or later affect both urban and rural residents.

Ultimately, we believe that it is important that the results of ESS mapping (both scientific and participatory) find an appropriate place in formal planning procedures. This is especially true for recognising the interrelations between the supply and demand of ESS between rural and urban areas, and thus the role that urban and rural managers play in the production and demand of these ESS, in order to then develop more balanced ESS and territorial governance systems.

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Chapter 4
Ecosystem Services in Multi-Scale and Level Planning for Rural-Urban Synergies

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Abstract Multi-scale and -level planning is particularly relevant when addressing ecosystem services (ESS) and its role in promoting rural-urban synergies. While ESS need to be addressed spatially at multiple scales to capture ecological processes, ESS value needs to be recognized at multiple levels of decision-making, and within each level. This chapter addresses the use of multi-scale planning (related to scales of ecological processes) and multi-level planning (related to levels of conducting planning and making decisions) to enhance rural-urban synergies based on ESS. A brief review is conducted of the scientific literature and of core policies that set the framework for multi-scale and -level consideration of ESS within spatial planning. Broad consideration, and integration, of ESS in sectoral and spatial planning must be adequately considered at, and within, multiple geographical levels and scales. Conclusions are drawn in relation to the role of ESS in enhancing rural-urban synergies and the recognition that an integration of multi-scale and -level planning is a pivotal condition for that to be achieved.

Keywords Ecosystem services · Spatial planning · Multi-scale planning · Multi-level planning · Rural-urban synergies

4.1 Introduction

The EU Territorial Agenda 2030 emphasises the need to create healthy ecosystems in territories. It seeks to encourage integrated development and spatial planning to safeguard the sustainable use of the territorial capital and its respective ecological functions. The COVID-19 pandemic has exposed the fragility of territories and the

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M. R. Partidario et al. (eds.), *Role of Ecosystem Services in Enabling Rural-Urban Synergies*, Landscape Series 20, https://doi.org/10.1007/978-3-031-98153-1_4

importance of proximity to nature as well as the need to innovate spatial planning to foster transformative approaches.

Most ecosystem services (ESS) are associated with physical territorial areas where the services provided express territorial functions that should be recognized in planning. For example, water infiltration is a key function for the regulation of floods, while the combination of several factors (water and air quality, visual landscape qualities, etc.) will contribute to functionally healthy territories. In this way, ESS enable the identification of functional areas that, when cross-related at different scales, can contribute to more sustainable policies in territories.

The leading argument in this chapter is that the state of ecosystems and their capacity to deliver services is inevitably influenced or impacted by spatial and sectoral planning decisions, with territorial implications. Consequently, this chapter aims to explore how multi-scale and multi-level spatial and sectoral planning can be transformed to enhance, rather than negatively impact ESS, while concurrently promoting rural-urban synergies based on functioning ESS.

Multi-scale planning refers to different scales of ecosystem processes, recognizing that multiple interactions and interconnections are established within and across different territorial or geographical scales (e.g., Cash et al., 2006; Lennon & Scott, 2014; Rozas-Vásquez et al., 2018). Multiple levels of planning refer to different levels of conducting planning and taking decisions. This engages the notions of multi-level governance, which includes multiple actors or stakeholders, their competences, responsibilities, and collaboration, as well as multiple sectors, policies, and processes.

While ESS needs to be addressed spatially at multiple scales to capture ecological processes comprehensively (Scholes et al., 2013; Andersson et al., 2015), ESS value also needs to be recognized at multiple levels of decision-making, as well as within each level. This integrated multi-scale and multi-level approach will enhance an interconnected and systemic analysis of the role ESS can play in establishing rural-urban synergies, as well as recognising that ESS contribute to territorial economic value created through rural-urban synergies. This perspective supports the structuring of the chapter and the achievement of its main aim: enhancing rural-urban synergies based on ESS through integrated multi-scale and multi-level planning.

Multi-scale planning, while given limited attention in spatial planning approaches, has been gaining relevance with ecological systems in landscape or green infrastructure planning (Lafortezza et al., 2013; Cortinovis & Geneletti, 2018; Von Haaren et al., 2019). With an urban and infrastructure focus in spatial planning, ESS have found resonance notably in urban planning (Gomez-Baggethun et al., 2013) or planning for urban development (Grêt-Regameya et al., 2017). Concomitantly, and bearing in mind the persistence of a rural-urban dichotomy in spatial planning (Davoudi & Stead, 2002; Olde & Oosterlynck, 2021), most ESS approaches outside urban or urbanised areas link foremost into other policies, such as agriculture or nature conservation. Literature has provided grounds to imply that the rural-urban divide fails to foster proper understanding of ESS flows (e.g. Wang, 2022). This situation indicates the potential of a multi-scale and -level planning approach of

integrating ESS to trigger rural-urban continuity and coherence in spatial planning and, thereby, providing a foundation to promote rural-urban synergies (e.g., Gren & Anderson, 2018) .

Rural-urban synergies have been established as a concept in the ROBUST project to mean *'connecting rural and urban places, people and products, for mutual growth and benefit, towards a shared, sustainable future'* (Woods et al., 2018: 2). Three principles for rural-urban synergies were also established in ROBUST to propose new opportunities for rural-urban synergies (Woods et al., 2018):

- New localities, as connecting the local by designing for the real areas in which we live, work, and collaborate.
- Network governance, as deciding together through participation in government and partnerships between sectors.
- Smart development, as growing smart by prioritising what each local economy can do best.

These include several opportunities to address ESS, notably: new localities as places characterised by ESS (for example organic farms for food production); using ESS to enable connections (for example flows of material and energy), to act in collaboration (for example water management networks or partnerships) and ESS as an opportunity for innovation (for example as an inspiration in scientific or other cultural services).

ROBUST further explored how broader areas of cross-sectoral interactions, at different scales, acted as drivers of rural-urban synergies in different contexts (Ruiz et al., 2021), for example in areas where tourism, food production and cultural services interact. This understanding suggests that ESS can play a role in establishing synergistic relations across sectors in rural-urban linkages.

Spatial planning must shift from being reactive to development (e.g., Albrechts, 2010; Hersperger et al., 2018) to become more proactive and integrate the benefits accrued from nature by society in order to enhance r-u synergies and to promote ESS and sustainability. There is a potential strategic and management role in spatial planning in providing direction to sectoral policies and development, that is largely under-explored given its reactive practice. Investing in, and exhibiting, proactivity in spatial planning may open space for ESS to contribute to the territorial economic value, created through rural-urban synergies, stimulating positive impacts, and reducing or avoiding negative impacts in planning development processes.

As mentioned by Schröter-Schlaack and Blumentrath (2011), *'spatial planning can be understood as a policy mix in itself, as it combines instruments with different binding forces and is applied across governmental levels and sectors complementing one another*.' This combination also exposes the interactive / relational nature of such instruments as different actors, from different institutional settings, are the 'players' that contribute to policy development and implementation.

In line with the above, this chapter further develops the concept of ESS in multi-scale and multi-level planning for rural-urban synergies. It reviews the relatively limited scientific literature on the subject, as well as existing relevant policy frameworks that set the context for integrated planning within multi-level governance.

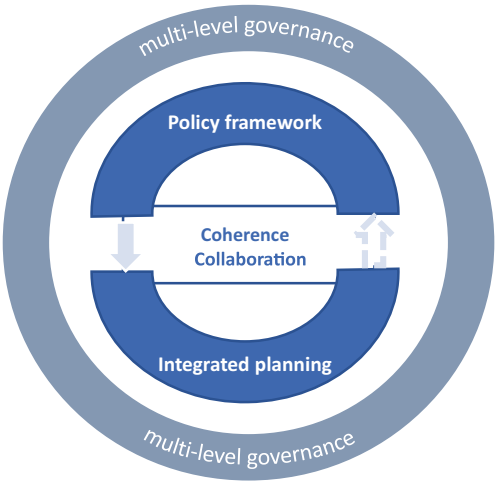

Fig. 4.1 Structure of elements, and their connection, as used in this chapter

Our analysis focuses both on policy coherence as well as on collaborative actions that are, or can be, enabled by multi-level governance (Fig. 4.1) through integrated planning in the context of mixed policy frameworks. The chapter concludes with key learning points and recommendations for enhancing the role of ESS in rural-urban synergies.

4.2 The Scientific Perspective: What the Literature Says

The increasing pressures on territorial resources and, consequently, on the characteristics, dynamics, constraints, and impacts on territorial systems, have given rise to a debate on how to integrate different perspectives and dimensions of global change (Verburg et al., 2015). Spatial planning, which is substantially concerned with land use planning, has been recognized among the causes of many forms of global environmental change, although it is also a powerful means of mitigation and adaptation of global environmental change (ibid).

Research and understanding of patterns of multiple and cross-scale dynamics in linked human-environment systems have advanced substantially in the past decade. There is an impressive diversity of tools, approaches, and measures for studying scale and scale-related phenomena (Cash et al., 2006). Referring to scale in ESS research and practice, this has been closely related with ESS mapping and the level of spatial detail required to capture ecosystem processes and the service delivery. There is a substantial body of literature on ESS mapping (e.g., Troy & Wilson, 2006; Naidoo et al., 2008; TEEB, 2010; Burkhard et al., 2012; Burkhard & Maes, 2017). ESS mapping and assessment is essential for understanding ecosystems as key components in land-use policies, and ESS relevance in related decision-making. Proactive recognition of such relevance is crucial to move towards sustainable

policy and decision-making, important for raising stakeholders' ESS awareness and for shaping decisions on both ecological processes and human activities (Brander et al., 2018).

To exploit the potential of ESS in spatial planning the focus needs to move beyond ESS mapping towards understanding territorial systems dependencies upon ESS, the role that ESS are playing, or can potentially play in the functioning of territorial systems and their dynamics. This requires engaging actors and their knowledge, stakeholders' perspectives at multi-levels, enabling broad consideration and integration of ESS value in spatial planning. The concept of integrated multi-scale and multi-level planning opens many points of connection with ESS and are systemized here, based on a literature review. This can be particularly relevant when observing and exploring the interaction between rural and urban dynamics to enhance synergies.

4.2.1 Spatial Planning for ESS Enhancement

The literature recognizes that spatial planning and ESS reveal strong dependencies given the relevance of ESS to human activities in rural and urban areas, and that spatial planning can be instrumental to enhancing ESS value. However, positions vary as to how this can be achieved. Almost two decades ago, Hein et al. (2006) found only scant elaboration on the various spatial and temporal scales at which ESS are supplied. Theirs became one of the earliest papers to examine the relationship between different spatial scales and values attached to ESS by stakeholders, considering both the ecological scales at which ESS are delivered and the decision-making scales through which stakeholders benefit from ESS.

These authors recognized that the analysis of ESS can be executed at multiple scales, from large regions to small parcels of land or individual land elements (e.g., trees) (Hein et al., 2006). For example, the supply of food relies, among other factors, on local pollination processes, regional water supply and global market trends. Using a single spatial scale may be sufficient for some ESS (for example provision of nitrogen) but not to adequately capture delivery of many other services (e.g., carbon storage (Andersson et al., 2015)). Likewise, the ESS benefit may be generated at local levels, however, providing benefit at the global scale (e.g., climate regulation capacity delivered by wetlands (Scholes et al., 2013)).

More recently, there is further research in the literature addressing the relationship between multi-scale and multi-level spatial planning and ESS, but findings remain limited, as noted by Raudsepp-Hearne and Peterson (2016). According to the most recent global assessment (IPBES, 2019), land-use change is one of the major drivers (direct and indirect) of biodiversity loss globally. The Charter of European Planning by the European Council of Spatial Planners defines challenges and good practices in spatial planning by, for example, building on the need to recognise social, environmental, and economic connectivity and to consider the

precautionary principle and the environment in all decision-making processes (Albert et al., 2020).

In theory, spatial planning should guide the responsible management of natural resources and protection of the environment through the rational use of both rural and urban land, bearing in mind its complementarity. In practice, instead of a case-based decision approach, land use decisions have been oriented to the development of large urban and industrial complexes and major infrastructures, and are thereby, according to the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), a major blocker of ESS value enhancement and respective integration in planning practices. Therefore, balancing trade-offs between environmental, social, and economic development priorities remains a challenge for integrated planning.

In the research note by Albert et al. (2020) on the regional assessment of the IPBES, it is argued that a targeted and integrated approach to spatial planning can substantially enhance the conservation and sustainable use of biodiversity and ESS. The authors argue that spatial planning, together with other legal and regulatory instruments, provide the *'backbone of policy mixes'* for biodiversity and ESS delivery. Spatial planning is thus considered by these scholars a key process instrument to explore spatial implications of combined policies on biodiversity and ESS, and to design synergistic solution strategies that serve both rural as well as urban territories. These include *'(i) mapping spatially explicit biodiversity and ESS information at an appropriate scale resolution, (ii) developing methods and tools for integrating this information in planning practice, and (iii) fostering delivery mechanisms'* (Albert et al., 2020: 103740).

Several dependencies of ESS on spatial considerations are identified by Albert et al. (2020). A core dependency is the effect of landscape composition and configuration, and particularly existing landscape connectivity, or otherwise fragmentation, in the delivery of ESS. The delivery of ESS is strongly linked to the spatial distribution and composition of biodiversity. Territorial transformation, when affecting biodiversity, means that ESS are being disregarded in spatial planning, with significant negative impacts on the delivery of ESS. One example is soil sealing or fragmentation. Another is the transformation of dominant natural or agricultural land uses into more intensive, extended, monocultures. The authors therefore argue for the importance of recognizing the relevance of ESS in spatial planning and the need to incorporate ESS knowledge at early planning stages.

Additionally, it is necessary to consider multiple planning instruments in spatial policy and decision planning levels to enable the consideration of cross-sectoral analysis and spatial co-management. This will be further elaborated in Sect. 4.3 through a policy review, highlighting that the framework of the new EU Leipzig Charter and the Territorial Agenda 2030 recognise the relevance of ESS in creating healthy environments in territories.

4.2.2 Scale Sensitivity and Context Dependency

Connecting local processes with those at broader global, transnational, and national scales, clearly requires multi-scalar and multi-level approaches. The benefits of recognising scale challenges in policy integration have been well documented in earlier research, as reported by Cash et al. (2006). As an analytical concept, scale provides a means to analyse local-global dynamics—the interconnections between local and global, and the simultaneity of those connections. An empirical focus on scale helps to identify the specific interests and influences of different actors at different levels, and how they shape decision-making and subsequent outcomes (Chaudhary et al., 2019).

Scholes et al. (2013) suggest two alternative approaches: 'multi-scale assessments' (conducting the assessment at two or more discrete scales) and 'cross-scale assessments' (multi-scale assessments which deliberately look for cross-scale interactions). The multi-level perspectives (MLP) advanced by Geels (2002) within sustainability transitions theory is very helpful in recognising multiple connections across different levels and scales of analysis.

In adopting a multi-scale approach, we analyse the interests and practices from local to global and vice versa. Such an approach is particularly useful for ESS research where ecosystems, communities, national authorities, international agencies, donors, and investors are becoming connected in diverse and unexpected ways. In looking across scales, it is possible to identify which ESS are being valued at what levels, and what impacts this has for local communities (Chaudhary et al., 2019).

A 'cross-scale' study is a form of multi-scale study, in which explicit attention is paid to the interaction between the scales (Cash et al., 2006). The usefulness of insights into what controls the patterns and behaviour observed comes from multi-scale studies, contributing to understanding cross-scale effects (Geels, 2002; Scholes et al., 2013).

Processes operating at different scales interact and influence each other (Gunderson & Holling, 2002), but there is often one scale where a specific process or function can be optimally analysed. Scale is an important issue in both ecological and social studies. Furthermore, the social and ecological structures that underpin ESS provision, use or value are observable at a variety of scales. Likewise, ESS can be supplied, used, valued, and managed at different spatial and temporal scales, and the appropriate scale of analysis depends on what is intended.

ESS should be seen as the product of complex interconnected social–ecological systems and therefore dependent on the interactions and feedback from a multitude of factors functioning at multiple scales (Scholes et al., 2013; Hein et al., 2016). For example, a macroeconomic policy of food price subsidies can cause land use changes at the local level. The Millennium Ecosystem Assessment (MEA) is itself an example of indirect multiple scale and multi-level governance. While driven by international processes, targeted at global concerns, and therefore assessed at that scale (Scholes et al., 2013), the MEA required the observation of local scale changes impacting the supply of ESS to deliver tangibility to global assessments.

Scale mismatches have been investigated by Satake et al. (2008) in relation to pollination and carbon storage services, exploring the payment for ESS. The authors compared landowners' local scale with decisions on deforestation with the larger scale used by animals to pollinate plants, and the global scale regarding carbon storage. Their findings suggest that while payment for carbon storage services can protect forests, at the same time it creates inequities among landowners' income levels.

Scale mismatches have also been identified by Ernston et al. (2010) using a network governance perspective. The authors explored the concept of scale-crossing brokers when considering the relationship between ecological processes and social processes of governance in Stockholm. Their conclusions point towards the importance of linking multiple core actors, such as government agencies and civil society groups, through social networks to help better match spatial scales of ecosystem processes.

4.2.3 Exploring Multi-Level Governance

Up to this point, the discussion has been focused on scale, including multi-scale (e.g. local to global dynamics) as well as cross scale (the interaction of different scales). It has been noted that ESS can be seen as the product of complex interconnected social–ecological systems, dependent on the interactions and feedback from a multitude of factors functioning at multiple scales.

While briefly introduced above, we will now further elaborate on the issue of levels, which provides valuable insights on multi-level planning and governance. Level is also important for exploring the linkages between rural and urban territories, for which different governance structures are needed to stimulate rural-urban synergies. Levels demand attention to structures, formal and informal institutions (such as rules, regulations, path dependencies, lock-ins), and relational elements in terms of interactions and interdependencies between societal, political and economic actors. Figure 4.2 illustrates what is gained from the notion of governance of ESS (following Loft et al., 2015) at different levels of decision making.

The governance aspect is often seen as multi-level and polycentric. Scholars focusing on the governance of ESS have shown the importance of multiple values and the notion of relationships and interactions for knowledge and information exchange (Loft et al., 2015; Jacobs et al., 2016; Chan et al., 2018). The aspects of institutional diversity, policy mixes, the wide diversity of actors, the fragmentation of knowledge and information, combined with the dimensions of negotiation, coordination and inclusiveness are all identified as main challenges in the governance of ESS (Loft et al., 2015; Winkler et al., 2021).

Interactions and interdependencies may occur across and/or within levels, responsible for substantial complexity in the system dynamics. 'Cross-level' interactions refer to interactions across decision levels within a same scale, while 'multilevel' is used to indicate the presence of more than one level of decision, without implying that there are important cross-level interactions (Cash et al., 2006).

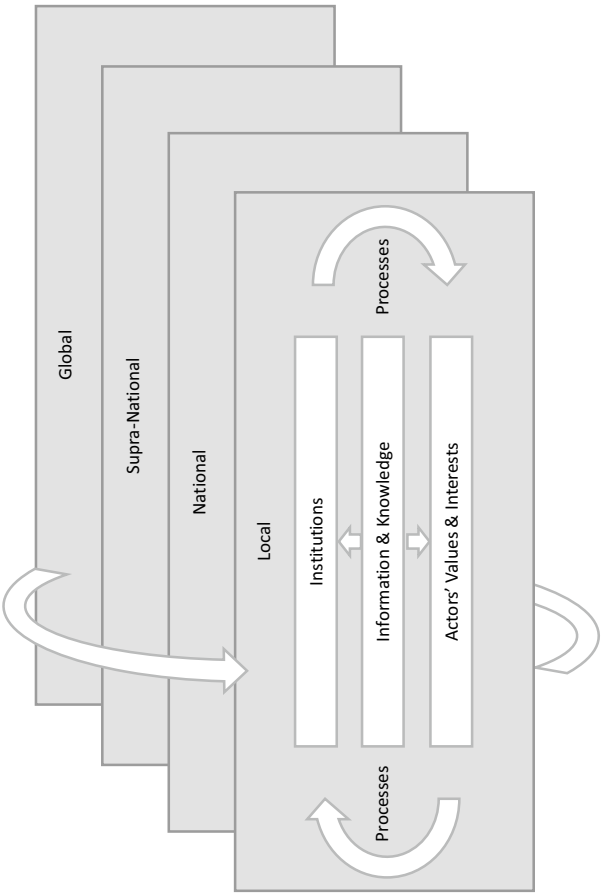

Fig. 4.2 Multi-level governance of ESS (Adapted from Loft et al., 2015)

ESS-related decision-making are characterised by multi-level processes that emerge from the interaction between multiple ESS-specific actors, processes, and institutions (Gupta & Pahl-Wostl, 2013; Primmer et al., 2015; Loft et al., 2015; Falk et al., 2018; Pahl-Wostl, 2019) from local to global levels. As pointed out by Falk et al. (2018: 202) in relation to ESS, "coordinating these decision-making centres is the next higher governance challenge".

The multi-level character of ESS presumes the inclusion of multiple actors, ranging from governmental levels, civil society, and private sector. Vertically it includes international, national, and subnational actors; and horizontally governmental ministries and agencies, development and environmental NGOs, business groups, research organisations and think-tanks, and civil society forums. The interactions between such individual and collective actors, and organisations, among and between multiple levels, is central in transition processes of ecosystem-based management (Olsson et al., 2008). This situation alludes to the challenge of considering a wide range of interests and value systems at different scales (Loft et al., 2015) for legitimate processes that balance and negotiate such interests. Several authors advocate the need for inclusive and participatory processes that build on reflexivity, learning and adaptation to increase institutional capacity for multi-level interaction (Loft et al., 2015; Reed et al., 2017; Pahl-Wostl, 2019).

Regarding processes, there is concern about the need for transparent decision-making processes of political negotiation "leading up to the choice, design, and implementation of institutions, in particular the combining of policy instruments" (Loft et al., 2015: 153). The design and implementation of coherent ESS-related policy mixes is also a challenging task (Loft et al., 2015) when, for example, a multitude of political interests are at stake that may block vertical and horizontal policy integration (Schleyer et al., 2015). Policy-related ESS are not static and do not have a predefined boundary. Schleyer et al. (2015) regard ESS as boundary objects that reflect the intersectoral policy relations, as they allow policymakers from different policy fields to discuss, negotiate and integrate knowledge from their respective fields, even potentially those subject to debate, such as what relates to rural and urban territorial priorities.

It is important to reflect on the ESS-related institutional interplay (Young, 2002) with institutionalised discourses of socio-political-cultural interactions (Loft et al., 2015; Pahl-Wostl, 2019). This leads to the need for a systemic vision of ESS as an institutional field (Farhad et al., 2015). Within a multi-level structure, bridging institutions play a key role for coordinating "the interactions among a range of actors at different levels of society and nodes of expertise and a diversity of experiences and ideas" (Olsson et al., 2007: 12). Such institutions are thus essential for promoting 'interorganisational collaboration' between similar/different actors in spatial planning processes seen as policy-mixes for ESS delivery.

4.2.4 The Strategic Role of Environmental Assessment Instruments

IPBES (2019) recognises the relevance of comprehensive environmental assessments (EA), such as environmental impact assessment (EIA) and strategic environmental assessment (SEA), as support instruments that mitigate the impacts of development activities on ESS. Moreover, IPBES also states that EA are crucial for spatial planning, proposing that they contribute to guaranteeing more integrated, resilient, and sustainable outcomes of planning processes. The EU Biodiversity Strategy 2030 indicates that, to enable the desired transformative change for European biodiversity, it is imperative to commit, implement and enforce (and where necessary review and revise) EU environmental legislation, where both the EU EIA and SEA Directives are included.

Spatial planning combined with EA instruments (as EIA and SEA), can serve as a useful combination of instruments to consider spatial implications of combined policies, and development options, on biodiversity and ESS (Rozas-Vásquez et al., 2018). While a strategic analysis of the potential impacts is highly relevant, the assessment of options for integrating ESS during the planning process adds a focus on sustainability and environmental aspects at strategic levels (Partidario & Gomes, 2013; Rozas-Vásquez et al., 2018).

Through the application of tools such as simulation modelling and scenario studies, spatial planning with EA (both SEA and EIA) explores trade-offs and opportunities to conciliate biodiversity conservation and ESS provision policy objectives, with sectoral economic objectives and actions often in conflict (Partidario & Gomes, 2013; Albert et al., 2020).

Spatial planning can thus proactively advance environmental and sustainability integrated strategies that safeguard sensitive areas, enhance the state of ecosystems, and identify synergistic land-use options (Kopperoinen et al., 2014). Scholars recognise the systemic properties in the action of spatial planning combined with EA instruments. This combination helps to balance diverse interests and policies in spatial strategies for cities, landscapes or regions (Grêt-Regameya et al., 2017; Albert et al., 2020).

Integrating an ESS approach into SEA of spatial plans potentially enhances the incorporation of the natural capital value in decision making and policy processes (Partidario & Gomes, 2013). However, there is increasing concern about the (in) adequacy of institutional contexts to enable such integration, as well as the lack of a common understanding on SEA and ESS that are limiting the adoption of an integrated framework (Rozas-Vásquez et al., 2017).

SEA, particularly when conducted with a strategic setting (Partidario, 2009, 2021; Partidario & Gomes, 2013) favours active multi-actor arrangements as a first step towards a successful integration of ESS in spatial planning. Nevertheless, findings by Rozas-Vásquez, et al. (2017) suggest that a common understanding of SEA and especially of ESS in a context of multiple actors is still at an initial stage (particularly in their area of study). The authors also pinpoint that the lack of

institutional guidelines and methodological support is considered the main challenge for integration (Rozas-Vásquez et al. 2017).

4.3 The Political Perspective: What the Policies Promote

We focus our analysis at the European level, reflecting ROBUST's European scope. Consequently, in this section, we explore recent EU environmental and territorial strategies that are relevant for rural and urban linkages and synergies, and focus both on binding legislative instruments as well as on non-binding programme instruments (in the latest also considering recommendation from the EU on the incorporation of ESS into decision-making).

As mentioned before, spatial planning can be understood as a policy mix (Schröter-Schlaack & Blumentrath, 2011) of several policy instruments that establish an overall functioning logic (Evers, 2005; Howlett & Rayner, 2007). To analyse the complex multi-instrument setting promoted by the EU, we adopt here some design principles for policy mixes with influence in spatial planning (inspired by Gunningham et al., 1998):

- Consider the range of policy instruments with influence in spatial planning.
- Understand the factors that help to recognise this range as integrative within the spatial planning logic.
- Identify the overall patterns that support a 'different' institutional design to understand the role of ESS in rural-urban linkages from the perspective of multi-scale planning.

The EU represents a supranational organisation with unique forms of multi-level governance in the formulation and implementation of EU policies. The architecture and coordination of this system presumes the transposition of legal and regulatory instruments, and recognition of strategies and communications by its Member States. (For further elaboration on the dedicated policy context for ESS, see Chap. 15)

4.3.1 Binding Instruments

Common Agriculture Policy (CAP)

The Common Agriculture Policy (CAP)[1] contains the EU priorities for agriculture and rural development. While ESS have not been explicit in the CAP up to 2020, its relevance in land use and spatial planning, particularly in the sustainable

[1] https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/new-cap-2023-27_en

management of forests, restoring, preserving, and enhancing biodiversity, including in Natura 2000 areas, makes CAP a key policy instrument in enhancing ESS. In addition, its relevance for ESS is also recognized in areas facing natural or other specific constraints related to water management, resource efficiency, climate resilient economy in agriculture, food, and forestry sectors, and in social inclusion, poverty reduction and economic development in rural areas.

The CAP promotes that both agricultural and forestry spaces should be considered in rural development through climate friendly land use and sustainable management instruments (as for example the promotion of carbon sink areas and mechanisms for carbon sequestration; or the valuation of both types of spaces with respect to soil erosion). The CAP focuses on non-productive investments in physical assets for ecosystem and climate resilience in spatial planning, complementing the achievement of sustainable use of agricultural and forestry spaces. Examples of such non-productive investments in spatial planning include the valuation of conservation status areas and of the public amenity value of Natura 2000 sites, the restoration of landscapes, or even management actions for water and soil protection.

The latest CAP (2023–2027) recognizes ESS and proposes an increase of investments to guarantee and enhance forest conservation and resilience of agroforestry systems, based on strategic planning and climate-planning instruments. Also, the following general objectives of the new CAP proposal are notable: (a) resilience across the EU territory to enhance food security, (b) contributions to climate change mitigation and adaptation, (c) efficient management of natural resources such as water, soil and air, (d) protection of biodiversity, enhance ecosystem services and preserve habitats and landscapes, and (e) employment, growth, social inclusion and local development in rural areas, including bio-economy and sustainable forestry.

Environmental Impact Assessment (EIA) and Strategic Environmental Assessment (SEA)

Based on the literature reviewed, Sect. 4.2.4 briefly elaborated on the role of strategic environmental assessment in assisting spatial planning towards better recognition, facilitation and incorporation of ESS in multi-scale and multi-level planning. In this section we signal both SEA[2] and EIA[3] as important environmental policy instruments that can promote the consideration of ESS as an integral part of policy formulation, spatial planning or the planning and design of large development projects, therefore contemplating multi-level planning.

Both these instruments are expected to be used, including public and institutional consultation, before any development decision is made in relation to proposals likely to have significant environmental impacts. Even though ESS are not explicitly recognised in the SEA or EIA Directives, in 2013 the European Commission launched guidance to incorporate climate change and biodiversity into both EIA and

[2] https://ec.europa.eu/environment/eia/sea-legalcontext.htm

[3] https://ec.europa.eu/environment/eia/eia-legalcontext.htm

SEA, with ESS being explicitly addressed as important factors for consideration during the assessment and when proposing recommendations.

4.3.2 Non-binding Instruments and Guidance Support

Green Infrastructure

As indicated in the Green Infrastructure Strategy,[4] the notion of green infrastructure (GI) is based on the principle that "protecting and enhancing nature and natural processes, and the many benefits human society gets from nature, are consciously integrated into spatial planning and territorial development". The strategy further states that the consideration of GI in spatial planning helps to reduce the loss of ESS associated with future land take and help improve and restore soil functions.

A multi-scale and multi-level approach to GI is advocated in seeking coherence, interconnectedness and interdependence in spatial planning solutions and decision-making processes to both rural and urban landscapes. Specifically, it recognizes the positive role of ESS for social, health and security/resilience benefits, promotion of sense of place and sense of belonging, connectivity between rural and urban areas, mitigation of the negative effects of land uptake and fragmentation, or even in relation to the multifunctional nature of rural areas, including access to sustainable, safe, and nutritional food through short food supply chains. The strategy was innovative by reaching out to spatial planning to ensure territorial continuity beyond Natura 2000 areas, connecting urban and rural realms.

The Implementation of this strategy was reviewed in 2019 and the following gaps were emphasised: (a) insufficient integration of GI in strategic spatial planning, (b) good practices not being scaled-up, (c) low recognition that scale "transcends administrative boundaries", or even (d) lack of monitoring systems in current strategic spatial planning practices. One aspect identified to support the improvement of GI implementation is the need to recognize coherence between ecosystem-based policies and adopt more strategic-based approaches to spatial planning. These, and other shortcomings linked to integration of EU policies in spatial planning, might find explanation in the lack of mandate and competences of the EU to legislate on matters of spatial planning, building on assertions of national sovereignty (Faludi, 2018).

European Green Deal

The European Green Deal[5] is a core package of European strategies to improve the well-being of people, promote climate neutrality by 2050 through green economy and environmental protection actions. It proposed to transform the EU's economy with a set of transformative policies and strategies including the 2030 Biodiversity

[4] https://ec.europa.eu/environment/nature/ecosystems/index_en.htm

[5] https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en

Strategy, the Farm to Fork Strategy or the European Climate Law, designed, among other objectives, to "increase the value given to protecting and restoring natural ecosystems, to the sustainable use of resources and to improving human health".

The 2030 Biodiversity Strategy[6] aims to reverse the trend of the loss of green urban ecosystems by promoting green infrastructures and nature-based solutions to be integrated in strategic urban planning. For strategic planning, with a multi-spatial dynamic. The Strategy also stresses the need for sustainable water resource management, restoration of degraded land, and protection and restoration of biodiverse areas with high ESS and climate mitigation potential. Concrete examples are given such as the use of resilience-oriented approaches to landscape and ecosystem valuation, or to improve agroforest working conditions and create new jobs in sustainable activities such as organic farming, rural tourism, or recreation. Special attention is given to monitoring systems and the importance of those to support the understanding of ESS protection, conservation, and valuation, as well as health or restoration efforts under strategic planning.

The Farm to Fork Strategy[7] is focused on ensuring "food security and safety, reinforce public health and mitigate their [food systems] socio-economic impact", with a resilience-oriented perspective. The macro-orientations of this Strategy are multi-sectoral, comprising activities from agriculture and fisheries to health and transportation. It intends to create a productive system focusing on food, the relationship between supply and demand, and emphasises the importance of evaluating the performance of the production systems to assure the protection and valuation of ESS by promoting strategic changes in land use. This strategy explicitly indicates the need to ensure "that the food chain, covering food production, transport, distribution, marketing and consumption, has a neutral or positive environmental impact, preserving and restoring the land, freshwater and sea-based resources on which the food system depends; helping to mitigate climate change and adapting to its impacts; protecting land, soil, water, air, plant and animal health and welfare; and reversing the loss of biodiversity".

The EU Climate Law[8] is intended to become a binding instrument that recognises the need to "integrate ecosystem-based approaches to climate change adaptation and mitigation and disaster risk reduction" through strategic multi-sectoral planning. In this Law, the need to consider climate change related risks is stressed, along with multilevel climate and energy dialogues, and climate and vulnerability baselines and progress assessments into strategic planning decisions. It also seeks an explicit consideration of policy mixes and coherence in relation to environmental policies and legislation, with consideration of integrative results in comprehensive national adaptation strategies and plans.

[6] https://ec.europa.eu/environment/strategy/biodiversity-strategy-2030_en

[7] https://ec.europa.eu/food/horizontal-topics/farm-fork-strategy_en

[8] https://ec.europa.eu/clima/eu-action/european-green-deal/european-climate-law_en

Territorial Agenda 2030

One of the most important points of the Territorial Agenda 2020, and its updated 2030 proposal, is support for the integration of ecosystems and valued areas into Green Infrastructures at all planning levels. Through the promotion of place-based approaches, the Territorial Agenda 2030[9] seeks to encourage integrated development and planning and safeguard a sustainable use of the territorial capital and respective ecological functions.

It promotes a multi-actor, multi-sectoral, multi-scale and multi-level approach to strategic spatial planning that focuses on mutual relations and people's well-being considering the sustainable development goals (SDG). This approach addresses the need to consider the functional links between neighbouring areas, for example the use of integrated territorial investments or community-led local developments to protect, rehabilitate and value ecosystems, landscapes, immaterial cultural values, and other unique place-based values.

Two strategic pillars of the Agenda deserve special attention: a) the integration beyond border through cohesion policies and strategies, macro-regional strategies, inter-metropolitan, functional regions, cross-border planning and legal cross-border agreements; and b) the promotion of a green Europe that protects common livelihoods and shapes societal transition with, for example, the application of a ecosystems-based approach that underline the territorial dimension and spatial planning contributions to the SDG (e.g. by developing nature based solutions, green and blue infrastructure, networks of ESS strategies, or land management).

EU Guidance document on integrating ecosystems and their services in decision-making

In 2019 the EU issued guidance on the Integration of the ESS in decision-making processes,[10] much grounded in the EU 2020 Biodiversity Strategy and the European Action Plan for Nature, People and the Economy (COM(2017) 198 final).

With relevance to this chapter we indicate the guidance principle 7 to "coordinate and integrate planning across governance sectors, levels and decision-making frameworks". This suggests a multi-level and multi-scale spatial approach to planning with a cross-sectorial notion and requires appropriate scale level consideration of ESS while providing interconnectedness and interlinkages between different spatial levels. In the guidance the need to define coherent policy objectives is recognised, with the need to obtain consistent baseline data, while identifying EA instruments, such as SEA and EIA, as supporting instruments.

Specifically for spatial planning, the guidance recognises that land planning and management decisions are crucial to steer land uses that safeguard natural ecosystems and the provision of ESS across the landscape or make land use choices complementary to each other by helping to avoid conflicts and tap into synergies between

[9] https://territorialagenda.eu/

[10] https://ec.europa.eu/environment/nature/ecosystems/pdf/SWD_2019_305_F1_STAFF_WORKING_PAPER_EN_V2_P1_1042629.PDF

land-use interests. It recommends an ecosystem approach to spatial planning anchored in the provision of effective strategic protection of biodiversity and the delivery of essential ESS where they are needed, with synergies established among policy objectives that can be achieved through nature-based solutions, tapping into environmental and socio-economic co-benefits. Such an approach requires information about potential risks of damage, conflicts and trade-offs of ESS, addressing them in a strategic manner, but also measures such as restoration, GI enhancement or agri-environment schemes that benefit biodiversity and enhance the flow of ESS.

Throughout the guidance, several opportunities in considering ESS in spatial planning, and in enhancing rural-urban connections, are made explicit. That includes using ESS as a source for investigating impacts of planning options and for comparing different spatial alternatives, revealing the flow of services from supplying areas to beneficiaries, this way identifying mismatches between supply and demand, as well as trade-offs or compensation actions to be undertaken in decisions, promoting a proper application of the mitigation hierarchy. Likewise, the guidance suggests the creation of synergies between policy objectives, identifying opportunities for locating offsets in a landscape context that can increase the strategicness of ESS and biodiversity benefits. Ultimately it will allow institutional and administrative boundaries to be overcome and enhance cooperation, for example by implementing spatial planning along natural boundaries such as river basins, requiring improved coordination and cooperation among authorities, and promoting participatory spatial planning based on local knowledge and stakeholder consultation.

This policy review reveals many opportunities for enhancing ESS through spatial planning, considering multi-scale and multi-level approaches through which rural and urban synergies can result in a more coherent and cohesive territorial development within the EU.

4.4 Concluding Comments on the Way Forward: Learnings to Promote the Role of ESS for Rural-Urban Synergies

Alexander (2016) identified 27 advancements in spatial planning theory and practice that must be achieved in three domains of action: object, context, and tools. This is a useful framework to identify how ESS can contribute to spatial planning progress. Taking ESS as "object" requires an emphasis on biodiversity within socio-ecological systems, as key "players" become able to improve the quality of spatial planning promoting rural-urban synergies. Looking into the "context" means creating grounds to reshape institutional arrangements in ways to mainstream ESS within the respective socio-ecological systems, in spatial planning. In relation to the "tools" means new tailormade inputs, such as ESS mapping, EIA and SEA and other instruments to make ESS operational, fostering new ways to recognize balanced socio-ecological systems as generators of benefits for society.

Previous sections have pointed towards the potential role ESS can play in multi-scale and multi-level spatial planning to enable rural-urban linkages and encourage rural-urban synergies: ESS as objects of/for spatial planning processes that provide contextual conditions for stimulating rural-urban synergies through appropriate tools (ESS mapping, SEA and EIA, GI among others). Several learning points can be highlighted for their relevance in promoting the role of ESS in stimulating rural-urban synergies.

A core learning point is the continuity of ESS which enables synergies, acting as forms of "channels", "platforms" or "objectives" for potential rural-urban synergies. In this respect nature-based solutions, green and blue infrastructures allow continuous structures that have a relevant role in the production and delivery of ESS, all contributing to human well-being. On the other hand, the functional role of ESS in territories, representing socio-ecological and economic benefits contribute to land value, justifying rural-urban synergies. That requires spatial strategies to be adopted which safeguard and enhance biodiversity and the value of ESS, while a trigger is needed to internalise ESS in spatial/land use planning. In this regard the nature of the policy blend of spatial planning allows cross-sectoral decision-making, recognising different sectoral policies in their relation to, or dependence on, ESS.

Another core learning is the need to ensure that public benefits provided by ESS are considered in decision-making, that beneficiaries and their relationships are identified, and that the ESS value in multi-scale and multi-level approach is addressed, while adapting to context. Notable is that different multi-scale and multi-level approaches demand a governance architecture that can encompass individual models and actions. There is still a weak understanding of ESS-space interactions which cross administrative borders, raising the need to identify causal flows in delivery, supply, and demand (where produced and where used).

Also relevant is the importance of time scales, since rural-urban synergies should connect to long-term visions of development, considering strategies for production/consumption, or generally supply/demand (proactive vs reactive). Mapping of spatially explicit information on ESS must be at the level of detail suited for different levels of decision, finding the most appropriate scale to start with, and recognizing interactions with other decision levels and ESS scales, ensuring coherence across scales.

Figure 4.3 shows how multi-scale and multi-level planning may enhance the integration of ESS in policy frameworks; and how, drawing on land value and ESS mapping, the value that ESS represent in land management can be integrated in land use planning, and become a factor to be considered in land take decisions. Enhancing the value of ESS requires a governance model to ensure that multi-stakeholders' values and priorities are engaged. This can be exemplified with the value of biodiversity in cultural and provision services in attracting tourism demand. Where ESS values are spatialized, spatial planning can justify such ESS as tourism resources, associate the ESS value to the land value, and how subsequently the management of ESS in tourism land use can be enabled.

Knowledge gaps exist in several of these domains being discussed. Overcoming this knowledge-to-action gap requires adopting three key structural approaches.

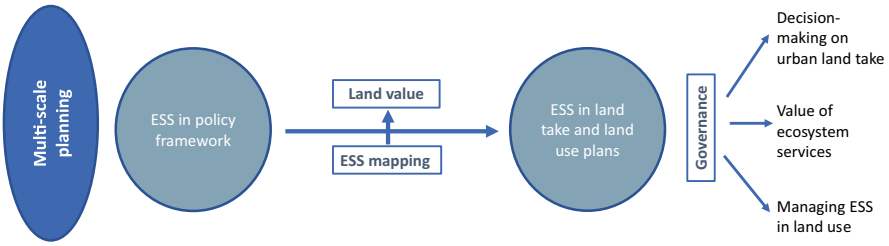

Fig. 4.3 The role of multi-scale planning and ESS in rural-urban synergies

First, that spatial planning ought to be seen as a keystone instrument to explore the spatial implications of combined sectoral policies, frameworks, and tools, while ensuring policy objectives, spatial and values integration. Spatial planning must also be understood as a policy mix in itself, to ensure effective allocation of resources for safeguarding, restoring and enhancing ESS value and biodiversity beyond the areas designated for nature conservation.

Second, spatial planning, informed by ESS and its value, can provide the basis for targeted investments into ESS, assisted by scenario-building and SEA. This can lead to the proposal of strategies for enhancing the implementation of biodiversity and ESS in spatial planning with connections to rural, regional and sectoral funding strategies, seeking synergies, avoiding unintended outcomes, and dealing with uncertainty.

Finally, fostering bridging institutions and communication channels that consider planning proposals as part of systematic governance and policy mixes across multiscale planning can facilitate public participation and stewardship, information and knowledge sharing, as well as rules (regulations), norms and responsibilities (path dependencies) to promote rural-urban synergies through ESS. Bridging institutions can help to build alliances between planners, administrative, public, business and civil actors to mainstream ESS in all relevant policy and decision processes towards more sustainable spatial development.

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Chapter 5
Community Partnerships for Ecosystem Services Provision

Francesca Galli, Massimo Rovai, Sabrina Arcuri, Giovanni Belletti, Andrea Marescotti, Henk Oostindie, and Daniel Keech

Abstract This chapter examines community partnerships as governance arrangements that support the provision of one or more ESS and help to strengthen rural-urban linkages. The chapter discusses different community-based governance models for the provisioning of ecosystem services and uses principles of collaboration, participation and partnership as a starting point for identifying existing or potential governance structures within and across urban and rural localities. It reviews six case-studies in different geographical contexts that were selected for their aimed valorisation and management of environmental resources that enhance ESS. The analysis of the six cases identify different dimensions such as the who, the how and the what to improve understanding of the governance mechanisms and arrangements adopted by the different communities partnerships.

Keywords Community partnerships · Ecosystem services · Governance · Rural-urban linkages · Rural-urban synergies · Management of environmental resources

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M. R. Partidario et al. (eds.), *Role of Ecosystem Services in Enabling Rural-Urban Synergies*, Landscape Series 20, https://doi.org/10.1007/978-3-031-98153-1_5

5.1 Introduction

Community partnerships are organised individuals whose collective action is aimed at the management of environmental resources delivering one or more Ecosystem Services (ESS). Inspired by shared values and community identity, identifiable communities of ESS users have a shared aim to sustainably preserve and valorise finite, tangible (e.g., land, rivers) and intangible resources (e.g. landscapes, cultural heritage). The presence, quantity and quality of ESS result from the management of the environmental resource itself. The governance of community partnerships defines, adapts and implements rules for the sustainable use of the natural resource (Ostrom, 1990).

Over time, the interest by policy makers and academics in community approaches to environmental resource management has increased in relation to aims and ambitions, structures, processes and rules. Choices must be made in community design, planning and implementation to find the best balance between size, openness, and inclusiveness of the communities, while not distorting constitutive principles and aims of community partnerships. Understanding how to manage relationships and social needs that arise within the communities, identifying new collaborative models and opportunities for natural resource management, is an emerging research field (Potts, 2020; Cox et al., 2016; Lockwood et al., 2010; Bodin & Crona, 2009).

This chapter contributes to this field of research by asking:

- What examples of community partnerships for ESS provision are there linking rural-urban contexts?
- How are they organised and funded, and which interactions take place at local levels?
- What ESS do they contribute to preserving or enhancing and how?

We address these questions by drawing on case studies identified by the ROBUST project partners and Living Labs from three different European regions, namely in Italy, England and Germany.

We frame community partnerships with recourse to the theory of common goods, and situate them between market and state mechanisms (Sect. 5.2). Accordingly, we describe the key features of selected community partnerships established for natural resource management in rural-urban contexts (Sect. 5.3). Section 5.4 analyses the governance of community partnerships by identifying their members, the role played by public authorities, their formal organization and funding, and the specific ESS addressed. We also show which rural-urban links they foster. We find that such partnerships, characterised by a unique mix of collaborating public and private actors, with differing aims, rules and coordination mechanisms, contribute to reinforcing one or more ESS, and directly or indirectly promote rural and urban areas relations and synergies.

5.2 Community Partnerships for ESS Provisioning

Within the context of community resource management, Community Partnerships (CPs) can be defined as "management systems where local communities have some level of influence over decisions related to (…) the management or benefits of environmental resources" (Muttaqin et al., 2019:1). The role of CPs and ESS can be framed within the management theories of 'common goods', which are neither completely public nor private. Theorised by Elinor Ostrom (1990), the active role of citizens and communities has gained importance in the political agendas because of the need to find new institutional ways for managing social and environmental emergencies. Unlike public goods, common goods must be managed and protected in order to endure (Hess, 2008). 'Commoning' of natural resources begins whenever their access and intensity of use are collectively managed by a community that negotiates rules against the background of traditions, norms and practises, paying attention to equitable access, use and sustainability (Lutzenberger et al., 2020).

Dictionary definitions of *community*[1] include "a social group of any size whose members reside in a specific locality, share government and often have a common cultural and historical heritage". Communities can be interpreted as fitting where both the State (limited by financial constraints and complex decision-making processes) and the market (driven by maximisation of individual interests), are not able to guarantee the quality of life and services to citizens, nor the effective sustainable management of environmental resources[2] (Rajan, 2019).

Stakeholder engagement is increasingly recognised in environmental decision making and sustainable natural resource management and planning (Talley et al., 2016; Prell et al., 2009; Fabricius et al., 2007; Wondolleck & Yaffee, 2000). Different categories of actors within the community include community dwellers (residents), researchers, local institutions and public administrative bodies, civil society organisations, associations and other non-profit organisations. CPs are characterised by the intention to pursue a common and shared goal, and participation in decision-making reinforces shared ownership and responsibility in the management process.

CPs can be organised according to different degrees of (in)formality while their internal organisation responds to minimum internal rules. The importance of setting the principles and rules for local actors to identify successful models and to

[1] https://www.collinsdictionary.com/dictionary/english/community

[2] Long before globalisation, western societies strongly relied on "nets" of social protection and kinship, neighbourhood relations, and intermediate bodies. All these served as a protection and buffer becoming particularly important during difficult times and crises. Contrarily, individuals who operate solely out of personal interest differ from 'citizens', who recognise themselves as part of the community to which they belong and in which public and private interests meet to find a balance for the common good. The state and market failures are not to be attributed to the limitations of these two institutions but, rather, to their incorrect application to situations where the community model would work more adequately, in line with a principle of "subsidiarity" (Bauman, 2000).

collaborate in the environmental governance effectively, is emphasised by Ostrom (1990). She proposed eight design principles[3] to characterise institutions and the organisation needed for managing common resources, the critical assessment of which have been undertaken (e.g. Cox, 2005; Cox et al., 2010).

Community initiatives are often voluntary, especially within civic ecology practices (Krasny et al., 2014). The conditions of community-based governance models for the provisioning of ecosystem services are open to question and subject to evaluation (Olsson et al., 2004; Armitage et al., 2007). As the local community is often most familiar with the functioning of the local ecosystem, its members are also in the best position to develop effective rules and strategies for its territory (Cox, 2005). In other words, the local community is able to organise collective action to initiate a change ingovernance (Sattler et al., 2018), and the change in the governance model and its rules is based on local knowledge which is crucial for natural resource management (Berkes et al., 2000). Changing governance models from top-down to community-based has been shown to favour the increase of several ecosystem services, including regulation, culture, habitat and landscape (Van Bussel et al., 2020).

The shift from centralised state control of resources, towards more de-centralised and collaborative organisational models, is helping to blur the boundaries between the public and private sectors (Shucksmith, 2010). Principles of collaboration, participation and partnership suggest a starting point for identifying existing or potential governance structures within and across urban and rural localities. Bottom-up organisations can encourage local participation, and there is room for the public decision-maker to act as a facilitator by supporting the mobilisation of resources within and between localities, building collective capacity to act among residents and networking people inside and outside the locality. Based on these premises, the network governance concept (Woods & Heley, 2017) describes the shift in recent decades from a centralised state to distributed and collaborative models of organisation and decision-making. Network governance consists of partnerships between public, private and third sector actors, with connections made on multiple scales within and beyond territorial borders. It can be understood as ‘power to’ rather than ‘power over’ and can therefore offer new localised solutions. This chapter refers to the network governance concept to explore and describe different types of community partnerships that deal with one or multiple ESS, either directly or indirectly, and at the same time contribute to strengthening some form of rural-urban linkage.

[3] The eight principles are the following (Ostrom, 1990). Principle 1: Well-defined boundaries; principle 2: Congruence between appropriation and provision rules and local conditions; principle 3: Collective-choice arrangements; principle 4: monitoring; principle 5: graduated sanctions; principle 6: conflict resolution mechanisms; principle 7: minimal recognition of rights to organise; principle 8: nested enterprises.

5.3 Community Partnerships for ESS in Rural-Urban Contexts: Case Studies

This section describes and discusses examples of CPs. It analyses the different governance arrangements aimed at managing different ESS in rural-urban contexts.

Table 5.1 provides an overview of the cases, brief descriptions and examples and key references. The cases include “Community cooperatives”, “Communities for agri-food biodiversity” and the "Stewards Farmers Consortium" in Tuscany (Italy); "Agri-environmental cooperatives" in The Netherlands, the “Saving meadow orchards” initiative in Frankfurt am Main (Germany); and finally the “Water with Integrated Local Delivery” project in Gloucestershire, (UK).

We selected the cases by approaching ROBUST project partners involved in the Community of Practice on ESS,[4] asking them to suggest meaningful and diverse examples. More specifically, partners were asked to identify, based on a template[5] and with reference to their context, cases of CPs aimed at the valorisation and management of environmental resources that enhance ESS in different geographical contexts. In the light of the Living Lab methodology applied in ROBUST, an important consideration in the selection was that, in each case, a participatory and deliberative process was followed by the CP to identify their ESS objectives. An example of these objectives is provided in Table 5.1, for each case.

As will be shown, the six case studies presented are characterized by different goals, structures and processes:We have attempted to describe and interpret this diversity by, first, analysing the organisation of selected CPs. We describe who is involved, what role the public sector plays, how the CP is formally organised, and how the activities are financed. Second, we identify and discuss how the CP addresses the use of one or more environmental resources, and contributes directly or indirectly to one or more ESS linking rural and urban territories.

[4] Link to ROBUST project Community of Practice on Ecosystem services: https://rural-urban.eu/CoP/ecosystem-services (accessed on 01.10.23)

[5] Partners were asked to provide replies to the following question: Can you identify a case that can be interpreted as a community partnership for the valorisation and management of a natural resource (that provides some type of ecosystem service)? Hence, partners were asked to describe the case, by addressing: who is part of the community partnership (public and private actors), what are the sources of funding, if and how is it formally established, how is it organised and at what territorial scale, and what is the resource and ecosystem service that is influenced by the community.

Table 5.1 Overview of the case-studies considered

Case	Description	Example and references
Community Cooperatives (Italy)—Case 1	Organisational structure: Formal entities regulated by specific national and regional legislation. They are designed to address environmental and social challenges affecting marginalised rural areas, i.e. land abandonment and landscape deterioration, depopulation, ageing and reduced access to basic services. Community cooperatives have a defined territorial scope and aim at the provision of environmental and social services for residents' wellbeing. They are strongly based on physical proximity and local resources. ESS objectives: Restoration of agro-ecosystems on the urban fringe.	"I Briganti del Cerreto[a]" (the Brigands of Cerreto) located in Cerreto dell' Alpe, within the National Park of the Tuscan-Emilian Apennines. Links: https://www.ibrigantidicerreto.com/ https://collabora.toscana.it/documents/2653136/0/ME.CO-Mentoring+e+Comunit%C3%A0+per+lo+sviluppo+eco-sostenibile+Studio2019.pdf/4717674a-2824-ff62-f753-8ede6185e462?t=1579793409336
Communities for agri-food biodiversity (Italy)—Case 2	Organisational structure: Formally defined by an Italian Law in 2015,[b] they are defined as: "local partnerships based on agreements between farmers, seed breeders, solidarity purchasing groups, education institutions and university, research centres, associations for the protection of quality of biodiversity of agricultural and food interest, school canteens, hospitals, catering establishments, commerce, small and medium-sized companies, small food. businesses, as well as public bodies". The partnerships aim at the recovery and transmission of knowledge on genetic resources of local food and agricultural interest; the realisation of short supply chains, direct sales, the exchange and purchase of agricultural and food products within local circuits.[c] ESS objectives: Enhancement of biodiversity in agricultural land.	Community for food and agro-biodiversity in Garfagnana (Lucca, Italy)[d] established to support local food identity by strengthening the role of farmers who grow and reproduce the seeds of local landraces, registered in an inventory of Tuscany Region. Link: https://comunitadelcibo.it/

Agri-environmental cooperatives/collectives in the Netherlands – Case 3	Organisational structure: Established since 1990, inspired by German and Danish examples and building on a tradition of cooperative approaches to farmland biodiversity conservation. Up to 2015, around 160 regional cooperatives were established to develop a broad range of rural development activities. These legal entities varied in size, membership (e.g. open to citizens or to farmers only), and degree of professionalism. Participation of cooperatives to CAP (Common Agricultural Policy)-funded agri-environmental schemes determined a major reorganisation. 40 collectives were established in 2015, as a result of intensive consultation, among cooperatives and with the national and provincial governments. These organisations offer a major advantage to farmers in terms of paperwork simplification, as the agri-env-scheme administration is a taken over by the collective.[e] ESS objectives: Enhancement of biodiversity in agricultural land and water management.	Out of the 40 agricultural collectives, specific cases are discussed and analysed here: Link: https://edepot.wur.nl/559899
"Saving Meadow orchards" initiative in Frankfurt am Main (Germany) Case 4	Organisational structure: The Frankfurt am Main region is characterised by pastures and meadows with fruit trees, a rich biodiversity and high ecological value. However, large, continuous meadow orchards are becoming increasingly rare. The beginning of "Saving Meadow Orchards" initiative dates back to the 2018 Lohrberg Manifesto (Lohrberger Erklärung) developed by around 90 stakeholders (local authorities, landscape and nature conservation organisations). They set common targets and mandated the Regional Authority with the coordination of the municipalities and the implementation of the information portal, information campaigns, unified marketing, and an inventory. Hence this regional association supports its member municipalities in preserving the stocks that are still available. By sharing expertise and creative ideas, nurturing commitment and networking, this association aims at protecting and valorising meadow orchards in the long term. Other activities include developing an orchard register to map areas and trees, record the respective characteristics (e.g. types of fruit, etc…) and supplement with photos of the fruit trees. Further, free services for orchard exchange (selling or leasing) and labour services and pruning courses are provided. In addition, five orchard routes (hiking and cycling trails for instance) focused on hessian cider deliver a combination of stations and activities related to apples, cider and orchards. Partners of the regional loops are wineries, museums, gastronomic establishments, cities and municipalities that have combined their commitments. ESS objectives: Biodiversity enhancement and the protection of cultural landscapes.	Regional Authority FrankfurtRheinMain information portal at https://www.klimaenergie-frm.de/Nach-haltig-keit/Streuobst/ https://www.mainaeppelhauslohrberg.de/

(continued)

Table 5.1 (continued)

Case	Description	Example and references
Stewards Farmers Consortium (Italy) Case 5	Organisational structure: This case concerns farmers as stewards of the territory: the community consists of a group of farmers who work in mountain contexts ensuring the surveillance and maintenance of watercourses to prevent hydrogeological instability, thus ensuring the ecosystem service of water regulation to the citizens living down the valley. In this case it is a specialised "widespread community", being formed only by farmers coordinated by the body that manages the maintenance of waterways. Payments for environmental services are settled based on the economic incentive and the voluntary participation of farmers who provide and are remunerated for environmental services. This governance arrangement involves a complex relationship beyond the 'provider gets' and 'user pays' mechanism (Engel & Palmer, 2008), and requires an integrated strategy based on the development of a local network of farmers, citizens, advisory system and local institutions. ESS objectives: Protection of water resources in the river basin.	"Farmers as stewards of a territory" in Serchio river basin (Tuscany, Italy). Analysed by Vanni (2014), this is a project which combines a multifunctional farming strategy with the provision of ESS, specifically for flood protection and the maintenance of water courses to prevent hydrological risks, while reducing public costs for public authorities.
Water with Integrated Local Delivery (WILD) in Gloucestershire, (UK) Case 6	Organisational structure: In 2012, members of the Countryside and Community Research Institute together with the Upper Thames Catchment, The Farming and Wildlife Advisory Group Southwest (FWAG SW), the Cotswold Water Park Trust (CWPT), Gloucestershire Rural Community Council and the Environment Agency (EA) developed the WILD Project, testing a new way of implementing the Water Framework Directive and connecting people with the water environment. This partnership aimed for environmental improvements to the rivers and other watercourses found into the Cotswold Water Park by connecting local communities and landowners together in understanding and getting involved in the management of local water courses. With local community input it also devised and delivered a plan of enhancements with the support of Natural England and the Environment Agency, turning it into a case study of the "catchment-based approach". The project ran in two phases and concluded in 2019. ESS objectives: Flood water management in the upper river catchment.	https://www.ccri.ac.uk/research-projects/04/2013/wild/

[a]In a small mediaeval village built in sandstone and chestnut wood, the closing down of the main cafeteria, in the 90s, was a symbol of the depopulation process that pushed families, and especially young people, to go down to the valley and look for a job. A group of young people and some of their family members decide to create a cooperative. Thanks to the network with other actors in the area, the cooperative initiates an activity of protection and cleaning of the park, enhancement of the soil, and promotion of a small community pact. Since then, the spread of virtuous collaborations at local level has allowed the restructuring of the old mill, its use to host and promote 'community tourism'. Forest management activities, maintenance works of the water springs, educational activities for children, promotion of local products, such as chestnut and its derivatives. Community services derive from a successful core set of activities: by operating and integrating with the market, the cooperative can provide services to the community, re-activating a relational network that would otherwise be lost. The services provided to the community, present today, can be increasingly structured and this is one of the objectives that the community cooperative intends to pursue in the future.

[b]Italian Law n. 194/2015 (Dispositions for the preservation of biodiversity related to agriculture and food). https://www.gazzettaufficiale.it/eli/id/2015/12/11/15G00210/sg%20 (accessed on 01.10.2023)

[c]Other possible aims are the study and dissemination of organic agricultural practices and other cropping systems with low environmental impact and the study and transmission of traditional knowledge related to agricultural crops, to the natural selection of seeds to cope with climate change and proper nutrition; the realisation of educational, social, and urban gardens, as collective tools for enhancing local varieties, environmental education and agricultural practices, social aggregation, redevelopment of abandoned or degraded areas and for the unused agricultural land".

[d]The Community for Food and Agro-biodiversity in the mountainous area of Garfagnana, in the Province of Lucca (Tuscany region), was established in December 2017. The relatively isolated localisation of the territory, enclosed between two mountain ranges (Apuan Alps and the Appennine), has favoured a rich biodiversity and the community's strong sense of identity. On this basis, the Community for Food has been established by local actors, including civil society and institutions. The setup of the Community for Food and Agro-biodiversity has been facilitated by external advisors, who guided the promoters in their initial steps and indicated a set of actions to move onwards.

[e]Further details and information on the Dutch Cooperative approach can be found at this link: https://enrd.ec.europa.eu/sites/default/files/w12_collective-approach_nl.pdf

5.4 The Governance of Community Partnerships for Ecosystem Service Provision in the Rural-Urban Continuum

The analysis of the six cases aimed to identify the "who", the "how" and the "what" of the dimensions, in order to improve the understanding of the governance mechanisms and arrangements adopted by the different CPs. These contribute directly or indirectly to ESS supply and demand, and ultimately link rural and urban areas.

The next subsections describe the key features of community partnerships by indicating: who is part of the community partnership in the cases considered and the role of the public and private actors (Sect. 5.4.1), and how is the community formally organised, managed and financed (Sect. 5.4.2). Section 5.4.3 highlights what ESS are directly or indirectly relevant for each case and if and how this contributes to linking rural and urban areas. Table 5.2 provides an overall summary.

5.4.1 Who Is Within the Community Partnership, What Role Is Played by Public Authorities?

Altogether, the collection of cases shows a mix of private and public partnerships, where the initiative and operational aspects are often taken care of by citizens and associations and the role of the public institution is to facilitate and encourage participation, to coordinate but also to support financially.

Community Cooperatives (Case 1) are governance models promoted by groups of citizens who participate according to their specific needs and twillingness to contribute to the growth of the community. Community Cooperatives are emerging, in Italy and Tuscany, due to a specific legal framework which is a sign of the strong political will to develop and strengthen this model of territorial governance based on cooperation. In Tuscany, during the constitution phase, the public authorities have financed the set-up of cooperatives that have carried out a development project and presented business plans in which they have demonstrated that they can create services/activities in the region that can be self-sustaining by fundraising.

In the framework of the Communities for agri-food biodiversity (Case 2), the partnership includes farmers, agri-food actors, local associations, and citizens/consumers living in the geographical area of the CP. Through the production of food, all those who purchase the products (i.e. consumers and other actors in the supply chain operating outside the territory) can be considered indirect “beneficiaries” of the CPs activity. Considering the specific role of the public actor in both the creation and the development of the CP, the public institution intervened in the set-up phase by deploying its own resources, also involving academic researchers, to take care of the animation phase that led to the definition of the statute and the strategy. Subsequently, the public actor has supported promotion events, exhibitions, fairs, etc. Public authorities are not members of the association in the case of Garfagnana,

Table 5.2 Community Partnerships (CPs) governance models

Case	Private partners	Role of Public actor	Formal organisation and funding	Ecosystem services provided	Rural-urban links
Community Cooperatives (Italy) - Case 1	Cooperative members (beneficiaries and working members with expertise in line with the coops' objectives)	Regulatory framework by law	Cooperative model	Landscape, Hydro-geological regulation; Agro-biodiversity; Local rural culture and traditions	Indirect benefits for the urban population residing downstream Direct benefits for tourists and visitors who come from urban areas
Communities for agri-food biodiversity in Tuscany (Italy) - Case 2	farmers, agri-food chain, local citizens-consumers	Coordination and support in the setting up	Social Promotion Association	Agro-biodiversity; Rural culture and traditions	Supply of high quality food Increase in the reputation of the area Increase in tourist flows Strengthening of the link with neighbouring urban areas
Agri-environmental cooperatives (The Netherlands) - Case 3	Local level: farmers join the coop. National level: association of coops to BoerenNatuur	Manage CAP environmental measures	Multi-level cooperative model	Soil fertility; Reduction of pollution of agricultural land; Biodiversity; Recreational services	Direct benefits for the population living in peri-urban area and residents Direct benefits for farmers who adhere to agro-environmental schemes

(continued)

Table 5.2 continued

Case	Private partners	Role of Public actor	Formal organisation and funding	Ecosystem services provided	Rural-urban links
Saving Meadow orchards in Frankfurt am Main (Germany) - Case 4	Association of farmers, wineries, environmental groups and education centres	Coordination and support, provides visibility and information	Association	Agro-biodiversity; Climate mitigation; Landscape; Local culture and traditions; Regulation of rainwater	Meadow orchards are localised in peri-urban areas Direct benefits for the population living in the area
Stewards Farmers Consortium (Italy) - Case 5	Farmers and Reclamation Consortium	Reclamation consortium as coordination and monitoring body	Consortium contract	Control and maintenance of streams	Indirect benefits for the downstream urban population
Water with Integrated Local Delivery (WILD) in Gloucestershire, (UK) - Case 6	Environment Agency, Farming and Wildlife Advisory Group, Gloucestershire Rural community Council, Cotswolds Water Park Trust, CCRI, farmers and owners	Animation activities to involve local communities, farmers and landowners	Partnership through multi-sectoral agreements	Control and maintenance of streams; Water purification	Indirect benefits for the urban population downstream (flood control) Direct benefits for the urban population (quality of drinking water) Direct benefits for farmers who adhere to agro-environmental schemes

but this can change in the other Communities for agri-food-biodiversity that are being developed in other parts of the region.

The Dutch Agri-environmental Cooperatives (Case 3) are organisations which, on the one hand, rely on a collective agreement with the government that grants the funds and on the other hand, on an individual contract with the farmer who is the final beneficiary of the agro-environmental subsidy. To date, the Netherlands is the only country in Europe where farmers, through agri-environmental cooperatives, implement the agri-environmental scheme in the context of the Common Agricultural Policy (CAP).

In *Streuobstwiesen* (German Meadow Orchards, Case 4) there is a regional agency that coordinates the activities of the members of the association which, for the most part, are farms and wineries but also environmental associations. Citizens are involved as members of associations and environmental education centres. In this case, the trigger is a "pact" signed by associations, farms, and public bodies to defend the meadow orchards from extinction from the pressures exerted by the real estate sector and soil transformation processes. The public authority has the role of coordinating and promoting information on the initiatives through the creation of a website and tourist-recreational itineraries in the peri-urban countryside of the Frankfurt region. However, the subjects who are more active, in operational terms, are the farms and wineries that produce cider and apple juice. Collective cellars are also available where small producers and individuals with fruit trees can go to produce the juice.

Stewards Farmers Consortium (Case 5, Italy) involve farmers who operate in the catchment area where their company falls and who, therefore, know the territory very well. Their surveillance and maintenance activities are paid by the Reclamation Consortium through a portion of the reclamation tax paid by the citizens. The Reclamation Consortium carries out coordination and regulation activities. The role of the public actor is fundamental because in addition to financing the activities of farmers through agreements, it also acts as a coordination and monitoring body.

In WILD Upper Thames Catchment (Case 6), the governance model is a partnership between the Environment Agency, the Farming and Wildlife Advisory Group (FWAG), the Gloucestershire Rural Community Council (GRCC), the Cotswolds Water Park Trust (CWPT) and the Countryside and Community Research Institute (CCRI, part of the University of Gloucestershire), with a broader partnership involving Thames Water, local councillors and agricultural advisors, and key farmers and landowners. The partnership works to improve the water environment through an integrated approach that meets the requirements of the Water Framework Directive (good ecological status of all watercourses) and provides a number of other multiple benefits (economic, social and environmental). The public body, together with the project officers, carries out animation activities to involve local communities, farmers and landowners, also through training and information activities. This helps to increase knowledge and skills on the management of local watercourses to limit or arrest the impacts of floods on local communities.

5.4.2 How Are the Community Partnerships Formally Organised and Financed?

Community Cooperatives (Case 1) are established based on legislation on cooperatives (regulated in Title VI of Book V of the Italian Civil Code). One of the fundamental principles that characterise cooperatives is the 'open door principle' or the possibility of entering and leaving without losing capital. Members of the cooperative can be user members, i.e. consumers of the services that the cooperative provides and/or working members, who make their professional and working skills available in line with the performance of the cooperative's activities. The community to which the cooperative's activity is addressed must be well-defined to allow the cooperative to prepare a project that identifies the needs, activities and the resources necessary to respond and implement the project plan.

The communities for agri-food biodiversity (Case 2) are organised as an association for social promotion, with a statute and a regulation. Membership is voluntary and entry and exit are flexible. There is a coordinator, with a charismatic leadership. Communication between the members takes place both formally, through meetings, but very often informally through exchange and co-operation Farmers and processors have full autonomy in their commercial decisions, as long as "free-riders" behaviours are prevented from taking place. The establishment of collective services (e.g. logistics) is not formalised (e.g. by contract) but is entrusted to the solidarity and reciprocity of the members.

In the Dutch Agri-environmental Cooperatives (Case 3), the governance model is multi-level. At the local level, the agri-environmental cooperatives are composed of farmers who have to implement different agri-environmental schemes for the different areas on the basis of annual management plans.[6] At the national level, the agri-environmental cooperatives join the BoerenNatuur (Farmers & Nature) association which mainly plays, an advocacy and collaboration role with the Ministry of Agriculture, Nature and Food Quality, the provinces, the water authorities, the dairy sector, the nature organisations and the agro-food market operators. This organisational model can be equated with a "coalition" model, which was created specifically for the exchange of ideas and projects in order to then draw on the available resources. In the Dutch case, the public funds for the process of setting up CPs, created to manage agri-environmental measures: consequently the resources originate from the agro-environmental measures of the CAP. These are forms of organisation with a medium-long term vision and with partners who are closely involved in the decision-making processes. The animation activities aimed at motivating farmers, encouraging them to work together and share knowledge and skills are

[6] See for more details: https://enrd.ec.europa.eu/sites/default/files/w12_collective-approach_nl.pdf

fundamental. These decisions are implemented through formal and written agreements: the Dutch cooperative model is so formalised and institutionalised that in some cases it replaces functions of national governments.

Streuobstwiesen (Meadow Orchards, Case 4) is an association whose members are organised similarly to the Community for agri-food biodiversity (Case 2). In this case, members benefit from the information, communication and promotion activities managed by the Regional Authority. In the Communities for agri-food biodiversity and in Streuobstwiesen (Meadow Orchards) indigenous and endogenous resources linked to agro-biodiversity are used, namely the endangered variety and the orchards (in danger of extinction due to the growing pressure of urbanisation). Resources that, although privately owned, become a common good thanks to the establishment of the CP, which provides the ESS (see below).

In the case of the Stewards Farmers Consortium (Case 5), the governance model is predominantly top-down, as the Reclamation Consortium exercises bureaucratic leadership over the farmers with whom it establishes a contractual relationship. It is a model where the relationships is from one (i.e. the consortium) to many (i.e. the farmers). Farmers have the opportunity to interact and exchange ideas and knowledge during the training and coordination meetings convened by the Consortium itself. In terms of funding, the Reclamation Consortium plays the main role as it provides the financial resources, but it is also able to raise funds by intercepting, for example, regional or rural development funds. Farmers provide labour and equipment to carry out the activities.

The case of the WILD Upper Thames Catchment (Case 6) is interesting and complex. Here, multi-sectoral agreements were defined for the management of environmental resources, and this required the presence of a facilitator to bridge the language and knowledge gap between the different sectors. The facilitator's solution was very successful albeit time consuming. However, this made it possible to use financial resources from various public authorities and private entities as well as to share "in kind" contributions from local communities, farmers, and landowners. The resources to be allocated to facilitation and payments for ESS derive from resources of the various entities of the partnership.

We have seen how the CPs are established based on different agreements, both flexible or formalised, and that depend on the local context. Often, the financial resources in the initial phase are institutionally sourced and are crucial for starting, before achieving a balance between the public goods (e.g. land, woods and real estate) and other private financial investments. While organisation and management can be either top-down or bottom-up, collaboration and intensity of activities are sometimes dependent on the presence of charismatic leaders.

5.4.3 What ESS Do the CPs Address, and Which Rural-Urban Links Are Nurtured?

The cases presented highlight a diversity of organisational structures of Community Partnerships (CP) in managing several ESS, generating different impacts in rural-urban synergies. This section identifies which ESS are directly or indirectly provided by the CPs and asks whether there is a clear rural-urban linkage, and which territorial scale applies in the different cases.

Cases 2 and 4-Communities for agri-food biodiversity and Streuobtwiesen (Meadow Orchards)- both focus on the protection and enhancement of agricultural biodiversity, historical landscape and culture linked to local knowledge and traditions, and are close to the network model. In the case of the Community for agri-food biodiversity, this consists in the creation of relationships to develop sales channels for products resulting from the use of local species and varieties in danger of extinction. The goal is also to: (i) strengthen the local food system, ensure the permanence of cultural and identity values and increase the reputation of the area; (ii) enhance recreational and cultural services as well as strengthen links with the neighbouring urban areas (such as the nearby Versilia seaside area, in Lucca province) through the commercial channels activated, that make it possible to maintain a high reputation for the territory of origin. In Streuobtwiesen (Meadow Orchards) the permanence and restoration of the orchards-meadow determines the delivery of a mix of ESS: permeable areas for better absorption and runoff of rainwater, reduction of heat islands and climate mitigation, preservation of the landscape and agricultural biodiversity in urban contexts. All these ESS bring direct benefits to peri-urban populations. The rural-urban link is spatially defined and the proximity has important implications for the creation of "niche" markets (as is the previous case) and for the development of recreational services. The rural-urban link is more spatially defined (as the regional authority is in charge of coordination and communication) as it takes place in peri-urban agricultural areas where fruit trees are planted, so a regional territorial scale applies in this case.

In both CPs 2 and 4 the aspect of proximity prevails even if, in the case of the Community for agri-food biodiversity, there is an online sales system that helps to reach virtual users. Both initiatives arose from the awareness of civil society actors (i.e. associations) who were then able to involve other actors. This finally created the conditions to receive public funding, but they also established themselves as independent associations that would be able to support themselves, in the future. In these cases, the role of voluntary work of associations and individual citizens is fundamental. In terms of replicability, both initiatives are easy to scale up and expand, as evidenced by the high level of citizen interest in these aspects of agro-biodiversity preservation. The role of knowledge and effective communication is fundamental to trigger the interest of citizens to create *ad hoc* associations for the care of these areas of cultural/identity value, but also useful for guaranteeing the resilience of cities. These two initiatives behave according to a networking model as they are conceived as a place for dialogue and mutual learning, as a hub for

acquiring and providing information, to support the implementation of projects while maintaining a high level of flexibility, with roles that are not so formally defined. Structures, therefore, are where collaborative action is essential to keep the various members together that do not need strong leadership and where forms of informal communication prevail.

In the case of the Community Cooperative (Case 1), the goal is to combine social services for the community with the restoration, care and enhancement of the agro-ecosystems surrounding the towns, often located in rural areas. Community Cooperatives deal with the regulation of ESS linked to the protection of waters, preservation and maintenance of forests, as well as cultural and recreational services related to the landscape and the improvement of the usability of the territory (including hospitality services). In in this case, the recovery, protection and enhancement of agro-forestry systems in mountain areas, and the services provided to the territory (i.e. linked to the landscape and socio-economic regeneration e.g. hospitality services, of environmental hiking, etc.), determine the indirect benefits for the downstream urban areas. These include the reduction of hydraulic risk and recreational and cultural services, that are also accessible by the urban population. In this case, proximity relationships prevail, and the activation was favoured by access to public funding even if, when fully operational, these cooperatives must have the ability to self-sustain or, in any case, develop fundraising skills through specific projects also oriented to the regulation of ecosystem services. It is a model based on a balanced mix of market and voluntary services. The community cooperative acts as a hub from which people can benefit: for instance when resources (e.g. land and/or properties), that are no longer used for private purposes, are made available to the Cooperative community on a free loan, to create new jobs, income and housing opportunities for the people of the community itself. It is, therefore, a form of alliance that plays a coordinating role at local level to optimise the use of resources and guarantees a range of services.

The Stewards Farmers Consortium and the WILD Upper Thames Catchment (Cases 5 and 6) are partnerships which were both initiated with the purpose of effective hydrological protection. The monitoring and maintenance of mountain streams have a positive impact on farmers' decision to stay on the land, as the payment gives value to their role. As in the previous case, there are also direct benefits for the urban population living downstream, as the risk of river flooding is reduced. In the case of WILD Upper Thames Catchment, there are benefits on the quality of drinking water because farmers are required to comply with eco-cultivation schemes. For these two cases, the territorial scale of reference is the river basin and the proximity between the members of the partnership is key to the success of the initiative. The Stewards Farmers Consortium was created with resources from the Reclamation Consortium (which indirectly are paid by citizens with the reclamation tax) while the WILD case was supported by an EU project and, subsequently, CAP funding for agro-environmental schemes. This form of partnership is widespread and can be traced back to Payment for Ecosystem Services (PES) or quasi-PES schemes, especially as regards the protection of water resources. The operating model is rather consolidated, but a clear definition of costs and benefits is required to identify win-win

actions for all parties involved. In these cases, the partnerships have been created with the aim of addressing complex problems that involve different stakeholders, and to experiment innovative solutions with respect to established routines. Thus, it is important to identify well-defined roles and rules for those involved and to formalise the relationships. Decision-making processes are carried out at the level of the partner group and any sub-working groups. Communication between partners must be frequent and clear.

In Dutch Agro-environmental Cooperatives (Case 3), the goal is to regenerate the ESS of agricultural land that has been subject to intensive farming, by promoting re-naturalization processes (ecological infrastructures, wetlands, etc.) with the consequent improvement of biodiversity, soil quality, and water. Farmers' action is crucial in this sense, as they adopt agri-environmental schemes, reduce the use of chemicals and restore ecological infrastructures on their farms. These activities contribute to the overall improvement of the environmental quality of peri-urban areas, their biodiversity, water quality and the recreational and cultural value for citizens. Especially in the case of cooperatives operating in peri-urban areas, there is a positive effect for urban-rural synergies related to the use of citizens for recreational and cultural purposes.

5.5 Concluding Remarks

This chapter focuses on community partnerships that support the delivery of one or more ESS, that also contribute to strengthening rural-urban linkages. We interpret CPs as organisational forms that organise themselves, based on shared principles and values, for the management of goods and services useful for the well-being of the community itself. Specifically, the chapter focuses on the production and management of ecosystem services to strengthen urban-rural ties.

In many cases, CPs - thanks to their ability to identify innovative and hybrid solutions between market and volunteering, and balance the formal and the informal - are more effective than merely hierarchical structures (e.g. the state or other public authorities which must comply with spending constraints and complex decision-making processes) and to the market mechanisms (where the logic of maximising individual interests often prevails). In all the cases considered there is a unique collaboration of public and private actors and stakeholders, with different rules and structures, incentives and mechanisms. Although they can all be considered formalised networks, the degree of flexibility varies greatly, depending on the underlying arrangement.

Community partnerships involve a mix of virtual or physical proximities and the forms of organisation differ and are influenced by the ecological and socio-cultural conditions in which they develop. These conditions determine the strengths but also the weaknesses with respect to the sustainable management of natural resources and the mix of ecosystem services provided. The role of public institutions is

fundamental in supporting and building CPs: this role ranges from creating a favourable policy environment, to providing administrative or financial support, or coordination.

Further research is needed in several respects: for instance, to assess the success of CPs in delivering ESS provision. In addition, the degree of openness and inclusiveness, as well as the territorial dimension, i.e. the overall dimension of the partnership need to be assessed in relation to the context. The risks to which CPs are exposed in terms of the degree of reliance on volunteer labour should be carefully assessed. Another key aspect is the integration of CPs across different policy areas and the coherence with overarching policies, for example to overcome inconsistencies. The most effective balance between trust, flexibility and formal rules, for example to avoid opportunistic behaviour, depends on multiple dimensions of a 'community'.

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Chapter 6
Payments for Ecosystems Services—Their Role in Creating Rural-Urban Synergies

Daniel Keech, Francesca Galli, Henk Oostindie, and Chris Short

Abstract In this chapter, rural-urban synergies are examined in the context of land and water management interventions and how these are stimulated by payments for ecosystems services (PES). A review of PES literature highlights, by drawing on 10 European case studies, that PES are based on core principles of (i) the recognition of both ESS suppliers and users; and (ii) that payment is conditional on ESS improvements flowing from ESS interventions. Key findings from the analysis include that the most successful PES schemes are cross-sectoral and multi-scalar in their impacts and may represent a correction of prevailing market relations of subsidy dependencies. The opportunities to combine the valorisation of rural distinctiveness with the enhanced opportunity for urban ESS delivery should be an ambition of PES schemes. Such objectives demand clear compensations for lost earnings in PES schemes, a flexible (or ESS-centric) territorial approach to developing PES partnerships and a greater understanding of public-private blended finance to devise PES innovations.

Keywords Rural-urban synergies · Payment for ecosystem services

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M. R. Partidario et al. (eds.), *Role of Ecosystem Services in Enabling Rural-Urban Synergies*, Landscape Series 20, https://doi.org/10.1007/978-3-031-98153-1_6

6.1 Introduction

In this chapter, rural-urban synergies are examined in the context of land and water management interventions. Of particular interest is how such interventions are stimulated by payments for ecosystem services (PES). Ecosystem services (ESS) are the ecological characteristics, functions, or processes that directly or indirectly contribute to human wellbeing: that is, the benefits that people derive from functioning ecosystems (e.g. Costanza et al., 1997; Ferrier et al., 2016; Schröter et al., 2019).

The connection between PES and rural-urban synergies emerged from the ESS Community of Practice within ROBUST, comprising seven of the project's Living Labs that had selected ESS as one function of rural-urban relations. The aim of the COP was to identify, map and integrate the key functional relationships of ESS in:

- spatial and sectoral planning,
- contributing to a redefinition of rural-urban relations,
- associating ESS use and delivery to planning instruments and governance models at multiple scales,
- exploring the role of ESS in enhancing rural-urban synergies.

PES is one tool in illuminating how payment/compensation schemes for ESS in European contexts reveal both public and private sector motivations within urban and rural contexts. Healthy ESS are a key condition for rural-urban synergy, and key findings from the analysis include that the most successful PES schemes are cross-sectoral, multi-scalar in their impacts and may represent a correction of prevailing market relations of subsidy dependencies. The opportunities to combine the valorisation of rural distinctiveness with the enhanced opportunity for urban ESS delivery should be an ambition of PES schemes where appropriate.

The chapter proceeds by revisiting the PES concept in the literature before outlining ten European PES schemes in different settings. The discussion builds on the characteristics of PES to highlight the integrative rural-urban potentials of PES.

6.2 Concept

Payments for Ecosystems Services (PES) are payments made to land or other natural resource managers, in return for the provision of specified ecosystems service (ESS) that may not be achieved without the payment (Smith et al., 2013). PES schemes tend to rest on two core ideas. The first is that there are two principal actors, namely the suppliers and the users of ESS. In considering these two types spatially through the rural-urban context, it can be understood that food and other rurally-produced materials are sent to the city in exchange for urban based-services, such as manufactured goods and governance (Gutman, 2007). This basic historical perspective (see Fig. 6.1, below) implies that ESS suppliers could include farmers and other types of rural land managers, while urban residents in the main are users

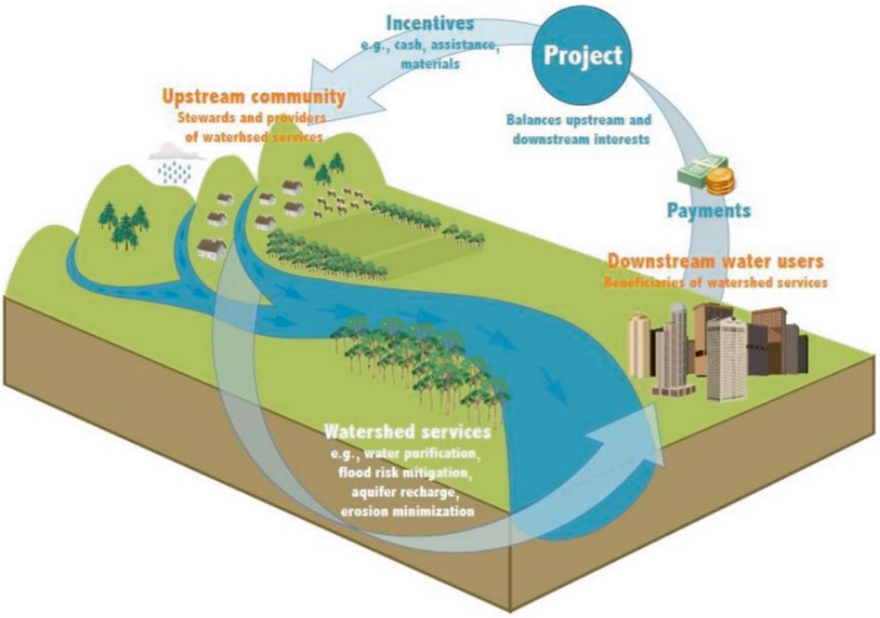

Fig. 6.1 PES model indicating rural-urban relations for water quality (Smith et al., 2013)

of rural ESS. In fact, the latter can be beneficiaries of ESS in both places, for example when visiting the countryside for leisure; or in the city, as consumers of clean water. Similarly, urban organic waste matter can be processed and returned to rural areas for example as composted soil conditioner (Eldridge et al., 2018; Hodson et al., 2021). The second core idea behind PES is conditionality, namely that payment is given (and can be withdrawn) as long as improvement results from the intervention for which payment is provided.

This exemplar illustration focuses specifically on the rural-urban ESS relationship of water quality. Here, city ESS 'users' invest in a project which incentivizes upstream land managers to improve water quality, thereby supplying direct urban benefits such as flood risk management and clean water. The investment (left unspecified in the diagram) might take the form of tax revenue or re-directed consumer income by water companies, for example. In practice, the rural benefits of the PES scheme are likely to be multiple and varied, including biodiversity, erosion control and jobs. The two core pillars of ESS (suppliers-users, and conditionality) mask a range of functions, contexts and motivations behind PES, including the relative relationships between suppliers and users, which may be arranged between combinations of multiple or single suppliers and users. PES schemes are also distinguished by the types of financial backers, including the state (for example through subsidies), private companies (through cost-benefit payments) or a combination of both (blended finance).

Within ROBUST, which aimed to better understand rural-urban synergies and introduce governance innovations to achieve these, questions arose which offer new pathways to explore PES, including:

- What recent PES schemes have arisen in Europe?
- Which theoretical models help to understand PES and its potentials?
- Which governance arrangements prevail in European PES and do these enhance rural-urban links?

These questions will be illuminated in the following sections. The chapter begins by discussing the key concepts behind PES schemes and their characteristics and functions. Examples of PES schemes in Europe are then explored to reveal PES schemes in different land and marine settings. Knowledge gaps are identified, along with key learnings linked to PES and links between rural and urban areas. While it is emphasised that PES literature and operations cover many different scales and places, the focus here is on local/regional ESS scales, reflecting ROBUST's place-based focus (via Living Labs), although some dispersed or supra-local rural-urban relationships are also highlighted.

Scientific Literature

In the literature, a range of different interpretations are linked to PES schemes, depending on the type of ESS being targeted. These include Payments for Watershed Ecosystems Services, Land Management Contracts and Compensation for Ecosystems Services. ESS payment schemes have been widely applied in both south and north-world contexts and became especially associated in the post-Brundtland/Rio Earth Summit period after 1992 with efforts to link environmental conservation with attempts to tackle poverty. As a consequence of this diversity, the types of actors involved in designing, monitoring, delivering and paying for compensation schemes also varies. An example of this is the distinction between contractual agreements to manage land to generate '*private* good-type services' such as food and raw material products, and the '*public* good-type services' such as biodiversity and landscape protection, a distinction outlined by Schaller et al. (2018). The realisation of public vs. private ESS thus requires different types of compensation sources including corporate incentives and government or quasi-public payments (for example from water companies) who 'invest' in ESS delivery on behalf of tax payers or essential service users.

A generic label of PES schemes is that they are '*financial incentives given directly to landholders to compensate them for implementing good land management*' (Capodaglio & Callegari, 2018)—implying that the introduction of ESS supporting management may be financially disadvantageous by incurring additional land management costs. However, this antithetical framing is especially associated with agri-environmental land management and somewhat underplays the link between beneficiaries and suppliers of ESS (Morrison & Aubrey, 2010).

Sven Wunder is a source of conceptual and operational insight into ESS (especially in relation to the global south), suggesting that:

> *The core idea of PES is that external ES beneficiaries make direct, contractual and conditional payments to local landholders and users in return for adopting practices that secure ecosystem conservation and restoration.* (Wunder, 2005:1)

Values have been assigned to natural capital and ESS in order to encourage decision-makers to carry out and advocate cost-benefit calculations of improving land and natural resource management practices. Wunder's description of PES indicates that the transactional arrangements for PES are between two types of people, namely (i) those (internal) land managers whose practices affect the quality of ecosystems, and (ii) the ecosystem users, who are external and potentially geographically removed from the area being managed. This is a rather linear relationship and risks masking numerous indirect beneficiaries of ESS, such as urban dwellers whose air quality may be enhanced through peri-urban forestry management designed to support biodiversity.

Who pays land managers for the realisation of beneficial outcomes is another possible variable of PES schemes. The state may be a direct payer, acting on behalf of ESS beneficiaries from whom taxes are collected. Private schemes may make the relationship between payer and beneficiary more direct, if these benefits accrue from specific localised services.

Wunder goes on to characterise PES in five distinct ways, suggesting:

> *A PES is:*
>
> 1. *a voluntary transaction where*
> 2. *a well-defined ES (or a land-use likely to secure that service)*
> 3. *is being 'bought' by a (minimum of one) ES buyer*
> 4. *from a (minimum of one) ES provider*
> 5. *if, and only if, the ES provider secures ES provision (conditionality).* (Wunder, 2005:3)

Wunder's list hinges PES on the idea that incentivisation for ESS suppliers is adequate compared to other proposed activities, and that any payments must be contingent on actually achieving contracted ESS improvements, underlining the need for bench-marking and monitoring results.

Smith et al. (2013) have extended this list to suggest that ESS provision should continue through permanent interventions, and, significantly, that PES should not achieve ESS in one area at the expense of another area, or one ecosystem to the detriment of another. This extension thus reiterates a critical engagement with Wunder's transactional relationship between a discreet provider of a particular ESS supplied to the benefit of identifiable end-users. In reality, ESS may have multiple, complementary (or even conflicting) functions with known as well as defined/undefined beneficiaries.

Incentives for ESS buyers include the costs associated with replacing ESS with fabricated services (for example, sewerage engineering in the case of water quality) or the level of avoided costs which might otherwise have been incurred without a PES (Capodaglio & Callegari, 2018). Some authors have estimated the total value of global ESS to be roughly double the Gross World Product (Costanza et al., 2014), providing the estimate of the worth of ESS to society, generated outside and beyond

the markets. This implies potential for financial mechanisms to stimulate ESS provision for the improvement of societal well-being.

The voluntary nature the transaction suggested does not mean that environmental improvements are made without financial compensation, but relate to practices which are unregulated or inadequately regulated, and in fact for a PES to be effective '*the scheme should be more cost effective than alternative mechanisms*' (Capodaglio & Callegari, 2018) including regulation. This facet of PES is an incentive to engage private land managers (i.e. those who intervene in ecosystem management) as well as community networks which have some say over land management (such as NGO networks or commoners). It is also associated with the limited success of some imposed or regulated schemes for environmental protection where public funding has been time-limited, or implementation monitoring and impact evaluation are inadequate. Nevertheless, PES schemes may well include governmental, civic or municipal 'ESS buyers', in Wunder's terms, because they act in the interests of taxpayers who may not have a choice in whether or not to join the PES (Russi et al., 2011). Examples of PES schemes might, in other words, include the income derived from fees or profits from tourism (as in the case of the Hoge Veluwe Forest in the Netherlands (Hein, 2011)), payments from quasi-public agencies such as water companies or wholly private companies (see case studies below).

Despite its proliferation, PES is also critiqued, particularly within ecological economics, and included within analyses which argue that caring for nature demands a post-humanist and relational perspective of the environment; that an instrumentalist, neo-liberal commodification of the environment denies the intimate symbiosis between people and nature exhibited, for example, in some indigenous communities (Singh, 2015). It is also increasingly understood that regulating (intangible) cultural ESS are less effective or commonly recognised and rewarded through commercial or market transactions (Ten Brink et al., 2009).

Others suggest the very basis of assigning a financial value to complex biophysical systems is flawed. The process assumes, for example, that if transaction costs for incentivising environmental practices are low enough, PES becomes a feasible market-based solution in situations where the ESS would be under-provided without outside intervention, or would be too costly to be provided through other methods or solutions. This may risk that PES becomes proposed as a market-based solution for intrinsic market failures (Muradian et al., 2010) with all the insecurities and inequalities linked to land ownership that entails, especially in places where subsistence land use is not tied to formal land ownership but to the use of common and shared resources. The framing of complex ecosystems, and biodiversity in particular, into graspable policy objectives is supported by pragmatic ecologists through valuation mechanisms. However, it is also proposed that this pragmatism risks overlooking the multi-faceted (including negative) motivations of some policies and institutions, while simplifying the richness of public discourse about the social importance of the environment. To avoid that possibility and to reverse existing problems, better participatory governance techniques are called for (for example by Spash and Aslaksen, 2012).

These critical and political interjections are associated with social justice aspects of ESS management, especially market-based (i.e. private) PES initiatives often relying on experimentalist governance (Eckert & Börzel, 2012), including quadruple helix stakeholder approaches (Voytenko Palgan et al., 2015). In other words, PES indeed may be developed outside, but not in isolation from regulatory frameworks or multi-stakeholder configurations, where shared and inter-related outcomes can be generated from the PES. This may require the inclusion of transparent governance and/or advisory measures to connect the management of the PES to such external agendas.

European PES Case Studies

In this section, a selection of European PES case studies are presented. The schemes described encompass different ESS and supplier-user configurations, however they are predominantly private sector schemes. The cases cover water quality, food production, biodiversity and leisure, and - albeit to different degrees - their integration, and have been selected to illustrate different payment models and opportunities.

(i) *Vittel and Volvic Mineral Waters (France)*—The Vittel study is well-documented in PES literature (for example, Capodaglio and Callegari (2018)) and a very similar case study is listed in the H2020 project Pegasus (Grant agreement ID: 633814). Vittel is an internationally marketed mineral water brand drawn from a specific underground source in northern France. The water quality and integrity relies upon a stable composition over time and must be bottled at source. Increasing nitrate traces in the source were recorded and linked to agricultural pesticides seeping into the limestone bedrock. The pesticides were linked to intensive maize production and overstocking of livestock, threatening the Vittel brand. The Vittel company offered farmers financial incentives to reduce their nitrate and adopt alternative pesticide application practices, although it took ten years to develop a mutually acceptable agreement. The subsequent compensation package needed to be higher than the cost of management changes on the part of the farmers, while the upper limit had to reflect the value of water composition to Vittel. A package including land acquisition by Vittel (which was then able to stipulate land use in agricultural tenancy contracts), guaranteed minimum payments to farmers participating in a pesticide transition phase. Results included a reduction in maize production by 1700 ha across 26 farms and 92% of the sub-basin was protected, leading to enhanced water quality.

(ii) *The Upper Thames metaldehyde scheme (UK)*—Obligations under the Water Framework Directive, as well as the legal requirements placed upon the utility company Thames Water, led to a system of PES that was instituted in the Upper Thames catchment. A key motivation was to encourage agricultural land managers to adapt their practices and substitute the use of pesticides containing the chemical compound metaldehyde for an alternative product containing ferric oxide. This replacement was devised to prevent watercourse pollution linked to agricultural run-off resulting in sediment pollution, and

ground-water contamination. Metaldehye is extremely difficult and costly to remove once it is dissolved in water. Thames Water, working with the national Environment Agency, the local branch of the NGO Farming and Wildlife Advisory Group and several local parish councils, funded a 5-year project to compensate and incentivise land managers. Of particular interest is the payment penalty—if the water quality as measured at the downstream extent of the catchment dips below a specified point in a two-week period, the land managers in the scheme collectively lose a proportion of the agreed payment. This distinguishes it from some other area-based PES schemes linked to localised impact. Other activities associated with this initiative included the introduction of natural flood management techniques to slow the flow of winter flood waters in the Upper Thames.

(iii) *'Farmer, Beer and Water' (Netherlands)*—FBW is a scheme for rural actors located in Lieshout, in the Dutch North-Brabant province. The scheme involves a brewery (Bavaria), over 50 farmers, and other stakeholders including the regional water board, the municipality, and the government of the province of North Brabant. The scheme aims to improve the quality and availability of groundwater in the area which is used by Bavaria Brewery for beer production but also by farmers for irrigation. The initiative in this project is primarily taken by the private stakeholders. The main goal of the scheme is to achieve and maintain a sufficient quality and quantity of groundwater in the area. Bavaria Brewery extracts 2.5 million cubic metres of groundwater for its brewing process each year, which causes water risks in agriculture in the summer period (droughts). At the same time about 1.5 million cubic metres of rinse water per year is discharged into a small river (the Goorloop) and finally leaves the area. A critical success factor is that all participants are either dependent on the groundwater for (part of) their economic activities, e.g. farmers and the brewery, or value the sustainability of the resource (municipality, regional water board).

(iv) *Greystones Single Gloucester Cheese (UK)*—Single Gloucester is a PDO protected hard cheese made in Gloucestershire. While complying to Single Gloucester production traditions, Greystones is a relatively new brand, resulting from a PES in the form of a farm tenancy contract between the cheese producer and the Gloucestershire Wildlife Trust, which owns the 27-hectare Greystones Nature Reserve, and includes the Salmonsbury Meadows Site of Special Scientific Interest (SSSI), designated principally for its wildflowers. The floral profile has resulted from mainly unchanged pastoral management for centuries. The Wildlife Trust, which acquired the reserve 20 years ago, specifies very sensitive and seasonal management of the land by the tenant farmer, whose cattle follow organic husbandry principles, thereby adding a premium to the price of the cheese. This management arrangement enables the Wildlife Trust to attract higher level agri-environmental subsidy, but also benefits from a cheese marketing arrangement through which the cheesemaker donates a proportion of the profits of Greystone cheese back to the Wildlife Trust.

(v) *Lysekil Nutrient Trading Scheme (Sweden)*—This scheme involved the establishment of a blue mussel (Mytilus edulis) farm in a coastal region of south west Sweden, on the Skagerrak (Smith et al., 2013). Eutrophication of sea water had resulted from 5–10% increases in nitrogen run-off into the Baltic sea, as well as from outflows of waste water from the local wastewater treatment plant, leading to excessive production of phytoplankton, which can overwhelm marine habitats. Blue mussels are filter feeders and consume phytoplankton, converting it into mussel flesh. A private mussel farmer operated the mussel farm, the establishment of which was supported through an INTERREG programme which established a co-ordinating network of public bodies and community organisations. Payments were received by the farmer through the scheme for the provision of nitrogen reduction, and mussels were marketed for human consumption. This commercial benefit was matched by environmental improvements in water quality, which were substantially cheaper to achieve than alternative technical and municipal interventions. The programme ran as a 6-year trial and PES were based on the level of nitrogen found in the mussels—effectively a recycling of nitrogen from the sea to the land. Future potential exists to bundle ESS through the mussels, which also remove phosphorus. The dispersed origin of the nitrogen pollution in the Baltic remains one challenge for this otherwise locally highly effective scheme.

(vi) *'Section 106' (S106) planning agreements and Community Infrastructure Levy (CIL) (UK)*—S106 Legal Agreements are agreements made between a planning authority (county and/or district council) and a developer/owner. These agreements contain obligations linked to a strategic development site which are required to mitigate the impact of the development. For example, if a development is likely to create more traffic, there may be obligations, either financial or non-financial, to carry out highway improvement works, or to ensure that a proportion of houses within the development are available as affordable housing. CILs differ from S106 agreements because they are not linked to a specific development, but income through CIL agreements may be invested strategically by the planning authority (usually a city, county or district council). Studies have indicated that potential exists for S106/CILs to become effective mechanisms for initiating rural water improvements, urban habitat management and peri-urban recreational ESS in relation to the Leeds and Liverpool canal in England (Defra, 2016), as a future contributory funding mechanism for previously public sector agencies, in this case the Canals and Rivers Trust.

(vii) *Landscape Auctions, Netherlands*—Around a decade ago, (sub-)regional Landscape Auctions emerged in the Netherlands with the ambition to mobilise private funding for the preservation, strengthening and payment of areas that maintain typical landscape attributes and features. Mostly initiated by regional nature and landscape organisations, often in collaboration with agri-environmental cooperatives, landscape auctions try to mobilise regional people, and most especially urban-dwellers, by organising social activities that

intend to induce participants to financially adopt landscape elements for a certain time period, and/or to volunteer in their maintenance. The resulting budgets mobilised through auctions are allocated to regional land users, which are usually farmers responsible for the maintenance of specified landscape elements and/or who are willing to work with volunteers. Sometimes accompanied by additional urban business sponsoring, regional landscape auctions succeed to different degrees in mobilising significant private funding for landscape management, to create continuity in land management activity and to strengthen wider regional rural-urban relations. The latter, for instance, may manifest itself through short-food supply chain initiatives, or meadow bird protection schemes targeted at regional urban dwellers (see www.landschapsveilingen.nl).

(viii) *Green Development Fund Brabant*—Partly financed by the national privatisation of public energy companies, the Green Development Fund of the Dutch Province Noord Brabant includes provincial administrations as sole shareholders. The Fund stimulates nature inclusive land use via various novel instruments. For example, it compensates and stimulates land users for ESS delivery, especially (but not exclusively) biodiversity and landscape features, ranging from experimenting with land tenure regulations that specify the quality of natural attributes, accompanied by a reduction of tenure prices for those with nature-inclusive business plans. Other methods include financing voluntary land consolidation schemes that facilitate similar purposes and a subsidy regulation for food forests (ie. agroforestry) in five different, province-owned locations. The overall set of instruments aims to improve land access ability for alternative rural business models. It is anticipated that these will develop complementary remuneration and compensation mechanisms for ESS delivery. This could be achieved by developing direct and close relations with regional food consumers, providing services for regional nature organisations, or more co-funding and risk-sharing oriented organisational structures and, more generally, through the uptake of economic activity that valorises ESS delivery indirectly. In addition to distinctive, farm-based initiatives linked to marketing regionally typical food qualities, this may comprise the provisioning of green care or leisure- and educational activity for multiple target groups. By providing in several direct and indirect opportunities for financial support to nature-inclusive land use, Green Development Fund Brabant aspires to strengthen wider regional rural-urban relations and interdependencies (see www.groenontwikkelfondsbrabant.nl)

(ix) *Serchio River, Tuscany*—The Serchio River has the second highest level of hydro-geological risk in Italy, as a territory very prone to floods and landslides. Recently, this situation has worsened because of climate change and of an unbalanced process of development. The river's basin presents features of hydrogeological instability, seismic risk and water pollution, and for these reasons it has been constituted as a "pilot basin" in Tuscany Region (cf. Upper Thames above). The Serchio river case (Rovai & Andreoli, 2016) concerns an ecosystem service directly supplied by farmers through activities carried out

beyond their own farms, initiated in 2007, with PES contracts starting in 2009/10. Land Reclamation and Irrigation Consortia in Italy coordinate public and private actions aimed at safeguarding the territory, its environmental protection, the hydraulic shelter, the development of agriculture, and the management of water. The Land Reclamation Consortium in the Serchio valley experienced difficulties in guaranteeing both direct activities aimed at territorial protection from hydraulic hazards, and a satisfactory level of monitoring and maintenance of the territory because of scarce endowment of human and financial resources. The process of abandonment of agricultural activities, also exacerbated this situation. Subsequently, the hydrological instability was addressed by awarding farmers with contracts for services of monitoring and light maintenance of the hydraulic network. This scheme proved more efficient and effective than contracting specialised firms, thus optimising farmers' local knowledge and peer-relationships. Farmers were required to present regular reports, which included digital photos and GPS coordinates of the hydraulic structures they were monitoring, to adequately map those structures and their level of criticality as well as prove their monitoring activity. Significantly, the use of a digital camera and of information technology tools were among the most critical aspects of the project and some farmers, especially if elderly, had problems using them. During the second year, only some of the previous agreements were renewed. Only 13 of the original 20 farmers were included in the continuing project; those with the best results for the initial period were chosen to stay on. Subsequently, the budget allocated to monitoring activities was reduced since an adequate knowledge of the territory had already been attained. In the operating year 2010/2011, agreements were made with 29 farmers, among which 25 were individual land managers, and four were cooperatives. They were awarded the monitoring and light maintenance of 40% of the territory, where ca. 33% of the hydraulic network is located, with a total cost of €44,000 to the authority.

(x) *PES within Italian Natura 2000 sites* - As part of European network of protected areas established through the European Habitats Directive (92/43/EEC) and the Birds Directive (79/409/EEC), (Marino & Pellegrino, 2018) and (Schirpke et al., 2018) describe PES schemes in 19 areas and evaluate their socio-economic condition at different spatial scales and for different beneficiaries. Various ecosystem services are addressed by these authors, including provisioning, regulating and cultural services. The latter were most frequently addressed by the "recreational value" service (e.g. small payments (€1) via SMS to visitors for signposts maintenance). Provisioning services involved, amongst others, the "forage and pasture" scheme for mountain farmers receiving a discount on their annual rent for sustainable cattle breeding) and "hunting and fishing" services for hunters spending part of their working hours on maintenaning work the protected area as a compensation for hunting rights. PES for regulation services concentrated mainly on "protection against hydrological instabilities" (e.g. municipalities allowing a Forest Consortium to freely benefit from raw material and recreation in the

forest for implementing reforestation operations to prevent flooding) and "carbon sequestration" services (for instance, an agreement between the forest management authority and NGOs to valorise forest management plan by selling carbon credits derived from wood saving).

Most initiatives concern "input-based" schemes where the payment is granted for a certain land-use practice or management activity securing ESS provision. In "output-based" schemes, which are harder to define and implement, payments were directly linked to the ESS provision to measurable units (i.e., metric tons of wild fruits, tons of carbon sequestered, water quality, etc.). Payments are both in kind (e.g. picking herbs, fruits, mushrooms) and in cash (e.g. discounts). Public authorities take the responsibility of managing protected areas as ESS "sellers", while private stakeholders, especially tourists or residents, are ESS 'buyers'. In addition, private enterprises or associations from rural and urban backgrounds may be involved in improving the effectiveness of agreements by assisting and supporting transactions between buyers and sellers. As further concluded, most of the PES analysed reveal local effects, although some might serve a wider area (the National Park, the wider forest, etc.) (Marino & Pellegrino, 2018:10).

Finally, socio-economic impact assessments have observed positive effects on the local economy and on the broader social well-being varying across the sites, depending on the type of ESS, the conditions of the PES agreement, and the general socio-economic context of the local communities (Schirpke et al., 2018:104).

Discussion—Knowledge Gaps

In this section some of the conceptual considerations associated with PES will be revisited in order to identify knowledge gaps. It is helpful to start by recalling Wunder's (Wunder, 2005) four general types of PES schemes, namely:

(i) Area-based schemes, where contracts agree management of particular land areas.
(ii) Product-based premiums, where consumers pay an environmental premium for goods or services with ESS enhancing management or governance methods (examples of which include fair trade or organic foods).
(iii) Use-restriction schemes, which reward providers for limiting resource extraction or land use development.
(iv) Asset-building schemes, which are linked to ecosystem restoration.

Within the context of ROBUST and its emphasis on rural-urban synergies, particular challenges or opportunities arise from Wunder's quartet. For example, area-based catchment management schemes may need to cross multiple administrative territories, demanding a territorially networked approach to environmental governance. Product premia, despite the extra cost to users, can serve to bind urban consumers to rural producers, species or landscapes. Making room for the countryside in cities, in the form of urban agriculture, offers psycho-social benefits for those involved (Howarth et al., 2020). In fact, the willingness of farmers to work in social and therapeutic programmes with lay people to secure medium-term land

management furthermore indicates the multi-functional nature of ESS, and the innovative financial models now available for PES compared to the earlier experiences described in Wunder's writing. Of particular interest in the context of ROBUST are three principles:

(i) The idea that PES is allocated as a compensation for potential lost earnings for a hitherto practised land intervention that undermines ESS delivery.
(ii) That PES is allocated in relation to a territorially defined area of intervention.
(iii) That PES is voluntary and alternative to policy/regulation and based on performance (i.e. conditionality).

These three themes are significant for the governance of rural-urban relations in both proximate and more extended scales and would benefit from innovation in spatial (regional) networked governance.

(i) *Compensation for lost earnings*

The Volvic/Vittel and Farmer-Beer-Water (FBW) schemes raise distinctions between types of market actors, namely on the one hand farmers as land managers whose practices directly affect the quality of natural assets exploited in the market by, on the other hand, commercial water bottling companies and brewers. The deleterious impacts of the agri-food industry result from a legacy of industrial subsidy and food retail structures and are well-documented (for example, Lang and Heasman, 2015). But in these cases, the co-dependence of commercial actors and the need to align and agree mutually beneficial practices is striking. The fact that Vittel was able to influence land management not just through agri-payment contracts but also through agricultural tenancy clauses following the purchase of farm land emphasises the importance of non-agricultural commercial actors as stakeholders in the governance of ESS. This link is also made in the Gloucestershire cheese example, much of which is sold in farmers' markets in towns across the county. In FBW, the PES has emerged as a systematic alignment of the interests of commercial brewer and barley farmers. The Swedish mussels example indicates that such commercial alignments and innovations not only cross public-private boundaries (i.e. they are multi-sectoral innovations), but relate to multiple ESS regulatory spheres governed by the municipal state—in this case waste, pollution and conservation measures. Together these types of experiences reflect ongoing attempts to establish true pricing systems (Michalke et al., 2022), which are a correction of prevailing market relations and dependencies with the purpose to remunerate positive externalities of land use practices.

(ii) *Intervention areas*

In relation to the second theme, the river catchment cases in particular indicate the importance of adopting an extended view of the area of ESS impact: interventions upstream affect water quality along the whole watercourse. WILD and the Serchio River cases both complicate the stakeholders needed in PES development and ESS delivery, and draw in extra-local actors, including agencies responsible for meeting the requirements of EU regulations such as the Water Framework Directive.

In this sense, the WFD, while not itself a payment scheme, has proved an effective regulatory goal when combined with national rules on water quality and governance arrangements for hydrological infrastructure. A common feature in these cases, which resonates in the literature, is that PES works well if the level of cost for adoption is demonstrably lower than the cost of alternatives—which in the Upper Thames and the French mineral water case would need to be chemical treatment of water pollution, and in Tuscany the requirement for specialist hydro-engineering had it not been incrementally integrated into agricultural routines. The shift from site-specific S106 agreement to the county-wide application of planning gain for environmental compensation interventions, indicates a more strategic view of the potentials of some forms of PES.

The case of Natura 2000 sites in Italy shows that the benefits from ESS provision are mainly enjoyed locally or at regional and wider levels, and PES schemes represent an opportunity to meet demand and supply of ESS in the same place raising stakeholders' awareness on the importance of biodiversity conservation and land management. As highlighted by Schirpke et al. (2018: pp. 102) direct economic impacts of PES are limited to the local level, whereas positive effects on human and social well-being could be observed at greater scales. Such effects may be evident, for instance, among people that benefit from the maintenance or improvement of specific ESS, especially cultural services provided by the sites, and among stakeholder groups that were involved, increasing their skills in sustainable management solutions.

Some cases, including Upper Thames, Serchio river, Landscape Auctions as well as Natura 2000 sites, reveal a reliance on farmers for local knowledge of their territories. Farmers' involvement in professional and social networks is an asset in the development of PES schemes. In this respect, the local knowledge-base of land managers, and their adaptability following the encouragement of civil society networks, implicates them in ESS governance networks which require a wide range of data types to complement ecological or policy expertise. As shown by the Natura 2000 case, PES provides a support for ESS providers such as farmers and forest-owners sustainable practices (Schirpke et al., 2018:104).

(iii) *Conditionality*

The blurring of public-private boundaries is evident in various cases, e.g. in those where commercial or civil society actors apply land use change through the instrument of tenancy contracts. Given the diffusion of land holdings in Europe, land managers will need to be involved in consultations to initiate PES schemes successfully induce specific practice changes. Cross-sectoral collaboration may need to be reviewed, enhanced and renewed to create links to public sector agendas (agri-environment schemes, water quality, urbanisation, carbon neutrality etc.), to deliver public benefits and /or offer useful springboards for private PES schemes that may combine cost savings with ESS gains. To do so, the role of the local/regional state will be significant, both as a contributor of tax-payers' money in some PES schemes, and as the democratic representative of citizens who rely on shared ESS, especially where these are generated (supplied) and enjoyed (demanded) locally. This is not to

suggest priority of state-led PES development, but rather, to emphasise that local administration can play important contributory roles in facilitating and enabling the alignment of ESS through co-designing PES innovations. Consequently, more profound understanding is needed of how to develop, maintain and evolve blended ESS finance and to systematically monitor the impacts and durability of PES interventions. For instance, the question remains of whether PES works in the case of weaker 'market demands' for ESS gains (witnessed in the pioneering days of fair trade).

Other knowledge gaps derived from our case-study inventory can be summarised as follows:

(i) While private companies may be happy to finance PES schemes with outcomes that deliver clear commercial benefits (such as clean water saving purification costs), they seek to isolate the costs of unintended or secondary ESS outcomes (e.g. biodiversity). How can the bundling of multiple ESS be embedded in PES schemes (as in the Natura 2000 case)?
(ii) If private PES schemes are linked to consumer markets, questions arise in relation to what period of time passes before schemes should be reviewed, if consumer markets change.
(iii) Certain PES configurations—such as multiple buyers and multiple sellers—are more complex to manage than if one side is a single party. The Dutch Landscape Auctions is one example of multiple-to-multiple supplier-user relationships, but these diffused models are under-researched. The Natura 2000 cases illustrate a network of actors that must be involved for the PES to function effectively.
(iv) How PES be arranged in places where complex, seasonal or traditional land tenure rights result in multiple stakeholders or within common land tenure settings needs further research. An example of this is the Portuguese Montado landscape (Cruz et al., 2016).
(v) Given the level of state subsidies spent on the environment in territorial subsidies, notably the CAP, it remains unclear if private sector PES schemes will ever be able to reach state-led ESS delivery approaches. Research is needed into strategic PES consolidation, including its integration with and dependency on state-led ESS delivery.
(vi) Provisioning and regulating ESS seem well-represented in our list of case studies. Supporting ESS seem to be under-developed with clear potential for rural-urban links, while the cultural ESS seem closely linked to rural life, as the NATURA sites case shows.

PES as Co-Shaper of Rural-Urban Synergies

Several cases imply the significance of rural-urban interdependencies, for instance by highlighting extended territorial spatialities (e.g. water courses) or by interlinking PES prospects with (complementary) product and service marketing opportunities (i.e. food, leisure, culture). The burgeoning scholarship on urban and peri-urban agriculture in recent years is roughly concomitant with PES literature timescales (for example Viljoen (2005), de Zeeuw and Drechsel (2015)). This literature associates ESS with topics including urban land use planning, the proliferation of short

food chains and rural-urban cultural connectivity. As such, it approaches ESS as a key condition for synergistic rural-urban relations in times of climate change and spatial unbalances between ESS demand (i.e. urban shortage) and supply (i.e. particular rural amenities). The ROBUST project experienced that PES attract a lot of interest among policy actors; PES were actively addressed and explored within a range of novel rural-urban governance arrangements, encompassing both upscaling (e.g. metropolitan areas) and downscaling initiatives (e.g. participatory spatial planning efforts) and several are discussed elsewhere in this volume. ROBUST experiences also show that PES interests may be driven by shared objectives to preserve and valorise rural distinctiveness as well as collaborative aspirations to enhance urban ESS delivery capacity for multiple purposes (e.g. heat stress reduction, health and life-style benefits, etc). In that way PES may enhance rural-urban synergy relations, including the (re-) introduction of 'typical' rural qualities into urban space. The growing amount of PES initiatives thus reflect a territorial or place-based capacity to explore, combine and align rural-urban synergy prospects. Such territorial capacity-building efforts should evolve alongside other comprehensive well-being concerns such as sustainable food systems, circular resource use, cultural connectivity and public infrastructure and public service provisioning.

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Part II
Emerging Topics: Putting Ecosystems Services into Practice

Chapter 7
ESS in Outer and Inner Space—Refining a Basic Concept: The Outer Space-Inner Space Notion as a Specification of the Rural-Urban Dualism as a Basis for the Application of ESS in German Spatial Planning

Reinhard Henke

Abstract Ecosystem Services (ESS) have a high potential to better inform planning decisions about land take. Land take is used throughout this text to indicate the transformation of land from its original state, for settlement and related purposes. This will usually concern land with natural or semi-natural vegetation. Competing terms are land consumption or the German equivalent *Flächenverbrauch,* which also is perceived as negative framing by many. Areas providing more ESS than others should be spared. However, ESS need to be properly transferred from a scientific concept into practice, including formal legal planning procedures. To optimise the science-practice interface, some concepts need precision. One way forward involves adapting the rural-urban dichotomy to the logic of planning laws. This chapter demonstrates an approach tailor-made for German Regional Land Use Planning, replacing rural and urban with Outer Space and Inner Space respectively. This reasoning informed a study commissioned and co-authored by the Regional Authority FrankfurtRheinMain (outside the ROBUST project but stimulated by it), which presents a specifically adapted list of suggested ESS indicators ready for application.

Keywords Regional Land Use Planning · Outer Space-Inner Space · Informed Planning Decisions · Limiting Land Take · Science-Practice Interface

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M. R. Partidario et al. (eds.), *Role of Ecosystem Services in Enabling Rural-Urban Synergies*, Landscape Series 20, https://doi.org/10.1007/978-3-031-98153-1_7

7.1 Introduction

This chapter illustrates an approach to introduce Ecosystem Services (ESS) into German spatial planning. More specifically: how can ESS be transferred into the legal procedure of producing a Land Use Plan according to the provisions of the German *Baugesetzbuch* (Federal Building Code, 2017), as applied in the ROBUST's case study region FrankfurtRheinMain by the Regional Authority FrankfurtRheinMain. At the Regional Authority, we perceived a need to look at basic notions, with the goal of matching ESS thinking with legal categories. We scrutinised the rural-urban construct and proposed a specification which fits the logic of the law, namely the *Baugesetzbuch* (Federal Building Code, 2017). This is necessary because that law is the instrument available for Spatial Planning. It is the Outer and Inner Space notion that takes the place of the conventional concepts of rural and urban spaces. Ultimately, this enables, by abstraction and generalisation, an operationalisation of the ESS concept, to help solving a specific problem: how to better inform decisions about land take by using quantified information about ESS provided by land prone to be taken in the planning process, in order to divert land take to areas with lower ESS levels. The result is a raster which enables planning authorities to arrange place-specific ESS information in a way that it responds to the problem. For a GIS environment, this means an additional layer assigning ESS information to either Inner or Outer Space. A study based on this logic proposed a set of 27 ESS indicators ready for application. It is hoped that other planning authorities can consider the uptake of this approach.

We do not address rural-urban for the sake of it. We have a specific problem which is a specification of the rural-urban topic, thus we specified the rural-urban approach to respond to our specific problem. This specification goes as far as introducing a new wording, namely Outer Space-Inner Space. This represents the crucial provisions of the legal instrument for planning decisions in Germany, the *Baugesetzbuch* (Federal Building Code, 2017).

7.2 A Need for More Precision in the Wording

What are we talking about exactly when referring to rural-urban? Although rural-urban was at the core of the ROBUST project, it is a poorly defined construct.

Definitions are social agreements which, at best, can be useful, accepted or uncontested. The issue here is not the absence of a definition, but the presence of a great variety of definitions (some of which are descriptions rather than definitions). In itself, this variety is not a problem. However, the definitions that authors use are not usually made explicit. Thus, a reader is confronted with the situation that s/he cannot be sure about the foundations of a given argumentation.

Definitions (and descriptions) of rural and urban, including linguistic variations like Town and Countryside, are usually based on aspects of land cover, land use,

planned land use, function, relation, or they are based on legal provisions, or they may even be colloquial. A closer look at the details will reveal the limited value of these definitional approaches.

1a. Land Cover

Starting from the simple 'let's show what is there' idea, maps have been and are produced, to represent the surface of the earth as it appears: the land cover. This is what the general public expect and use: topographical maps, hiking maps, road maps and so on. Depending on the purpose, maps can feature roads, or footpaths, or waterways and the like. Mapping needs generalisation: decisions must be taken about references to (for example) municipal boundaries or cadastral information. Areas of similar character must be grouped in one way or another: Even when the database provides extensive details, abstractions are needed (to signify concrete, asphalt, cobblestone roads; oak, elm, beech forests; colza (or rapeseed), strawberries, ploughed agricultural land; and so on). Any decision to qualify a land cover as either urban or rural based on this kind of map is arbitrary because they have not been compiled for that qualifying purpose.

1b. Land Use

There is a difference between Land Cover and Land Use. Determining and mapping[1] the use of land needs additional information which is not necessarily obvious from resources such as aerial photographs. Is a building used for housing or for offices? Is a complex of hangars, runways and apron areas used as a military or as a civil airport? Are meadows used for grazing cattle or for human recreation? Extra care must be taken in areas of transition. For example, how would an abandoned vineyard feature? Or demilitarised barracks?

Here, too, the decision to qualify a land use as either urban or rural is arbitrary. This is about the actual land use at one or more points of time in the past.

1c. Planned Land Use

A special type of land use maps include those showing a *future* land use. Within the context of this chapter we can confine our reasoning to Land Use Plans as defined by the German *Baugesetzbuch* (Federal Building Code, 2017): As a modification of 1b, these plans add a time layer and show, for parts of the plan, the *proposed* land use. The difference between actual land use and proposed land use might not (depending on the layout) be easy to spot, especially for laypersons, because these areas of land the use of which is to be transformed can be small, and scattered around existing structures. In other words, large parts of these Land Use Plans have the same contents as land use maps, and make no statements about urban or rural distinctions either.

2a. Attempts to describe functional regions

While based on land cover and land use interpretation, describing functional regions has a different purpose: other features are taken into consideration. Often details include densities (inhabitants per km^2, for example), or the

[1] The (traditionally physical) graphic representation of the information.

presence of institutions considered to be urban (hospitals, universities, theatres for example). This leads, typically, to composed calculated indicators, and the resulting figures per area then can be grouped in degrees of rurality (or urbanity, or other categorisations). A prominent example is The New Degree of urbanisation (Dijkstra & Poelman, 2014). Here, population densities have been calculated, resulting in municipalities being classified as either 'densely populated area' ('alternative name: cities'), 'intermediate density area' ('alternative name: towns and suburbs') or 'thinly populated area' ('alternative name: rural area'). Unfortunately, the authors frame the results of this calculation as 'degree of urbanisation'. Indeed, this is used to define what a city is, it *'[...] also introduces a new harmonised city definition'* although this is based on population density calculations only.

2b. Relation

Adding to 2a, there are attempts to consider relations of a given territory with other territories. The idea is to qualify that given territory as part of a larger unit, or to define that larger unit. If the focus is on flows, for example of people, commuter relations are often used. Prominent weaknesses here are data bases (their reliability, their comparability, modes of transport used), and the need to decide about thresholds. For example, Dijkstra and Poelman use a 15% cut-off margin for a specific detail of their analysis: *'if 15% of employed persons living in one city work in another city, these cities are treated as a single city'* (Dijkstra & Poelman, 2012). This challenge of considering relations can lead to an indeterminable variety of approaches, many of which are complex and not easy to comprehend. The latter is an issue sometimes overlooked in science. Within legal procedures, lines of argumentation must be traceable. Legal decisions can be challenged and, ultimately, be rejected by law courts. Before it reaches such stages of escalation, decision makers might reject arguments that require too much expert knowledge to understand them.

3. Legal Definitions of Rural-urban

Outside the academic world, in public administration from local to EU levels, governments can, and do, decide and impose designations of rural and urban, for example for the sake of the allocation of funds. These designations will be based on factual data, but eventually it is the decision that counts. Often, these designations relate to territorial entities (NUTS or LAU[2]). The EU expects Member States to differentiate their territories, but doesn't impose the method, conceding that Member States and 'Regions' are free to use their own definitions.[3] In the German Land of Hessen (where FrankfurtRheinMain Region is located) two different legal definitions[4] of rural exist. Land Use Plans, however, do not define

[2] NUTS: Nomenclature des unités territoriales statistiques; LAU: Local Administrative Units. The hierarchical system used by the EU to reference administrative units (Eurostat, 2023).

[3] For example: 'it is left to the Member States to define which territories are to be considered as 'urban areas" (European Commission, 2015)

[4] According to the Regional Land Use Plan only two towns inside the area covered by it are rural (Regionalversammlung Südhessen, Regionalverband FrankfurtRheinMain, 2010, 17); according

rural-urban; they fall into the category of Planned Land Use (see 1c, above) instead.

4. Colloquial

   In its colloquial or narrative use, rural-urban is a stereotypic simplification. It may be rooted in our minds as one of the fundamental dualisms like good and evil, black and white, love and hate, but must be treated with care in professional use. Here it is where categories are mixed and mixed up, for example: land use where rural is concerned, lifestyle when it is about urban. Suburbia, urban fringe, urban-rural divide, countryside around towns, urban-rural interface and commuter belt all fall under this category. Urban areas may relate to the zone *within* a municipal boundary but could also include the areas *around* a corecity. These terms have a merit when it is to initiate reflections about a complex reality, but need backing and precision during the debate—which is usually not provided. A best practice of this necessary precision, providing some 40 pages of explanation of the key terms, is the Ruimterapport Vlaanderen (Pisman et al., 2018).

There is nothing wrong with this variety of approaches. Users must bear in mind, however, the following:

1. These approaches shouldn't be seen as compatible, that is, they shouldn't be blended when analysing a real-life planning problem (Land *use* which is obviously rural takes place outside *legally* defined rural areas, for example: about 25% of the surface of Frankfurt am Main (NUTS DE712) is used for agriculture.)
2. These approaches are context dependent. For example, it doesn't make sense to refer to population densities when it is about an application for LEADER[5] funding, because areas applicable for LEADER funding are defined legally. Context dependency also means that data availability plays a role: is it about the interpretation of *existing* data (the application of available GIS information, for example), or the search for *new* data? In the case of the latter, from which sources does new data emerge? Field work, aerial photography, satellite imaging? True colours, infrared? Night-time light emissions? 'Mapping' is a potentially confusing expression in this context and, again, needs clarification.
3. These approaches are problem dependent. Indeed, we should always check whether a specific approach, and results based on it, contribute to solving our problem. If this is not the case, namely if something presented as a solution does not respond to our problem (or if, as is often the case, the underlying problem isn't disclosed), we will have to design our own approach. To complete the argument: a problem exists when a situation is perceived as dissatisfactory, and when the means to transform this to a satisfactory situation are unknown. It is important

to the rural Development Programme (implementing the European Agricultural Fund for rural Development) it is 22 towns (Land Hessen, 2016, 32).

[5] LEADER: Acronym for Liaison entre actions de développement de l'économie rurale, Links between actions for the development of the rural economy), European Union funding mechanism primarily for rural areas.

to state who is affected by this dissatisfactory situation, and in what way, and whose perspective prevails. We also speak of a problem when a satisfactory situation is at risk of becoming dissatisfactory without the applications of adequate means.

4. To conclude: Any decision to qualify a given plot as either urban or rural is arbitrary. Accordingly, many approaches tend to avoid the dualism by providing differentiated or alternative wordings. 'Peri-urban' (PURPLE, 2021) is a well-established example with a compelling body of backing argumentations. It is a reference for ROBUST because PURPLE played a prominent role in the project.

7.3 A More Precise, and Problem-oriented Approach and Wording: Outer Versus Inner Space

The Regional Authority FrankfurtRheinMain participated in the ROBUST project as a practice partner. We focused on a specific issue of our ongoing efforts of drafting a new edition of the Regional Land Use Plan. Our research question was:

> *How can a specific type of planning decisions, decisions enabling land take, be better informed through the deployment of the ESS (Ecosystem Services) Concept?*

Planning decisions are based on a wealth of information meant to represent the complexities of our built environment. Practitioners regret that the knowledge enshrined in the ESS approach has not yet been introduced into the legal system of German spatial planning. This is a missed opportunity because we need better arguments to protect open space, which is a limited resource, from land take. Our assumption is that ESS are valuable and provide vital benefits for people. This has been addressed exhaustively throughout this book.

For our FrankfurtRheinMain application the basic working assumption has been that ESS demand is induced by land uses in what is colloquially coined 'urbanised' areas (thus, where people live), and that ESS are provided by the non-urbanised areas. This is a simplification because ESS demand is present in non-urbanised areas, too, as ESS provision is present in urbanised areas. However, ESS in the urbanised areas isn't addressed here because it isn't the topic of this specific research. Here, we are exclusively focused on the areas *outside* the urbanised areas, and at those which are candidates for land take that would reduce or destroy ESS in these specific zones.

The other facts about the case study:

1. A real life *application:* The case study is not an academic exercise but an approach to feed advanced information into the procedure of German Regional Land Use Planning. This is advanced information because ESS is not being applied in this procedure yet. German Land Use Planning is a long established sophisticated and complex legally-based procedure. In the ROBUST project, the

reference area was the FrankfurtRheinMain Region in Germany, where a specific non-standard version of this procedure is being applied, i.e. it is one *single* Plan (a *Regional* Land Use Plan) for the combined territories of 80 towns and cities, including Frankfurt am Main. The German standard approach would be 80 individual and independent Plans. Collating, compiling, maintaining and updating this Plan is a substantial and time-consuming undertaking performed by the Regional Authority FrankfurtRheinMain, based on legal assignments.

2. A real-life *problem:* Regional Land Use Planning is legally obliged to find a balance between 'development' and the protection of resources. Its instrument is the assignment of land uses, that is, providing the legal base for additional housing and industry and the associated infrastructure ('development' in short; actually, it is land take: the transformation of 'not-yet developed' land). In practice this means that, in the ongoing process of drafting the new edition of the Regional Land Use Plan, planners have to decide,[6] on an area by area basis, where to allow land take. In terms of problem definitions, this is perceived as unsatisfactory by planners because any land take reduces ESS, to the disadvantage of citizens. These area-specific decisions must[7] be based on balancing all available relevant information, and this balancing must be traceable (because, ultimately, it might be challenged in legal procedures). To be noted is that this process is *enabling* legally based 'development'; *implementing* the Plan is not within the remit of the Planning Authority.
3. Refining the terminology: Ultimately, we leave rural and urban behind. The German *Baugesetzbuch* (the Federal Building Code, 2017) does not use rural-urban. We introduced the Outer Space-Inner Space concept (Herbst & Henke, 2016) where we, by way of abstraction, divide the municipal territories in just 2 categories: built-up (Inner Space) and not-yet-built up (Outer Space). Planning decisions enabling land take expand the Inner Space and reduce the Outer Space accordingly; it is a zero-sum game.

   3.1 General merits of this terminology: (a), referring to the reasoning presented in Sect. 7.1 of this chapter, we alert readers about our specific approach by departing from the standard wording: it is a wording usually not used in this context so that we hope to avoid confusion with other terms. And (b), we can now use the two terms as a shorthand for and a precision of the usual Euro-English dualism of 'developed' and 'undeveloped'. 'Developed' is deliberately presented in inverted commas in this chapter.[8] The term is, within our context of spatial planning, usually used to express the idea that land is covered with buildings and related appliances and with infrastructure, or,

[6] Although they do not take the legal decision eventually (this is done by a parliamentary chamber) the reasonings of the administration determine the contents of the formal resolution.

[7] Legally determined: Baugesetzbuch § 1 (7), Federal Building Code (2017)

[8] That English developed-undeveloped dualism has a derogatory undertone of 'lagging behind' or 'being incomplete'

within a different logic, as 'urbanised[9]' or 'built-up'. The short-hand dualism now is Outer Space-Inner Space. Any space is either Outer Space or Inner Space.[10]

3.2 Specific merits of this terminology: This is the key to bridge the gap between science and practice in this ESS application context. Outer Space–Inner Space reflects the logic of the *Baugesetzbuch* (Federal Building Code, 2017). This Law provides for the instruments planning authorities apply. Planning authorities are bound to it and depend on it—there is no alternative way according to the law dating from 1960. This has been reformed, updated and modified frequently throughout the decades. The provisions crucial for our problem are given in §§ 30, 34 and 35; however, these paragraphs have not been designed primarily for the limitation of land take, they are complex and not easy to understand and they do not mention urban or rural.

In plain words, these paragraphs define, decisively, where 'development' (*Vorhaben,* undertakings) is possible. Thus, areas *protected* from 'development' are by and large defined ex negativo. Although the *definition* is given ex negativo, the *term* is made explicit, it is *Außenbereich* which translates to Outer Space.

The Law does not, however, provide a comprehensive antonym to *Außenbereich,* Outer Space, this is what we have introduced under the name Inner Space. Inner Space, in our definition, is the combination of two constructs the Law provides. One is the built-up area (also called 'urbanised', or 'developed', or 'settlement area'), *Im Zusammenhang bebaute Ortsteile* according to § 34 (contiguously built-up parts of the municipality). The second one is the *Geltungsbereich eines Bebauungsplans* according to § 30 (area covered by a binding land use plan[11]), where landowners applying for a planning permission according to the provisions of the plan must be granted that permission. Again, any part of a municipality is either Inner or Outer Space.

4. Land take, and a finite resource: Obviously and inevitably, 'development' as described above comes at a cost, which is land take. In terms of Outer and Inner Space: Inner Space is enlarged, and Outer Space is reduced accordingly (which is ultimately unsustainable). This process is at the heart of spatial planning in

[9] 'urbanised' as a synonym for 'covered with buildings and related appliances and with infrastructure' is potentially misleading because building activity happens in remote rural areas, too, of course. Another issue is the covert vagueness of the term 'development': Strictly speaking, 'development' is the variation (not necessarily the increase, can also be the decrease) of the value (e.g. of the number) of a parameter (e.g. female employees subject to social insurance contributions) of something (e.g. the inhabitants registered as residents of Frankfurt am Main), but this is usually not specified to this detail.

[10] The virtues of legal logics: There is no need for interpretation nor room for negotiation. For any given plot it is clear which rules apply.

[11] We do not differentiate whether that land is actually already, or just not yet, built-up. Within the reasoning of our research question, land within such a §-30 type of area must be assumed to be taken already, although it may take time until land owners exert their rights to build.

that updating a plan or producing a new plan entails decisions about the extension of Inner Space.

There is a political target of limiting land take to 30 ha per day in Germany,[12] meaning, that in the long run, land would be consumed completely, finite as it is. However, long before that, the functioning of a region would be at risk because of the reduction of ESS. Unfortunately, this problem isn't reflected in the Law, on the contrary, the Law treats the Outer Space of a municipality as the (putatively unlimited) reservoir for 'development'. Legally, it is not possible to *prohibit* land take altogether and any formal plan has to allow for a degree of development.[13] Enabling land take through spatial planning has to be based on the balancing of all available arguments. We recognise a need to better inform such balancing and see that ESS is a concept that is ready to be made available.

5. A theoretical concept under development: Ecosystem Services is a relatively new concept which has not yet been introduced in legal spatial planning in Germany. It is scientifically sound. and there is a plethora of publications about various details and variations. Planning experts are well aware of it, and it is accepted by the planning community. The challenge is to make this concept fit for practice. The messages of the concept, and its focus on the benefit for people, lead to a need to introduce it into the planning procedures. Spatial planning is legally required to take *all available information* into account, and can no longer ignore the input the ESS concept can provide. However, this requires consideration of a complex legal and procedural structure which has developed over decades. Besides the simple fact that a legal basis for the application of ESS in spatial planning needs to be created,[14] a set of practical challenges needs to be overcome, namely that practitioners (assuming they have an academic background) need operational versions of the concept. They need data and applicable methods, for example to qualify and quantify data to turn them into information. They need to put their findings about ESS to the mandated decision bodies who in turn need to be convinced about the soundness and the practicability of the proposals. Within this challenge, our Outer Space-Inner Space approach offers a raster to convey ESS findings into the established legal system. This legal and procedural structure (the *Baugesetzbuch* and the related provisions) is being developed constantly, and we expect that it will account for ESS in spatial planning in the future.
6. Operationalisation by abstraction and generalisation: We can assume that ecosystems are widespread, as are their services. Equally, demand for ESS is

[12] 'The development of additional land for settlement and transport purposes is to be limited to an average of less than 30 hectares per day by 2030', Federal Government (2021), 270

[13] This is based on the Federal Constitution, Article 14: "(1) Property and the right of inheritance shall be guaranteed. Their content and limits shall be defined by the laws. (2) Property entails obligations. Its use shall also serve the public good. (Basic Law, 2022)

[14] Authorities cannot act without legal empowerment. If ESS isn't introduced formally into the regulations it cannot be applied. Conversely, decisions taken ignoring ESS aspects could be annihilated by law courts claiming that not all available information has been considered.

anywhere, where there are people.[15] However, with all respect for the virtues of (for example) urban gardens and birds of prey between the runways of Frankfurt Airport, both for the purpose of Regional Land Use Planning and within the framework of the ROBUST project, a clear focus is needed. Inspired by the rural-urban dualism, we stipulate that ESS is provided by rural areas and demanded from urban areas (this is where most people spend most of their time). As we have demonstrated, rural-urban does not fit our problem and accordingly we introduced Outer Space-Inner Space instead. This is a powerful dualism which can be applied to take stock of, to quantify, and to qualify ESS. A structured inventory of Ecosystems can be created, for any municipality, preferably based on GIS information—either collating existing information or, presumably, through additional targeted research and targeted data collection with the ultimate goal of an ESS layer within the GIS. As one result, this can form an entry point for transporting ESS from theory to practice. It is the missing link. As another result, this can provide for the better-informed balancing decisions as demanded above. When land take is under debate in a planning procedure, alternatives can be scrutinised based on the information about ESS doomed to be lost through the proposed land take.

Linking this practice-led approach to science, the Regional Authority FrankfurtRheinMain experts worked with leading scientists in the field of ESS application. Based on the raster, the scientists developed a set of ecosystem services indicators following an expert-based and application-oriented evaluation. *'The proposed list for the region of Frankfurt/Rhein-Main contains 27 ecosystem services, with one or more associated indicators each.'* (Albert et al., 2022, 1). The research question pursued was how to propose an approach which is both scientifically sound and relevant for the application in the formal planning procedures. Focused on the Outer Space of our region (Albert et al., 2022), the selection of the set of 27 indicators followed a 3-step approach. Firstly, an international literature review on ESS indicators was undertaken. Secondly, the resulting list of indicators was narrowed down by using criteria such as the representativeness and sufficient sensitivity of the indicators for the selected ecosystem service in the region, the potential of spatial differentiation of ecosystem services, the data availability for processing in GIS environment, the density of data for the application across all indicators in the whole region, the capacity for mapping out alternative development scenarios, and possibility progressing towards indicator-related monetisation of development alternatives.

7. A need to match the legal instrument: Formal legal planning is based on science, informed by science and evolves through science. However, the interface between science and governance needs additional attention. Scientific findings cannot be applied immediately in planning, for a variety of reasons, one being that the established legal and procedural instruments do not necessarily fit

[15] Following the anthropocentric definition by the *Millennium Ecosystem Assessment* (2005) that ecosystem services are 'the benefits people obtain from ecosystems'.

scientific findings. If needed, accepted and backed by political majorities, those laws and regulations can be adjusted. However, if that is not, or not yet, the case, scientific findings must be translated to fit the procedures. Concerning the research question discussed here, Outer Space-Inner Space paves the way.

7.4 Transferability

The approach outlined is transferable to any German municipality responsible for Land Use Planning. It follows the provisions of the Federal Building Code which is binding for all municipalities, some 10,500 in total. It provides for an interface between ESS and applied spatial planning. It is also transferable to other countries, provided they apply a spatial planning system which follows the same logic as the German one.

7.5 Conclusion: Outer-Inner is a Powerful Specification of Rural-Urban

Our approach doesn't contradict any of the rural-urban definitions, instead it is a problem specific proxy for them. As we have demonstrated, under the competences of the Regional Authority FrankfurtRheinMain, rural-urban is a vague construct that can be rendered more precisely. Outer-Inner is one method for achieving this precision. Inner Space is urban ('urbanised'), it is urban land *use* (as opposed to land cover) because it includes areas associated with the actual buildings. It also includes urban green (parks and gardens), which is no contradiction[16] to being 'not rural'). However, agriculturally used land is not counted as Inner Space. Outer Space includes all areas with agricultural land use, plus waters, nature reserves and forests. Accordingly, this is a very adequate approach to the idea of rural in our region.

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[16] Green space within the Inner Space accounts for 4.4% of the Regionalverband's area only anyway.

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Chapter 8
Co-construction of an Ecosystem Services Based Metropolitan Green Infrastructure in Lisbon

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Abstract Following the ROBUST Living Lab methodology, the Lisbon Living Lab was designed and carried out following multi-stakeholder dialogue structured in interactive workshops, with a bottom-up governance arrangement in working groups led by the stakeholders to tackle a real-word problem. In this context, one of the working groups aimed to address the improvement of the Green Infrastructure Strategic Plan for the metropolitan area of Lisbon based on the Ecosystem Services concept. The purpose was to bring coherence to the existing detached patchwork of local green infrastructures. This chapter reports on how the governance arrangements created played out in the Lisbon Living Lab process. Consequently, following analysis of the outcome and evaluation of the process, a conceptual model for Collaborative Green Infrastructure Planning is proposed.

Keywords Ecosystem Services · Green Infrastructures · Co-construction · Metropolitan Areas · Multi-stakeholder dialogue

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M. R. Partidario et al. (eds.), *Role of Ecosystem Services in Enabling Rural-Urban Synergies*, Landscape Series 20, https://doi.org/10.1007/978-3-031-98153-1_8

8.1 Introduction

Research programs and projects have become increasingly focused on producing socially relevant research. To that end, it is acknowledged that researchers need to step out of the academic context, find ways to tap into other types of knowledge, such as those provided by non-academics, stakeholders, and practitioners (e.g., Nowotny et al., 2001), in order to understand complex real-world problems. This calls for transdisciplinary research approaches integrating all forms of knowledge available for a specific setting through the co-production of knowledge (Klein, 2004). These approaches are acknowledged to be pivotal in enabling change and supporting innovation to bring about transformative change (Bergmann et al., 2021), ideally supported in transdisciplinarity. According to Lang et al. (2012) transdisciplinarity is "a reflexive, integrative, method-driven scientific principle aiming at the solution or transition of societal problems and concurrently of related scientific problems by differentiating and integrating knowledge from various scientific and societal bodies of knowledge".

In the EU-funded research project "Rural Urban Outlooks: Unlocking Synergies (ROBUST)", a Living Lab approach was used to engage in transdisciplinary research to produce innovative knowledge on urban-rural synergies (Knickel, 2021) (see also Chap. 1). Living labs have various definitions, according to the context, and can generally be defined as "an arena", meaning a geographically or institutionally bounded space (Voytenko et al., 2016) and also a "form of public–private–people partnerships (4Ps) of companies, public agencies, universities, users, and other stakeholders, all collaborating for creation, prototyping, validating, and testing of new technologies, services, products, and systems in real-life contexts" (Westerlund & Leminen, 2011).

The eleven ROBUST Living Lab settings in different European regions consisted of research and practice partners addressing, in geographically bounded areas, real-world problems as identified by active stakeholders in that area. According to Ståhlbröst's categorization (2012) the Lisbon Living Lab can be framed as a mixed type between an "intermediary Living Lab" where independent partners are invited to innovate at a collaborative arena, and "Living Lab as a project", where the Lab exists during a project's lifetime to support the innovation process in that project and closes when the project ends. Even though the ROBUST Lisbon Living Lab started as a "Living Lab as project" type, it had the ambition to become self-sustained and exist beyond the lifetime of the project as a self-organised arena.

The ROBUST Living Labs were structured into phases to offer a unified but flexible LL method to allow comparisons across the partners: 1. Envisioning, 2. Experimenting, 3. Experiencing, and 4. Evaluation, monitoring and reflecting. These set the stage for how to progress in exploring the urban-rural synergies in practice. The Lisbon Living Lab dealt with three communities of practice (CoP) themes in an integrative way at the metropolitan scale: Ecosystem Services, New Business Models and Sustainable Food Systems. An overview on the methodological approach in the ROBUST Living Labs can be found in Knickel et al. (2019). For

the purpose of this chapter, we will focus on the developments in the Experiencing phase of the Lisbon Living Lab. In this setting a working group on Metropolitan Green Infrastructures emerged, linked to the CoP theme of Ecosystem Services. The working group (WG) recruited multiple actors who shared the common purpose of initiating a coherent green infrastructure strategy for the Metropolitan Area of Lisbon.

The concept of Green infrastructures (GI) has been popularized by Benedict and MacMahon (2002) introducing GI as a way to conserve natural ecosystem values and functions. It provides associated benefits to human populations. In Europe, it found policy resonance following, in 2011, the evaluation process of the EU Biodiversity Strategy 2010. There are multiple definitions of GI in literature. A review can be found in Monteiro et al. (2020). Here we use GI as defined in the 2013 European GI Strategy: "a strategically planned network of natural and semi-natural areas with other environmental features designed and managed to deliver a wide range of ecosystem services" (COM(2013) 249 final). This strategy, even though born out of nature conservation issues, is innovative in bridging sectoral policy silos as to spatial planning and cohesion policies towards the implementation of GI in and beyond the border of areas designed for nature conservation (e.g., NATURA 2000 network).

By doing so, the GI concept became intertwined with the Ecosystem Service concept (Maes et al., 2013, 2014; Cortovinis & Geneletti, 2019). GI is acknowledged as the way to maintain the benefits and services that ecosystems provide. Thus, the spatial dimension of GI strongly builds on ecosystem service (ESS) mapping (Maes et al., 2013). Amongst the approaches suitable for GI planning that have been put forward, the ESS assessing and mapping matrix approach by Burkhard and others (2009) has been widely applied. It is "efficient, fast, accessible and adaptable" (Jacobs et al., 2015) and can build on existing resources, providing a spatial overview of ESS distribution, notably at the regional level. The mapping matrix approach uses a land cover map (such as the CORINE land cover map available for Europe on COPERNICUS[1]) as a proxy for ecosystems, and values the provision of ecosystem services in each land cover class using expert judgement as applied in the matrix approach by Burkhard et al. (2009). This matrix approach has been refined by introducing habitat mapping, such as the EUNIS habitat classification (Davies et al., 2004) instead of land cover classes. It was also refined by using environmental models to estimate the actual provision of a service by a specific ecosystem. Based on the availability of resources, particularly data and knowledge, a "tiered approach" was put forward by Grêt-Regamey et al. (2015) to progress towards ESS mapping in an evolutive way. Thus, the expert-based judgement in the matrix approach has been a starting point to further progress along these directions.

One of the weaknesses that has been pointed out in this matrix approach is the confidence resulting from the use of expert estimates (Jacobs et al., 2015). The use

[1] https://land.copernicus.eu/en/products/corine-land-cover

of expert elicitation has been used across disciplinary boundaries whenever there is uncertainty (Helmer-Hirschberg, 1967; Landeta, 2006).

Campagne and Roche (2018) propose a "knowledge elicitation protocol" to ensure best-knowledge estimates of ESS provision across ecosystems by experts. According to Drescher et al. (2013), there is wide array of experts and expertise: ranging from expert scientists, who carry a knowledge more global in scope, to practitioners who became experts "through training and years of experience in applying their practical, technical or scientific knowledge to solve questions", encompassing a more local knowledge.

A comprehensive approach to ESS mapping and bundling can be found in Chap. 3. The use of ecosystem services mapping as a planning tool is understood to be an active asset in promoting the conservation of the natural functions of territory. Nevertheless, literature points out two main challenges (Di Marino, 2021): on one hand there is a deficit in science communication, meaning the transfer of scientific knowledge on GI and ESS into planning practices; and on the other there is a deficit in multi-scale integration, meaning the implementation of the concepts of GI and ES at different scales.

This chapter aims to describe the collaborative process within the Working Group on "Metropolitan Green Infrastructures" the purpose of which was to contribute to finding mutually-supportive linkages between rural and urban areas that foster territorial wellbeing, based on GI, through the participation of multiple stakeholders. It therefore showcases the process of developing a metropolitan GI network using a bottom-up approach within a transdisciplinary research context, notably to identify the phases, and assess catalysts and constraints within the process.

In the following sections, the underlying problem to be tackled in the Lisbon Living Lab will be further detailed, the governance arrangements created will be presented, the Living Lab process will be reported and accessed, and finally, a conceptual model for Collaborative Green Infrastructure Planning will be proposed.

8.2 The Lisbon Living Lab: Territory and Governance

8.2.1 Lisbon Living Lab Territorial Features

In the ROBUST framework described in Chap. 1, each Living Lab has a governance structure built as a partnership of an academic partner with a practice partner. In the Lisbon Living Lab the research partner was IST/University of Lisbon (https://www.tecnico.pt) and the practice partner was the Commission for Regional Development of Coordination of Lisbon and Tagus Valley (CCDR-LVT) (https://www.ccdr-lvt.pt). Both partners worked together in promoting a bottom-up process for exploring rural-urban synergies in the region of the Metropolitan Area of Lisbon. CCDR-LVT is a regional delegation of the central government in this territory

responsible for the coordination of spatial planning as carried out by the 18 local governments (municipalities) in the metropolitan area. CCDR-LVT is also responsible for the development of the Regional Strategic Plan (PROT-AML), including establishing a procedure to ensure a coherent Metropolitan Green Infrastructure for the Metropolitan Area of Lisbon. More detailed information on the Lisbon Living Lab can be found in the ROBUST Report (https://rural-urban.eu/publications).

The area covered by the Living Lab is the Lisbon Metropolitan Area (LMA) (Fig. 8.1), the largest Portuguese urban region. It covers an area around 3000 km^2 with a population of 2,871,133 inhabitants in 2021, representing approximately a quarter of the Portuguese population. It is also the third-largest urban region of the Iberian Peninsula, after Madrid and Barcelona. Lisbon Metropolitan Area is a NUTS II region with 18 municipalities, divided into two large areas divided by the Tagus estuary, each of them with nine municipalities. North of the river Tagus it includes the municipalities of Amadora, Cascais, Lisbon, Loures, Mafra, Odivelas, Oeiras, Sintra and Vila Franca de Xira; and in the south, the municipalities of Alcochete, Almada, Barreiro, Moita, Montijo, Palmela, Seixal, Sesimbra and Setúbal.

The Lisbon Metropolitan Area is a very diverse territory both in terms of biophysical characteristics as well as land uses. Highly populated urban areas co-exist with agricultural land, forests, and wetlands. The region has eight areas integrated within the European Natura 2000 Network, and nine national protected areas covering approximately 15% of the region. These are core areas in the Regional Ecological

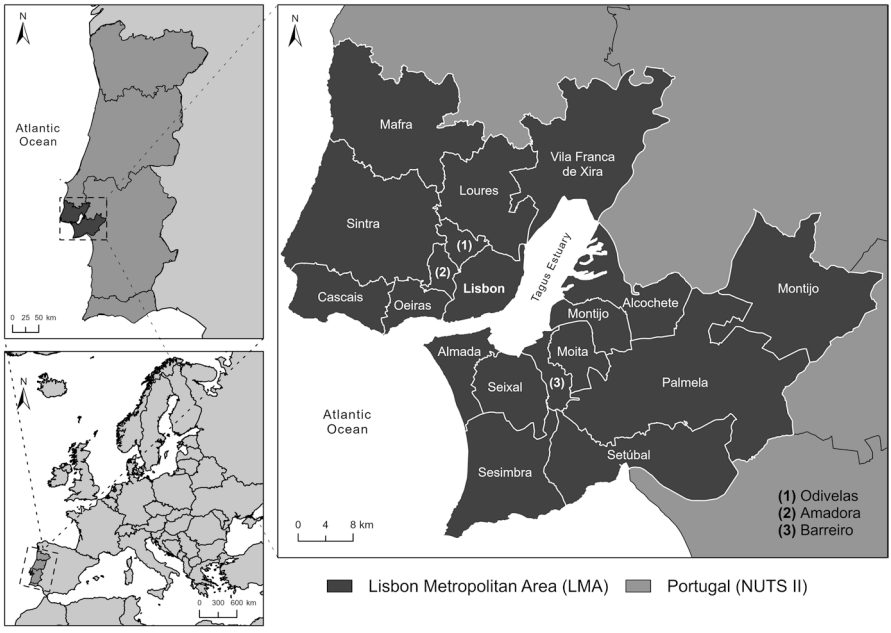

Fig. 8.1 Municipalities in the Lisbon Metropolitan Area

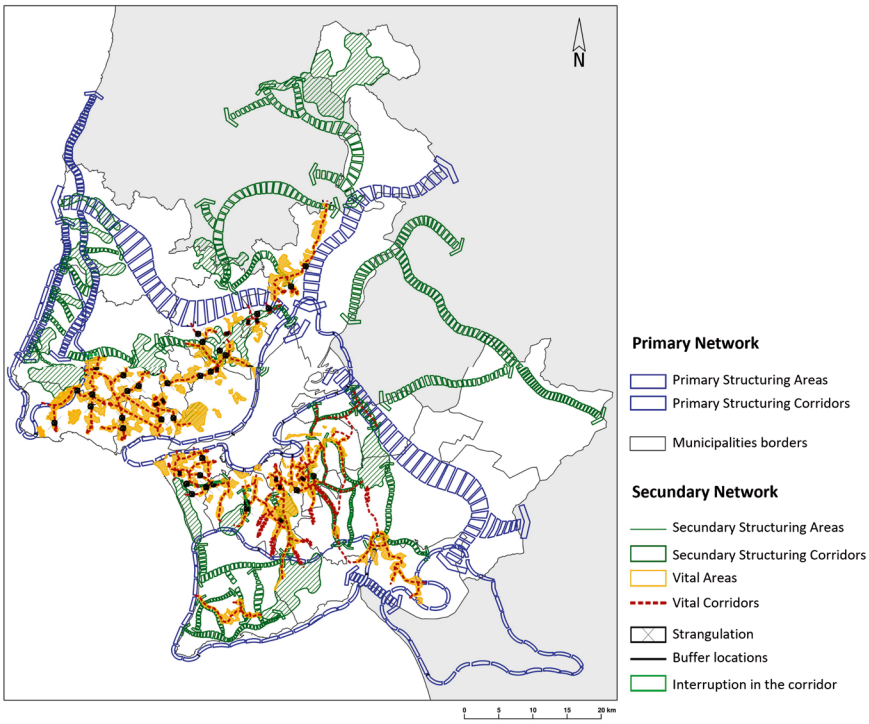

Fig. 8.2 (**a**) Regional Ecological Network of the LMA (**b**) Mismatching GI across administrative boundaries in LMA. Examples of Sintra and Mafra

Network (Fig. 8.2a), included in the Strategic Plan for the Lisbon Metropolitan Area (PROT-AML). Within the Portuguese planning system, the Regional Strategic Plans must be adopted by lower-level territorial management instruments such as the Municipal Master Plans (MMP).

Since 1999, GI planning has been an integral part of the spatial planning system in Portugal. The Strategic Plan for Lisbon Metropolitan Area, in place since 2002, nevertheless misses a clear policy guidance or procedure for implementing the GI functions local land use zoning maps, therefore each municipality uses its own interpretation to establish GI within its administrative boundaries. Ultimately, this is leading to an incoherent patchwork of local green infrastructures. An example of mismatching GI across administrative boundaries is provided in Fig. 8.2b. This is the core issue of the real problem identified by the participants that justified the creation of the WG on Metropolitan GI within the Lisbon Living Lab.

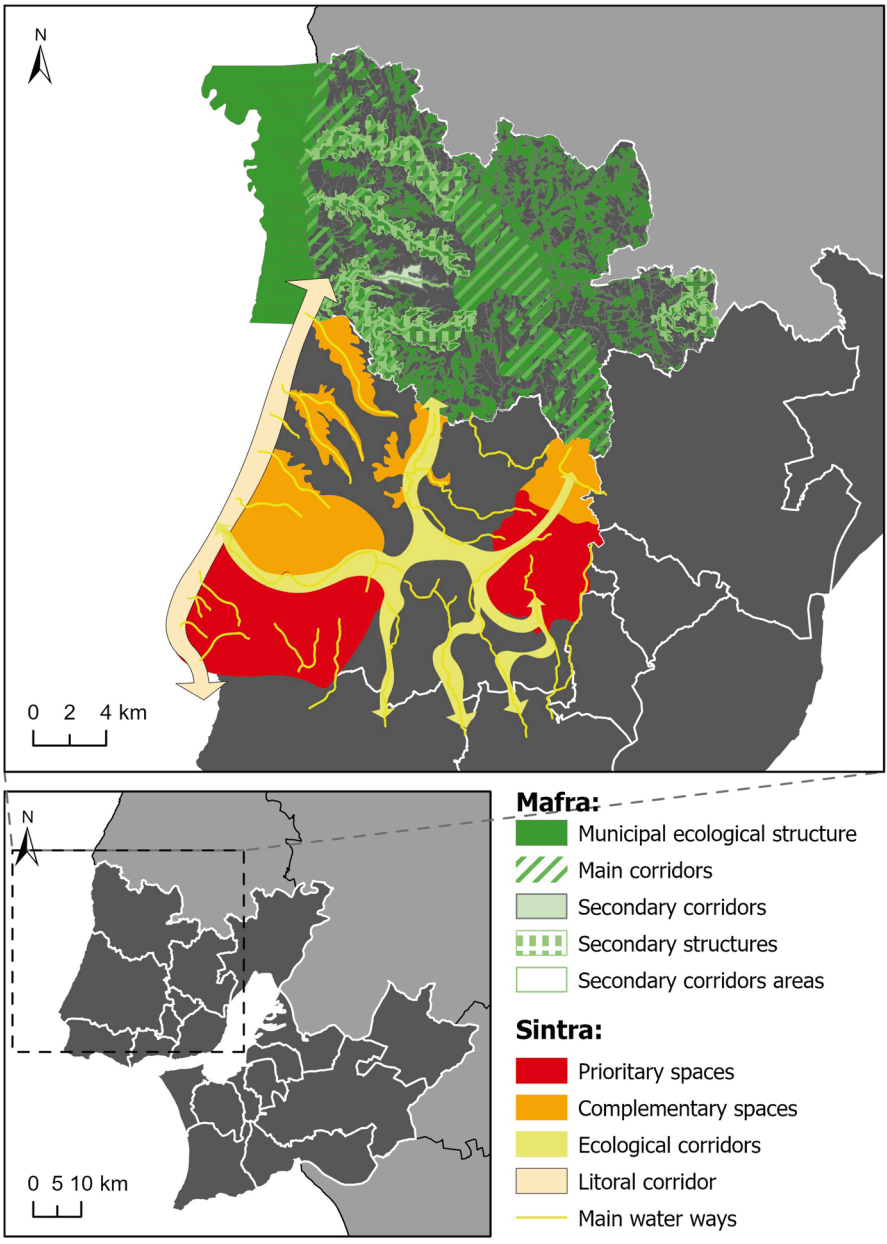

Fig. 8.2 (continued)

8.2.2 URDyLab: Lisbon Living Lab Governance Arrangement

Following the ROBUST Living Lab methodology, the Lisbon Living Lab was designed and carried out following multi-stakeholder dialogue. It was structured in interactive workshops following a bottom-up governance arrangement (called URDyLab in the Lisbon Living Lab) organised in topic-specific working groups led by the stakeholders. The practice and research partners provided support on demand, by building on online meetings of all stakeholders and questionnaires to understand strengths and weaknesses of the work and outline ways to progress.

Construction of the URDyLab is grounded in real-word problems that can be tackled through a bottom-up approach. Thus, the WG are self-organised, having total autonomy to discuss matters they put forward themselves, following a process and outcome-oriented perspective. Together they develop action plans where they set objectives and expected results, list tasks and discuss programmatic options. Actions are not structurally formalised, responsibilities are informal, but each group choses a leader that coordinates the workflow and the sessions. The implementation of action plans depends on the interest and effective will of the stakeholders that voluntarily gathered in the working groups. Partnership is informal, dependent on the will and trust established across the individuals as well as with the ROBUST team. Participation is open and free.

Regular working sessions provide engagement moments for the co-construction processes to produce knowledge. Relevant is that participants understand and perceive the process and the sessions as "safe space" for open sharing, without a hierarchy or judgement by the group. There is also a common understanding that the knowledge co-created in the group generates opportunities for an increased capacity to influence the decision-making process.

The following sections address developments carried out in Step 3–"Experiencing" based on the URDyLAB arrangement shaping a collaborative laboratory of experimental practices in the Working Group on "Metropolitan Green Infrastructures". As described, multiple actors gathered, from academic GI experts to a variety of practice partners notably from the local governments of the Lisbon Metropolitan Area.

8.3 The Co-construction Process Towards an ESS-based Metropolitan Green Infrastructure

8.3.1 Methodology

Based on the URDyLAB arrangement a collaborative process was initiated. It involved a group of stakeholders from different institutional contexts, whose daily activities are related to the planning or management of green infrastructure. This group included municipalities, central government agencies and the Metropolitan

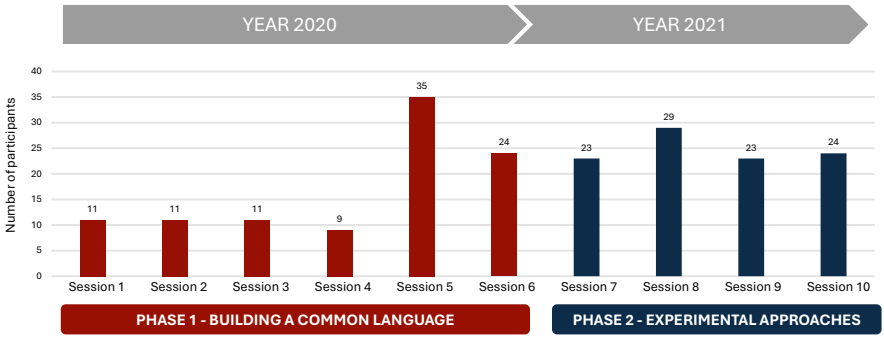

Fig. 8.3 Participation dynamics—number of participants in each working session

Area of Lisbon administration. This working group was coordinated by the municipality of Setúbal.

Ten participatory sessions/meetings were organised with the stakeholders between July 2020 and November 2021. These were held virtually (via ZOOM), due to the COVID-19 pandemic. From the 18 municipalities invited which deal with local green infrastructure, 16 responded and participated in multiple meetings. The scientific partner IST, establishing a partnership with NOVA School of Science and Technology (FCT-NOVA) for this working group, had a supporting role, assisting leading local stakeholders by suggesting methodologies, organisation of sessions on demand, synthesising contributions and participating in discussions. In this role, the scientific partners were able to test their theoretical knowledge base by confronting concepts with on-the-ground applications. Each Session lasted for approximately 3 hours.

The ten work sessions were structured in two phases: Phase 1—Building a common language, and Phase 2—Experimental approaches (Fig. 8.3).

8.3.2 Phase 1—Building a Common Language

Phase 1 covered 6 sessions, starting July 2020. The first 4 sessions were focused on sharing individual experiences, structuring the problem, and devising an action plan. The last 2 sessions were centred on a literacy workshop.

The presentation of the municipal green infrastructure plans of Setúbal, Palmela, Almada, Lisbon and Mafra revealed a wide spectrum of methodologies being used. Whereas Setúbal and Almada used the ESS concept, the municipalities of Palmela and Mafra used solely the existing legal instruments (e.g., legally protected areas). In the case of the municipality of Lisbon, although it does not explicitly refer to the ecosystem services approach, the local GI plan is nevertheless structured according to benefits from biodiversity to people, as habitat and climate change mitigation/adaptation.

By plotting these multiple municipal GIs on a common map, the mismatch became visible. This reinforced the initial Living Lab objective focused on the urgency of developing a metropolitan green infrastructure providing ecosystem services as the foundation for an ecologically based planning model in the Lisbon Metropolitan Area.

A short survey gauged the familiarity of the participant with the ESS concept. This showed that only 28% of participants were familiar with the concept and definition of ESS, while almost 70% had never worked with the concept, even though most intended to work with ESS or using an ESS approach in the future.

There was a common understanding that the levels of knowledge on ecosystem services among participants were uneven. Although being a broadly familiar concept, it was still very ambiguous, notably in relation to executing the GI planning process.

These findings explained the difficulties experienced by participants in applying the Burkard et al. (2009) matrix, assessing it against a set 20 ESS (Table 8.1).

Following the initial assessment within the group, the action plan was structured accordingly:

1. Promoting literacy on the ecosystem service concept;
2. Defining a methodology for conceptualising green infrastructure at a metropolitan scale valuing local expertise;
3. Developing a collaborative mapping of metropolitan ecosystem services;
4. Defining a management and financing model for metropolitan green infrastructure that takes into account ecosystem services.

Phase 1 was finalised in a "ESS literacy workshop" taking place in the two last sessions (5 and 6). The aim was to systematically approach the ESS concept by providing information and applying it. It was led by the members from the participating universities. After exposing the concept in detail, a survey among participants led to a selection of the five most relevant services for the territory of the metropolitan area: "tourism and leisure", "regulation of water flows", "availability of water", "food" and "climate regulation".

Table 8.1 Set of Ecosystem services explored in sessions based on the Millennium Ecosystem Assessment classification

Provision	Regulation	Supporting	Cultural
Food Fresh water supply Raw materials Genetic resources Medicinal resources Ornament resources	Air regulation Noise reduction Climate regulation Extreme events moderation Water regulation Waste treatment Nutrient cycling Erosion control Pollination Biological control	Life cycle maintenance Genetic diversity	Aesthetic information Recreation and tourism Art and design inspiration Spiritual experience Cognitive development

In an exercise, each participant was asked to locate 3 of the 5 most relevant ecosystem services chosen in an area of the metropolitan Lisbon of their choice. The second session of the workshop was structured around the presentation and discussion by participants of the exercise results.

The workshop proved to be pivotal to capture the interest of participants (peak of 35) and it raised the level of participation from around 10 before to over 20 after the workshop (Fig. 8.3). It also improved self-efficacy, meaning improving the confidence in themselves to be able to apply the methodology, and ultimately, improving also the commitment of those involved in the process.

8.3.3 Phase 2—Experimental Approaches

This phase covered the four sessions (7 to 10) starting in February 2021. It focused on mapping of ESS through the operationalization of the ESS concept. It was structured as an iterative process of design, experimentation, feedback, discussion, and refinement.

Methodologically, the Burkard matrix was adopted and adapted. The Portuguese land cover map, available as a free download, was used (COS2018) (https://www.dgterritorio.gov.pt) and, for methodological purposes, restricted to the five selected ESS. The discussions were principally focused on two intertwined issues: how to use expert judgement and what is the most suitable scale for mapping the ESS in the metropolitan area?

Expertise and confidence

Even though the original matrix approach (Burkhard et al., 2009) is typically used by scientific experts for the ESS assessment, in this case it was decided to use the broad concept of expert practitioners in the process (see Drescher et al., 2013) by tapping into local knowledge and mobilising expert practitioners.

These expert practitioners were those participating in the URDyLAB and other small groups from the same functional areas of the regular participants, typically from the urban planning and environment departments within the municipal councils.

Use of Burkhard's matrix was frequently reported by these expert practitioners as challenging to navigate due to the abstraction and subjectivity in the matrix approach and therefore also very time-consuming. The matrix approach was developed by Burkhard and colleagues to deal also with situations where there is a lack of structured quantitative information on ecosystem services. The expert practitioners found it hard to embrace the application of their knowledge in this way. Thus, it was found useful to position this methodology into a wider context, where the qualitative expert-based approach was only the initial stage in the process as proposed in the tiered approach framework adapted from Grêt-Regamay et al. (2015) (Fig. 8.4).

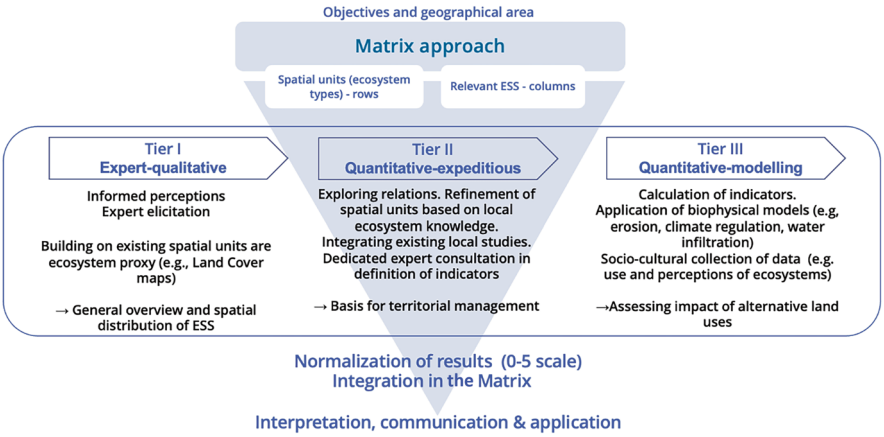

Fig. 8.4 Adaptation of the tiered approach by Grêt-Regamay et al. (2015) to the matrix approach used in the working group

To cope with the perceived subjectivity, participants were asked to fill in a "Confidence Matrix" (Campagne & Roche, 2018; Maranha, 2022). This matrix was used to weight the scorings of participants. Maranha (2022) found that the greatest difficulties in completing the matrix were related to the "artificial surfaces" (using the CORINE land cover terminology), and in particular in mapping the cultural ecosystem services.

Scale—local vs regional

The assumption that using a unified methodology based on ESS would ensure *per se* the coherence in the resulting map at the metropolitan scale was proven wrong. It became evident that the assessment was carried out in a comparative way in each municipality, meaning, each municipality scored highest "best performing" land cover class in terms of the ecosystem services present in their territory, resulting in a rated score of 5 on the 0–5 scale in the Burkhard matrix. In fact, these locally very relevant ecosystem services could actually be less relevant at a regional scale. For example, the ecosystem services provided by the urban forest in the centre of city of Lisbon is very relevant for the well-being of the inhabitants of Lisbon, but the ecosystem services it provides are expected to be less relevant when compared to those of a Mediterranean woodland in the Natura 2000 site of Arrábida that is classified as being of European relevance located further south in the metropolitan area in the municipalities of Setúbal, Palmela and Sesimbra.

To understand the consequences of these two approaches to ratings on the ESS mapping for the metropolitan area, the municipality of Palmela carried out the assessment using both local relevance and regional relevance. The two matrices were plotted producing two maps (Fig. 8.5). The comparative observation of the two maps shows that when judging against the ecosystems present, the municipality ratings are higher than when rating them against the wider range of the ecosystems present in the metropolitan area. Realising this kind of bias, not been found

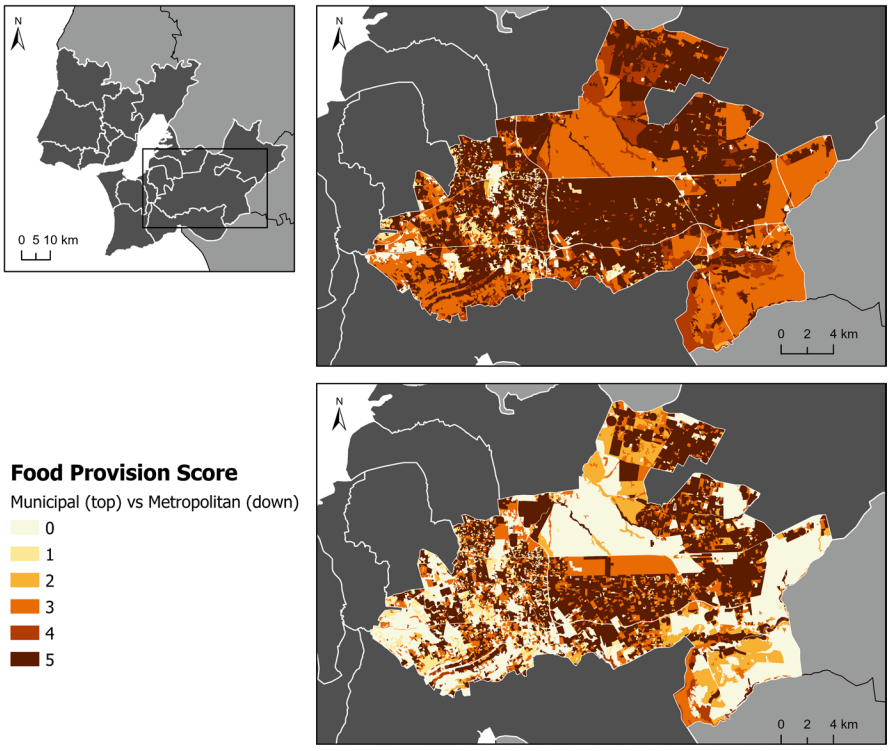

Fig. 8.5 Municipal perspective (top) versus Metropolitan perspective (down) using the example of ESS "Food provision" in Palmela

referenced in literature before, proved relevant for structuring progress towards a metropolitan map.

After this discussion, the refinement process focused on introducing a "value" to local expertise and revisiting the method of integration of the matrixes by introducing a weighting procedure.

To take best advantage of local expertise to inform the metropolitan mapping, it was decided that each participant should focus on the relevance of the ESS in their municipality.

Local expertise was also applied in the integration method of the matrixes, as the scores of the land cover classes of each municipality were weighted according to the proportion of that land cover present in the municipality. The relative land area was used rather than the absolute land area in order to include the expertise of smaller municipalities, meaning that when 2 municipalities have 10 km^2 of dunes but in one this represents 10% the total area, the scoring would be weighted more than if dune cover represent 1% of the municipality's' total area.

After the participants (10 of the 18 MAL municipalities) completed the review of the matrix, a combined map was plotted in a patchwork style where starkly contrasting scoring became evident at the municipality borders generating territorial

discontinuities (Fig. 8.6). This led to revisiting both the technical specifications of the land cover map and the definition of each ESS according to the CICES classification. This situation led some participants to engage in bilateral meetings to agree on a common understanding of the ESS produced in the shared land cover classes and to standardise their classification criteria.

After the individual mapping, discussion shifted to the best statistical methods for integration of the information provided in the 10 matrixes. The intention was to produce a single matrix that enabled the mapping of the totality of the metropolitan territory, creating a generalised map of MAL avoiding territorial discontinuities across administrative boundaries.

The normalisation of the results used the following statistical processes:

1. **Median** by arranging the values in order of magnitude;
2. **Average weighted by the representativeness** of land cover classes in each municipality;
3. **Average weighted by the degree of confidence** in scoring.

All methods were plotted resulting in 3 maps (Fig. 8.7).

To assess the results of the 3 normalisation procedures, participants were asked to validate the classification for their own municipality. From the discussion it was concluded that the majority of participants were most satisfied with the results obtained with the application of the median.

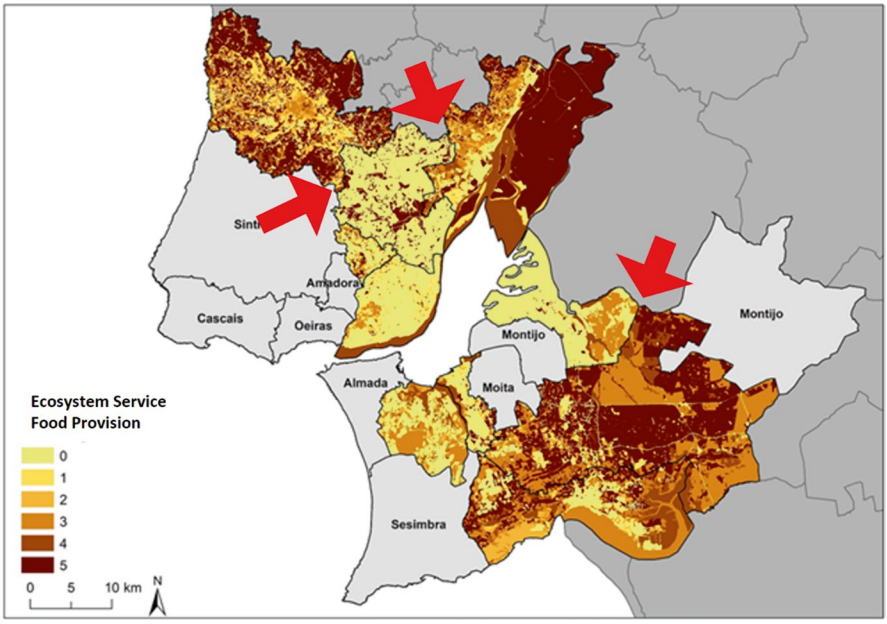

Fig. 8.6 Joined plotting of the ESS "Food provision" based on the scoring carried out by the municipalities (red arrows indicate examples of discontinuities)

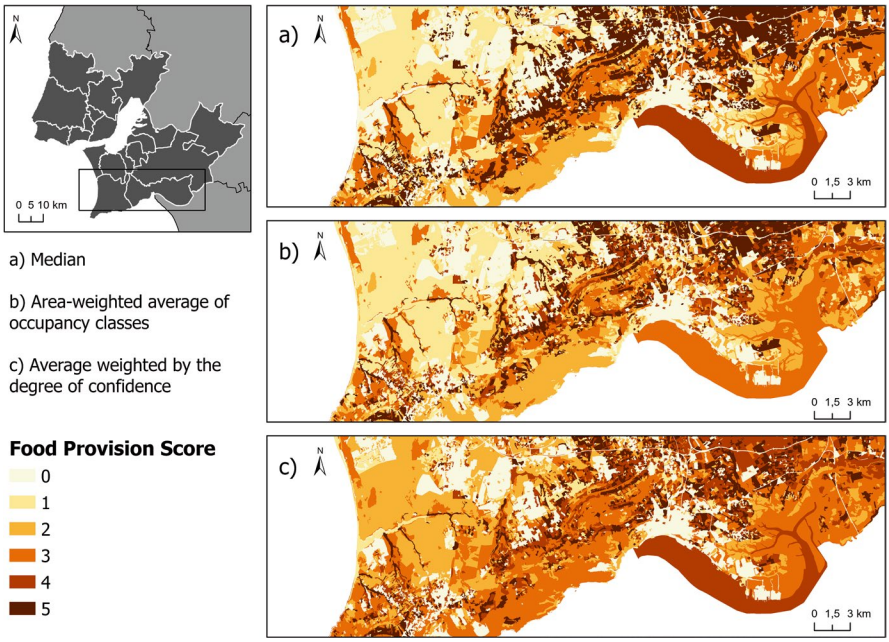

Fig. 8.7 Normalisation of results for ESS "Food provision" at the southern edge of the Metropolitan area—focus on Setúbal municipality: (**a**) median, (**b**) area-weighted average of occupancy classes, and (**c**) average weighted by the degree of confidence

Based on this information, a final ESS map was produced (October 2021) based on a systematisation procedure, with statistical and cartographic treatment, having in mind to identify ecosystem services hubs that would act as anchors for the development of metropolitan green infrastructure.

To synthesize and assess the work developed in the Lisbon Living Lab, it was decided to superimpose the produced ESS map for the metropolitan area on the existing Metropolitan Ecological Network of the Regional Land Use Plan for the Metropolitan Area of Lisbon. The concept of "ecosystem service hub" was introduced to identify areas where there was a concentration of high value ESS (Fig. 8.8). In general, it was found that, spatially, the Metropolitan Ecological Network is coherent with the ecosystem service hubs, meaning that it is well defined at regional scale, that the missing coherence needs to be resolved when it is implemented at local scale. In terms of focus, the participants found that the existing Metropolitan Ecological Network has a monofunctional character, focused on the supporting services, unlike the metropolitan green infrastructure they desired, which should be multifunctional, articulating various ecosystem services.

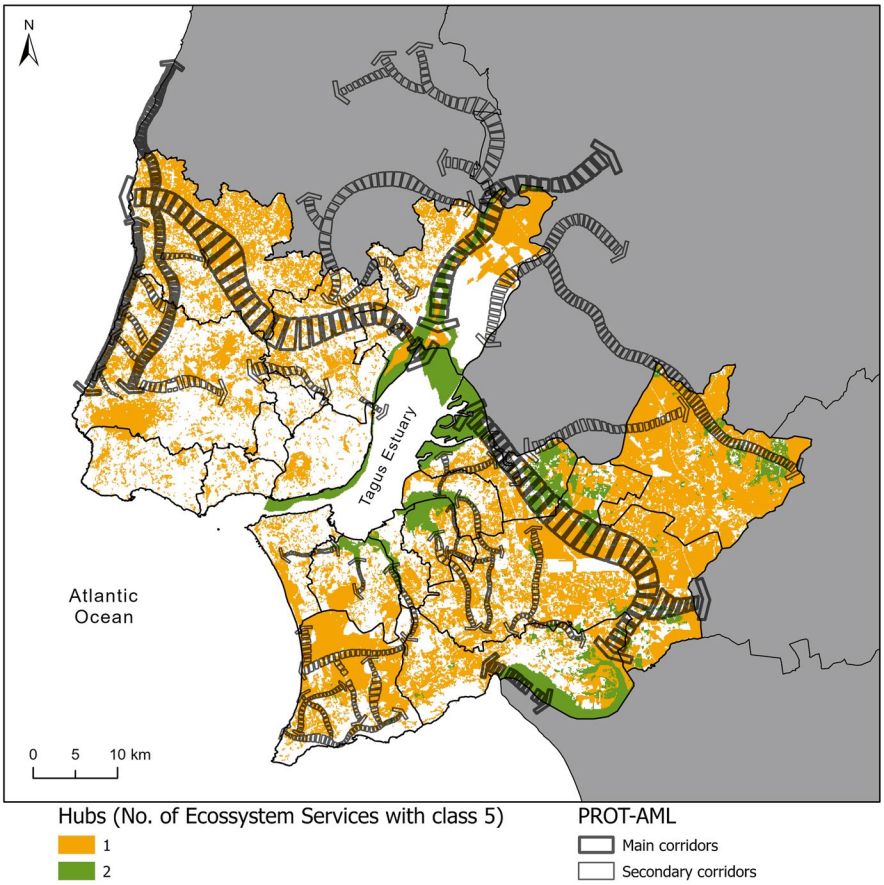

Fig. 8.8 Network superimposed on the Ecosystem Services Hubs

8.3.4 Concluding the Process

The process was concluded in November 2021. Although the Living Lab did not achieve its main objective, which was the development of a unified understanding/concept of metropolitan green infrastructure, it was acknowledged that the objective was too ambitious to be achieved within the scope of the ROBUST project. This was notably so because most of the time was used to make progress on the co-learning process on the ecosystem concept and application. Some participants expressed their frustration not to have achieved the objective. Interest and intention to continue the process was expressed. However, no concrete commitment of participants was made towards a new governance model that could take this process beyond the term of the project, particularly after the withdrawal of the catalysing role played by the research partners. But it was also acknowledged by the participants that the final ESS map would prove useful both for the regional authorities (CCDRLVT) when

starting the revision process of their strategic plan, and for the municipalities to use as guidance to ensure continuity of the local green infrastructures across administrative boundaries.

8.4 Discussion

8.4.1 Evaluation of the Living Lab Process

The evaluation of the performance of a Living Lab is described by Beaudoin et al. (2022) as the "act of assessing the process and outcomes, and effectiveness as the level to which a living lab is successful in achieving a certain desirable process or outcome". Both Ståhlbröst (2012) and Vervoort (2022) refer to "impact" of the Living Lab on the innovation process and its participants, disentangling 5 types: "internal impact"—as in the process of sharing among participants; "societal impact"—associated to external behaviour changes leveraged by the Living Lab, "economic impact"—referring to profits arising from the innovation process, "environmental impact"—related to the improvement of environmental quality by putting the innovation to use, and "regulatory impact"—meaning, the influence that the innovation process has on defining public policies and norms.

To capture the perceptions of participants on the impact of the Working Group "Metropolitan Green Infrastructure" in the Lisbon Living Lab, interviews were carried out with 10 participants from 7 municipalities (April–May 2021) and a discussion was held during the final session (session 10—November 2021). The participant interviews were structured around 4 main themes: motivation of enrollment in the working group, understanding of concepts and methods on ESS mapping, integration of ESS in territorial planning, and governance of the metropolitan green infrastructure. Interview results show that:

Motivational aspects of enrolment in the Living Lab were fourfold: (1) "being invited", as "being counted", relevant in a regional context and in an international project, (2) the "instrumental value" of participation associated to the potential usefulness of the ESS concept to tackle issues in the ongoing planning process (i.e. revision of the municipal master plans), (3) the "relevance of the objective" related to a common understanding of the relevance to progress towards an EES map for the metropolitan area to inform the revision of the Metropolitan Green Infrastructure Strategic Plan, and (4) the potential "communication value" of being able to foster intermunicipal relationships. The two latter are strongly focussed on the "value of spatial continuity" (connectivity) at metropolitan scale, both in GI planning and its future management.

None of the participants (except those representing the Setúbal municipality) had ever used the ESS concept or were knowledgeable of the Burkhard Matrix prior to joining the working group. Thus, the **understanding of concepts and methods on ESS mapping** was limited. This became evident during the exercise of ESS

assessment using the matrix in their territory. The difficulties mentioned were linked to lack of personnel knowledge on the ecosystems and their services. Eventually, participants called on colleagues from other departments, with different disciplinary backgrounds, and used auxiliary maps available. The confidence placed in their assessment was low concerning Cultural services (notably those related to aesthetics, cognitive development, and spiritual appreciation) and in some regulation services, such as soil fertility and genetic and medical resources. Confidence was also low in specific land cover classes as in urban areas and water bodies.

Concerning the role and potential of the **integration of ESS in territorial planning**, participants mentioned it was relevant in: (a) justifying their planning decisions on protection of areas from construction by demonstrating the value of the undeveloped territories (that are often neglected) and exposing its intrinsic value; (b) providing information for the creation of a more coherent network of green infrastructure and complementing the already existing legal instruments (e.g., nature conservation areas); and (c) promoting the implementation of the GI in an operational way if the payment for ESS should be put in place.

The question on **governance of the Metropolitan GI** aimed to better understand how the participants envisioned the follow-up of this working group for the development of a green infrastructure network from an organisational point of view. The interviewees agreed that (a) it needed the leadership of an institution at regional level, either CCDRLVT (the regional representative of the national government) or the AML (the regional association of municipalities of the LMA); and (b) that it should happen in a collaborative way to promote more interaction between municipalities and across the administrative boundaries. All participants referred to the constructive Living Lab experience to highlight opportunities for collaboration to improve Metropolitan GI.

Summing up, a high "**internal impact"** resulting from high levels of mutual learning in the Living Lab and the UrdyLab setting became evident. In addition, "**environmental and regulatory impact**" are expected to become visible in the short term as participants gained more knowledge on ecosystems and their services and showed interest to apply the ESS concept in making the regulatory plans (e.g. Municipal Master Plans). **"Societal and economic impact"** might become visible only after the implementation of the Green Infrastructures, with future assessments possibly shedding more light on these impacts in the Lisbon Living Lab.

8.4.2 Collaborative Green Infrastructure Planning

Based on the Lisbon Living Lab experience and the "ideal–typical transdisciplinary research process" by Lang et al. (2012), a model of Collaborative Green Infrastructure Planning was conceptualised in three phases through the interaction between science and practice, contributing to the process of GI planning and benefiting from a

transdisciplinary approach. The Lisbon LL experience demonstrated how researchers can act as catalysts of the process, facilitating the communication process between scientific knowledge and practical knowledge. Phase 1. "Co-creation of a common language" concentrates understanding and structuring the problem relating it to underlying theories and concepts. Phase 2—"Experimenting approaches" is centered upon the common exploration of methods for the operationalization of concepts in a way that suits the objective and flow of the planning process. Phase 3—"Implementing in territorial planning" is associated with the procedures towards on-ground implementation of the GI plan. Phase 3 was not achieved in the context of the LL during the duration of the ROBUST project.

Along the process the scientific realm gains insights on knowledge gaps that foster innovation in research and the practice realm builds up capacities for fostering more structured approaches to address the planning process in innovative ways (Fig. 8.9).

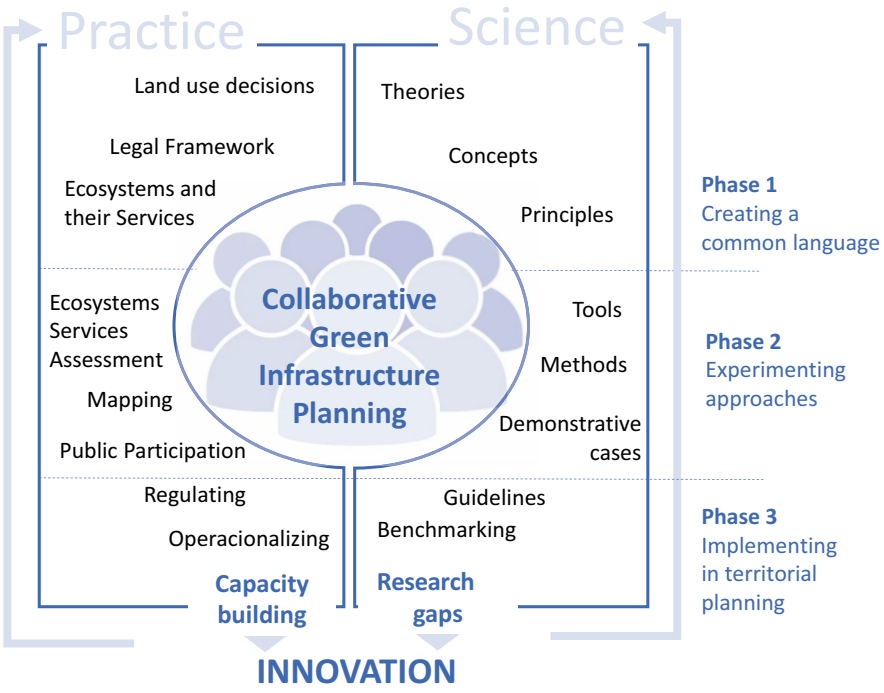

Fig. 8.9 Model of Collaborative Green Infrastructure Planning

8.5 Concluding Remarks

The Living Lab experience described in this chapter is unique in its features, development and outcomes. It represents an open and flexible learning process, engaging multiple actors and perspectives, bringing innovation into the heart of local planning practices, driven by a mix of academic and practice efforts that despite some abstraction, raising questions about real-life problems.

The fact that most of the project ran through the duration of the pandemic was challenging. But the availability of participants was also higher to engage in experimental processes as for governance innovation. It was easier to meet online, which was an important motivation. There was also greater enthusiasm to learn new things and to develop activities that were more innovative, as if the limitations imposed by the pandemic needed to somehow be compensated.

The lack of knowledge and experience with the concept of ecosystem services was to some extent a restriction to the learning process. Many participants from different municipalities were concerned that lack of data and unclear methods would increase subjectivity in interpretation, a problem that was minimised with the several opportunities to discuss, learn and apply. Even so, not all municipalities involved attempted to explore the implementation of the concept of ecosystem services through the land cover maps in their own territories.

The nature of the exercise also enabled the combination of multiple scales and the comparison between individual municipal and collective regional understandings of ESS functions and values. This enhanced the recognition of the different meanings on the role of green infrastructures to enable ecosystem services between local and regional scales, how rural-urban linkages could be improved and how innovative governance arrangements could contribute to achieve this aim. Ultimately, it enabled local level participants to recognize that biophysical processes in spatial planning could create additional value to the review process of their municipal master plans. Not only could they recognise the connection with the regional requirements for an ecological structure, such as the sharing of experiences across the various municipalities, and the development of a common language, they also enhanced their trust and capacities to address ecosystem services in spatial planning processes.

These findings are promising in that they reveal a role for experimental governance in creating new structures, connecting regional and local levels with new interchangeable dynamics that largely go beyond the limited bureaucratic and legalistic relationships across municipalities and with the regional, and even national, levels of authority.

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Chapter 9
Multi-local Living and Cultural Ecosystem Services

Thomas Dax, Olli Lehtonen, Toivo Muilu, Ulla Ovaska, Mikko Weckroth, and Hilkka Vihinen

Abstract This chapter examines multi-local living (MLL) as a form of rural-urban interaction. The development of MLL is described in Austria and Finland where MLL and second homes in rural areas are common phenomena, but from different cultural backgrounds and for somewhat historically different reasons. In both countries, MLL is connected to cultural ecosystem services (CES). However, the dominant types of CES and the types of activities differ, as they build on diverging ecological foundations. The recent effects of COVID-19 on multi-locality are also discussed in both countries. The pandemic emerged as a new driver of MLL but also as a challenge linked to social and spatial justice aspects, raising questions about who are the beneficiaries of CES.

Keywords Multi-local living · Rural-urban interaction · Cultural ecosystem services · Austria · Finland

9.1 Introduction

In this chapter, we discuss multi-local living (MLL) as a form of rural-urban interaction. In particular, MLL flows can produce positive ecosystem services (ESS) outcomes, especially in the cultural sphere. Rural-urban multi-local living adds to experienced well-being in many ways: it offers spatial flexibility of work location,

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M. R. Partidario et al. (eds.), *Role of Ecosystem Services in Enabling Rural-Urban Synergies*, Landscape Series 20, https://doi.org/10.1007/978-3-031-98153-1_9

mobility in service provision and spatial behaviour, and access to outdoor recreation in nature. The development and present situation of multi-local living is described in Austria and Finland where multi-local living and second homes in rural areas are common phenomena, but for somewhat historically different reasons.

Second homes can be found commonly in countries that have major tourist amenities and in countries with extensive territory, low population density and late urbanisation (Kowalczyk, 1994, as cited in Vágner et al., 2011). Countries with many small rural landholders are expected to create a higher number of second homes (Vágner et al., 2011). As a case in point, Finland is a sparsely populated country where land ownership is quite scattered. Historically, this is mainly due to a series of land reforms during the twentieth century, the last round of which—unlike in the rest of the Nordic countries—took place as late as after World War II (Jussila, 1972). Inheritance practices have partly added to the access to second homes. There is plenty of lake, sea and river shoreline in the country, and people that have backgrounds in rural areas may inherit plots of land on which they build a summer cottage in farm estate distribution (see e.g. Kupiainen, 2007). Many Finns own parcels of rural land, even when living in cities. A piece of land at the lakeside has long been accessible. According to the most recent Free-time resident barometer (Voutilainen et al., 2021) as well as Adamiak et al. (2015) survey, second home owners' income is equivalent to the average income in Finland.

In Austria, respectively, many urban people still maintain a family house in a village, even over long distances. Moreover, adherence to rural and remote places remains current. This cannot only be viewed through clinging to land ownership and family premises in the countryside, but also through the long-term tradition of commuting to regional and increasingly distant urban agglomeration centres. The rising commuting reality contributed to linkages between rural and urban systems, but also put a strain on this lifestyle. Due to the differences in the ecological foundations, multi-local living in Finland takes mostly place by the water (lake, sea or river), whereas in large parts of Austria the cultural ecosystem services linked to MLL are mountains and remote regions.

Cultural ecosystem services (CES) "cover all the non-material, and normally non-extractive, outputs of ecosystems that affect physical and mental states of people" (Haines-Young & Postchin, 2012). CES include spiritual enrichment, cognitive development, reflection, recreation, aspects related to the existence of a healthy ecosystem and aesthetic experiences (e.g. CICES, 2018; MEA, 2005). The CES concept extends the understanding of human–nature relationships and the ways in which people behave in the environment (Baulcomb et al., 2015; Flint et al., 2013). Rather than considering CES as products of nature that people utilise for a particular benefit to well-being, CES can be seen as a broader entity: a combination of environmental spaces, cultural practices and the benefits that result from the processes of interacting with nature (Fish et al., 2016). This interaction process can happen in different locations so at its simplest, MLL shifts demand for ecosystem services.

Studies have listed motives for second home ownership over and above financial investment, including respite from everyday life, experience of informality and relaxed lifestyle, a return to nature, ideologies about rurality, or an expression of

personal identity (see e.g. Bjerke et al., 2006; Vágner et al., 2011). Motives for multi-local living relate to the use of CES (Strandell & Hall, 2015; Pitkänen et al., 2020). CES can be viewed as the intangible benefits obtained from ecosystems, and the inclusion of these aspects in understanding motivation for MLL and for shifts in spatial movements is central. These might include aesthetic value, spiritual inspiration, feelings of belonging, sense of home and identity, whereby all of these might be related to and nurtured by the specific natural environment (Milcu et al., 2013). The motives to spend time in the countryside may refer to interest in subsistence activities, including hunting, fishing, and gathering wild and home-grown products, which have been connected to rural lifestyles (e.g. Pouta et al., 2006). In Pitkänen and Kokki's (2005) study, opportunities for fishing as well as picking berries and mushrooms were important motives for recreational home use in Finland.

Residential environment is a motive for multi-local living and the denser the residential area, the more people use second homes, highlighting the abilities of some rural areas to compensate for the lack of CES experienced in urban environments (Strandell & Hall, 2015). In fact, research on second home usage has indicated that common motives of second home use are escape from everyday urban life, relaxation and contact with nature (Hall & Müller, 2004), which extends the motives of multi-local living to include ecosystem services in general. Research also highlights that rural second homes have a high potential to provide health and well-being benefits associated with an increased connection with nature (Pitkänen et al., 2020).

Research evaluating the impacts of multi-local living on the use of CES is limited. This is surprising as the increasing popularity of multi-local living has undermined the ability of population statistics to describe the distribution of the population in urban and rural areas. People are spending more time in different areas than they have been assumed to in permanent population statistics (Lehtonen & Vihinen, 2020). This challenges the resource allocation for restoration and maintaining of the CES as people are active in different areas than assumed.

In this chapter, we compare how multi-local living is evolving in Austria and Finland, and in relation to some unexpected societal changes such as COVID-19. We assume that CES function as a pulling or pushing factor in these changes, affecting mobility flows between urban and rural areas. However, we do not argue that being 'in nature' is the only reason for using a second home or engaging in MLL; social reasons often dominate accounts of motives (see e.g. Coppock, 1977; Hall & Müller, 2018).

The chapter is based on several sources and methods. In the ROBUST project, we co-developed rural-urban interaction in workshops with multiple actors in our Living Labs. In addition, we have simultaneously studied multi-local living in other projects, which are based on statistically representative surveys among the population in Finland, utilising qualitative attitude analysis, namely the Free-Time Residence Barometer and the Rural Barometer. Furthermore, we use population dynamics described by monitoring mobile phone activity data, which reports the number of people staying in the area over a night. This information is based on mobile tracking data that is fully anonymized to maintain privacy and it reveals how many people live, on average, per month, in grid cells.

In Austria, data sources are limited to census data on secondary homes and registration of dwellings as 'main' or 'supplementary' dwellings that are available at the municipal, i.e. lowest administrative level. Moreover, we base our argumentation on literature from both countries and beyond.

The chapter proceeds in four sections. Following this introduction, the key concepts are presented. The third section compares recent developments of multilocality in Austria and Finland. Cellular analysis is used to illustrate the scope of MLL in areas with abundant CES assets. Moreover, the effects of COVID-19 on MLL will be discussed in both countries. Concluding remarks are made in the fourth section.

9.2 Multi-local Living and Cultural Ecosystem Services

Multi-local living is an example of rural-urban interaction at a distance, heavily motivated by the CES rural areas offer. Distance indicates concrete kilometres (km): MLL connects urban and rural places which are not always adjacent. According to the most recent Free-Time Residence Barometer, the average distance between the first and second homes in Finland is 108 km; in the case of the capital area province it is even further, on average 167 km (Voutilainen et al., 2021, 3). Simultaneously, increasing mobility and digitization have made it possible for substantial numbers of people to live and work more place-independently, which has increased the impact of multi-locality on the use of areas and their population dynamics. In addition, the experiences of the COVID-19 pandemic, including lock-downs, home-working and urban flight have brought the popularity of rural areas into strong focus.

Cultural ecosystem services relevant from the MLL perspective include using the environment for sport and recreation and using nature to help stay fit. The physical environment can be experienced actively or passively, thus watching plants and animals where they live and enjoying the beauty of nature contribute to using nature to de-stress. Moreover, things in nature that help people identify with the history or culture of where they live or come from, i.e. the spiritual importance of nature, constitutes important CES for multi-local living. Essential CES are also those things in nature that we think should be conserved for future generations to enjoy or use, and those elements that are esteemed important by others and valuable for future generations. (CICEC, 2018.)

In its simplest definition, MLL means that a person, or family, has more than one residence or place to stay for an extended period (Lehtonen et al., 2019). It can be roughly divided into job- or housing-related contexts, depending on the main motive for being multi-local. In addition, one may act multi-locally because of hobbies, property ownerships or caring of family-members living further away. As well as such voluntary arrangements, multi-locality may also be involuntary, for example in some cases of custodial accommodation when the place of residence is different e.g. during the work week and the weekend. Job-related multi-locality refers to situations when people work in multiple places (such as home, second home, cafés, coffee-shops, co-working spaces and public libraries) (see e.g. Lapintie et al., 2018).

Commuting can also be included as a form of multi-local working—however, multi-locality can also be an alternative to commuting. Essential for the definition of multi-locality is that it takes place regularly, and in the case of MLL it requires an overnight stay (Rannanpää et al., 2022).

In search of a definition for residential multi-locality, Weichhart (2015, p. 62) outlines a range of options to assess multi-local practices as a 'highly complex and multifaceted phenomenon'. As a sub-set of multi-locality, it implies a 'multi-local practice of life, meaning simultaneous availability of two or more residences at different places' (ibid., p. 63). In search of assembling different spatial characteristics and functions the alternating use of different types of places is of particular interest. The spatial concentration processes (see e.g. Soininvaara, 2020) that cause the growth and consolidation of towns and cities also strengthen mutual dependence between rural and urban spaces. This affects multi-locality patterns combining contrasting spatial units of urban and rural life.

It has been estimated that half of the population of the Nordic countries has access to a second home, and these are increasingly used year-round. Hence, instead of making permanent moves, people increasingly opt for sharing their lives between an urban official residence and a rural second home (Adamiak et al., 2015). Officially, in the Nordic countries, statistics on registered populations show the continuity of the population concentration in urban areas (Adamiak et al., 2016), which ignores emerging interest in counter-urbanization (Adamiak et al., 2015). Multi-locality is a common phenomenon also in many other European countries. For example, the increasing use of more than one dwelling by individuals and households in Austria recalls the fact that multi-local behaviour has significant historical precedents.

People have several reasons for living in multiple locations in order to best satisfy their everyday needs (Weichhart, 2015). All geographical locations do not necessarily provide the set of wished-for and satisfying goods and services. In addition to the residential mobility that has characterised our contemporary society already for some decades (Hanson, 2005), our ways of working and performing daily activities have become more flexible, radically transformed by the development of the Internet and advance of mobile and virtual digital services.

9.3 Multi-locality Development in Austria and Finland

9.3.1 Recent Surge in Multi-local Living in Austria

In contrast to common assumptions of a clear and unique linking of people to space, observations of combinations of various housing arrangements can be traced back in the past, particularly in the context of Austrian regions (Scannell & Gifford, 2010). Employment concentration and the rise of job availability in the period of industrialization since the late nineteenth century created a strong push towards large cities, although rising access and transport facilities did not necessarily result in a permanent relocation of workers from the countryside to the city. Particularly

with the increase of mobility over the twentieth century, an intensive spatial exchange developed along a widespread commuting pattern, above all in the eastern part of the country. Simultaneously, with the advent of tourism, mountain regions (of Austria, but in general over the entire Alpine range) were promoted as attractive landscapes and were widely ascribed a predominant function as recreational spaces. In particular, out-migrants from rural areas as well as wealthy urban people increasingly sought to retain or acquire dwelling facilities in those areas. From the start of this upsurge in the popularity of the recreational countryside, mountains and other rural regions in Austria were hence characterised by high proportions of "second homes" (ÖROK, 1987; SIR, 1995) with challenges acknowledged besides the benefits for individuals and households using them.

9.3.1.1 Socio-cultural Background to Retaining Linkages to Rural Spaces

With rural out-migration towards small regional centres, provincial cities and metropolises, large shares of former rural populations found their main place of residence and life in urban contexts. However, many people retain their linkages to place of "origin" or keep the legacy to family bonds in rural regions, e.g. through a second home. Others seek to find expressively a home for weekends or for recreation purposes in a surrounding that abounds in natural assets, cultural specificities or other personally valued attractions. In particular, mountain regions reveal a rich set of examples where "urbanites" approach those aspects, intimately linked to topography, landscape, space, emptiness and generally a set of desired natural resources (Moss, 2006). This spatial phenomenon is particularly visible in remote municipalities with high attractiveness for tourism purposes and a specific recognition for a "culture" of second residences and/or mountain touristic appeal. Levels of second homes are thus elevated throughout the western part of Austria where a significant intensity of tourism prevails and in specific climatic health resorts in other parts of Austria that are long-renowned for accepting incoming tourists. The official figures attain a level of second home residences in some administrative districts of about 25% (e.g. Zell/See, Horn, Gmünd), and in some municipalities even up to 100% (Bad Kleinkirchheim, Semmering, Attersee am Attersee, Nussdorf am Attersee, Saalbach-Hinterglemm and Lech). This means that there are more second home owners than permanent local residents.

At the same time, it should be noted that due to definition and registering grey areas these statistics don't include all cases of multi-locality, for example if not all persons from a household are registered at all of their diverse residences. In particular, the divergence between personal statistics of main and secondary residence and households, i.e. dwellings attributed to one of the two groups underpins this problem for fully grasping the scope of multi-locality. The example of the figures for the case study of the "Living Lab" Graz in the H2020 project ROBUST reveals this divergence. Statistics for second homes (at personal level) are much lower than second home shares due to a count of used residences in this area. Table 9.1 compares the shares in individual selected municipalities for the two indicators and highlights the strong incidence for some (small areas).

Table 9.1 Second home registration and second home residences (in % of total number of inhabitants, respectively residences in selected municipalities of LL Graz

Muncipality/area	Second home registration	Second home residence
City of Graz	15.6	15.0
District Graz-Umgebung	7.8	12.0
District Voitsberg	6.9	17.0
Laßnitzhöhe	16.3	15.0
St. Radegund	12.8	24.0
Semriach	12.5	21.0
Stattegg	12.5	14.0
Hirschegg-Pack	12.0	43.0
Krottendorf-Gaisfeld	2.7	15.0
Stallhofen	3.1	11.0
Werndorf	3.9	6.0
Söding—St. Johann	4.0	10.0

Source: Statistics Austria (2022), Similo data (2020)

The much higher level of second home residences implies a much stronger incidence of the issue than indicated by personal registers. This also points to the unreliability in measuring numbers of persons involved in multi-local activities. As the registration of residence in Austria is only compulsory for "main dwellings" other dwellings are severely underreported. Underestimation includes additional members of households, since in general only one or two members of households register at the second home place, with no strict prescription for registering all residences available, no reporting on other forms of uses of residences (in renting apartments in touristic facilities or other forms of occasional use of residences), and very limited grasp of non-Austrian residents, i.e. residents from abroad who own second homes in Austria. The problem seems to exist throughout the Alps and is particularly discussed in attempts to limit second housing trends in Switzerland (Schad et al., 2015) but also in Austrian provinces, including Tyrol and Salzburg. In recent years an exceptional boom could be observed where investors "developed" chalet-villages throughout the Alps in order to be able to sell/rent apartments (similar to second home ownership) avoiding the increasingly restrictive regulations on second homes (Metler, 2021). On the other hand, this "commodification" of natural areas in the Alps is propagated as "safe investment" but has tremendous effects on land use and includes negative ecological impacts (Hilber & Schöni, 2018).

The spatial unevenness of the indicator can be seen from Fig. 9.1, presenting shares of second homes in municipalities of Styria, in south-eastern Austria. Most locations with good accessibility to the city of Graz show very low levels of second homes as people there prefer daily commuting to their workplaces, while more remote areas in the mountain regions of Styria show a high incidence of second homes. Moreover, locations are selected on the basis of available CES and contributions to life quality. This is also true to the edges of the LL Graz which extend into the mountains.

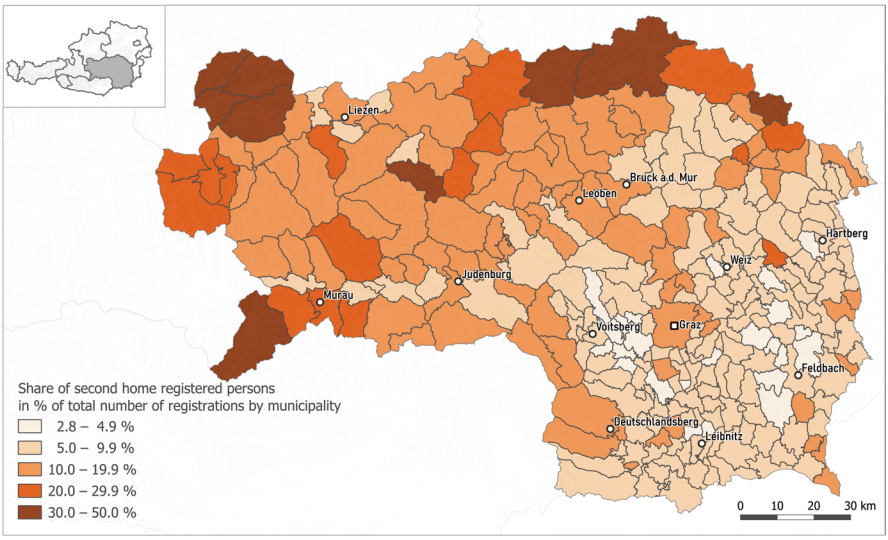

Fig. 9.1 Share of second home registered persons in municipalities in the province of Styria (Data source: Bundesamt für Eich und Vermessungswesen (BEV) 2022, Statistics Austria, 2022; design by BAB 2022)

9.3.1.2 Main Divergent Features and Types of Multi-locality

Due to the various features of multi-locality we can observe that the underlying housing arrangements of households and individuals might be very different. In the context of the ROBUST case study and in general in Austrian regions two predominant drivers have influenced spatial processes throughout at least the last five decades:

- The strong linkages of rural population to their 'place of origin' led to a continuous increase of commuting patterns, particularly in the second half of the twentieth century when employment increasingly concentrated in and around urban centres. However, with improved traffic infrastructure (for private cars), rising gaps in housing prices and the narrative for 'rural lifestyles' adapted to family cycles, an expanding range of rural places became attractive to large shares of active population oscillating (daily or weekly) between place of work and place of home (Dax, 1999). While this group of households retains its place of home in its rural origin, many had to find arrangements for part-time dwellings near their place of employment (or education).
- For the second group, the opposite decisions can be observed. Those individuals and households moved their prime place of housing towards urban areas (or close to their employment locations), with many of them keeping housing in the countryside as second homes or as an "anchor" to their rural life. Regularity of use and integration into the local community might be very diverse, from weekly to rather sporadic visits.

These main forms of multi-locality are long-established mobility patterns in Austria, including a particular high share of the whole national population. Beyond the rural—urban linkages expressed in these employment related relationships, more and more an asset-oriented demand for places of recreation and leisure evolved and led to a steady increase of second homes (by nationals and foreigners) particularly in the mountain regions of Western Austria. There are several other factors which characterise and influence presence in the different parts of multi-local living (discussed by Duchêne-Lacroix, 2020) such as: rhythm of presence and absence in diverse locations; place-specificity of activities; motifs for selecting settlement, employment, education and other activities places, and combinations of activities; legal conditions and ownership of dwellings and settlement facilities; properties of settlement areas and locations of diverse activities, and their spatial distance and characterising differences.

9.3.2 Multi-local Living in Finland

Although moving to a summer villa at the lake or seaside was a habit among wealthier Finnish urban people already by the late nineteenth century, MLL has become more common during recent decades (Lehtonen et al., 2019). The biggest multi-local yet statistically opaque population group comprises residents of summer cottages, a seasonal population in rural areas. The number of summer residents has multiplied since the 1990s (Adamiak et al., 2016; Voutilainen et al., 2021) and it has been estimated that about 2.4 million out of the total of 5.5 million Finns regularly spend their time in rural areas (Adamiak et al., 2016; Mökkibarometri, 2016; Voutilainen et al., 2021). The second most common form of MLL is students living in two dwellings in Finland: the estimated number is 500,000 and their housing is focused on the urban areas, coinciding with most post-school education locations in Finland (Pitkänen & Strandell, 2018). MLL related to work is relatively rare although accurate statistics are not available. However, the statistical tax database records that deductible allowances for secondary accommodation for work were used by only 10,908 taxpayers (Finnish Tax Administration, 2022).

Significant ownership of mainly rural second homes and summer cottages increases the possibilities for nature experiences and recreation, as the second homes are most often in forest or agricultural environments and/or waterside shores. Moreover, most of the second homes are located outside rural community centres or villages and do not form any clear settlement structure as such (Hiltunen & Rehunen, 2014). The popularity of the seasonal rural re-location of the population is explained by the fact that positive images, such as nature, traditions, a pleasant environment, freedom and authenticity are strongly combined with the countryside and produce human well-being (Pyysiäinen & Vihinen, 2020). These factors are enabled and supported by recreation services open to everyone which, in Finland, are characterised as the ‘everyman’s right’. These rights essentially cover walking, skiing, and cycling freely in the countryside, as well as temporary camping, gathering wild

foods and flowers, fishing with a rod and line, and using water areas for boating and swimming for anyone living or staying in Finland. The scope of everyman's right is much wider in Finland compared to other countries and can be regarded as a cultural phenomenon (Finnish Ministry of the Environment, 2016).

9.3.2.1 Combining the Benefits of the Urban and the Rural for Increased Wellbeing

Rural-urban interaction is increasingly intertwined with increasing one's well-being through flexibility, increased mobility, and blurring borders between the urban and the rural. According to the Rural Barometer 2020, many Finns would prefer to live in a more rural environment than at present. With 40% in the age group of people aged 45–64 this wish is particularly high among older active people. However, among the same respondents, intentions to move to a more rural (15%) or urban environment (15%) is not high. A major change of place of permanent residence is thus not expected. Instead, multi-local living is increasingly implied (Pyysiäinen & Vihinen, 2020).

In 2020, approximately 20% of Finnish citizens considered themselves rural and 41% urban. A significant proportion of respondents, 37%, perceive themselves to be both rural and urban (so-called dual identity). Between 2009 and 2020, citizens' identities have become marginally more urban. The share of rural identity has slightly decreased compared to the previous Rural Barometer survey (2013), while the share of urban identity has slightly increased. The number of people experiencing a dual identity (both rural and urban) has remained notably stable (Pyysiäinen & Vihinen, 2020).

Multi-local people are likely to have an urban or dual rural and urban identity. The place of work and the place of residence are often located in the same municipality, but according to Statistics Finland (2019), 67% of free-time residence owners were out-of-towners in 2017. More and more Finns express a desire to have a place of free-time residence in the countryside in the future, to live and work full- or part-time in rural areas and to own property there. Currently, about 25% of urban dwellers spend 1–6 months every year in rural areas. Multi-locality works in both directions: almost 11% of rural dwellers spend annually at least 1 month in the centre, outskirts or suburban area of a city (Pyysiäinen & Vihinen, 2020). Finally, the perception of 'good life' is connected to rural areas in the opinion of 61% of Finns.

9.3.2.2 Capturing the Transforming Settlement Structure

Limited attention has been directed at including multi-locality in the planning of public services, such as recreation. This is because multi-local people are missing from the official population statistics which are based on housing data from population registers where the individuals are tied to one regular apartment and thus, one place of residence (Dittrich-Wesbuer et al., 2015). Therefore, planning and public

service structures of society and different administrative systems do not sufficiently account for the increasing mobility of people caused by multi-locality because there is no available official data on the seasonal (or other periodic) movement of the population. Indeed, large-scale population studies have ignored the fact that the changes in the number, distribution, and patterns of use of second homes transform the whole settlement system and lead to the increasing dispersion of population statistics (Lehtonen & Vihinen, 2020). Public services and resources are planned and allocated mainly based on the permanent settlement structure and population statistics which ignore the dynamic use of areas by the seasonal population. For example, the Finnish system of central government budget transfers to local governments, which compensates for income disparities between municipalities, does not recognize seasonal population (Rannanpää et al., 2022).

From cellular data, it is possible to study the "invisible use of areas" as the seasonal mobility flows of the population are not shown in the permanent population statistics. The population dynamic is described using Telia's (telecommunication company) Crowd Insights mobile phone activity data which reports the number of people staying in the area over a night. The data is based on mobile tracking data that is fully anonymized to maintain privacy and it gives information of how many people live on average per month in grid cells visualised in Fig. 9.2.

The average population varies greatly in the municipalities and rural-urban categories from month to month (Fig. 9.2). The population movement from urban to rural areas during the summer and from rural to urban areas during the winter can

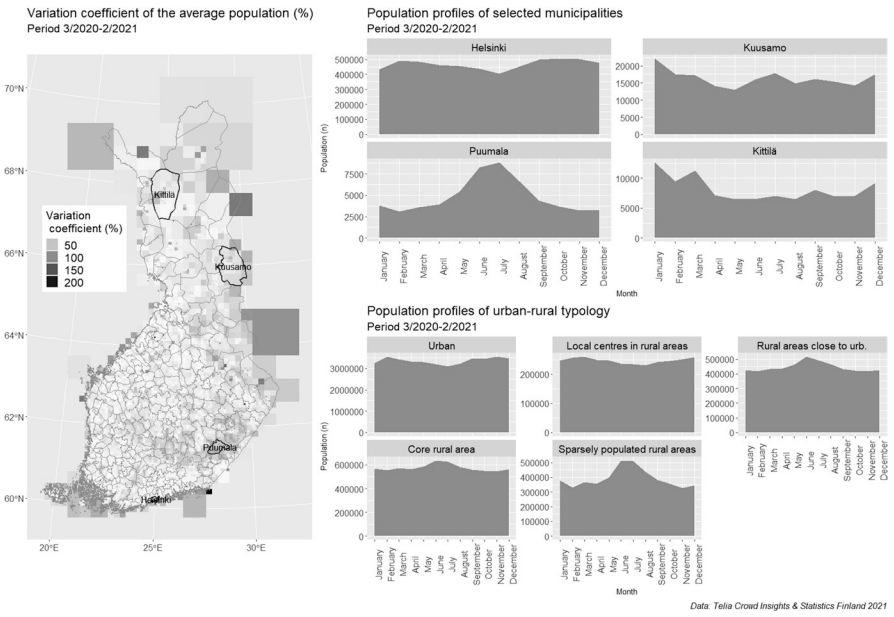

Fig. 9.2 Monthly variation in average population by population grids, selected municipalities and rural-urban categories. (Data source: Telia Crowd Insights)

be detected from the population variation coefficients and population profiles of the municipalities and rural-urban categories. For instance, the average population in the sparsely populated rural areas increases in July by 30,4% compared to the average population of the year. In urban areas the corresponding decline in the average population in July is 7,9%. Regionally, the biggest change in average population occurs in Uusimaa region, the Finnish province that includes the capital city Helsinki, and where the average population in July drops by about three-quarters, to 150,000 inhabitants. At the same time, the average population in the South Savo region, about 120 km to the north-east, increases in July by 30,000 inhabitants, over a fifth of its registered population. Regional flows of the population are striking in profiles of Helsinki compared to Puumala (Fig. 9.2). In the capital, the average population drops remarkably during summer whereas in Puumala, a rural municipality of around 2100 official inhabitants, the average population almost triples.

Average population profiles show that the use of areas is dynamic and changes rapidly over time which are also reflected in the recreational use of the areas. For instance, based on the LVVI (2011) database it can be estimated using cellular data that the recreation activity in the sparsely populated rural areas during the year is 48% higher than the activity estimated with permanent population statistics. Correspondingly, the recreational activity in urban areas decreases by 14% as also the total population decreases in summer because of MLL. Overall, the recreation activity in rural areas increases by 13%. The figures clearly demonstrate that MLL temporally shifts the demand for CES between rural and urban localities.

9.4 Multi Local Living and COVID-19

It is often noted that societies are restructured and changing core features by the impact of "external shocks" (e.g. Rodik, 1999). This applies also to the spatial organisation of societies and as such to rural-urban synergies including multilocality and MLL. Furthermore, it is well acknowledged that one of the most significant shocks the global community has faced during the last decade is the COVID-19 pandemic initiated in 2020. In an unprecedented way, restrictions for leaving home and moving around were issued in most countries of the world leading to several phases of 'lock-down' in the years 2020–2022, each for a duration of several months. Hence, in this section we will review the impact of the pandemic on the volume and forms of multi-local living in the Austrian and Finnish context.

9.4.1 Recent Changes in Multi-local Living Due to COVID-19 in Austria

The long-term relevance of diverse poles of life in spatial organisation across Austria can be interpreted as cultural recognition of oscillating movements and settlement arrangements for large shares of population. This trait based on historical inherent

Table 9.2 Scenarios of multi-local living according to life course and diverse motifs

	Young adults (18–35)	"Rush Hour" (36–60)	"Second Spring" (>61)
Education/ Training	Students/young employed	Regular jobs/Self-employed/Commuters	New interests and learning/"career after the career"
Personal relationship	Partnership creation/first child/long-distance relationship	Patchwork-family/ parents-children relations	(New) partnership/housing apart or together/ grandchildren
Leisure/ recreation	Young creatives/sports and leisure focus	Adventurers and recreation seekers/ nature and sports	Search for meaning and tranquillity/late returners

Source: Oberösterreichische Zukunftsakademie (2019, p. 21)

features of spatial behaviour has evolved further over recent times due to the extension of individual transport opportunities and incorporated an amplifying range of spaces, including increasingly remote rural spaces. It reveals very distinct features and reflects socio-cultural distributional differences among social groups of a population which is experienced in significant tensions between these groups. The dependence on different motivations, life phases as well as resource distribution can be visualised through scenarios that reflect very distinct objectives for involved individuals and households. The following table presents an overview of such different types of multi-local arrangements on the dependence of diverse motifs and stages in the life course (Table 9.2).

These scenarios reflect the rising observation that multi-locality has achieved a particular dynamic and gained status of a mass-phenomenon for inhabitants in Austrian regions. Changes in the requirements for work relationships reveal a decreasing linkage to place of work and more place-independence for workers. This might shift motivations and practise for an increasing scope of workers to be interested in home-placed work arrangements or a stronger mixture of working more regularly from different places. COVID-19 restrictions have accelerated and demanded a strong acceptance of more flexible work arrangements. This had important implications for periods of presence and absence (Weichhart, 2015, p. 76) in different places and regions and enhanced a more positive view on multi-locality (Oberösterreichische Zukunftsakademie, 2019, p. 36). Nevertheless, with an expected flattening off of the pandemic, a more conscious awareness of challenges and restrictions of multi-locality is required. This includes a reflection of transport needs for involved persons and goods, an increasing need to realise ecological transformation, and a heightened awareness for implications of MLL (positive and negative) on permanent residents.

Whilst a long-term management of such a pattern of way of life will be shaped by transition demands due to ecological and technological changes, the drastic impact of recent movement restrictions in COVID-19 showed very short-term reactions. With regard to multi-locality, almost all rural municipalities in Austria experienced a strong rise in second home registration over 2020, which is conceived as an immediate consequence of mobility restricting rules issued due to the pandemic.

According to a survey by Statistics Austria, published in the daily newspaper Der Standard (2021) in 2020, the number of multi-local dwellings rose by 4.97% (vs. 0.40% in 2018 and 0.77% in 2019). This trend occurred in all rural parts of Austria which are not characterised by high tourist intensity. In addition, the pandemic also impacted on general views on settlement and location decisions. As far as visible (for 2020) urban people tended to move to the surrounding fringes of cities and towns, underpinning a trend shift also in demand for rural homes. The area affected by these spatial movements has extended and underlines that suburbanization is a persistent feature (ORF, 2021). What is more, spatial trends of place of homes and increasing multi-locality are overlapping, but both address the search for combining affordable housing with access to valued natural assets.

9.4.2 Recent Evolvement of Multi-local Living Due to COVID-19 in Finland

The first COVID-19 case in Finland was confirmed on January 29th in 2020 and the first wave of the pandemic peaked at late April the same year. The national government responded to mitigate the spread of the pandemic by implementation of the Emergency Powers Act on March 16th, including closure of all schools and government-run public facilities, and recommendation to teleworking and social distancing. A few weeks later, on March 27th, the government also deployed subnational movement restrictions by closing the borders of the Uusimaa region, which had the most confirmed cases, as an attempt to slow down the spread of the epidemic in the rest of the country.

With the already enforced teleworking regulations this caused an outflow of Uusimaa residents to more rural parts of the country a few days before the closing of the border as people moved to their free-time residences for the period of lockdown. The volume and spread of this "escape from the city" during the pandemic in Finland was later on confirmed by the mobile data usage analysis (Willberg et al., 2021). This mass exodus from the Uusimaa region at the beginning of COVID-pandemic in Finland is a telling example of the surge of preference for a more rural environment and the appeal of nature-based recreation and cultural ecosystem services (CES) provided by more rural surroundings.

The increased demand placed upon rural amenities during the COVID-19 pandemic has been studied with various datasets and methodologies. First, in the Finnish context Fagerholm et al. (2021) applied a map-based online survey collected through a PPGIS application from a city of Turku to examine the outdoor recreation and nature's contribution to well-being in a pandemic situation. The results of Fagerholm et al. (2021) confirm that nature at large gained importance in the exceptional situation and people considered that the contributions of nature to subjective well-being during COVID-19 were strong regardless of how actively they recreated outdoors. In line, the negative wellbeing impact of COVID-19 lockdown among urban populations living in dense settings with limited public space

is confirmed also across national contexts (see e.g. Samuelsson et al., 2020). A preference for rural surroundings, and as such increased multilocality in a form of the use of second homes, has been observed also in studies applying a conventional survey-based approach. The Finnish Free-Time Residence Barometer from 2021 by Voutilainen et al. (2021) documented the dramatic increase in remote working from free-time residence caused by the coronavirus pandemic with the share of people who worked remotely from their free-time residence as being 43% of all remote workers in 2021 compared to only 7% in 2016.

In sum, the above literature suggests that rural amenities (e.g. cultural ecosystem and outdoor recreation services) gain relative importance over the urban ones (public transport, restaurants, sport and culture venues) during the lockdown caused by the COVID-19 pandemic. Such interpretations of short term rural to urban shifts during the crisis align with the branch of literature that studies the spatial nature of subjective wellbeing, showing higher life satisfaction in rural areas compared to the big city living (e.g. Weckroth et al., 2022).

While it's clear the COVID-19 pandemic dramatically increased short-term multilocality, the data on permanent migration patterns also suggests an increased preference towards more rural residence after the pandemic (Lehtonen, 2021). Still, it is not yet known if these changes are persistent into a post-pandemic period. However, as Willberg et al. (2021) note, the data indicating a strong demand for secondary homes on the Finnish real estate market at the latter half of 2020 also hint towards a more permanent shift to more rural living as well as remote working and multi-local living. As such, both the short and long-term effects of the pandemic to the spatial behaviour of the population in Finland are similar to the Austrian case described before.

However, it needs to be noted that the possibility to relocate to holiday homes applies mainly to the highly educated segment of society working in jobs, such as IT and related sectors, that are not tied to fixed location, and those who have a free-time residence in the countryside. By contrast, a majority of service work, construction, and health care cannot be done by teleworking. As such, the increase of multilocality includes a relevant social sustainability dimension to consider. In this sense, external shock of the COVID-19 pandemic has revealed and also intensified certain work-related inequalities within socioeconomic strata (e.g. Zöllner & Sulíková, 2021). However, it is clear that the above-mentioned shift towards teleworking strengthened by the pandemic applies only to the working population whereas the use of holiday homes by those already retired is most likely more constant through time.

9.5 Conclusions

The experience from these two countries illustrates the connection between cultural ecosystem services and multi-locality, but also the importance of the rural-urban dimension. One of the main motivations of Finns for staying at the summer cottage or second home were the CES provided by the vicinity of water (Voutilainen et al.,

2021) while main motivations in Austria relate to features of mountain and/or remote environments. The CES appears as an increasingly relevant motivation for multi-local living and supports its persistence. The rural-urban interaction implies that these two spatial 'categories' are not that separate; multi-locality means living in both places and combining them. On account of the mutual dependence, it is important to underline efforts to provide and shape CES also in urban areas.

The key question is how rural-urban interaction is shaped, and how able we are to capture the phenomenon of multi-local living as a part of it. Interaction between different types of areas and between regions is highly case specific. The Finnish case study information allows for a deeper understanding of the clearly seasonal mobility of the population and of its motifs. On the other hand, the example of Austria focuses on a stronger work-home place relationship and, above that, increasing influence of landscape and nature features on new forms of attracting mobile people.

Ecosystem services are a pivotal driver and central motivation for multi-local living and support its functions and stability. With rising concern for societal challenges arising from transition needs due to sustainable development requirements, securing provision and access to these assets is more and more valued. The high-resolution information in space and time from recreational use is currently missing. Therefore, fine-grained, cellular data would expand opportunities for developing next-generation models of human interactions with the natural environment.

The COVID-19 pandemic was both a pull factor and push factor for multi-local living. In the context of COVID it was evident that not everyone can escape the urban stresses imposed by lock-down. In more general terms, multi-local living seems to be historically shifting from residual connections with country roots to desirable lifestyles which rely on, invest in and exploit cultural ecosystem services. Or, as in the Finnish case, it is increasingly a combination of the two. However, the end result is that CES are coming under additional pressure. Awareness-raising about sustainable use of rural areas and associated CES among the multi-local population, as well countryside visitors enjoying the 'everyman's right' opportunities, remains important.

As Samuelsson et al. (2020) notes, the pandemic has served as a "natural experiment around human-human and human-environment interactions without comparison in history". As such, it has surfaced certain hidden desires for 'atmosphere' and heritage aspects (Kazig, 2013) contained within preferences for proximity to nature, rendering visible the appeal of CES and outdoor recreation opportunities. Accordingly, it has also struck fractures to the "urbanisation as an inevitable megatrend"-narrative as a dominant spatio-political imaginary (Luukkonen & Sirviö, 2019). In sum, it can be concluded that the COVID-19 pandemic has functioned as an incentive to foster the transition towards multilocal society by making both individuals to reconsider and rearrange their list of priorities and preferences on location choices and to create more pressure on policymakers to formulate policies that better recognize the actual spatial behaviour of the population.

Long-term experiences of multi-local living in diverse regions of Europe suggest an increased relevance of the phenomenon, depicting strong interaction over various

types of spaces. The creative and flexible use of space is blurring the boundaries between rural and urban, and particularly focuses on CES as a driving force for spatial behaviour and locational preferences. As the pandemic has shown, shocks and events shaking the foundations of our society are bound to bring about change of our spatial relationships, settlement practices and movements.

The conclusions of this chapter lead us to ask, what kind of political decisions will have to be made to support sustainable spatial developments so that cultural ecosystem services could be managed, enhanced and even revitalised through multi-local living. During this inquiry, a number of possible questions for future research and policy attention have emerged. As to policy, it is urgent that this kind of mobility is made properly visible in official population statistics. The welfare impact of multi-locality should be studied and measured, as well as the impact of multi-locality on social equality. From the point of view of sustainability, means to facilitate sustainable solutions in transportation, housing and energy use need to be promoted. Policy measures that could enhance the use of intangible natural resources instead of tangible, non-renewable resources are required. In the light of the key themes discussed in this volume, it is essential to study how a sharing economy might be developed, in which sectors, and supported by which business models, to help underpin rural-urban synergies.

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Chapter 10
The Governance of Nature-Based Approaches to Flood Risk Management in the Lower Severn Catchment (England)

Daniel Keech and James Blockley

Abstract This chapter reports on a new arena of flood risk governance in the lower river catchment of the Severn, Britain's long river. As a result of Living Lab (LL) activity directed towards the natural management of fluvial, pluvial and surface-water run-off in the county, a new governance group was established. The 'Working With Natural Processes' (WwNP) sub-group reports to the regional, multi-stakeholder body The English Severn and Wye Regional and Coastal Flood Committee (RFCC), which advises on the allocation of state funds for flood protection along two river catchments. The chapter outlines complexities of flood risk management in Gloucestershire, describing locally specific flood policy and protection challenges in the light of a changing climate, plans for urban expansion and in light of defined political and geographical limits that complicate catchment-wide ESS governance. The establishment of the WwNP sub-group formalises a strategic approach to 'green' flood risk interventions and supports the networking of flood authorities and land managers. The chapter describes how the LL facilitated the group's establishment, not least by trying to align different interests, and particularly by helping to connect urban and rural spatial interests in natural processes for reducing flood risk, which are usually separated into rural and urban areas.

Keywords Nature-based solutions · Rural-urban synergies · Ecosystems services governance · Flood risk management

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M. R. Partidario et al. (eds.), *Role of Ecosystem Services in Enabling Rural-Urban Synergies*, Landscape Series 20, https://doi.org/10.1007/978-3-031-98153-1_10

10.1 Introduction

10.1.1 Objectives of the Chapter

This chapter outlines a Living Lab (LL)[1] experiment in Gloucestershire, which led to the establishment of a new governance mechanism to support decision-making in relation to nature-based flood solutions in the Lower Severn catchment in England. Within ROBUST, all LLs are founded on a collaboration between a research and a practice partner. In Gloucestershire these partners were staff at the University of Gloucestershire's Countryside and Community Research Institute (CCRI), and Gloucestershire County Council (GCC) respectively. Each LL prioritised three themes to work on, and in Gloucestershire these were ecosystem services, sustainable food systems, and finally business models and labour markets. The work outlined in this chapter links to the ROBUST theme of ecosystem services. The role of GCC as the Lead Local Flood Authority is therefore very significant in this theme as the County Council is principally responsible for local flood risk policy making and flood alleviation strategy.

The two objectives of the chapter are to:

(i) Examine how nature-based solutions to flood risk (specifically catchment) management represent ecosystems services that link rural and urban areas;
(ii) Share the experience of establishing new forms of regional governance of nature-based flood risk solutions, in the hope that practical lessons may be transferable.

The structure of the chapter is as follows. Firstly, the county's river catchments and flood contexts are introduced, followed by a description of the complex and multi-agency governance of flooding in the county and wider region, involving representation from state, private and civil society sectors. Thereafter, the LL experiment is described, resulting in the establishment of a new regional governance structure for nature-based flood solutions. Finally, some critical questions are asked about the process of the LL as well as the need to ensure that nature-based solutions are considered within an urban-rural continuum, rather than, as hitherto, a rural landscape intervention with marginal impacts in urban settlements.

[1] A detailed overview of LLs and their role in ROBUST will be included in the book's introduction.

10.1.2 Introduction to Gloucestershire's Water Resources, Catchments and Flood Contexts

Gloucestershire (Fig. 10.1) is a largely rural county in south-west England and includes several important rivers and wetland habitats. Gloucestershire borders Wales and lies immediately to the north of the city of Bristol. London is about 180 km to the east of the county town of Gloucester, past which the River Severn flows and becomes tidal soon afterwards. The Severn is Britain's longest river and its basin area covers over 11,000 km^2 extending from North Wales, into the English Midlands and parts of the south-west. Its estuary, which has the third largest tidal range in the world and is beloved by surfers for its 'bore[2]', a wave caused by a strong incoming tide moving against the river's current as the river narrows. The Severn Estuary is fed by the River Wye, which, in its lower reaches, forms part of the border between Gloucestershire and Monmouthshire in Wales. While the Severn and Wye meet the sea together in the west of the county, the River Thames rises in

Fig. 10.1 Location of Gloucestershire

[2] https://www.thesevernbore.co.uk/. Accessed 18th August 2021.

the east of Gloucestershire, flowing south and then eastwards to connect some of the densest urban settlements in England, including the capital. The county is, fluvially speaking, interesting because it contains both headwaters and estuary features and the multitude of tributaries is shown graphically in Fig. 10.2 (below), with the Cotswold plateau being a point of flow division, west and east.

Other local wetland areas include the Cotswold Water Park, an expanse of flooded sand and gravel pits; and the Cotswold River Valleys, which drain the Cotswold plateau and flow into the Water Park and The Thames. While the east of Gloucestershire is elevated, the centre (where a quarter of the population lives in Gloucester and nearby Cheltenham) and west lie in the Severn's flood plain.

This description of the county's springs and estuaries, as well as mineral excavation craters, provides a picture of a watery, lop-sided topography, sloping from north-east to south-west towards the sea, for which sea-level rises of around 20 cm by 2050 (Wye Valley AONB, 2016) are predicted, as well as the increased likelihood of serious fluvial-pluvial inundation (Environment Agency, 2020). Flood risk in the elevated Cotswolds is connected with run-off as a consequence of agricultural and rural development, rather than concerns linked to bursting banks or ground saturation. The agricultural run-off is quickly transported into the river system and poses increased flood risk downstream. These details reinforce the importance of the LLFA compared to contexts in catchments, and indicate that conventional 'hard' engineering may not, in isolation, alleviate catchment-linked flood risk.

In addition to these topographical, fluvial, climatic and pluvial considerations, plans have been drawn up to increase the size of the county's main settlements, by building 35,000 new homes and adding 192 hectares of so-called 'class B' light

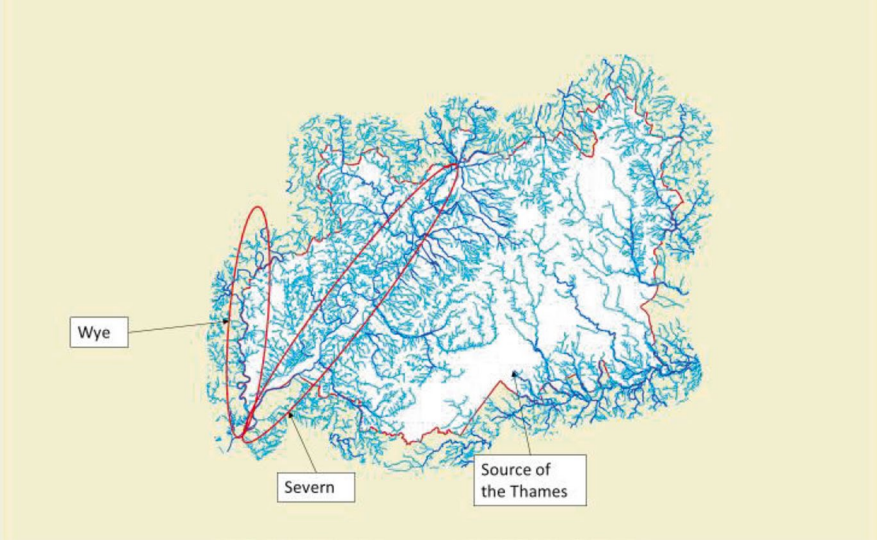

Fig. 10.2 Gloucestershire's river catchments. (© Crown Copyright and database rights 2022, Ordnance Survey 100019134)

employment land (offices, light industry and storage) (Gloucestershire County Council, 2017: Policy SP1). This will create the need to ensure that hard surfaces in the development plans do not exacerbate urban run-off, while the impact of any down-stream flooding may affect more people in expanded settlements.

Flooding has come acutely into local focus in the last decade or so:

> *devastating effects of flooding … following the unprecedented flooding in Gloucestershire in 2007, and … in 2012 and 2013* (Gloucestershire County Council, 2014: ii) (See also Fig. 10.3 below).

The floods were linked to extraordinary meteorological and physical factors including (i) heavy and unseasonal rains, (ii) the subsequent overflowing of the banks of the River Severn, and (iii) the nature of the tidal estuary of the Severn which has a high tidal reach, preventing outflow of the flood waters.

Meanwhile '[*m*]*uch of the western part of the borough [of Tewkesbury] is in an area at high risk of flooding.*' (Gloucestershire County Council, 2017: 2.19).

The mid-reaches of the Severn in neighbouring counties last burst their banks as recently as 2020, affecting 1600 homes.[3] The National Flood and Coastal Erosion Risk Management Strategy for England indicates that, although £2.6bn (€3.05bn) of government funds have been directed towards flood risk defences between 2015

Fig. 10.3 Tewkesbury flooded in 2007. (Image by C. Shervey (https://www.flickr.com/photos/34179117@N00/872788950 accessed 6th December 2021), source Gloucestershire County Council)

[3] https://consult.environment-agency.gov.uk/west-midlands/svwms/supporting_documents/201204%20Severn%20Valley%20Water%20Management%20Scheme%20FAQs.pdf. Accessed 15th July 2021.

and 2021, *'we cannot eliminate the risk of all flooding and coast erosion'* (Environment Agency, 2020: 11). This seems alarming, given that the increased frequency of severe weather events, including high-intensity rainfall, leads to severe fluvial and pluvial flooding incidents. Even so, existing land use is exacerbating flood risk and in recent years nature-based solutions have been tested in Gloucestershire as a way to meet future challenges.

10.2 Flood Risk Governance in Gloucestershire

10.2.1 Natural Flood Management and Urban-Rural Links

Natural flood management (NFM) is one of a broad range of nature-based solutions for addressing environmental challenges such as flood risk, and which constitute, according to the International Union for Conservation of Nature:

> *actions to protect, sustainably manage, and restore natural or modified ecosystems, that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits* (Cohen-Shachman et al., 2016).

This means that, rather than relying on hard engineering such as the construction of dykes or flood barriers, NFM is *'the alteration, restoration or use of landscape features to reduce flood risk'* (Pescott & Wentworth, 2011). In other words, in some contexts NFM can be understood as a form of rural land/landscape intervention applied to manage the *'sources and pathways of floodwaters'* (Holstead et al., 2017), which Morris et al. (2016) have summarised in three ways:

- Retaining water in the landscape through infiltration and flow over land, for example through seasonal mires or water meadows;
- Managing (i.e. impeding) flow connectivity, for example through woody dams which hold back and slow seasonal flood waters;
- Water storage, such as attenuation ponds.

Although GCC holds important responsibilities in relation to flood risk management, the catchments of the county's major water courses reach beyond its borders. In 2014, a regional network, the English Severn and Wye Regional Flood and Coastal Committee (RFCC) secured funding for a rural sustainable drainage trial in Gloucestershire (see case study below).[4] Altogether, there are 12 RFCCs working across England. They were established by the national government and cover major river catchment systems. They are funded through a levy on member LLFAs and bring together local politicians and technical experts who advise on the allocation of state-provided (Environment Agency) funds to cover 6-year programmes of flood risk operations. The finance secured for the Gloucestershire trial via the RFCC helped to implement natural flood management techniques along a number of

[4] https://www.stroud.gov.uk/environment/flooding-and-drainage/stroud-rural-sustainable-drainage-rsuds-project. Accessed 12th March 2021.

tributaries of the Severn, including the River Frome. This revealed measurable flood attenuation results in settlements downstream from the interventions, as well as providing rural nature conservation, countryside management and community development benefits (Short et al., 2019).

Despite this and other interesting localised projects, the adoption of nature-based solutions in general have been suboptimal in the UK (Vilcan & Potter, 2020; Wingfield et al., 2019) and remain non-statutory. Instead, funding for flood risk management is:

> *targeted towards numbers of homes protected from the flood schemes invested in. This tends to mean that urban areas, which are more densely inhabited and where most businesses are clustered, are the main beneficiaries of the schemes.* (LL interview 18th Feb 2019).

Flooding is clearly an important expression of urban–peri-urban–rural relationships in the county in at least three respects. Firstly, because major flooding has been experienced three times since 2007, affecting large parts of the county, and substantial sea level rises are predicted. Secondly, areas of low-lying peri-urban land in Cheltenham are being identified for substantial urban expansion (Gloucestershire County Council, 2017 § 2.28). Thirdly, agricultural management has a significant impact, in Gloucestershire and beyond, on surface water flooding in urban areas and on the quality of designated rural and wildlife landscapes.

Consequently, GCC needs to work in partnership with other organisations that have separate or distinctive influence over flood risk. Key partners include:

- six district (sub-county) municipalities with delegated emergency response authority from GCC and support the development and implementation of planning and land use policies;
- the national (ie. English) Environment Agency, an important independent but publicly funded body responsible for environmental protection and, among other duties, maintains a strategic overview for flood risk management, and holds state funds for flood risk interventions.
- the Lower Severn Internal Drainage Board—drainage boards are also publicly funded bodies with elected local representation, and their duty is to manage and maintain sea and flood defences and drainage in low-lying agricultural and flood sensitive areas;
- the two privatised regional water companies (which provide sewerage, waste water drainage and drinking water services), Thames Water and Severn Trent Water. These are the principal water companies covering Gloucestershire but two more, Wessex Water and Dŵr Cymru (Welsh Water) supply water in the south and west of the county.

These partnerships are schematically presented in Fig. 10.4, below.

Within such official configurations, which clearly indicate the need for collaboration, are community groups and other interested parties who may be affected by flooding, including stakeholders such as the private owners of agricultural land. For example, there are 20,000 land owners alone in the area covering the 2014–2017 River Frome NFM trial within Stroud District, one of the six districts within Gloucestershire. The RFCC has recently extended funding by another 3 years, following its first successful phase (see case study below).

Case Study: Stroud Rural Sustainable Drainage

Following the floods of 2007, community flood action groups were established in river valleys in Stroud District. They campaigned for better protection for residents and properties from flooding, but over the years, communities and authorities have realised that the Upper River Frome and its tributaries are not suited to hard engineered solutions. This is in part due to the physical nature of the catchment and the distribution of the properties at risk, but also due to the heritage and aesthetic value of the Stroud valleys. In 2012, the Environment Agency commissioned a report into the feasibility and potential benefits of implementing Natural Flood Management (also called Rural Sustainable Drainage Systems) (RSuDS) throughout the catchment of the Frome and associated tributaries.

Acting on the findings of the study, the Severn and Wye Regional Flood and Coastal Committee and GCC agreed to fund a project officer to implement and promote RSuDS in the Frome catchment. Successfully implementing the approach to achieve real reductions in flood risk required extensive partnership working between communities, land managers and farmers (Short et al., 2019). The project has secured help from owners of riparian woodland and agricultural land to implement RSuDS measures to help reduce flood risk for downstream urban communities. The project has been extended by another 6 years with funding from GCC and the RFCC.

Source: Stroud District Council. https://www.stroud.gov.uk/environment/projects/stroud-valleys-natural-flood-management-project/

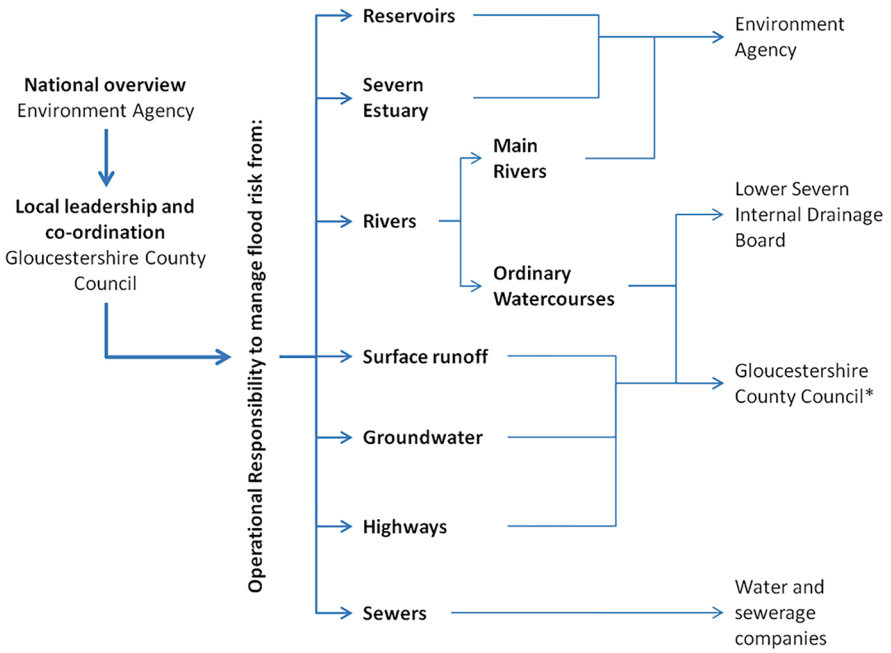

Fig. 10.4 Overview of connected watercourse management Gloucestershire. (Source: GCC 2014: 2)

To summarise, Gloucestershire faces a range of increased flood risks through a combination of climate change, land use, the proliferation of hard surfaces linked to urbanisation, and varied internal topographical contexts and catchment dynamics outside the boundary that require cross-border collaboration. It also has a complex but well-developed flood risk governance arrangement with a recent history of experimental investment in multi-stakeholder and community partnerships for natural flood management solutions across the rural-urban catchments of the Upper Thames and the Lower Severn, funded by the RFCC and substantially integrated into rural community networks. The timing and focus of the Gloucestershire LL was, therefore, fortuitous and met with enthusiasm.

10.3 The Living Lab in Gloucestershire

10.3.1 Background

Since 2010, Gloucestershire County Council (GCC) has had statutory responsibility as the county's Lead Local Flood Authority[5] (LLFA), concerned with flood risk coordination for surface water, ordinary watercourses (to be distinguished from 'main rivers' which fall under the responsibility of the Environment Agency) and groundwater. In 2014 GCC adopted a 10-year Local Flood Risk Management Strategy, and publishes annual progress reports on its implementation. A new flood risk plan is being drafted.

In the Gloucestershire Living Lab (LL), and under the leadership of GCC, the RFCC was targeted as an institution likely to be capable of improving rural-urban links through a more integrated approach to catchment management. Earlier NFM trials, which were multi-stakeholder arrangements including state agencies, local councils, private landholders and rural communities, had been linked to river systems rather than local authority areas. GCC is politically represented at the RFCC, and used to *'networking with other lead local flood authorities every four months … in the south-west and up to Worcestershire and Telford'* (stakeholder interview, 7th March 2019).

The RFCC already coordinates flood risk work across democratic and administrative boundaries along the Severn and Wye catchments (but not the Thames, for which there is a separate RFCC), and has been instrumental in supporting natural flood management (see above) in Gloucestershire. The RFCC was therefore the governance arrangement identified in the LL as likely to create change around ESS-related rural-urban links. Consequently, the innovation objective of the LL was to develop a special sub-group of the RFCC which would oversee natural flood

[5] https://www.gloucestershire.gov.uk/your-community/emergencies-and-your-safety/flooding-and-drainage/gloucestershire-county-councils-local-flood-risk-management-strategy-lfrms/. Accessed 12th March 2021.

management interventions and provide a form for research and practice exchange in the region including Gloucestershire.

10.3.2 Implementing the LL in Gloucestershire

As set out in the introductory chapter of this volume, the work of the LL followed four iterative stages, accompanied in parallel by monitoring and evaluation across all four phases. Table 10.1, below, sets out the activities in each phase. Within the Gloucestershire LL team, a total of three researchers from the University of Gloucestershire's Countryside and Community Research Institute and eight GCC staff were involved. In relation to the ESS theme, the two authors led the LL work, supported by Gary Kennison, the GCC County Ecologist at the time.

The table reflects the four-phase LL implementation process followed by all participating LLs, and which was outlined in methodological guidance (Maye et al., 2018). In the case of ESS rural-urban governance in Gloucestershire, the first phase involved exploratory interviews with five stakeholders with an interest and expertise in natural capital and water-related environmental issues in the county. As well as two GCC employees (the co-author and the county ecologist), this group included the out-going chair of the RFCC, a catchment control official at Thames Water and the co-ordinator of the multi-stakeholder Gloucestershire Local Nature Partnership. These interviewees variously suggested or supported a stronger and more strategic consideration of NFM in flood risk operations in the county and the region.

A policy review of flood risk, agri-environmental and coastal erosion policy documents, as well as a review of academic NFM literature (cf. 2.1 above) reinforced the piece-meal and project-specific implementation of NFM in the UK as a whole. Six additional interviews in phase 2 examined the implementation of NFM in the

Table 10.1 Pursuing ESS rural-urban governance innovation in the Gloucestershire LL

LL Phase	Time period	Activity
1. Envisioning—the focus of the LL experiments was jointly formulated, discussed, agreed and articulated in a *Research and Innovation Agenda*	Oct 2018–Feb2019	Joint development of the Research and Innovation Agenda. This followed 5 exploratory stakeholder interviews and policy analysis
2. Experimenting—Background research, consultations, prototype thinking and ideas testing	Mar–Sept 2019	Review of NFM literature. Further interviews with 6 additional stakeholders
3. Experiencing—Experiments were implemented and refined	Oct 19–Mar 21	Expert group workshop. Development of sub-group proposals, terms of reference and initiation
4. Reflecting	Throughout; final evaluation with the team in May 21	Formal interviews with ROBUST evaluation leader and short film produced by ICLEI (see below)

county and wider region in recent years. Interviewees included employees of two environmental NGOs, two local council officers who had been involved in NFM implementation in Gloucestershire, the current chair of the Severn and Wye RFCC as well as an independent member of the neighbouring Thames RFCC, where an NFM sub-group already exists.

10.3.3 Initiating a New Governance Structure

Earlier NFM trials, which were multi-stakeholder arrangements including state agencies, local councils, private landholders and rural communities, had been based within small tributaries of larger rivers, and while they proved effective, did not lead to the initiation of united strategic action in favour of wider, catchment based NFM. However, these projects were linked to river systems, rather than being confined to single local authority areas. GCC is familiar with such cross-boundary collaboration, as suggested above, through its membership of the RFCC.

After interviews with the officials of the RFCC, the LL team felt reassured that it was important and possible to move beyond project-based interventions towards a better integrated and strategic uptake of NFM as a multi-functional form of ecosystem service linking rural and urban areas. Because LLFAs hold responsibility for flood risk management in their local authorities, it was clearly vital to secure LLFA support in the region. After a delay due to the COVID-19 pandemic of about 7 months, the LL established a competency group composed of LLFA officers in the English Severn and Wye RFCC area. This comprised two members of the LL team, seven LLFA officers and the chair of the RFCC. On 5th November 2020, an on-line workshop proposed the establishment of a sub-group of the RFCC, and on 26th January this was approved by the RFCC, following the presentation of draft terms of reference (see Table 10.2). These were subsequently ratified on 20th April 2021.

Two key allies were instrumental in this development. The first was an independent RFCC member for the Thames region, where a similar group has been operating since 2018. This member was interviewed by the LL team and subsequently provided detailed guidance to the competency group. The second key ally was the equivalent member of the English Severn and Wye RFCC, who agreed to 'sponsor' the request for the establishment of the sub-group as its founding chair, immediately broadening the focus from NFM alone to all nature-based rural and urban flood management interventions. The sub-group's focus and name thus became *Working with Natural Processes*.

Since 26th January 2021, the LLFA competency group has been consulted on the (i) the broadening of the sub-group's objectives to include all nature-based processes in water management, to reflect the perspective of NFM as a management train, or continuum, from upper catchment land management to urban multiple-benefit urban SuDS (including water quality, water quantity, biodiversity and amenity); and (ii) the operational fulfilment of the sub-group's terms of reference, through the establishment of two activity 'tiers'. The first of these is an annual

Table 10.2 Terms of Reference Working with Natural Processes sub-group of the English Severn and Wye RFCC (as adopted on 26th January 2021)

1. To promote an integrated catchment management manifesto for flood and coastal erosion risk management (FCERM) in the English Severn and Wye RFCC area, working with natural processes, including natural flood management
2. To promote a co-ordinated cross functional approach to the delivery of environmental outcomes across the English Severn and Wye RFCC
3. To act as an impartial forum of experts to discuss and exchange information between partners and academia, providing a platform for engagement and sharing of best practice thereby raising awareness of possibilities of working with natural processes
4. To inform and advise the RFCC on environmental aspects of FCERM
5. To have oversight of all funded working with natural process/natural flood management projects in the ES&W RFCC area
6. To challenge the development of future capital programmes and ensure integration with other environmental programmes
7. To review projects and assess their environmental benefits and impacts before they are formally discussed and agreed by ES&W RFCC
8. To monitor the Capital Investment Programme, ensuring accountability for delivery of broad environmental outcomes
9. To regularly report progress to the RFCC, where necessary provide support to develop a greater understanding and knowledge and if necessary, to recommend specific action
10. To promote climate change resilience, adaptation, extreme weather response to influence and enable integration of key objectives in river basin and SMP planning
11. To review new evidence, research opportunities to help with engagement planning
12. To evaluate any gaps that exist in engagement work knowledge and facilitate information and research dissemination across the internal and external partnerships

information and exchange event for all regional NFM practitioners. The second is a biannual scrutiny group which will review all RFCC funded operations for their attention to nature-based flood solutions. In this way natural processes for water management will be strategically integrated in the regional flood management work as soon as they are planned by the RFCC, and regular data and practice developments will be systematically shared. The sub-group will have a very tangible, specialist advisory role to the RFCC.

10.4 Critical Reflections

10.4.1 Nature-Based Solutions to Flood Risk Governance as an Integration Tool

Two important new environmental concepts to emerge in the UK are *natural capital* and *environmental net gain*. In 2018 the UK government introduced its 25-year Environment Plan (25YEP), in which objectives to enhance natural capital are outlined.

Natural capital frames the environment as a valuable natural asset producing vital and cost-free ecosystem services, signalling a shift in the ways the impact of development on the environment are perceived. The prominent elements of natural capital in the 25YEP are clean air and water, reduced risk of environmental hazard (i.e. flood and drought), sustainable use of natural resources and greater human engagement with natural heritage and beauty (DEFRA, 2018: 23).

Some anxious voices were encountered in our interviews in relation to the relative contributions which housing development and agricultural land use can offer to achieving natural capital targets:

> *The biggest driver that has certainly degraded the natural resource [of Gloucestershire] but also has the ability to improve it, is agriculture. I get [irritated] when I hear people identifying development as being the biggest threat. I think it is [a significant threat], but nowhere near the biggest threat. I would say agriculture has to come first every time.*—26th Feb 2019.

This concern is emphasised in relation to debates about which land use blends can optimise natural capital in the county:

> *Changes in agricultural land use could help change the flood risk level, but that requires land managers to be able to pay for these changes, which may require a shift from food production. In some areas, food production is simply not a priority in terms of land use.*—24th January 2020.

Environmental net gain foresees the introduction of legal regulations to ensure that housing and infrastructure development balances the target to build 300,000 new homes a year in England by the mid-2020s, against the protection of biodiversity and the wider environment. These objectives are to be achieved without extra burdens being placed on developers. Much of the Plan's narrative on environmental net gain is linked to housing development and, while natural capital is represented within urban greenspace, it is closely linked to rural and agricultural land uses, including practical methods such as integrating habitat management and environmentally sensitive building and land management methods. Clearly, such objectives are ambitious and will require market-based mechanisms to fund natural capital improvements alongside legal enforcement and scientific monitoring.

Tensions between agriculture, urban expansion and conservation are inherent in ESS governance discourse. The emphasis here is that the success of NFM has been intrinsically connected to positive interactions between flood risk managers, local communities, farmers/land managers. It follows that a formal and accountable governance arrangement such as the RFCC sub-group—namely the ESS innovation in the Gloucestershire LL—will, firstly, regularly include landholders in best practice exchanges with NFM practitioners. Secondly, the sub-group, in embracing NFM, will advise the RFCC about the application of delegated funds for land-based flood interventions. In short, the new sub-group promises to be an arena of practical exchange in which farmers will be important participants. They will be informed of practical innovations and express views on how and where upstream land management can be integrated into RFCC projects.

10.4.2 Opportunities and Bottlenecks

10.4.2.1 Opportunities Arising from the New RFCC Sub-Group

Beyond its immediate potential for extending the focus of strategic nature-based solutions down from country to regional level, the RFCC sub-group also has the potential to co-devise new incentivisation tools to secure flood and habitat-related ESS in the region. This is helpful, for example in the context NFM, prototypes of which have been trialled in Gloucestershire. In addition, the RFCC could also inform non-state incentives, i.e. payment for ecosystem services. In relation to the latter, the River Severn Partnership[6] is a cross-sectoral partnership funded by the government which very clearly links the region's economic development to its environmental resilience. This is a departure from earlier silo-based policy-making which separated economic and environmental objectives, towards synergistic and systems-based approaches. The RFCC and the LLFAs have a role to play in cementing this link:

> *I feel positive about the potential benefits of NFM as a land use or water management practice. This is an area that we need more research and evidence-based data for greater investment.*—22nd Nov 2019.

10.4.2.2 Bottlenecks Inhibiting NFM Interventions

Even so, evidence and investment represent clear bottlenecks in the achievement of the LL innovation, alongside the complexity of flood risk governance in the region. In combination these factors make it difficult to find the right leverage for change.

The efforts needed to operationalise NFM in a case-by-case manner may exacerbate the ambivalence with which it is regarded as an effective flood risk strategy. A key critique of NFM schemes, many of which are run as civil society-led partnership initiatives, is the absence of adequate evidence for a causal link between NFM interventions and downstream impacts and, in the main, monitoring has taken place in small catchments (Lane, 2017). Sustainable Drainage Schemes, which are NFM interventions demanded of developers as a condition of planning permission, are commonly implemented in a piecemeal manner, and usually associated with new developments, even though they represent only 1% of buildings in the UK (Lashford et al., 2019).

Such scholarly views are echoed locally, where frustration at the strategic and cultural challenges to grasp NFM is tempered with optimism about its potential, informed by regional experiences:

> *regulations relating to SUDs…are pathetic and developers may be able to get around them to their advantage'. […] 'hard engineering remaining the prevalent intervention, including flood barrier construction and river dredging without an integrated consideration of*

[6] http://www.riversevernpartnership.org.uk/. Accessed 5th April 2021.

> *natural requirements. […] DEFRA and others including farming unions and commercial advisers still imagine that NFM somehow threatens the productivity of land management businesses […] as somehow distinct or a distraction from economic farming. A challenge is therefore to engage sensitively and positively with land managers around NFM.*—8th Jan 2020.

> *instead of getting the water past a development as quickly as possible, what is there that can be done upstream? [Such as] re-meandering rivers, woody debris dams.*—7th March 2019.

Water companies, especially Thames and Severn Trent, have been enthusiastic advocates of NFM in the region. However, an additional challenge relates to the 5-year Asset Management Period (period of infrastructural maintenance investment), which is shorter than both the life-cycle and assessment period needed to gauge NFM effectiveness.

NFM, as a nature-based catchment intervention, is neither statutorily or strategically enforced within regional development controls, and success depends on continued evidence-based monitoring and the support of thousands of land managers whose cooperation needs to be better incentivised. Despite this, some success has been noted following multi-stakeholder attempts to promote and adopt NFM locally through networks such as RFCCs already, which emphasise relational urban-rural water management concepts, such as catchment-based approaches (Dadson et al., 2017).

10.5 Conclusions

This chapter has set out how, in a county at the source and the estuary of two major river catchments, a LL methodology has been applied to experiment with novel regional governance innovations. The modest success of the experiment was linked to a range of advantageous contexts which included:

- The urgency of increased flood risk severity and seas-level rises;
- An existing regional and multi-stakeholder governance network which had already supported natural flood management measures and pilots;
- A cluster of Lead Local Flood Authorities already in contact with each other through the RFCC and other fora, and through shared flood risk exposure along the Severn;
- Recent national policy development linked to natural capital enhancement;
- Emerging scientific evidence in relation to the interdependence of rural land use and urban flood risk.

Undoubtedly, the LL came at a good time for Gloucestershire and expanded the capacity with which the issue of strategic nature-based flood risk solutions could be explored in practice, thanks to project funding and capacity from ROBUST. This allowed coworking between the University and GCC and additional stakeholder engagements in the region, and allowed GCC to become involved in the

international networks of ROBUST (including, for example, the 10th international Ecosystems Services Partnership conference in Hannover in 2019).

The chapter has also outlined how, as a consequence of flood policy in England, flood risk management resource allocation remains linked to interventions which seem most likely to protect lives and properties in the most densely populated urban centres. While this is understandable, it isolates land management as a rural concern linked to farming. Meanwhile, substantial urbanisation plans may result in exacerbated surface water run-off if nature-based urban sustainable drainage interventions, such as above-ground water storage, swales and water meadows and rain water gardens are not well-planned and managed. At the time of writing there is no legal compulsion for such measures to be included in development plans. As such, for counties like Gloucestershire, where river catchments flow in and out of rural landscapes and urban settlements, nature based solutions need to be seen along territorial continuums and the new sub-group will, it is hoped, enhance opportunities for networked governance of ESS implementation, performance and monitoring in the region. In time, the work of the sub-group could be extended to support calls for compulsory nature-based flood management solutions via the political representation within the RFCC. The subgroup might also see a role in advising regional reforms of post-Brexit agri-environmental subsidy where these can be linked to land management impacts on water dynamics and community engagement in the monitoring of nature-based flood installations.

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Chapter 11
Land Sparing and Land Sharing: Rural and Urban Drivers of Ecosystems Services Delivery in the Netherlands and UK

Henk Oostindie and Daniel Keech

Abstract This chapter builds on notions of land sharing and land sparing, to cover contemporary ecosystem services (ESS) governance challenges. Attention is paid to how such challenges affect rural-urban dynamics. Empirically grounded in the UK and the Netherlands, land sparing/sharing possibilities are explored from distinct rural and urban perspectives. Dutch policies to introduce circular farming could radically reduce the environmental impacts of agriculture, while also reshaping landscapes around the city of Ede. In Gloucestershire, peri-urban growth offers possibilities for integrated urban green infrastructure and/or enhancement of dispersed and protected rural landscapes and habitats. These binary notions of land sparing/sharing can distinguish and characterise different ESS delivery orientations, in terms of regional rural-urban interdependencies. Studying both urban and rural dimensions of ESS indicates the need for innovative governance of ESS. The chapter calls for more comprehensive insights into rural-urban land use features, interactions and outcomes, to unravel and plan sustainable ESS governance.

Keywords Land sharing · Land sparing · Rural-urban synergies · Ecosystems services governance · Circular farming · Urban expansion

11.1 Introduction

Drawing on case studies in the Netherlands and the UK, this chapter considers how distinct rural and urban perspectives inform attempts to integrate eco-systems services (ESS) within land uses. In particular, the binary concepts of land sparing

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M. R. Partidario et al. (eds.), *Role of Ecosystem Services in Enabling Rural-Urban Synergies*, Landscape Series 20, https://doi.org/10.1007/978-3-031-98153-1_11

(LSp) and land sharing (LSh) are revisited as a way to delineate urban and rural ESS perspectives. Originally conceived of as a way to optimise the balance between agriculture and biodiversity, LSp foresees the location of intensive agriculture in areas of the most productive land, while separating and protecting (sparing) areas of rich biodiversity from cultivation. By contrast, LSh foresees the integration of food production and ecological enhancement in the same areas (Phalan et al., 2011; Rabbinge et al., 1994). In this chapter it is suggested that LSp-LSh debates, while closely focused on biodiversity, inadequately illuminate rural-urban links.

In the Netherlands, emerging circular farming policy agendas foresee fundamental changes in the way that rural food production is organised, while in the UK, green infrastructure enhancement has the potential to incorporate ESS within urban expansion plans. Studying urban and rural dimensions of ESS, particularly for their connectedness and interdependence, indicates the need for innovative governance of ESS, including the need to align different views on contemporary rural-urban synergy potential. Typically, urban citizens are characterised as users or receivers of rural ESS (Castan Broto et al., 2012; Holden, 2004), with notable exceptions from urban agriculture (e.g. de Zeeuw & Drechsel, 2015) and urban ecology (Goode, 2014). ESS governance in urban spaces falls to city councils (e.g. through planning policies or flood risk engineering), but in rural areas more often to the provincial offices of national agencies (such as environmental or agricultural ministries): these are two distinct governance levels, policy arenas and activity sectors with limited connection (Curry et al., 2014).

This chapter specifically seeks to illuminate how the binary concepts of land sharing and land sparing are associated with contrasting attempts within ROBUST to optimise/sustain ESS delivery in two different rural-urban constellations.

The two cases represent a range of radical policy developments, driven by multiple challenges including climate change and its impacts, the poor environmental performance of agriculture, expanding urbanisation and its implications for feeding urban populations and, in the context of this chapter, Brexit, which excludes the UK from the Common Agricultural Policy, the European Commission's emerging Farm-to-Fork Strategy and its 'parent', the European Green Deal. In response to these differentiating dynamics, we ask:

- How can rural and urban ESS delivery features be examined with the help of the binary concepts of land sharing and land sparing?
- How do contrasting land use optimization orientations affect rural-urban dynamics and ESS governance?

In the case studies which follow, Dutch circular farming ideas focus on agro-ecological versus agro-industrial inspired rural ESS delivery futures, as an outspoken rural representation of the LSh versus LSp binary. This rural representation is notable in the light of population densities in Ede municipality[1] (373/km^2) and

[1] https://www.citypopulation.de/en/netherlands/admin/gelderland/0228__ede/ accessed 8th March 2023.

Gloucestershire county (242/km^2) (Census, 2021), which highlight their peri-urban characters. The UK case introduces an urban equivalent by linking various ESS including biodiversity, flood risk management and access to green space through urban expansion plans. As such, both cases depict ongoing policy searches for novel ESS governance arrangements characterised by different stakeholder configurations, including various controversies that may arise within them.

The chapter aims to contribute to existing research in two distinct ways, firstly, by linking and relating urban and rural perspectives to the realisation of ESS. The rural perspective is distinctive in Ede's ongoing agro-ecological versus agro-industrial circular farming debate and its accompanying land-sharing versus land-sparing ideas. Gloucestershire's urbanisation plans reflect particularly urban claims on adjacent agricultural land which may involve shifts away from agricultural land use in favour of alternative ESS delivery. Such potential shifts are controversial, given calls for a more diverse and less export-dependent UK food supply system, already *'dangerously dependent on just two countries (the Netherlands and Spain) for the lion's share of its fresh vegetable imports'* (Garnett et al., 2020).

Secondly, the chapter complements existing ESS literature in relation to emerging mapping and valorisation techniques and approaches (Burkhard & Maes, 2017; de Groot et al., 2010, 2012; Hein, 2011; Maes et al., 2016; Pieninger et al., 2013; Salzman et al., 2018; Scott et al., 2018), implications for planning, remuneration and governance challenges (Allen, 2003; Braat & De Groot, 2012; Fisher et al., 2009; Gomez-Baggethun & Muradian, 2015; Herzon et al., 2018; Primmer et al., 2015; TEEBagrifood, 2018) and rapidly growing attention for urban ESS delivery potential (Bolund & Hunhammar, 1999; Radford & James, 2013; Wolch et al., 2014; Yang et al., 2015). So far, these ESS literatures have paid little attention to the question of how to understand and theorise rural-urban interrelations, interdependencies and synergy potentials as crucial components and prerequisites of promising and sustainable ESS delivery futures.

The chapter proceeds as follows. After some methodological clarification, it continues by revisiting longstanding land sharing versus land sparing debates. In the third section, the two case study regions are introduced, followed by a comparison of their principle differences in terms of ESS delivery orientations and some concluding reflections on their significance in relation to future place-based ESS research and governance.

11.2 Methodology—The Case for Comparison

This chapter builds primarily on the activities, experiences and outcomes of the Living Lab (LL) approach (adapted from Voytenko et al., 2016) as applied in the ROBUST project (see Chap. 1). ROBUST was a collaborative learning effort that joined research and policy partners in their aspiration to work on rural-urban synergy potential. To do so, the project considered the following potential synergy fields; (1) ecosystem services; (2) sustainable food systems; (3) public

infrastructure and social services; (4) cultural connections and (5) business models and labour markets, of which each project partner prioritised 3 principle fields of interest. LL Gloucestershire and LL Ede both included ecosystem services and sustainable food systems in their principle fields of interest. In order to elaborate a joint research and innovation agenda for the LL, partners engaged in a lengthy and systematic process of local inquiries, especially literature and policy research. The resultant research and innovation agenda became a guide for further Living Lab activity, which comprised complementary data-collection methods, including interviews with key actors and multistakeholder workshops around how to foster ESS delivery in relation to rural-urban synergy building. Both LLs highlight some interesting comparative analysis, which in this paper is supported by literature review with a focus on scholarly work that concentrates on how to approach and understand the linkages between (i) ESS delivery, (ii) rural-urban land use features and (iii) spatial planning. In summary, Ede and Gloucestershire were LLs in the ROBUST project that both explored how rural-urban links could be strengthened through a more synergistic approach to ESS. While the experiments operationalised to achieve such strengthening are discussed elsewhere in this volume, this chapter compares the synergistic potential of ESS in Ede and Gloucestershire. The key point of comparison lies in the rural and urban perspectives that each LL brings in aiming for synergies, which we emphasise by overlaying local LL data onto the LSp-LSh concept.

11.3 Revisiting the Land Sharing Versus Land Sparing Debate in Relation to ESS

Land sharing and land sparing are not new terms, with roots in European scenario studies on the future of farming, food productivity, land use optimization from the early 1990s, and a shift in the conceptualisation of protected areas, towards the goal of achieving ecologically beneficial land management patterns (Rabbinge et al., 1994). The main message of earlier studies was that, at European level, it would be preferable to concentrate food production in regions with the most favourable agricultural conditions and, conversely, to end farming in regions where land use change would benefit nature conservation and landscape preservation. Implicitly, therefore, LSp is a (rather narrowly-framed) land use optimization plan that advocates a (further) segregation of food production from other types of ESS delivery. The scenario study by Rabbinge et al. (1994), '*Ground for Choices*', reflects a dated preference for further modernisation of agriculture, a strong confidence in agro-industrial optimization processes, as well as little sensitivity for the political reality at that time. Consequently, the outcomes of the study never reached prominence in European policy making, its ideas were not widely embraced by many agricultural and rural scientists and gradually disappeared from discussion on the future of farming. Even so, its principle ideas are more indirectly present in later debates, as illustrated in the

Dutch circular farming case below. Direct references to the binary notions shifted towards scholars with other disciplinary backgrounds. Ecologists, for instance, associated LSp and LSh with the ecological pros and cons of more bundled versus single ESS delivery (e.g. Grass et al., 2019).

While LSp and LSh ideas emerged in rural scholarship, there are some equivalents with special attention to urban spatial dynamics. Scholars of urban sprawl, for instance, address the various negative externalities of spatially fragmented urbanisation processes (Bengston et al., 2003; Cespedes Restrepo & Morales-Pinzon, 2018; Holden, 2004; Irwin & Bockstael, 2007; Wadley, 2012). Following similar lines of thought, concepts including the 'compact city', 'functional segregation' and 'spatial quality' flourished in the Netherlands with the overarching aspiration to prioritise spatially more restricted and delineated urbanisation processes (Boelens, 2011; Busck et al., 2009; Fertner, 2012).

In the UK, urban Green Belts around cities have been protected in planning as a way to avoid creeping urbanisation. In practice Green Belts mainly constitute farmland, irrespective of the quality of the land and soils. From an ESS perspective, this type of thinking primarily associates ESS delivery with 'external' green or rural space. More recently, growing scholarly interest can be seen around the societal benefits associated with, and need for, internal urban ESS delivery, in order to benefit public health, urban quality of life and climate change mitigation (Bolund & Hunhammar, 1999; Allen, 2010; Haase et al., 2012; Castan Broto et al., 2012; Radford & James, 2013; Wolch et al., 2014; Yang et al., 2015; Pauleit et al., 2019; Elmqvist et al., 2015, 2018). This emerging research corpus on urban ESS delivery may be perceived as a move towards the internalisation of ESS delivery in urban space, further illustrated by the growing popularity of associated notions as urban green metabolism (Kennedy et al., 2011; Perrotti & Stremke, 2020) and, as illustrated in Gloucestershire, green infrastructure is:

> *a strategically planned network of natural and semi-natural areas […] designed and managed to deliver a wide range of ecosystem services* (cited in Rolf et al., 2020).

More broadly, green infrastructure (GI) has been closely associated with the reconciliation of nature conservation and economic development, especially as a contribution to sustainable urbanism (Grădinaru & Hersperger, 2019).

In summary, the LSp versus LSh binary has its origins in both rural and urban scholarship, as part of wider debate on the pros and cons of functional integration versus functional segregation in rural and urban settings and spatial planning characteristics. Analytically, this scholarly debate differentiates ESS delivery orientations, as visualised in Fig. 11.1.

So far, such differences in rural and urban ESS delivery orientations have been largely analysed in isolation. Land sparing versus land sharing (or, in overlapping terminology: multifunctionality versus monofunctionality) arguments appear prominently in discussions of farmers' roles and positions in food chains, food systems and wider rural development processes (e.g. Van der Ploeg, 2022). The internalisation versus externalisation debate, especially, resonates in urban space optimization and priority setting discussions, and includes references to multifunctionality (e.g

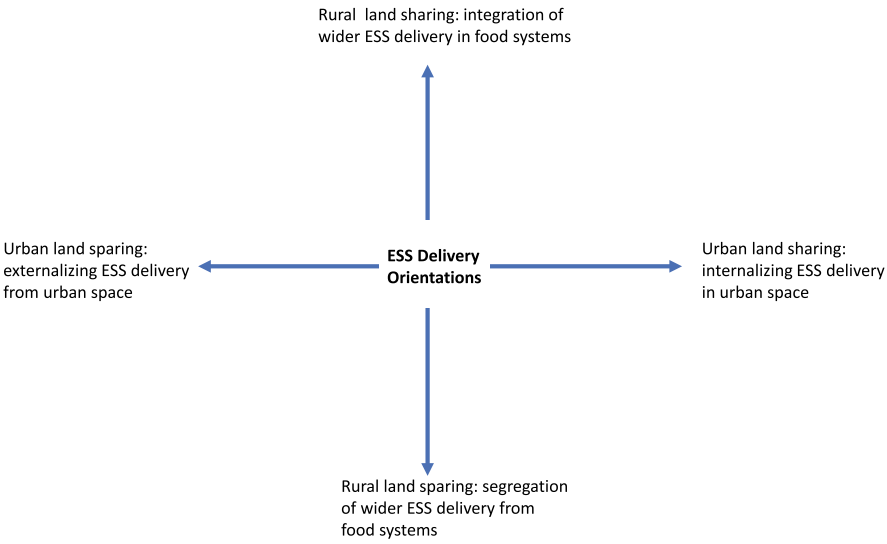

Fig. 11.1 Rural-Urban ESS delivery orientations

Ghafouri & Weber, 2020). In the next section, the two ROBUST case-studies are introduced to demonstrate that it is particularly the place-specific interaction patterns and alignment efforts of rural and urban ESS delivery orientations that illuminate synergy prospects.

11.4 Case Studies

(a) ***Circular Farming in Ede municipality***

Located in the heart of the Netherlands, close to important east-west land and water transport corridors, Ede municipality has about 100,000 urban residents and 20,000 rural dwellers. Being a typical example of Dutch poly-centric urbanisation processes, Ede's urbanisation is connected to a history of military training, textile industry and, more recently, international transport, logistics and agro-industrial sectors. Ede has poor, sandy soils accommodating small-scale family farming which, since the 1950s, has increasingly focused on animal production (especially poultry, dairy and pigs), intensification and scale-enlargement, and major agricultural labour productivity gains, facilitated by adjacent Wageningen Agricultural University. A strong dependency on fodder imports (principally soy) and food export markets (especially Germany) is associated with growing societal concerns about persistent regional agri-environmental problems including emissions, nutrient losses, loss of biodiversity, odour nuisance and particulate matter. Simultaneously, a diversification of agriculture and rural business models/entrepreneurship can be

witnessed, via the exploitation of a longstanding regional tradition of rural tourism: Hoge Veluwe Natural Park is partly located within Ede's municipal boundaries. The outcome of these multiple dynamics is a flourishing regional and rural economy, albeit increasingly facing tensions and conflicts between agricultural activity and alternative rural functions (Centraal Bureau voor de Statistiek, 2018; Ede Municipality, 2015).

Ede is actively involved in an inter-municipal policy collaboration called Food Valley. In line with the EU's smart specialisation objectives (e.g. McCann & Ortega Argiles, 2016), Food Valley aspires to become a smart specialisation region where research, innovation, education and industrial activity concentrate on sustainable and healthy food systems to foster economic development and prosperity. Food Valley initiates, stimulates and facilitates active collaboration between six municipal administrations and a multitude of regional agri-food businesses based on so-called triple-helix approaches (Ede Municipality, 2015; Regio Foodvalley, 2009, 2015, 2016): multi-stakeholder innovation processes with active participation of public, private and research actors. Food Valley's aspiration to enhance global food security implies that it pays relatively little attention to regional specific rural-urban relations and interdependencies. Certainly, it may support alternative, more multifunctional and nature-inclusive agrarian pathways within Ede's urban food policy aspirations, but primarily collaboration across globally operating agro-industry and food technology corporations is welcomed, prioritised and sought. This is reflected in a strategic research agenda around the so-called 'protein transition', which seeks to reduce dependence on external fodder sources by substituting legume varieties and using insects as alternative protein sources to sustain and safeguard regional intensive livestock production. Other contested proposals to reduce and mitigate negative agri-environmental impacts of intensive systems include manure surplus valorisation techniques, ranging from biomass-based renewable energy to its transformation into organic fertiliser for export to soy producing countries (e.g. Brazil) to restore current distortions in global nutrient flows (Gies et al., 2017).

(b) ***Green Infrastructure in Gloucestershire***

Gloucestershire (populationc. 650,000), is located on the border with Wales, north of the regional capital Bristol (population c. 480,000), and about 160 km west of London. Its democratic local authority structure is 'two-tier': Gloucestershire County Council operates schools, libraries, police, fire and rescue, flood risk, housing and a range of other public services. The county is further divided into six district councils, which have their own elected members and, of particular relevance to this chapter, authority over land use planning. In common with Ede, the county has a polycentric urban pattern, with two adjacent urban centres—the administrative capital Gloucester, and the former spa town of Cheltenham—which between them account for about 40% of the county's population. These two urban districts were joined by a third, Tewkesbury (population c. 95,000) to form a collaborative planning vision called the Joint Core Strategy (JCS, adopted in 2017). The three remaining rural districts are Stroud, Cotswold and the Forest of Dean. Each of the latter lie partly within designated landscape areas, namely the Cotswold National

Landscape and the Forest of Dean National Forest Park. The county contains small parts of two further cross-border National Landscapes —the Wye Valley in the west, and the Malvern Hills in the north. Consequently, in considering development opportunities, the Gloucestershire planning authorities are restricted by designated rural landscape character such as the National Landscapes and the Forest, as well as within ecologically or geologically sensitive areas of national importance, such as Sites of Special Scientific Interest, of which there are 120 in the county (GWT, 2015). Taken alongside the urban Green Belt (which is spatially and not qualitatively characterised) and high flood risk areas, there is very little room for manoeuvre in building allocation in the county. This has a knock-on effect for farmland. Historically, planning authorities would have exempted so-called 'best and most versatile' agricultural land but planning regulations have been revised by successive governments to facilitate development.

In the last decade, a range of planning consultations have examined potentials for economic growth in the county, notably along the M5 motorway corridor. A participatory visioning process called Glos2050[2] identified new ecological and economic development opportunities, including the idea to expand Gloucester and Cheltenham into one 'supercity'. While that proposal was not adopted, it remains a strategic economic priority in the JCS to expand west Cheltenham, for residential and commercial uses (on land owned by Tewkesbury Council), thereby enhancing the county's economic potentials by expanding the cybersecurity industry. Cheltenham is the home of the Government Communications Head Quarters (GCHQ), the UK's national cyber-intelligence service, and substantial levels of cyber-related commercial and residential development are envisaged. For example, Policy A7 in the adopted JCS envisages 1000 new homes, in association with and in addition to 45 hectares devoted to the expansion of cyber-security and high-tech commerce. Overall, the JCS suggests 1525 new homes a year are needed over 20 years to meet the county's housing needs (paragraph 2.28), while Policy SP1 outlines the need for over 35,000 new homes and 192 hectares of 'B-Class' employment land (offices, light industry and storage). A question arising from these development plans is how to ensure the opportunities they unlock also enhance local ESS, rather than compromise them in the process of building on green space.

An important concept to influence urbanisation plans in Gloucestershire has emerged (as in the Netherlands) from national policy, in the shape of *natural capital net gain*. In 2018 the UK government introduced its 25-year Environment Plan (25YEP), in which objectives to enhance natural capital (NC) are outlined. Natural capital frames the environment as a valuable natural asset producing vital and cost-free ecosystem services, signalling a shift in the impact of development on the environment. The prominent elements of NC in the 25YEP are clean air and water, reduced risk of environmental hazard (i.e. flood and drought), sustainable use of natural resources and greater human engagement with natural heritage and beauty (Defra, 2018: 23). Explicitly, rather than reducing the 'value' (i.e. condition) of the

[2] https://glos2050.com/ accessed 24th November 2020

Table 11.1 ESS delivery characteristics of Ede and Gloucestershire (Glos)

Case study	Dominant ESS delivery perspective	LSh-LSp context	Rural-Urban synergy
Ede	From the **rural** outwards, especially interrelations between food production and other ESS: biodiversity, landscape values, sustainable water management, soil quality.	Focus on pros and cons of integrated vs. segregated **rural** ESS delivery with less attention for urban land use implications. Regional landscape scale ESS a key focus, but with links to global agri-food chains.	Competing (global versus regional).
Glos	From the **urban** outwards, with special attention to water regulation and biodiversity.	Focus on regional urban expansion and its impact on flood risk mitigation and biodiversity net gain. Regional and local landscape scales ESS are important as a **development** mitigation.	Complementary (regional rural-urban synergy potential)

environment, building development should enhance natural capital via 'net environmental gains' (Defra, 2018: 33). This ambition means that where development takes place, not only must environmental damage be mitigated, but the level of natural capital must be greater than it was before development, to be contractually agreed through conditions within planning permissions. Whether or not net environmental gain is to be a compulsory element of planning permission was, at the time of writing, still a matter for consultation, but its significance lies in its potential to internalise ESS delivery in urban development, via existing and new policy instruments. Key practical methods for achieving net gain include integrating habitat management and environmentally positive building methods into development plans and practices, and/or to identify areas outside the development zones for improvement as a form of compensation. In other words, Gloucestershire's planning dynamics mirror an urban LSp/LSh perspective compared to the rural perspective in Ede. Urban LSh makes ESS and NC opportunities intrinsically part of urbanisation, whereas urban LSp opts for compensating negative environmental impacts of urbanisation by enhancing natural habitats in rural areas elsewhere in the county. Such rural-urban perspectives are summarised in Table 11.1, below:

Having introduced the two case studies and their respective spatial perspectives on ESS delivery concerns and enhancement, the next section will further contextualise policy developments which facilitate or hinder the strengthening of rural-urban synergies.

11.5 ESS within Rural and Urban Policy Settings

(i) *Circular farming and the Ede Municipal Food Strategy*

The rural LSp-LSh debate in Ede municipality cannot be isolated from wider national and regional discussions around how to progress towards sustainable

farming futures. This discussion is characterised by contrasting circular farming logics, perspectives and practices. As part of regional Food Valley, Ede municipality associates circular farming prospects often with rest-flow recycling and remanufacturing with the intention to close nutrient and resource cycles through novel techniques. It covers topics including the transformation of urban food waste into fodder for animal production, urban carbon capture for high productive glasshouse horticulture and rest-warmth use from rural biomass energy plants for urban heating. In addition, there are circular farming ideas and practices that concentrate on returns to land-based farming with the intention to re-integrate food production with other ecosystem services such as soil quality and fertility, nature and landscape values, biodiversity, mitigation of flood and drought risks, etc. As such, this agro-ecological circular farming perspective redefines agriculture's role in rural development processes and underlines regional prospects of novel, more multifunctional rural business models. Table 11.2 below summarises the distinct attributes of circular farming, seen from the contrasting agro-ecological and agro-industrial perspectives, logics and aspirations in Ede (Graaf et al., 2018; Ministerie van Infrastructuur en Milieu, 2016).

This co-existence of contrasting ideas, practices, interests and aspirations makes it challenging for Ede municipality to profile itself unambiguously. In practice, it facilitates both agro-industrial and agroecological circularity pathways. Through its urban food policy it tries to shorten regional food chains, stimulate direct consumer-producer relations, facilitate food education and foster social cohesion. Other agro-ecological circular farming aspirations remain much less explicitly addressed in municipal urban food policy. These include a significant extensification of agricultural land use (and thus reduction of current food output volumes) to the benefit of agriculture's ability to strengthen the delivery of other ESS including biodiversity, pollination, water quality, drought and flood management, soil erosion prevention, preservation of landscape values, cultural heritage, etc. The same goes for

Table 11.2 Contrasting circular farming perspectives and practices in Ede

Agro-ecological inspired circularity	Agro-industrial inspired circularity
Strategic preference for rural land sharing	Strategic preference for rural land sparing
Preference for integrative food production	Preference to segregate food production from other ESS
High confidence in the transformative capacity of empirical diversity in farming practices & professional identities in agriculture	Less confidence in the role of farmers as co-shapers of farming futures and agrarian development pathways
High confidence in novel forms of territory-based collaboration, novel rural coalitions, novel producer-consumer relations and novel rural-urban partnerships	High confidence in novel alliances between agriculture and other industrial sectors, cross-sectoral innovation approaches and novel technologies
Strong belief in wider societal benefits of family-farming	No specific family farming concerns
Above all territorial spatial lens on sustainable rural-urban relations	Emphasis on increasingly dispersed and diffuse rural-urban interdependencies

agro-ecological circular farming claims on potential positive spillovers into the wider rural economy and ESS performances. The food policy reflects municipal reluctance to explicitly embrace alternative, more multifunctional rural business models by prioritising LSh in future rural spatial planning. Agro-ecological circular farming advocates claim that such business models might bring more internal remuneration incentives and mechanisms for ESS delivery through their engagement in novel rural markets for high-quality food, leisure facilities and care and educational activities. These emerging rural markets would depend, at least partly, on such wider rural ESS profiles and qualities. These, it is claimed, could be further facilitated by CAP reform that establishes more convincing linkages between agricultural subsidies and farmers' wider ESS delivery capacity, willingness and performances. Prospects of rural business models grounded on rural LSh, multiple income sources, low external input farming and wider ESS delivery, could be further stimulated—and in contrast with prevailing food chain dependencies—by more regional cooperation between farmers and other rural entrepreneurs with ESS delivery, food proximity and circularity as different but simultaneously overlapping rural-urban synergy prospects.

Regional criticasters of foregoing agro-ecological inspired circular farming claim that such a perspective is no longer feasible after decades of agricultural modernisation, that such developments would even undermine food security and food affordability, not only nationally but also throughout the world, threatening Dutch agri-business and agricultural competitiveness. Hence, its potential societal benefits are downscaled, linked primarily to supporting small-scale farming which meets niche consumer demands, or farming continuity in less favourable ecological settings. Obviously, these associations with sub-optimal food systems are difficult to isolate from status quo interests, or what van Lieshout (2014) describes as the 'politics of scale'.

(ii) *Green infrastructure plan and biodiversity net gain in Gloucestershire*

Ede's story describes rural-centred approaches to ESS delivery, expressed through LSp vs. LSh debates. In Gloucestershire such debates have a more urban inflection, especially through the need to expand urban settlements (housing quotas are distributed from national to local government). In addition, the (now superceded) 2017 UK Industrial Strategy, which gaves the circular economy a high profile, also stimulated arguments for urbanisation. It emphasised that productivity relies on the responsible use of resources and foresees technological advancements which will reduce the environmental impact of farming (Department for Business, Energy and Industrial Strategy, 2017: 75). Gloucestershire's Local Industrial Strategy highlights the attractiveness of the county's natural landscapes as a draw to investment and in-migration linked to high quality of life. The local environment helps make Gloucestershire a 'magnet county' rebalancing the current loss of young people to cities elsewhere (GFirst LEP, 2019: 4–5).

> We want to establish Gloucestershire as a leader in sustainable growth by developing a baseline to determine how best to protect, maintain and enhance our natural capital assets. (GFirstLEP, 2019: 6)

Gloucestershire's growth and productivity prospects are linked to its ability to recruit skilled workers, who, it is predicted, will be attracted by the 'magnetic' force of the county's high cultural ESS values. Two particular activities envisage the enhancement of GI and natural capital to mitigate urbanisation, which can be understood within LSp-LSh arguments. Firstly, the development of a regional park (another Glos2050 idea that did gain resonance) foresees further enhancement of the county's landscape attractiveness and the delivery of ESS in terms of flood risk management, the reduction of air pollution (linked to the expansion of public transport connectivity) and the consolidation and safeguarding of green spaces. The proposal is closely linked to a project of the Gloucestershire Nature Partnership called *Natural Improvement Areas*, which seeks to identify GI opportunities linked to planned developments.

In Gloucestershire, the Local Nature Partnership (LNP) is leading progress on the mapping and enhancement of natural capital, in both rural and urban settings. LNPs are multi-stakeholder networks established and funded by the government which implement environmental policy at the local level. Members include civil society groups (such as nature conservation organisations), universities, local councils and regional representatives of government environmental agencies. Natural capital mapping involves a detailed assessment of the county's habitats at the scale of one square kilometre. Each of these squares will be assessed for their current natural capital as a contribution to ESS. For example, woodland might offer flood risk or biodiversity value. After this first stage of mapping, the LNP will articulate opportunities for enhancing natural capital. This might envisage land use change, for example, reducing intensive arable production in favour of permanent pasture or woodland planting. In such cases, not only would there be a shift in the ESS type (from food to flood risk, in this example), but also a need to incentivise any optimal land use shifts. Significantly, the LNP led the collaborative process of natural capital mapping in order to develop a Strategic Framework for GI, in the absence of a GI Plan, a notable absence:

> *A county-wide Green Infrastructure Strategy is not forthcoming, but GLNP has worked hard to update and refine the Strategic Framework for Green Infrastructure. Many Districts are creating their own Green Infrastructure plans and strategies, all of which will have regard to, and be guided by, the principles contained within this framework.*[3]

In the case of urbanisation plans, a number of existing tools are available. Firstly, Section 106 agreements are contracts designed to finance social or environmental compensation in relation to a development. For example, if a new housing area creates additional transport mobility or educational demand, the developer may be required by the planning authority, through a S106 agreement, to finance road building or school expansion. Environmental projects such as habitat creation are also common. A feature of S106 is that mitigation measures are linked to the area within or around the development location. Recent reforms allow planning authorities to

[3] https://www.gloucestershirenature.org.uk/green-infrastructure-pledge accessed 9th December 2022.

decouple S106 investment from the development location, through a community infrastructure levy (CIL) charged at a variable area rate on housing and retail development. This creates opportunities to be more strategic about locating development mitigation, but also comes with challenges. For example, the CIL is at slightly different levels of introduction across the six district planning authorities. In addition, although the CIL can be assigned for strategic mitigation including for functions carried out by the county council—which retains planning control for services including transport, flooding and education—the CIL is paid by developers to the district planning authority. Meanwhile, S106 agreements may still be applied and can operate in parallel with CIL (Ives & Excell, 2018), thus potentially causing tensions in any case where a district's strategic objectives do not fully align with the county's.

Secondly, a voluntary scheme called *Building with Nature*[4] has been established by a network of architects, conservationists, planners, housing agencies and builders. This scheme, initiated by the Gloucestershire Wildlife Trust and the University of the West of England, promotes and accredits sensitive and restorative building work and provides professional training. In the adopted Minerals Local Plan, which sets out policies for the extraction, use, transportation and restoration of the county's minerals mineral resources (such as limestone and gravel), priority is given to developments which enhance natural capital and help facilitate Building with Nature adoption (GCC, 2018 §422). The whole plan, in fact, has been given *Building with Nature* accreditation, an accolade that, it is hoped, will be extended to district local plans.

The LNP remains the sole body with county-wide strategic engagement with GI, through the natural capital mapping agenda. The vision associates GI with the two urban centres, but also as a corridor linking other settlements with the Natural Landscapes and the Forest of Dean. While still an ideal vision, this implies attention to both integrated ESS delivery, via extensive GI around settlements, as well as externalisation of ESS, as evidenced by the roughly north-south axis following the M5 motorway.

Gloucestershire seems to offer possibilities for both LSh and LSp approaches in urban and rural settings following development. In contrast to Ede, where integrative land use is discussed at the level of the individual farm, in Gloucestershire land sharing and sparing options incorporate ESS delivery within wider urban and rural landscapes/uses. Sustainably constructed and environmentally sensitive settlements complement a regional park proposal and the quality of designated landscape areas. Equivalent challenges exist nevertheless, including the tension between different types of ESS:

> *Changes in agricultural land use could help change [i.e. lower] the flood risk level but that requires land managers to be able to pay for these changes, which may require a shift from food production. In some areas, food production is simply not a priority in terms of land use.* (Interview GL1)

[4] www.buildingwithnature.org.uk Accessed 8th July 2020.

This conservationist, interviewed as part of the ROBUST project, argues for a rebalancing of land use in favour of flood risk mitigation over farming. The importance of flood risk management in Gloucestershire is not to be underestimated. The county experienced severe inundation in 2007 and 2014 and unusually high floods in 2020 on the River Severn which, in its middle reaches, led to wide-spread urban evacuation. Gloucestershire needs to develop novel governance arrangements in order to reduce flood risk, especially where upper catchment fluvial and pluvial flooding is compounded with surface water run-off from urban hard surfaces and from floodplain agriculture near Cheltenham and Gloucester. However, this is complex. Regional experts feel that existing flood risk arrangements could be strengthened by focussing on the Severn river catchment, as a way to connect upstream rural land use and downstream urban settlements, offering a more integrated rural ESS delivery at landscape level to prevent urban floods. Although many nature-based flood interventions are made within individual farms, and rely on community support, in Gloucestershire ESS delivery is not principally framed as a farm business consideration, as is the case in Ede. In that sense, Gloucestershire's land sharing versus land sparing debate reflects a meso-level and urban perspective on land use in relation to regional natural capital objectives. GI opportunities are primarily linked to urban growth plans and a catchment-based approach that builds on the complementarity between nature-based upstream interventions and downstream hydrological engineering. As part of that, rural land sharing is predominantly associated with specific designated rural areas, whereas urban land sharing is thought to bring net environmental gain and enhancement of urban quality of life. Specifically, Gloucestershire's ongoing internalising of ESS delivery in its urbanisation plans take its food system less explicitly into account compared to the Ede case, although similar tensions in ongoing re-balancing and re-considering of regional land use can be observed.

11.6 Conclusion

As visualised in Fig. 11.2, Ede and Gloucestershire reflect rather different rural-urban ESS delivery orientations as overall outcomes of their rural-urban land use features, interaction patterns and stakeholder priority setting. The Ede case underpins in particular the relevance of differentiating rural responses to changing urban ESS demands and concerns, going along with major land use planning challenges. After decades of rural land use segregation to the benefit of competitiveness in globalising food markets and compact city planning ideologies with little attention for urban ESS delivery, regional spatial disbalances in and fragmentation of ESS delivery profiles require a serious re-balancing and re-calibrating of both rural and urban ESS governance, as illustrated by recent outbursts of farmers protests[5] against further agri-environmental policy restrictions.

[5] https://112ede.nl/page/Nieuwsdetail/54811/massaal-protest-boeren

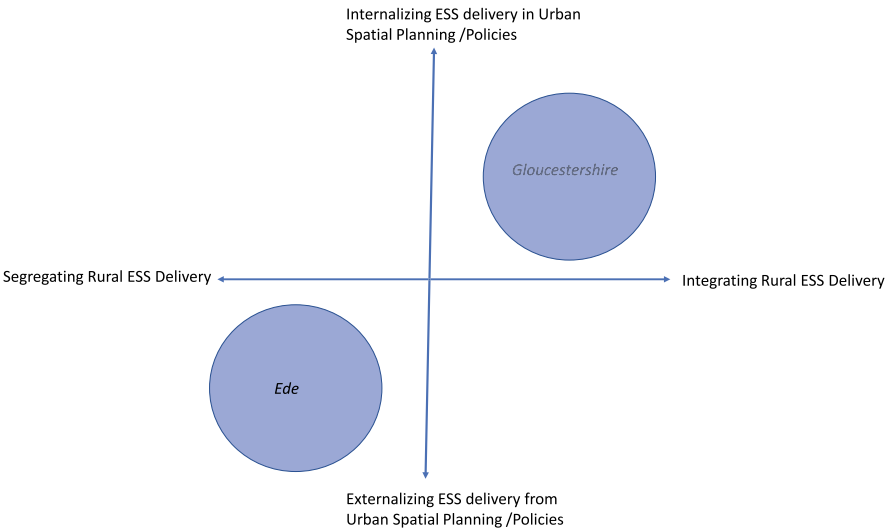

Fig. 11.2 Contrasting ESS Delivery Orientations of Gloucestershire and Ede

In Gloucestershire, climate-change related flood risks mobilised urban policy actors to reconsider regional ESS delivery vulnerabilities and to start a process of internalising ESS delivery in urban planning and policy making. It may bring novel rural-urban alliances and partnerships around ESS delivery. Yet, so far outcomes of ongoing urban internalisation attempts remain rather uncertain due to the complexity of multi-level land use planning procedures. This means that ongoing urban ESS engagement and its implications for future rural land remain in flux. Rural land sharing prospects will be strengthened if urban flood risk management becomes part of cross-municipal, well-balanced and mutually beneficial rural-urban policy measures. Ongoing calibration of rural-urban spatial planning policies will have negative impacts in case of straightforward annexation of rural space to the exclusive benefit of urban ESS delivery concerns. In other words: progressing towards synergistic ESS governance hinges on regional stakeholders' ability to align urban internalisation efforts with rural integration opportunities and prospects. One of Gloucestershire's challenges in that respect concerns a GI strategy that follows administrative rather than ecological boundary setting procedures. For that reason, its Local Nature Partnership might be a more promising platform for place-based and synergistic ESS governance.

By revisiting LSp and LSh debates, and by associating both notions to wider land use and ESS delivery debates in rural and urban settings, ESS delivery orientations have been distinguished and compared. The case studies emphasise that ESS delivery cannot be isolated from societal challenges around how to optimise, accommodate and facilitate rural-urban interaction. Although ESS comprise an interesting and promising lens to strengthen rural-urban links, stakeholder perspectives might bring particular ESS priorities to the fore, at the expense of others. It is desirable,

therefore, that rural-urban interactions deserve more explicit attention from ESS scholars, with particular regard to the intertwining of ESS governance and other rural-urban synergy prospects that have the potential to foster well-being as a facet and outcome of economic development.

Acknowledgements The authors are grateful to Simon Excell of Gloucestershire County Council for his help with early drafts of this chapter. ROBUST receives funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 727988.

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Part III
Across Communities of Practice – Cross-Cutting (Horizontal) Issues and Debates

Chapter 12
Business Models that Valorise ESS and Advance a More Socially and Ecologically Grounded Economy

Karlheinz Knickel, Marina Knickel, and Matt Reed

Abstract The services ecosystems provide can be seen as assets in developing individual businesses and local economies. The business models examined in this chapter represent strategies that valorise a high-quality cultural and natural environments. We argue that they make lifestyles and economic systems more environmentally and socially sustainable. The strategies link orthodox business goals with the societal goal of a more socially and ecologically grounded economy. Our analysis focuses on how ecosystem services are valorised and different kinds of value are created. We are interested in the goods and services provided, customers and revenue streams, the related strategies, and the creation of cross-sectoral synergies. The basis of our analysis is a set of business model archetypes compiled in the EU-funded ROBUST project. The business models range from organic farming and regional quality labels to ecotourism and the valorisation of food heritage and green lifestyles. They comprise individual and shared businesses and place-based approaches like renewable energy sourcing partnerships. For each model, we discuss how they support the creation of win-win situations and valorisation of ecosystem services (ESS), identify limiting factors, and explore the potential role of policy.

Keywords Ecosystem services · Business models · Valorisation strategies · Place-based · Rural-urban relations

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M. R. Partidario et al. (eds.), *Role of Ecosystem Services in Enabling Rural-Urban Synergies*, Landscape Series 20, https://doi.org/10.1007/978-3-031-98153-1_12

12.1 Introduction

12.1.1 Background

The dominant patterns observed in economic and business development can be characterised by decoupling economic activity from local socio-economic, cultural and natural systems (Jackson, 2017; MA, 2005; OECD, 2012). Closely related has been a spatial concentration of specific industries and market concentration, scale enlargement, specialisation, and increased capital intensity at the level of individual businesses (Costanza et al., 2017; Knickel et al., 2018). The related changes in economic and business structures coincide with:

- an increasing predominance of business models that are focussed on maximising profits and shareholder value, as opposed to business models that are more closely aligned with the needs—and opportunities—of an environmentally and socially desirable development;
- lack of acknowledgement of the role of (ESS) in conventional economic and business development, which is in stark contrast to increased concerns about the quality of life and well-being, especially among younger generations, as well as increasingly pressing global challenges (the latter articulated above all in the UN Sustainable Development Goals, SDGs) (UN, 2015).

Against this background, we ask in this chapter whether there are more business models, strategies, and new forms of organisation that are more closely aligned with the common goal of a sustainable and equitable economy, which is socially and ecologically grounded. In Europe, a strategic backdrop to equitable economic change is embedded in the notion of 'just transition' where 'no-one is left behind. The European Commission has established financial instruments within the Just Transition Mechanism[1] (2019–2027) including a Just Transition Fund, a loan scheme and an investment guarantee fund to create leverage for realignments in areas where the regional economy is most carbon-intensive.

More broadly, the reference to more environmentally and socially sustainable business models points to the relevance of the analysis for more recent EU initiatives and policies such as the European Green Deal, the EU climate and biodiversity policy, the Farm-to-Fork strategy (F2F), the circular economy and the EU's Territorial Agenda. The European Green Deal aims to make Europe climate neutral by 2050, contribute to achieving the 2030 EU Biodiversity Strategy goals, boost the economy through green technology, ensure sustainable and safe food systems, create sustainable industry and transport, and cut pollution. The expectation driving these new, ambitious policy orientations is that climate and environmental

[1] https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal/finance-and-green-deal/just-transition-mechanism_en

challenges can be turned into opportunities to make the transition just and inclusive for all (European Commission, 2021, 2022).

Additional EU initiatives have recognised the importance of business approaches that blend commercial and social or environmental objectives, namely social enterprises. For example, the mapping of social enterprises in Europe following the Social Business Initiative (2011), and the Employment and Social Innovation Programme (2018) has highlighted both the importance of such alternative business models in Europe and their complex 'ecosystems' of commercial, regulatory and intelligence networks (European Commission, 2020).

The questions posed in this chapter align with Bidmon and Knab (2018), who argue that realising the transition towards sustainable development—meaning a sustainable society and supportive economy—requires new business models. These models provide a framework within which ESS are captured in language and can be associated with financial or economic outcomes and values. We are using the term 'valorisation' as first used in financial English as an intervention to fix the value of a commodity. In this context, we see businesses as interventions by socio-cultural actors to create or affix an economic value to ESS's flows and processes. ESSs can be commodified, but we are seeking models that do not break the complexity of ESS and resist the ecological and social simplifications inherent in the processes of commodification.

Related to this, we are interested in business models that valorise high cultural and natural values, including enhancing the supply of ESS, which in this way, also contributes to achieving the SDGs in this way, these models are regenerative, they enhance the supply of ESS, we mean the attentive management of ecosystems to protect them from degradation and introduce incentives for that attention to be sustained, or even extended. In this way these models are regenerative. Our analysis follows the common definition that ESS comprise provisioning, regulating, cultural and support services and the related social, cultural and environmental benefits introduced by the Millennium Ecosystem Assessment, and now used widely. ESS are provided by the ecological functions of natural ecosystems (Burkhard et al., 2010, 2012; MA, 2005).

Our particular interest lies in the ESS that are not normally rewarded by conventional market demand and supply mechanisms. In the following, we will speak of sustainable business models when they contribute to an *increased* supply of ESS (Bocken et al., 2014; Stubbs & Cocklin, 2008; Toxopeus & Polzin, 2017). We hypothesise that sustainable business models and the related strategies make lifestyles and economic systems more environmentally and socially sustainable, enhance ESS provision and contribute to social cohesion and job satisfaction.

In this chapter, we ask what key features and mechanisms of business models could best safeguard ESS, what might constrain sustainable business models, and how limiting factors can be overcome.

12.1.2 Brief Review of Related Research

In the following, we will briefly review key literature on sustainable business models, asking what constrains them, and why it seems so challenging to create, sustain and upscale the related innovations.

Business models can be defined as *"a focal firm's core logic for creating, delivering and capturing value within a stakeholder network"* (Jensen, 2013). Alternatively, they can also be seen as *"stories that explain how enterprises work"* (Magretta, 2002). A business model describes how a business relates to factor and product markets (Zott & Amit, 2008). Value creation is the core of a business model and a shared task of all actors involved (Casadesus-Masanell & Ricart, 2010). In essence, a business model describes how value creation between parties or partners — based on certain principles — is organised, at a particular moment, in a specific context, and given available resources (Jonker & Faber, 2021). Orthodox business models tend to be driven by financial value creation and are well understood (Casadesus-Masanell & Ricart, 2010). Dyllick and Hockerts (2002), Fjeldstad et al. (2012), and Foss and Saebi (2015) focus on the timelier question: the emergence of sustainable business models and new organisational forms and innovation in business models. The analysis and discussion in this chapter focuses on illustrating the basic ideas contained in these more conceptual articles.

Burkhard et al. (2010, 2012), Costanza et al. (2017), Houdet et al. (2012), and others explored ways to sustain natural capital and ecosystem services (ESS). Despite a body of work on interdependencies between new, more sustainable businesses strategies and ESS by now, a potentially significant role of sustainable business models in the valorisation of ESS—i.e., safeguarding and enhancing the supply of ESS—has still not received sufficient attention of scholars. This is notable as in the same analysis; it is recognised that ESS, and the natural capital assets that produce them, are seen as representing a significant contribution to sustainable human well-being, that many ESS cannot (or should not) be privately owned and that conventional markets largely elide, undervalue or ignore them. Bridging ecology, economy and social sciences, the same authors conclude that many ESS are such that providing benefits to one person does not reduce the number of benefits available for others; that is, they are 'non-rival'. Moreover, when defined as 'non-excludable', the latter means they can be treated as either 'public goods' or 'common goods'. Clean water supply, water quality, biological control, some cultural services, biodiversity and climate regulation are examples of non-rival and non-excludable services, which could, in turn, be considered public goods (Felipe-Lucia et al., 2015).

While the studies put forward, for example, by Burkhard et al. (2010, 2012) and Houdet et al. (2012), provide an important foundation for further analyses, they tend to focus on mapping and GIS, quantitative assessments, supply-demand accounting, and modelling. The related analyses, and, where it is the case, ambitions to influence policy development, are soon confronted with the complexity of the ESS concept, and the context-specificity of supply and demand, both with important implications such as:

- The number of ecosystem goods and services to be covered is potentially very large,[2] and many values attached to the natural or cultivated environment rely on an area's unique character.
- Interpreting ecological information collected from one spatial-temporal scale does not necessarily mean it can be applied to another.
- The supply and demand data are limited, and stakeholder values, estimates and opinions often drive the process (Gorriz-Misfud et al., 2016).
- Suitable market-based mechanisms are absent.
- Different communities and cultures will value ESS differently, subject to their beliefs, opportunities and relative agency.

Daily et al. (2000) argue that *"the process of economic valuation could greatly improve stewardship"*. Others like de Groot et al. (2010) recognise the challenges in integrating the concept of ESS and values in landscape planning, management and decision-making. In particular, scaling and bundling ESS and economic valuation (translating scientific knowledge to economics) seems only meaningful to a limited extent.

TEEB (2008) and, more recently, Naturkapital Deutschland (2016) and IPBES (2022) go beyond monetary valuation in emphasising the consideration of ESS in private sector decisions. Business cases for biodiversity and facts for entrepreneurs are provided, with particular attention paid to entrepreneurial development opportunities. Closely related analyses are put forward by Knickel (2001), Knickel and Peter (2005), Perrin (2018) and Cetara et al. (2022), who explore green market opportunities, the valuation of (or adding value to) ecosystem goods and services, and business policies for urban nature-based solutions. Paradigmatically distinct from the ESS approach, Nature Based Solutions (NBS) look to leverage the protection of nature in ways that simultaneously benefit people and nature. NBS is defined variously by different actors. The IUCN places a well-managed nature at the core of NBS schemes, whilst the EU has adopted a definition that relies on nature inspiring and supporting solutions. The literature on NBS contains a more advanced discussion of sustainable business models with different types of value propositions, delivery and capture approaches (Bocken et al., 2014; Boons & Lüdeke-Freund, 2013; Schaltegger et al., 2016; Stubbs & Cocklin, 2008). Particularly useful for the analysis presented in this chapter is the work of Perrin (2018). The author identified several key issues limiting the potential to explore and make use of commercial opportunities connected with ESS:

- Businesses tend to focus on immediate profits; a lack of concrete ways to capture sufficient tangible return on investment over a short timeframe and scarce evidence on long-term costs and benefits, resulting in limited interest in the private sector. Public-private cooperation tends to be constrained by a lack of understanding across various stakeholder groups about the value of nature-based solutions (NBS) and differing stakeholders' expectations.

[2] See the Common International Classification of Ecosystem Services, CICES, developed from the work on environmental accounting undertaken by the European Environment Agency, EEA.

- Values are volatile, i.e., they vary in time, context and between social groups, heightening uncertainty and risk. The common approach of private investors to discount (or depreciate) assets is seen as particularly problematic by some stakeholders.

The sustainable business models we will showcase later in this chapter contain mechanisms for overcoming (or circumventing) these bottlenecks and indicate how value for businesses and local communities can be created based on ESS's benefits.

The remainder of the chapter is divided into four sections. We briefly present the approach used and the five sustainable business models analysed. We then present the results of a comparative analysis focusing on how ESS are valorised. The chapter concludes with a brief synthesis of key findings and implications for future research, focusing on transformation-oriented approaches.

12.2 Approach Used and Data Basis

The reviewed literature indicates that business models can be defined in various ways. In the following analysis, we explore business models in socio-economic terms and aim to examine how they can 'valorise' ESS.

The basis for our analysis is a set of business model archetypes compiled jointly by practitioners and researchers in the EU-funded Horizon 2020 project ROBUST on enhancing rural–urban relations (ROBUST, 2022). Five of the 20 business models developed in ROBUST were selected for this chapter to demonstrate that sustainable business models can deliver diverse ESS, including food production, carbon storage, cleaned air, biodiversity, pollination, recreation, and education. This diversity is also meant to illustrate multiple opportunities for the valorisation of ESS at the business level. Profiling business models, their mechanisms and impacts followed a common protocol. The template used to characterise each business model is presented in Annex 1.

This chapter studies the five selected business models from various disciplinary angles to determine common properties. We are particularly interested in the logics of how firms operate and how value is created and captured, or as framed by Baden-Fuller and Morgan (2010), Brynjolfsson and Milgrom (2012), and Ritter and Lettl (2017)—the *value-creating logic*. As part of the approach, key actors, products, services, and revenue streams are identified in each business model. In examining the potential benefits of each selected sustainable business model, we also intend to investigate the perspective of entrepreneurs, local communities and policymakers.

More generally, we explore to what extent and how sustainable business models can achieve economic and social goals—such as unlocking local economic development and stimulating a positive societal impact—and whether and to what extent they can contribute to advancing a more socially and ecologically grounded economy (Fig. 12.1).

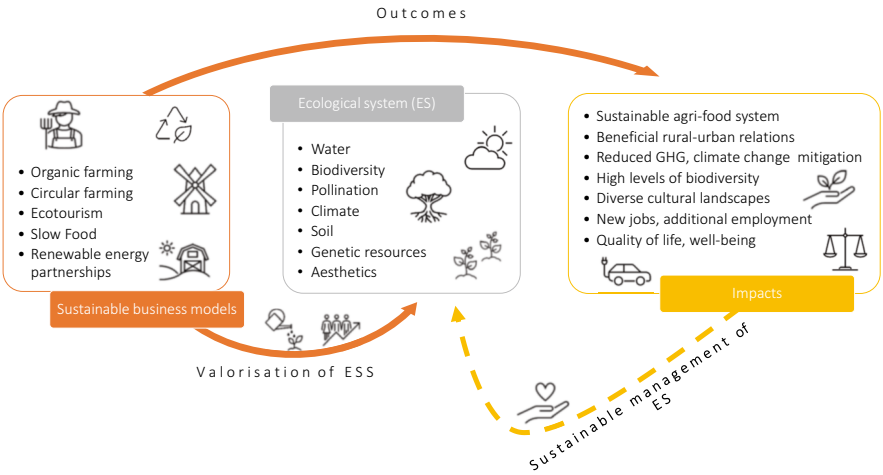

Fig. 12.1 Overview of the conceptual approach used

12.3 Five Business Model Archetypes

In the following, we will briefly present five business model archetypes covering a spectrum from single enterprises to business chains, shared businesses, and territorial partnerships.

The five business models are:

1. Organic farming
2. Circular farming
3. Ecotourism
4. Slow Food
5. Renewable energy sourcing partnerships

12.3.1 A Summary Overview of Business Models' Basic Features

According to multiple international classifications, ESS include providing materials (e.g., food and fibre), improving water quality, providing wildlife habitat, crop pollination, soil formation, temperature regulation, mitigating storms and floods, buffering pollutants, and supporting a wide array of cultural benefits, including recreational opportunities and aesthetic values and more (Fermilab, 2022; TEEB, 2008). In this chapter, we can only discuss a limited range of these services.

Table 12.1 provides a first overview of the basic features of the five business models with the specific ESS they can potentially valorise. As part of the analysis in this book chapter, the ESS were selected from the established classification of ESS (see Table 12.1) and attributed to each business model based on expert judgement.

Table 12.1 A summary overview of the basic features of each business model with a selection of the ESS it can potentially valorise

Business model, plus a brief description	Key actors	Organisational characteristics	ESS[a]
Organic farming *Aims at sustaining the health of soils, ecosystems and people*	Farmers, consumers, processors, retailers, policymakers	A systemic approach emphasises synergies in natural and agri-food systems	Food, storing carbon, education, recreation, aesthetic, stewardship, habitat, biodiversity, pollination, soil formation
Circular farming *Aims at minimising the use of raw materials by closing loops as locally as possible*	Farmers, processors, industry, policymakers	A systems approach to the cycling of raw materials, cross-sectoral cooperation	Food, wood, raw materials, biofuels, photosynthesis, clean air, reduced GHG, education, stewardship
Ecotourism *Aims at responsible travel to natural areas, maintaining environmental quality and well-being of local people*	Gastronomy, tourists, tourist agencies, NGOs, farmers, tourism operators, rafting companies and hospitality-related businesses	Place-based strategies, bundling of services	Recreation, aesthetics, scenic beauty, stewardship, habitat, biodiversity and wildlife, education, clean air, purified water, pollination
Slow Food *Aims at good quality, flavoursome and healthy food; environmentally-friendly production; fair prices for consumers and fair conditions and pay for producers*	Farmers, consumers, processors, consumer organisations, local governments and NGOs	Differentiation and quality, absence of middlemen	Food, education, recreation, aesthetics, stewardship, habitat, biodiversity, pollination
Renewable energy partnerships *Aims at new forms of territorial collaboration connecting rural and urban co-investors in production and consumption*	Farmers, processors, local public administrations, private households	Local and municipal level cooperation of renewable energy providers and users, wider sharing of responsibility, absence of middlemen	Biofuels, wood, photosynthesis, store carbon, reduced GHG

[a]Based on TEEB Europe (in: https://ecology.fnal.gov/ecosystem-services/ accessed: 27.08.2022)

12.3.2 The Five Business Models

Each business model will in the following be briefly described focussing on:

(a) what is the business model with its key actors, organisational characteristics and the concerned ESS;
(b) the way ESS are valorised with mechanisms and resource use features;
(c) strengths and weaknesses, and, where relevant, other related business models with their specific features and corresponding strengths and weaknesses.

Organic Farming

Organic farming is a sustainable business model for single enterprises, representing an archetype of ESS's valorisation. Its farming strategy focuses on sustaining the health of soils, ecosystems and people. To do so, it relies on ecological processes, biodiversity and nutrient cycles adapted to local conditions. The same ideas are expressed in the four principles that provide the foundation for organic farming (IFOAM, 2022). According to these principles, agriculture should *"sustain and enhance the health of soil, plant, animal, human and planet as one and indivisible; be based on living ecological systems and cycles, work with them, emulate them and help sustain them; build on relationships that ensure fairness regarding the common environment and life opportunities; be managed in a precautionary and responsible manner to protect the health and wellbeing of current and future generations and the environment"*.

The main ESS that organic farming valorises are food, carbon storage, education, recreation, aesthetic landscape values, stewardship, habitat, biodiversity, pollination and soil formation. Organic farming builds on natural systems and the ESS they provide. Its basic ideas are to 'work with nature' and to harness synergies instead of trying to achieve systems control—which, as Kasperczyk and Knickel (2006) and Knickel (2014) point out, is a significant strength at a time of rapidly decreasing resource availability.

Valorisation is based on a steadily increasing number of food consumers in many European regions willing to pay a higher price for organic food products (FIBL, 2022). The ESS that organic farming uses enhances, and valorises—e.g. aesthetic landscape values, stewardship, biodiversity and soil formation—are associated with the food product. Clearly defined rules of production, control systems and certification, labelling of organic products, and monitoring of trade in organic products ensure that natural resources are managed sustainably and build consumer confidence.

Multifunctional rural enterprises and rural care represent business models with some commonalities with organic farming. Many organic farms successfully integrate other activities, such as social care (Moriggi et al., 2020). Multifunctional rural enterprises build on farming diversification, boosting the supply of ESS and increasing environmental quality (Oostindie, 2020a). Rural care enterprises integrate people with physical, mental or emotional disabilities. Common activities in

such settings are agriculture-related and sometimes in market gardens, artisanal processing or in nature conservation (or combinations of those) (Vulto, 2020).

A limitation of organic farming as a business model is that transitioning from conventional to organic farming constitutes a challenge for farmers, specifically during the 'conversion' period. Another critical factor is the entry of larger retail chains into the organic market and competition with cheaper imported organic food products. It helps to reach more consumers but puts the manifold local benefits of organic farming in question. Public support makes it easier for farmers to switch to and maintain organic farming systems and represents payment for public goods in economic policy terms. Similar business models, less directly and less comprehensively linked with ESS provisioning, are multifunctional rural enterprises, rural care, and circular farming.

Circular Farming

Circular farming aims to minimise inputs of concentrate feed and chemical fertiliser as well as outputs of harmful substances and waste. Residual products from one chain are feedstocks for another. The focus of circular agriculture is minimising the use of raw materials by closing loops as locally as possible—within the farm, at the local level, within a larger region, or across national borders. The related ESS are raw materials, biofuels and photosynthesis, food, wood, clean air, reduced GHG, education, and, related to the use of non-renewable resources, stewardship.

Moving towards circular farming implies searching for practices and technology that minimise the input of finite resources (such as phosphate and water), encourage the use of regenerative ones, reduce or even prevent emissions (e.g. GHG, nitrogen, phosphorus), and stimulate the reuse and recycling of resources in a way that adds the highest possible value for businesses. High-tech circular farming aspires to improve natural resource use through reuse, remanufacturing and recycling. A common business model in the Netherlands combines urban organic waste for renewable energy production with residual heat for urban heating and glasshouse horticulture (Oostindie, 2020b).

Circular practices can help to make production systems less dependent on external inputs, and they can, in this way, drive the resilience of local economies. The biggest obstacles circular practices are confronted with are related to the low cost of some non-renewable resources that need to reflect real scarcities and externalities (like the costs of water pollution). Valuing food and acknowledging existing externalities also encourages consumers to buy sustainable food and energy.

Circular farming as a business model can be expressed in traditional land-based farming practices and more high-tech inspired practices such as urban rest-flow valorisation or bioenergy production (Oostindie, 2020b). Sometimes, new applications are based on traditional knowledge or farming wisdom from traditional farming systems. Similar business models are multifunctional rural enterprises, closed-loop agriculture and organic farming.

Ecotourism

Ecotourism is a form of tourism in areas of high natural value, typically including farmed landscapes and pristine and relatively undisturbed natural areas (TIES,

2015). Rural tourism has existed for a long time in regions with favourable conditions. However, the explicit focus on high nature value and higher ESS provisioning as an asset for individual businesses and the local economy is a recent phenomenon. Ecotourism tends to be low-impact and often small-scale. Environmentally sustainable practices, responsible travel to natural areas, maintaining environmental quality, and the well-being of local people play an important role in ecotourism businesses. The related ESS includes recreation, aesthetic landscapes and scenic beauty, stewardship, habitat, biodiversity and wildlife, and, less directly, education, clean air, water purification and pollination. Ecotourism is about valorising rural lifestyles and natural and cultural heritage. A tool commonly used in conjunction with ecotourism is regional quality labels.

A limiting factor is that a minimum amount of regional cooperation and coordination of individual business developments is essential. Valorising regional quality, traditional local food culture, rural lifestyles, and food heritage work best if accompanied by local and regional level actions. The experiences in biosphere reserves and natural parks show how much coordinated efforts can increase potential benefits. The new activities relate to tourism activities like participatory educational visits, catering, healthcare services, and recreational activities. The business model tends to be profit-driven but with a smart use of local resources and the recognisable importance of social gains.

Ecotourism stands for business models that aim at valorising heritage and rural lifestyles. Closely related place-based business models are commoning, as various expressions of community-supported agriculture, regional land banks, green funds and crowdfunding, and Slow Food. Commoning, for example, represents a societal attempt to revitalise the principal features of the commons in commercial activity. It builds upon the commons' definition, collectively owned property with broadly shared rules about access, use, responsibility and care for natural resources (Oostindie, 2020c). Commoning aspires to go beyond economic value creation by incorporating other sustainable resource use concerns and checks and balances. The innovativeness of commoning resides particularly in novel ways to combine commercial activity with other values.

Slow Food

Slow Food is a global, grassroots movement and organisation founded in 1989 to prevent the disappearance of local food cultures and traditions. The movement and related business model emphasise landscape attributes expressed in regional, often artisanal quality food products and their appreciation by food consumers. Three interconnected principles define the basic concept of 'good' food: good quality, flavoursome and healthy food; clean production that does not harm the environment; and fair prices for consumers and fair conditions and pay for producers. The ESS that the Slow Food business model and movement relate to are food, education, recreation, aesthetic values and stewardship, and, less directly, habitat, biodiversity and pollination.

The establishment of local food hubs, short food chains and box schemes are comparable. Like Slow Food, they are about providing the population with a

sustainable supply of products from the region. Typically, several regional businesses which produce, process and distribute food, cooperate within an area using commonly defined terms, common administrative structures and joint marketing (Kneafsey et al., 2013; Wiskerke & Verhoeven, 2018). Local food hubs curate a set of food products that embody specific goals like the food at risk of being wasted or products from a particular area, representing a local culture, and use those products as the basis of a retail catering offer. Food hubs often possess a profit redistribution mechanism in which a proportion of the revenue is used towards social goals (Reed, 2020a). Food cooperatives are fair retail, distribution and consumption chains. They offer consumers a way of buying products directly from a producer, without the need for middlemen (Fair Trade is a prominent example). This is due to their operation via social networks where orders and deliveries are agreed upon. Box schemes connect food producers with consumers even more directly. Entrepreneurs bring together their own food and additional products from other farms—usually from within a region—to offer customers a broad range of typically fresh fruits and vegetables. The produce is often sold as an ongoing weekly or fortnightly subscription, and the food boxes are delivered directly to a consumer or a local collection point. More advanced box schemes use ICT to make the business more efficient and consumer-friendly (see Crowdfarming, 2022; Querbeet, 2022). Typical is also cooperation with bakeries and butchers (Kneafsey et al., 2013). These initiatives focus on food's social, cultural and recreational value, displacing the focus on food as a commodity and highlighting its relationship to more expansive natural systems.

A limiting factor for Slow Food enterprises is that they require a functioning cross-sectoral infrastructure that enables regional value chains of producers, suppliers, preparers, trade, etc. Where this organisational infrastructure is in place, it is much easier for single enterprises to ensure a sufficient supply of sustainable food of high quality (Bauchinger, 2020).

Renewable Energy Sourcing Partnerships

Renewable energy sourcing offers novel rural business opportunities, including village-based investments in solar and wind energy parks. The related business model involves new forms of territorial partnerships and collaboration, such as energy cooperatives that connect rural and urban co-investors in renewable energy production and consumption (Oostindie, 2020e).

Key actors include farmers and other rural landowners, urban dwellers, especially those with sustainability concerns, energy companies open for investments in smaller-scale and more participatory renewable energy projects, and green investment funds with similar ambitions. It should be noted that in the case of this business model, collective efforts to allow the realisation of renewable energy sourcing plans as single-actor initiatives frequently face different types of problems (e.g. regulatory, financial, and societal resistance). The innovativeness of the approach resides primarily in its contribution to renewable energy sourcing with the aspiration to make the latter more viable, visible and accessible. Renewable energy sourcing combines the provision of ecological, community and economic values. Benefits include contributing to more sustainable energy systems, reduced dependency on

energy imports, and additional rural income opportunities. The related ESS include biofuels, the more efficient use of wood, carbon storage, photosynthesis, reduced GHG emissions, clean air and education.

Other comparable examples are food cooperatives and dynamic purchasing platforms. A common characteristic is that they bring actors from diverse rural sectors together, including agriculture, processing, tourism, etc., together, extending benefits and re-establishing linkages between rural and urban systems (Ovaska, 2020).

Potentially negative impacts include tensions with other types of rural ESS delivery (food, nature, biodiversity, water management, etc.), specifically the effect on rural amenity values (e.g. landscape) and further pressure on scarce land resources, especially in peri-urban areas, as well as local conflicts around the distribution of costs and benefits, such as of solar and wind energy parks.

12.4 Comparative Analysis and Discussion

In this section, we focus on two cross-cutting issues, each with the relevant features of business models:

- Value creation characteristics and mechanisms for valorising ESS
- Limiting factors and policy implications

12.4.1 Summary Overview on Value Creation and the Way ESS Are Valorised

Before the findings are presented in more detail in the following subsections, Table 12.2 provides a brief overview of how the five selected business models create value and how ESS are valorised.

It should be noted that compared to more conventional business models the business models selected for this chapter tend to have distributional implications. Some examples include value accrued locally and for many actors (rather than to one or two large businesses) and the production of multiple co-benefits that provide value to other sectors and groups.

12.4.2 Value Creation Characteristics of 'New' Business Models and their Significance for Sustainability

This section will discuss the analysis of distinctive characteristics of value creation and the main revenue streams of the examined business models.

Table 12.2 Summary overview of the business models, their value creation and revenue streams as well as the way ESS are valorised

Business model	Value creation and revenue streams	Mechanism(s) for valorising ESS
Organic farming	Higher product quality, health, reduced pollution	Agriculture relies on nature's pollination, pest control, and erosion control services. Ecological farm management enhances ESS such as pollination, flood control, carbon storage, biodiversity, and recreation
Circular farming	Reuse, remanufacture, and recycling of resources for the highest economic value and improved natural resource use. Circular farming generates employment opportunities, often locally	Circular farming and green infrastructure (green roofs, green spaces) improve air filtration, CO_2 sequestration and energy saving
Ecotourism	Recreation, fishing, hiking, and birdwatching. Ecotourism is a fast-growing sector generating significant employment and opportunities for local development	Ecotourism businesses benefit from the ecosystem's recreational value. Tourism-related businesses' revenue from accommodation, guiding, adventure or sale of local handicrafts or consumer products can serve as an incentive to protect and conserve biodiversity and the local ecosystem
Slow Food	Supplying the population with sustainable regional high-quality food products. Collaboration of businesses in food production, processing and distribution; joint administrative structures and marketing. A proportion of the revenue is used towards social goals	Territorial or place-based strategies for food, education and stewardship are prioritised. The economy is more than a market for profit-making: the social value of delivered services and the well-being of rural and urban regions and their residents are key considerations. The focus is placed on product market strategies that emphasise differentiation and quality
Renewable energy partnerships	Conserving forests and increasing their area is becoming a priority for governments and is now recognised as a business opportunity in terms of carbon credits—payments for carbon sequestration.	Keeping carbon stored in ecosystems is increasingly a major business opportunity. Voluntary carbon offset schemes are already operating, and plans for official REDD (Reduced Emissions from Deforestation and Forest Degradation) schemes are advancing. REDD-Plus goes beyond and includes the role of conservation, sustainable management of forests and enhancement of forest carbon stocks.

The food and producer-consumer-related business models focused on high product quality and freshness, sometimes including delivery as an extra service. A higher value-added and employment creation can be seen on farms and related rural businesses. They, therefore, have a higher local and regional multiplier effect than

long-distance food chains (Hediger & Knickel, 2009; Kneafsey et al., 2013; Wiskerke & Verhoeven, 2018). Product delivery to the door or a local collection point is common. The direct connection and exchange can improve mutual understanding, build trust, and enhance relations between food producers, processors and consumers. Business models that support the consumption of local and regional, as well as organic and seasonal food products, also advance a more sustainable food system (HLPE, 2019; IPES-Food/ETC Group, 2021).

Ecotourism provides a vivid illustration of value creation and value capture strategies. It creates income and employment opportunities for rural areas and businesses by valorising high nature value and higher levels of ESS provisioning. At the same time, it provides a strong incentive for carefully managing natural resources. Visitors to a region, typically urban dwellers, are willing to pay for the ESS that are provided (Ivesa & Kendal, 2013; Knickel, 2001; Zasada, 2011). In this way, a common (or public) good acquires some of the characteristics of a private good. Territorial cooperation and a minimum amount of coordination of individual businesses increase the potential of ecotourism. The products and services offered comprise a high nature value environment and an increased supply of ESS. Both are often combined with the offer of high-quality regional products. Revenue streams include the charges for overnight stays, regional taxes or entrance fees to natural parks, and payment for services like guided tours, horse riding and similar services. The main cost items are related to landscape management (partly compensated through agri-environmental payments), the maintenance of basic infrastructures (like visitor centres, hiking trails etc.), and generally the basic costs of products and services offered.

Territorial cooperatives such as renewable energy partnerships are examples of multiple or mixed value creation, usually comprising economic, ecological, cultural and community values. A wide range of products and services is offered, with particular attention paid to mutual benefits and contributions to sustainable development. Revenue streams tend to comprise both private as well as public money. Integrative rural land use facilitates the strengthening of rural-urban linkages, blending rural-urban values, and broadening rural economic activities. Territorial cooperatives successfully mobilise public support and steer public funding towards rural economic activities.

Prior studies on value creation in orthodox business models point to working within an organisation's or value chain's boundaries (Goldsmith & Samson, 2006; Jonker & Faber, 2021). These studies conclude that the underlying paradigm of a linear economy is not open to discussion, implying that conventional business models remain intact, and the underlying related organisational logic structure remains the same. This effectively means that no added value or additional societal benefit is created.

At the same time, in sustainable business models, we observed that the locus of value creation increasingly extends traditional firm boundaries, as inferred above. This observation corresponds with prior studies (Dyer & Singh, 1998; Gulati et al., 2000; Normann, 2001; Santos & Eisenhardt, 2005). In line with Kolstad (2007), Jackson (2017), Bidmon and Knab (2018), our analysis has shown that the transition

towards a sustainable society and supportive economy requires the generation of new business models and that these models and their wider use play a crucial role in shaping these transitions.

12.4.3 Mechanisms for Valorising ESS

Based on the analysis of distinctive characteristics of value creation and main revenue streams of the examined business models, we will look more closely at how ESS are valorised in our set of business models in this section.

Looking across the sustainable business models presented above, we find that strategies that address environmental, social, cultural and economic potentials in a more integrated fashion can be found in the private sector, civil society initiatives, and public-private arrangements. Entrepreneurs with different sectoral backgrounds or civil society organisations often drive related initiatives and business innovations. Local, regional, and national public policy bodies tend to support and sometimes catalyse.

The business models presented above use different mechanisms, have distinct characteristics and are innovative in different ways. In several models, for example, in food chains, cost-effectiveness is achieved through the absence of middlemen. In others, territorial or place-based strategies for food, culture and ecosystems are at the centre. A common feature is that they view the economy as more than a market or money transaction for profit-making. Instead, the social value of services produced, and the well-being of rural and urban regions and their residents, are key considerations (for a more detailed analysis, see OECD, 2020; Knickel et al., 2021). Cost leadership is a minor competitive strategy in sustainable business models. Much more important are product market strategies that emphasise differentiation and *quality*—the latter in the most encompassing sense, for example, in line with the Slow Food principles referred to above.

The following are some more specific findings on key actors and organisational structure:

- The sustainable business models presented above have equity implications. Compared to more conventional business models, they focus on the shared creation, production, distribution, trade and consumption of goods and services. Working collaboratively is transformative for both the communities where exchanges are happening and for the individuals involved. Internal relations are often primarily trust-based with relatively simple organisational structures. Shared sustainability concerns and business opportunities join rural and urban actors in novel partnerships around renewable energy production, circular economy goals, social care, local quality food and producer-consumer relations. Collective efforts are often found in areas where single-actor initiatives face regulatory or financial constraints, or, for example, in the case of wind energy,

social resistance. Renewable energy sourcing partnerships contribute positively to rural-urban relations by forging novel forms of commitment and collaboration between rural and urban dwellers. The same partnerships often address wider socio-economic sustainability and regional quality of life concerns. Related to local quality food, we found alliances with public institutions like canteens in kindergartens, schools, or hospitals.

- Ecotourism businesses have better chances to be successful in regions where many businesses and regional administrations pursue similar goals. Therefore, agreement on a 'green' vision for a region and regional-level coordination plays a significant role. Joint action is also key in landscape-level management and in the maintenance of, for example, clean lakes and rivers. Regional tourism boards typically play an important role in this coordination. Other relevant actors include cultural institutions such as museums, cultural centres, and marketing or business associations.

Cross-sectoral and multi-actor collaboration was also found important in studies by Vanhaverbeke and Cloodt (2006), Teece (2010), Zott and Amit (2008), Laterraa et al. (2012), Knickel et al. (2018), and Jonker and Faber (2021). References in these studies are made to the architecture of the organisation and the network of parties as the basis for value creation. Value creation tends to be perceived as a collective organisational task occurring in value chains and/or networks. A common conclusion is that describing a business model for only one chain, network, or partnership component is of limited use.

Commoning aligns commercial activity with multiple sharing mechanisms that allow overcoming the limitations of exclusively market-led relations. It contributes to wider societal responsibility sharing for more sustainable natural resource use. 'Territorial' business models, like renewable energy sourcing partnerships and circular farming, tend to avoid sectoral agglomerations and concentration based solely on locational or logistical cost savings. Instead, they emphasise opportunities for collaboration, functional connections, and interdependencies.

Several business models are about (re)connecting food producers more directly with consumers and vice versa. By focusing on high product quality and freshness and including delivery as an extra service, these models provide higher value-added, create employment on farms, rural businesses, and the local economy and allow greater traceability and accountability in the food chain. Kneafsey (2017) and others provide data on the EU's socio-economic effects of short food supply chains that correspond with this finding.

Regional quality labels are an integrative approach linking business and territory. They enable consumers to trust and distinguish quality products while helping producers market them better (Kneafsey et al., 2013; Wiskerke & Verhoeven, 2018). EU quality policy aims to protect the names of specific products from promoting their unique characteristics linked to the geographical origin (Protected designation of origin, PDO) and traditional know-how. Product names can also be granted a 'geographical indication' (Protected geographical indication, PGI) if they have a

specific link to the place they are made. Other EU quality schemes emphasise traditional production processes or products made in difficult natural areas such as mountains or islands (Kneafsey et al., 2013).

The common objective of business models that involve territorial and cross-sectoral collaboration is to enhance rural entrepreneurship, sustain rural development and improve rural quality of life. This is done by exploring novel forms of territory-based collaboration, not only among each other but also with public policy bodies and civil society organisations (Oostindie, 2020d). Novel partnerships, coalitions and alliances are a typical feature. Territory-based cooperation and community building are central mechanisms, often accompanied by a gradual diversification of commercial activities. Entrepreneurs believe that going beyond sectoral thinking and striving for systemic changes are crucial for sustainable development. Especially their support for more integrative, inclusive development initiatives makes territorial cooperatives an interesting partner for public bodies.

A common feature of these different business models is the bundling of services, including ESS and related benefits. This bundling is sometimes expressed in the ambition to create co-benefits or synergies. It finds its expression in ecotourism development, where a region is much more attractive if it combines landscape quality with high nature value, gastronomic offers that are locally sourced from organic farms, cultural offers (Knickel, 2001), and a high quality of public infrastructure such as a network of cycling routes (Knickel & Peter, 2005). Organic farming is another business model based on integrating, bundling and valorising ecosystems' services. Organic farming as a business model is sustainable because it focuses on maintaining and increasing ESS. However, it should be noted that the idea of integrating, bundling and valorising that can be observed in sustainable business models is in stark contrast to more recent trends in ESS-related research and spatial planning that seems to move in the opposite direction of disaggregating, accounting, mapping and valuing in monetary terms.

The reorientation in business models can also be seen in elaborating new business model canvases. The Circular Business Model Canvas focuses on implementing circular economy principles (Ellen MacArthur Foundation, 2016), and the Triple Bottom Line Canvas includes social and ecological values (Joyce & Paquin, 2016). All of these go beyond traditional business model frameworks, which focus almost exclusively on the perspective of one organisation with an emphasis on creating financial value (Jonker & Faber, 2021).

Our findings correspond to those of Zott and Amit (2008), who underlined the importance of *novel* business models coupled with product market strategies that emphasise differentiation. The same authors found that the focus of organisation design has shifted from the administrative structure of a firm to the structural organisation of its exchanges with external stakeholders.

12.4.4 Limiting Factors and Policy Implications

Based on the analysis above, multiple advantages of sustainable business models could be identified. Knowing that the economy is dominated by businesses that follow the conventional model, we must ask why advantageous business models play a smaller role. In the following, we will discuss potential reasons based on the same empirical material and the literature review results. The underlying assumption is that favourable regulatory and policy frameworks can foster sustainable business models. The analysis should therefore be highly relevant for policymakers and administrations who want to drive sustainable investment decisions in the private sector.

Having looked across sustainable business models, we believe the following factors limit multiplication and scale enlargement. Where possible, potential solutions are suggested.

1. Low prices of food products from specialised, large-scale, indirectly subsidised, industrialised production. This is aggravated by the creation of limited awareness and deskilling among consumers. Similarly, competition with low-cost mass tourism and between regions and regional green tourism offers. Social and environmental externalities are not considered, meaning there is no level playing field for sustainable business models and strategies. One implication is that the definition of property rights and fiscal regimes needs to be revisited.
2. Limited access to finance for entrepreneurs who want to launch a business that is less vulnerable to being path-dependent and locked into the dominant food system. The key challenge in this respect is integrating natural assets that have yet to be included in economic calculations and price systems. Our examples show that novel forms of territorial cooperation and new offset mechanisms between public and private goods could play a much more important role in policy. Public-private partnerships (PPP) allow the pooling of resources, skills, knowledge and institutional capacities and a sharing of the financial burden.
3. Cross-sectoral tensions and conflicting interests, lack of coordination and cooperation, and time required for building trust-based relations. There is a need to forge new networks, inclusive partnerships, and governance approaches. IT advancements and a transdisciplinary research approach open new avenues for creating new organisational arrangements among firms, partners, and customers and for enterprise innovation. The EU LEADER, LIFE and Horizon programmes as well as some more recent EU policy frameworks like the Farm-to-Fork strategy and the Territorial Agenda are promising in this respect.
4. Policy preference for well-established practices and models (e.g. large-scale renewables infrastructure vs. smaller-scale decentralised energy systems), which are easily governed and regulated. The need for more policy space for less conventional business models and self-governance approaches is closely related. The problem is aggravated by inappropriate and sometimes conflicting or outdated regulatory frameworks (e.g. phytosanitary regulations regarding the re-use

of food waste). Policy should encourage experimentation with new (research-based) concepts and models, such as ESS.

To develop sound policies, local authorities, civic organisations, and businesses must collaborate—and local governments play a key role in this arena. Local government, businesses and community leaders must be empowered to foster innovation and experimentation appropriate to different communities and ecosystems. Local governments and NGOs have many options to support businesses through certification and labelling, using widespread standards tailored to local conditions. Local policy can also incentivise citizens and businesses to invest in natural capital as experimental and novel business models augment and enhance ESS (Perrin, 2018; TEEB, 2010).

12.5 Conclusions

Our conclusions focus on two main findings: the shift from cost-benefit to co-benefit that has emerged in the examined sustainable business models which we argue is needed; and the important connections between ESS and the development of individual businesses and the local economy.

This chapter presents a broad spectrum of business models that can successfully valorise ESS. Key characteristics of these business models are distinctive resource use characteristics and novel organisational forms, including blended commercial approaches such as social enterprises, which have secured formal policy support for two decades in Europe. Generally, environmental sustainability and the regenerative use of natural resources are emphasised. Sustainable business models tend to be place-based, emphasising multifunctional resource uses, including land.

In sustainable business models, particular attention is paid to the balance between efficiency and resilience, collaboration and competition, diversity and coherence, and small, medium, and large organisations with different needs. Therefore, they tend to also lead to a wider distribution of value added and more beneficial relations between urban and rural areas.

All our examples show that societal goals can be more effectively achieved if individual motivations, entrepreneurial thinking, and innovation are coupled with cooperation and coordinated action. Other characteristics are different parameters of success such as the maintenance of the natural resource base, social cohesion, job satisfaction and security, well-being and work-life balance.

In contrast, overly dominant, orthodox success parameters for businesses, like profitability and return on investment, are hardly compatible with the rapidly increasing demands for environmentally sustainable societal development. Conventional business models focus on products and services that perform better and, most importantly, are cheaper than the competitors. We have also seen a tendency towards oligopolistic markets, where super-profits are generated, as

technologies are used to lock-in consumers across sectors—energy, IT provision, and semiconductor manufacturing—as examples.

In contrast, a key feature of more integrated sustainable business models is shifting from cost-benefit to co-benefit considerations. In this and other respects, the business models presented here are also about resisting what William L. Cary (1974) coined as the "race to the bottom". They represent alternatives to rationalisation, look beyond cost leadership, and embody a shift in thinking and strategies from competition towards co-benefits and cooperation. As part of that shift, these models resist the disaggregation of ESS and the financial valorisation of the individual aspects of ESS, focusing on the role that intervention can play in creating value. To disaggregate ESS is to ignore the role that interaction and synthesis play in the functioning of ecosystems and risk fetishizing one element, such as carbon at the expense of the systemic focus required. Focusing on protecting and enhancing ecosystems entirely, it acknowledges the limits to our knowledge and understanding—previously a systemic failure in economics—and the possibility of the unexpected, such as so-called 'black swan' events.

The business models examined in this chapter focus on making lifestyles and economic systems more environmentally sustainable, for example, by maintaining the natural resource base and ecosystem integrity, nature conservation and preservation of high nature value areas, or promoting climate-friendly production systems and lifestyles. Some examples illustrate how socio-cultural and quality-of-life goals can reinforce each other.

Several food-related business models represent a redesign of a local economy based on food, agriculture, tradition and culture. They tend to feature a significantly higher value-added, and they can create employment on farms and in related rural businesses leading to a higher local and regional multiplier effect. Several examples also show that rural spaces are places of symbiotic development opportunities in, for example, environmental management or the leisure economy.

Many new business models are not organisation-centred but dependent on a joint approach by citizens, companies, and government configured around a value proposition. Some of these new business models are organised more horizontally, in networks, and digitally facilitated. If used wisely, digitalization has the potential to strengthen the interactions between parties and enable new organisational relationships. They can also open the question of distribution, which in some highly unequal countries and territories is a burning social question.

More research is needed to encourage the application of ESS and approaches aimed at the valorisation of ESS more systematically. New research-based concepts and models, such as ESS, must be piloted in real-life settings, accompanied by transformative and action-oriented empirical research. At the same time, it is important to remain critical and reflexive regarding how terms such as the bioeconomy, the circular economy, or smart growth are used, especially in policy contexts. Adopting a longer-term, societal, and equalitarian perspective in economic and business development requires significant changes in policy orientations. Climate change is driving innovation; the race now is to ensure that adaptive and transformative changes can be enacted quickly enough.

Annex 1

(New, rural) business models, their mechanisms and impacts

Business model Name	**…**
Type	Short supply chains Exploiting ecosystem services Providing care, social economy Job creation Recreation, leisure Climate change Territorial development Other (please specify) PLEASE ONLY LEAVE ONE THAT BEST CHARACTERISES THE BM
Sector	Agriculture Food Environment Services Other (please specify) PLEASE ONLY LEAVE ONE THAT BEST CHARACTERISES THE BM
Level of organisation	Individual/private/family business (e.g. farm shop) Business/chain/association/shared/societal business (e.g. cooperative) Territorial (e.g. national park, nature reserve) Other (please specify) PLEASE ONLY LEAVE ONE THAT BEST CHARACTERISES THE BM
Short description	[PLEASE DESCRIBE WHAT/WHY. MAX. 1000 CHARACTERS WITH BLANKS]
Mechanism	[PLEASE DESCRIBE HOW. MAX. 800 CHARACTERS WITH BLANKS]
Innovativeness	[PLEASE DESCRIBE IN WHAT WAY THE BM IS INNOVATIVE. MAX. 500 CHARACTERS WITH BLANKS]
Value creation	[INSERT SCORE: 1 PROFIT FIRST …… 5 MIXED …… 10 SOCIETAL GAINS]
Societal impact	Beneficial (e.g. energy transition, new jobs, empowering women to do business): • • • • Negative (e.g. pollution, spoiling the landscape, over-exploiting natural resources): • • • • [3-4 BULLET POINTS MAX. EACH ON BENEFICIAL & NEGATIVE; MAX. 600 CHARACTERS WITH BLANKS]

Business model Name	…
Rural-urban synergies	[WHAT CONTRIBUTION CAN THE BM MAKE TO IMPROVING THE RELATIONS BETWEEN RURAL, PERI-URBAN AND URBAN AREAS? MAX. 800 CHARACTERS WITH BLANKS]
Connections with labour market and employment effects	[HOW IS THE BM CONNECTED WITH LABOUR MARKETS? WHAT EMPLOYMENT IMPACTS DOES IT HAVE? MAX. 800 CHARACTERS WITH BLANKS]
Enabling factors	• • • • [3-4 BULLET POINTS; MAX. 600 CHARACTERS WITH BLANKS]
Limiting factors	• • • • [3-4 BULLET POINTS; MAX. 600 CHARACTERS WITH BLANKS]
Relevant governance arrangements	- Which kind of actors are included: public, private, civil society (third sector)? - Which territorial levels are involved: local, subregional, regional, national, global? - What do the members actually do together -what does cooperation mean in practice? - How are the network interactions organised and what are the ways and models of interaction between the actors (including virtual platforms)? - How does the network strengthen social interaction and trust? [TYPICAL INSTITUTIONAL/ORGANISATIONAL FEATURES; MAX. 800 CHARACTERS WITH BLANKS]
Role of (local) government	Initiator Facilitator Regulator Financial support/financially responsible No role PLEASE ONLY LEAVE THE ONES THAT APPLY FOR THIS
Connections with policy environment	[HOW DOES THE BM DEPEND ON RULES AND REGULATIONS, HOW CAN (LOCAL) GOVERNMENT INFLUENCE IT? MAX.800 CHARACTERS WITH BLANKS]
A typical example	[WHAT/WHERE/WHO/CONTACT FOR MORE INFO]
BM references	[URLS, PUBLICATION REFERENCES, ETC.]
Name **Date**	[PLEASE PROVIDE YOUR NAME & DATE]

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Chapter 13
Food Policies in the València Region: Strengthening Rural-Urban Synergies and Ecosystem Services

Néstor Vercher Savall and Irune Ruiz-Martinez

Abstract Reconciling food production and the protection of ecosystems is a major contemporary environmental concern. Sustainable regional food policies can support the development and maintenance of local food production by integrating value chains with a variety of environmental, climate and resources management issues. This chapter examines how food policies and associated actions through the València Living Lab have sought to strengthen rural-urban connections in relation to ecosystem services (ESS). The main body of evidence in this chapter comes from València, Spain. The shift of València in public policies toward sustainable and local food systems has become an important narrative in rural-urban relations and ESS enhancement. Regionally, València needs to manage food system dynamics of diversification and future climate risks as part of a resilient system that ensures environmental protection, local food provision and strengthened rural-urban relations.

Keywords Food policies · Food systems · Ecosystem services · Rural-urban relations · Agriculture · València · Territorial planning · Territorial governance

13.1 Introduction

Sustainable food production is a pressing global concern. After decades of agricultural modernisation, especially intensification of production and the globalisation of markets and production chains, food systems are under pressure to transition towards more sustainable pathways due to a common concern for food security, climate change and nutritional quality (Sonnino, 2023).

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M. R. Partidario et al. (eds.), *Role of Ecosystem Services in Enabling Rural-Urban Synergies*, Landscape Series 20, https://doi.org/10.1007/978-3-031-98153-1_13

Food policies around the globe demonstrate the ability to contribute to ecosystem services (ESS) from a regional hinterland and peri-urban perspective, both strengthening the rural-urban linkages. Food policies promote the diversification of food production and seek to reconcile urban planning, the hybridization of sales and networks, as well as the branding of local products. These outcomes have positive and encouraging effects on ESS despite having a different approach to each specific food plan. While food production is a principal provisioning ESS in its own right, other ESS underpin most food production systems. However, all this is not explicitly stated in many regional food policies and still requires further scientific evidence.

In the study, we argue that regions need new approaches, through better rural and urban relations, to improve the sustainability of their food systems. In order to illustrate this thesis, this chapter is focused on València as a case study. València highlights rural-urban links in its emerging regional food policies for enhanced ESS and *vice-versa*, and the importance of ESS and food policies in strengthening rural-urban links. As such, València reflects the increasing public interest in sustainable local/regional food systems and their novelty within the territorial context.

The chapter now proceeds in four sections. The next section will present our theoretical approach, examining the dynamics of food systems in relation to their effect upon ESS, and how some regional/local food policies try to optimise the food-ESS relationship. Following this, in Sect. 13.3, the Living Labs methodology applied in the València case study will be described. In Sect. 13.4, the main findings on the emerging food policies and how they are integrated to ESS are presented. Finally, in Sect. 13.5, key ideas and conclusions are discussed.

13.2 Theoretical Background

13.2.1 Ecosystem Services and Food Systems

The concept and classification of ESS has been developed in scientific literature since the end of the 1970s (as highlighted by Costanza et al. (1997) who listed 17 groups of services). ESS can be described as the human benefits gleaned from a multitude of ways from a variety of ecosystems including agroecosystems, forest ecosystems, grassland ecosystems, aquatic ecosystems, natural ecosystems, urban ecosystems, etc. The Millennium Ecosystem Assessment (MEA) distinguished four main types of services: provisioning, regulating, supporting and cultural services (Almeida et al., 2020). Provisioning services refer to the production of food and water; regulating ESS control climate and disease; supporting ESS are linked to nutrient cycles and crop pollination; and cultural ESS include spiritual and recreational benefits.

To date, the principal focus of ESS has been on the protection of natural resources (biodiversity, water use/quality and soil degradation) within the so-called natural ecosystems. However, increasingly the ecological impact of agriculture and food

systems and their dependence on thriving ecosystems has become evident (Foley, 2005).

Food systems are usually understood as a set of activities comprising the production, processing, distribution and consumption of food. From a comprehensive point of view, they also include the interactions between and within natural and human environments and their effects on living conditions, especially food and environmental security, and social welfare (Ericksen, 2008). Food systems are changing as a result of the complex, dynamic interactions of a range of environmental and socioeconomic drivers: from climate change, agricultural intensification, concentration of production, vertical integration and coordination to industrialisation, deregulation and economic liberalisation and urbanisation (Pimbert et al., 2001; Thompson et al., 2007; Thompson & Scoones, 2009). Changes in various dimensions of farming, including land use, enterprise innovation and productivity all have an impact on the ways that food influences the provision of ESS (Lardon et al., 2018).

Cycling processes, for example the water cycle, offer clear examples of how food systems are closely interrelated with ecosystems and the services human beings receive from them. The amount of water used in irrigation or food processing leads to a constant reduction of renewable water sources and forces the use of groundwater supplies at a higher rate than the recovery rate. Another example is the carbon cycle. In this case, deforestation processes linked to the expansion of crops and pastures reduce the capacity of ecosystems for carbon sequestration. This process has been further exacerbated by the growing use of fertilisers, especially during the twentieth century. Moreover, the use of fertilisers has led to an increased generation of reactive nitrogen and has therefore negatively affected the stability of marine ecosystems, air quality and greenhouse gas emissions. The above-mentioned cycles have a clear effect on at least three of the ESS dimensions, i.e., provisioning, controlling and supporting.

Different parts of the world embrace distinct food systems, depending on their history, social and economic conditions, and ecological context (Foley, 2005). Each food system is usually associated with specific agricultural processes that lead to land use changes over time. Moreover, land use changes and agricultural transformation, and therefore food systems, impact the different dimensions of ESS. In Table 13.1, we synthesise some of the most significant agricultural processes (from land abandonment to land fragmentation, intensification, diversification, extensification, and specialisation) and their effects on ESS. For example, agricultural abandonment processes leading to re-naturalisation can reduce food production (provisioning), while improving carbon sequestration (regulating) and biodiversity (supporting). Another example is agricultural diversification and its comprehensive effects on ecosystem services. Diversification can support new crop production (provisioning), carbon sequestration and better water quality (regulating), new animal species (supporting) and the recovery of previously abandoned areas or traditional crops (cultural).

Land use changes take place either alternatively (at different times and sites) or simultaneously (e.g. two processes of rural abandonment at the same time towards either urban or natural areas), although they are often part of the same sequence

Table 13.1 Agricultural processes and their link to the dimensions of ESS

ESS	Agric. abandonment → Urban areas	Agric. abandonment → natural areas	Fragmentation of farmland	Agric. intensification	Diversification	Agric. extensification	Specialisation
Provisioning	↓ crop/food production	↓ crop/food production	↓ crop/food production efficiency	↑↑ crop/food production	↑ crop/food production	↓ crop/food production	↑↑ crop/food production
Regulatory	↓regulating services (e.g. carbon sequestration and storage)	↑ regulating services (e.g. carbon sequestration and storage)			↑ regulating services (e.g. carbon sequestration and storage)	↑ regulating services (e.g. carbon sequestration and storage)	
				↓ water quality/ erosion control	↑ water quality/ erosion control	↑ water quality/ erosion control	
Supporting		↑ biodiversity	↓ biodiversity	↓ biodiversity	↑ biodiversity		↓ biodiversity
Cultural	↓ cultural and recreation activities			↓ cultural and recreation activities	↑ cultural and recreation activities		

Source: Authors' elaboration

(Foley, 2005). For example, land abandonment is often a consequence of urbanisation processes (from agricultural to urban land use), but can also result in a transition to natural systems (from agricultural to 'natural' land use and protected areas). In any case, changes in food systems and their relationship with ESS adopt a territorial dimension. In the following section, we review this territorial dimension from the rural-urban perspective.

13.2.2 The Territorial Dimension of Food Systems and Ecosystem Services: A Rural-Urban Perspective

The relationship between food systems and ESS cannot be analysed independently from spatial considerations. The way a territory is socio-spatially configured influences this relationship. Also, changes in food systems and ESS affect the territorial structure of communities and regions. The rural-urban perspective is particularly relevant for addressing the relationships between food systems and ESS.

Food chains play a direct role in an exchange between rural food supply and urban demand globally, but also at the regional and local level. Food provisioning is also an integral part of the responses being applied to a variety of territorial issues, such as biodiversity, access to water or limiting flood risks, landscape conservation (e.g. the maintenance of orchards and terraces), the enhancement of protected spaces and natural areas, socio-political considerations (e.g. food sovereignty), and cultural aspects (e.g. tourism and leisure) (Lardon et al., 2018).

Similarly, the provision of some ESS can generate threats to other ecological resources (Soulard et al., 2018). For example, the scarcity of arable land and water and the fragility of cultivated ecosystems in Mediterranean areas might hinder the development of agriculture (Ortiz-Miranda et al., 2013). Moreover, water management is often disconnected from food provisioning and poorly integrated into territorial projects (Marraccini et al., 2013). Food provisioning very often involves government regulation (e.g. laws, policies, regulations, decisions and actions/practices) or market incentives to try to optimise and balance the emergence of multiple benefits from the food system (Stallman, 2011).

Food provisioning is both a multiscale and a cross-sectoral issue and thus addresses all three dimensions (social, economic and environmental) of sustainability in regions. Sustainability incorporates the development of innovative forms of organisation, agriculture, transport and energy models that limit the impacts on nature, climate and water. Indeed, sustainable food systems are able to provide marketable services (e.g., cash crops) alongside (or at the expense of) other socially relevant ecosystem services (e.g. eco-tourism) that differ within and between localities.

Recent approaches such as agroecology, which foresees agricultural land use that enhances biodiversity, and circular economy, which moves from an extractive economic model to the constant reuse and refashioning of material resources, have

indicated new ideas for an enhanced interaction between urban and rural areas. These include urban organic waste recycling, catchment-based water management, and the establishment of closer market relations between producers and consumers to support urban food systems (Zasada et al., 2019) and are therefore well-suited for supporting food production beyond the city.

Peri-urban agro-ecosystem services are generally characterised by a high intensity of demand/use due to a very large number of immediate local beneficiaries, compared for example to ESS generated in rural areas distant from densely populated areas. The density and diversity of beneficiaries, such as urban citizens (demanding water resources, air quality, local food), tourists (consuming landscape), creative industries (taking advantage of pull factors of the labour force linked to urban proximity to natural ecosystems), have particular characteristics due to their proximity to rural-urban ecosystems. This supports the idea that different ESS are produced from several ecological/economic processes and that there is an interdependent, qualitative relationship between beneficiaries and suppliers of ESS. For instance, cities may provide markets as well as social and producer services for rural populations whereas, for many of the rural populations access to rural land or produce through family or reciprocal agricultural relationships can also be crucial (Tacoli, 1998).

Peri-urban agro-ecosystem services are affected by territorial phenomena such as urban sprawl. Agriculture on the urban edge can stimulate opportunities for economic growth linked to environmental processing and management, the leisure economy and the other forms of land use. The extent of such opportunities will depend on the ability of planning tools for specifying land use conditions. However, urban sprawl is causing the loss or fragmentation of agricultural lands and, consequently, the decrease of crop production as well as of regulating services.

In this regard, farmland fragmentation has become a problem causing ecological damage and low crop production efficiency (EEA, 2006; European Environment Agency & Schweiz, 2011). In some regions, fragmentation and the fact that vegetable food systems are still connected to conventional food chains are leading to a shift or loss of production (Filippini et al., 2018). In other urban regions, vegetable and high-value crops prevail around peri-urban areas due to market-access advantages and the capacity to provide food at all times (Opitz et al., 2016). Scheromm and Soulard (2018) suggest this decrease of food production affects more small and non-diversified farms whereas larger and diversified farms are more likely to be resilient under pressure from urbanisation.

Diversification is recommended for transitioning towards a more sustainable food system and associated benefits in short food chains. In this regard, urban regions and their peri-urban areas, which are characterised by urban markets and their export channels, have emerged as a potential for SME-based innovation that can underpin green infrastructure, help manage urban sprawl and enhance urban ecosystems. Otherwise, extensification and abandonment of agricultural areas can lead to decreases in food provisioning ecosystem services and negatively affect biodiversity and water quality and supply services. Changes in agricultural systems can also lead to crop specialisation (e.g. fruits and horticulture) and development of

more intensive agricultural processes, which can increase food production outputs, but may also reduce biodiversity and other regulating services (Foley, 2005).

The capacity of food systems to reinforce ESS and promote sustainability depends to a large extent on the design and implementation of effective public policies. The following section seeks to explore the policy dimension of this phenomenon, mainly in the European context, from a rural-urban perspective.

13.2.3 Food Policies Promoting Sustainability Through Ecosystem Services and Enhanced Rural-Urban Linkages

New urban food policies have emerged to enhance the sustainability performance of urban food provision systems and to promote societal movements and cultural activities. Zasada et al. (2017) point out that it is necessary to consider regional contexts where, in addition to encouraging food production, organisational innovations aimed at shorter food supply chains are fundamental. These authors also stress the importance of ensuring that food provisioning operates within the limits of environmental, economic, and social sustainability for the re-connection of natural ecosystems and rural areas with urban areas, and that food provisioning must be acknowledged in research and policy.

The multitude of food-related challenges ahead (e.g. food security issues in cities, including food sovereignty, and the sustainability of increasingly vulnerable ecosystems) will rely on the close integration of food sustainability into everyday lived experiences, requiring a complex range of actors (Keech & Maye, 2019). New ways of thinking, new methods of public action, new constellations of stakeholders, and new initiatives to link food consumption and food production are needed to deal with the above food-related challenges (Lardon & Loudiyi, 2014). In this regard, an increasing number of social innovation initiatives are being identified across rural and urban areas with the potential to address local food needs and promote sustainability (Cattivelli & Rusciano, 2020; Vercher, 2022; Vercher et al., 2021).

Food is connected to a wide range of local and regional policy areas and can be a vehicle to integrate the economic, social and environmental dimensions of sustainability, as well as for addressing justice and health issues at different geographies and scales, including cities (Moragues et al., 2013). Specifically, a comprehensive body of literature has advocated for the localisation of food systems as a way to better connect rural producers and urban consumers (e.g. Jarosz, 2008), while better social outcomes from food systems for farmers and consumers require new and alternative business models (cf. Chap. 12). These can include social enterprises, which balance commercial and social/environmental objectives (Keech, 2017). Indeed, food policies are a means to reshape rural-urban linkages through food by creating synergies on other domains such as public health, social equity and regional economic growth (Filippini et al., 2019; Sadler et al., 2015). Certainly, food policies

are gaining ground in the wake of growing urban populations, changing diets and consumption patterns, and with sustainable agriculture and food supply chain innovations and solutions to potentially reduce urban footprints and vulnerability to global changes (Zasada et al., 2019).

Especially at the local level, local authorities face multiple eco-social challenges compared to national and international food policy approaches, which tend to focus on silos, especially food production, or diet-related public health (Coulson & Sonnino, 2019). These silos can undermine spatial food justice because the transformation of food systems requires, according to Sonnino 'polycentric' and 'plurivocal' governance. Even regional food policies have their own unique history and, depending on the trajectory each develops, different governance models (Morgan, 2009). In this sense, rural-urban food system synergies are necessary not just to enhance ESS performance, but also to underpin spatial justice in the multi-actor governance arrangements outlined in this chapter.

Urban and regional food policies in Europe have frequently been inclusive of sustainability concerns championed by civil society. Accordingly, food policies are multi-dimensional and include alternative food networks in their elaboration and implementation, in contrast to rural-focused food policies which have tended to foreground industry concerns such as enhancing productivity, resource efficiencies or securing labour supply. Likewise, part of this reaction to the productivity and industry model (Viljoen & Wiskerke, 2012) has been led by more health-conscious public procurement policies, e.g., the examples of Utrecht and Amsterdam described by Morgan (2009).

Other examples of local food policies have been shaped by a broader context characterised by the international acceptance of food as an urban challenge, as promoted by the Milan Food Policy Pact. Olsson (2018) analyses that urban food policies with sustainability ambitions are embracing a number of Sustainable Development Goals in the environmental, social, economic and equity dimensions. However, research has indicated that, while some cities have attempted to implement integrated policies including different ESS dimensions of the agro-food system, other cities have focused attention on food security action (Filippini et al., 2019).

Certainly, the reach of ESS is different with respect to final end-users' decision-making. The economies of food chains are linear and market-based, while ESS considerations involve complex global ecological interactions (e.g., regarding global issues of climate change and natural disasters) with which commercial food sector actors may feel only partly associated. Supporting services are fundamental to all other services, but their relationship to human needs can be indirect and complex too.

In contrast, although most cultural services are well-perceived by populations and usually help to raise public support for protecting ecosystems, they are often characterised as being "intangible," "subjective," and difficult to quantify in biophysical or monetary terms (Daniel et al., 2012; Small et al., 2017), requiring unique or complementary actors and governance arrangements. Likewise, ESS integration around food is complex and distinctive when developing policies. Many local, urban food policies include support for regional food systems and rural ESS, often through

support for short food supply chains, while rural food policies are often industry and productivity focused. This raises questions about how multiple ESS associated with the food system can produce rural-urban synergies.

13.3 Methods and Data

13.3.1 Methods in the Context of the ROBUST Project

This study was designed, collected and analysed within ROBUST, an EU H2020 project aiming at examining how linkages and synergies between rural and urban areas can be promoted to realising smart, circular and inclusive development for a sustainable Europe. It explores how rural-urban synergies can be applied in practice to strengthen regional collaboration, interdependence and interconnectivity.

The central approach in ROBUST was the Living Lab (LL) model, an experimental form of social innovation applied to optimise rural-urban synergies. In particular, the work in the LL in València is the main source of analysis in this chapter. This case study vividly highlights rural-urban interdependence through the ESS of food provisioning. In València, the LL indirectly supported the development of a sustainable urban food strategy, linking it more explicitly to the region's rural agricultural hinterland. In the following sections, we firstly introduce the territorial characteristics of València province as the main study area. Thereafter, the qualitative data collection and the analytical process are presented.

13.3.2 Case Study: València Province

València province is one of the rural-urban regions in the Mediterranean area. As shown in Table 13.2, it presents different territorial features, new policies and emerging planning instruments, that affect the way that rural-urban relations will develop and indicate that local/regional food production can enhance provisioning, regulating, supporting, and cultural ecosystem services while assuring food quality in the region. In València province, food policies and the consequent governance mechanisms, at both local and regional levels, were examined in discussions within the LL.

València province (NUTS 3) is located in the centre of the region of València (eastern Spain) and is one of the three provinces in the region. The province covers 10,700 km^2 and has 266 municipalities with a population of over 2.5 million. The vast majority of the province's inhabitants (95%) reside in urban areas, the largest being the provincial capital city of València on the Mediterranean coast, representing less than 70% of the province's total surface.

Table 13.2 Description of the case study

Case study	Description
Study area	València province
Country	SPAIN
Population	2,591,875
Surface, km^2 (density, inhab/kM^2)	10,806 (240)
Ecosystems	
Geography	Alluvial plain, coastal plain, hills
Water resource	Irrigation channels
Biodiversity interest	Coniferous forests and shrublands
Natural hazards	Fire and flooding
Food systems	
Main production	Vegetables, fruits and dry crops
Types of farms (average farm size)	Small and medium-scale farms (5 ha), part-time farmers, outsourcing tasks and specialised farms (fruits)
Public policies	
Food policy	Municipal food strategy, regional food policies (proximity sales, public food procurement, organic farming plan)
Urban planning	Urban sprawl, *Huerta* Plan, natural protected areas

The whole region is economically diverse (with tourism, industry, financial services, governmental and agricultural sectors), but unprecedented growth and development in the previous decades has been unbalanced, resulting in complex territorial, social, economic and landscape realities and tensions that must be addressed at the regional scale. These tensions include, for instance, depopulation of inland areas along with urban overcrowding on the coast, erosion of and increased pressure on natural ecosystems, building development in areas of high-risk of flooding, economic structures specialised in labour-intensive services and low productivity, and mass, low-cost tourism, etc.

The region of València can be divided into three areas: the coastline, the intermediate area, and the rural hinterland. The coastal area is characterised by intensive and irrigated agriculture (mainly horticulture) showing serious problems of economic profitability and loss of agricultural assets. Secondly, in the intermediate areas, permanent crops (e.g. fruit trees) predominate. This is the case of both the coastal and intermediate areas consisting of rain-fed crops (mainly rice) and irrigated agricultural space around the city of València called "*La Huerta de València*" ("València's garden"). Finally, an inland area, where dry crops (especially olive and almond) prevail and there is an increasing awareness of agriculture as a driver for the local economy. The search for increasing viability is the current challenge for the maintenance of this agricultural system, and especially by farmers who maintain this landscape.

The most productive areas are the coastal plain and the intermediate area, but agricultural land production supports high pressures from strong urbanisation and intensive tourism. Therefore, it will be critical to maintain the link between coastal

and rural ecosystems, supported by high-quality food production. Fresh food production for local consumption in some specific locations is considered an option for the maintenance of the Huerta and it has been argued that inland areas represent a unique landscape for the development of these spaces (Sarabia et al., 2021).

13.3.3 Data Collection and Analysis

The University of València and the Valèncian Federation of Municipalities and Provinces (FVMP), as key partners in the València LL, collaborated with other regional and local stakeholders to illustrate the importance of implementing rural-urban territorial processes and explore new synergies. Food policies were prominent elements of the innovation projects promoting rural-urban synergies. Different social, economic and public stakeholders involved in the food policies participated in the meetings and workshops carried out.

The data for this research draw on a larger data set collected during ROBUST workshops (September 2017–September 2021). The LL team organised regional multi-stakeholder workshops intended to explore and discuss the nature and characteristics of cross-sectoral interactions between different stakeholders within and across the different thematic fields. In addition, the regional workshops aimed to explore the place-specific potentials and bottlenecks for fostering rural-urban synergies. In these workshops, other stakeholders beyond the ROBUST consortium were invited, such as policymakers, NGOs, etc. During the meetings and workshops, the stakeholders identified the main policies addressing food sustainability and rural-urban relations.

The starting point of the València LL process sought to create common ground for discussion (envisioning phase). Firstly, the LL team selected those potential stakeholders who were well-informed about rural-urban links in terms of relationships and governance. We used the focus group technique to tackle our challenge through different topics. A meeting dedicated to sustainable food systems took place in April 2018 and involved two agriculture trade unions, a regional consumers association, an agri-food cooperatives' association, and three public actors (two local and one regional).

The second phase of the València LL (experimentation phase) involved the introduction of experimentations directed towards achieving the objectives and innovations planned in the initial meetings. Accordingly, the València LL embraced co-creation to achieve cooperation and governance innovations involving different stakeholders. The main co-production activities related to food systems and ESS are listed below:

September 2019. Workshop on cross-sectoral relationships sustainable food systems and other CoPs. The workshop also attempted to identify existing and potential relationships in different sectors of rural and urban areas. A total of 22 participants attended the workshop representing three different stakeholder groups (public government, private sector, and interest group representatives).

September 2020. Virtual workshop on potential governance arrangements. Ten participants representing three different stakeholder groups attended the workshop: trade unions of agriculture and consumers, two mayors of rural municipalities, a regional government technician specialising in food health, regional rural development actors (LEADER), and a farmer and manager of a cooperative.

May–June 2020. Individual interviews with public actors (regional and local actors) to identify cooperation/governance gaps in food systems, such as those linked to the development of a regional law about the proximity of local food and to the public procurement of local products, as well as the municipal food council.

March 2021. Several meetings with the World Sustainable Urban Food Centre of València (CEMAS) to start a study on sustainable food in education centres.

In the third stage (experiencing and analysing), the València LL team analysed and interpreted the data collected during the experimentation phase, expanding this analysis with new data and innovation proposals.

In summary, this work builds on the data and analyses derived from the València LL workshops and meetings plus other ROBUST CoP reports. Research is based on a documentary analysis of the reports generated within the ROBUST project for the specific case of València and a qualitative analysis of workshops and interviews notes. Through documentary analysis, we synthesised detailed information on specific activities, goals, innovations, governance arrangements, and actors involved in each of the food policies in the València LL. The relationships between the emerging food policies and ecosystem services were examined through the qualitative analysis of these data according to the four categories of ESS: provisioning, supporting, regulation, and cultural.

13.4 Results

13.4.1 The Shift of València's Public Policies Toward Sustainable and Local Food Systems: Exploring Rural-Urban Synergies

Local and sustainable food is promoted at different administrative levels in València. The València LL identified and discussed in particular the potential of four policies: i) València local food plan; ii) the Territorial Action Plan for the Protection of the Huerta of València; iii) the organic farming plan; and iv) València regional law of proximity and food public procurement.

At the municipal level, the City of València joined the Milan Urban Food Policy Pact and was elected as World Food Capital in 2017 by the United Nations Food and Agriculture Organisation (FAO). Since then, València city council has been developing a Local Food Plan, to run until 2025, which seeks to integrate food actions into health, education, and other policy areas in the València Metropolitan Area.

This plan also aims to enhance synergistic rural-urban food functions at least at the province level, as reflected in the following objective explicitly:

> The València 2025 Agri-food Strategy is therefore a process focused on building a sustainable agri-food system, in which community-territory ecosystem relations (urban, peri-urban and rural) are established on the basis of balanced, socially just and environmentally friendly relations (València city council, 2018: 5).

Initiatives such as "Food for Cities", promoted by the FAO, or approaches such as "City-Region Food Systems" are mentioned within the plan as frameworks by which the territorial and rural-urban dimension of food systems should be addressed, with particular emphasis on public procurement, territorial planning and new multi-scale governance mechanisms (local, regional, etc.).

The territorial perspective of the plan is emphasised in strategic line 6, concerned with "Territorial food planning". This strategic line of work aims to introduce food sovereignty criteria in municipal urban and territorial plans, with a metropolitan vision that reaches urban and peri-urban areas of València province:

> It is necessary to advance towards a perspective of food endowments and facilities such as those already contemplated in mobility, housing, education and health plans, while at the same time strengthening and coordinating territorial planning tools that guarantee the security and survival of the municipal and metropolitan agricultural territory. (València city council, 2018: 43)

The above-mentioned line includes several different implementation programmes. One of these addresses the elaboration of supra-municipal plans from a bioregional and, therefore, rural-urban point of view, for the inclusion of an agri-food perspective. In this programme, the specific actions refer to metropolitan action plans, the agri-food sustainability perspective in local plans, and collaboration with other planning instruments under development at regional level. Other programmes strengthen rural-urban links through green infrastructure connecting elements at municipal and regional level and, therefore, between agricultural and urban areas. In addition, actions are designed to improve the transition between the edge of urban areas and the beginning of the Huerta, so that the Huerta expands towards and into the city (and not the other way around).

In order to promote inter-municipal co-ordination in the food sector and therefore strengthen rural-urban links, the Local Food Plan includes a new food policy institution: the Food Policy Council. This brings together civil society organisations (especially from the food sector), academia, local and regional public representatives, and local and regional agricultural organisations. The council's members are organised around eight thematic working groups, including, e.g., public procurement, communication, short food chains, etc. The Food Policy Council allows for vertical coordination (València city council and regional government) and horizontal coordination of stakeholders (between organisations and local councils acting across various municipalities in the urban, peri-urban and rural areas of the València province).

The Local Food Plan, as set out in its different programmes, seeks to coordinate with other existing planning instruments at the regional level. One of the most

important of these is the Huerta law approved in 2018. This law recognises the social function of the Huerta in València as a key element for the agricultural development of the territory, food sovereignty and social welfare. It also includes a Territorial Action Plan for Management and Revitalisation supervised by the Agricultural Council, a public-private organisation representing all the urban and rural stakeholders involved in the Huerta of València.

In addition to the regulation protecting La Huerta, the government of the València region has been promoting organic farming and agroecology through several plans since 2016. The outcomes derived from the first plan (2016–2020) show an improvement in organic consumption in public centres (schools, government facilities, etc.), and increases in the number of young farmers and the acceleration of total sales (from €150 million in 2016 to €626 million in 2020) (Generalitat València na, n.d.). The most recent agroecological transition plan (II Pla Valencià de Transició Agroecològica) aligns its objectives with the goals set by the EU Green Deal and sets out specific actions in support of agroecology in rural areas at risk of depopulation. Other initiatives reflecting the rural-urban perspectives in the plan include cooperation mechanisms between municipalities for the creation of multi-actor platforms connecting producers as well as short food supply chain marketing channels between rural areas and cities.

Other collaborative initiatives driven by the València city council include local branding, which seeks to revitalise local production in the peri-urban areas. At regional level, there are regulating instruments for both public food procurement and proximity sale of local production which take into account the entire region of València (NUTS 2) in order better support the integration of the most remote rural areas of the region into the supply of public sector food. Decree 201/2017 (20.02.2018), which regulates the proximity sale of food products, responds to this demand for the integration of rural and urban areas. Specifically, it complements the current regulatory framework on healthy diets and food processing by considering the direct food sales by farmers as an agricultural activity, regardless of whether it takes place at the farm gate, in local markets or in short food supply and marketing chains.

The main purpose of the Decree 201/2017 is to guarantee food security and to enhance marketing opportunities for processed product sales directly to consumers, or reach markets via short commercial chains. The distances between remote and urban areas in València are modest—the most remote areas are located on a maximum isochrone of about 90 min, the dryland producing areas around 30–60 min, while the most productive area –including the Huerta of València—is located in a radius of 30 min by car and 30 km. Thus, in terms of policy instruments, the sale of local food in short food supply chains enhances inclusion of producers situated in the most remote rural areas by helping them reach consumers at the heart of urban centres.

Meanwhile, the València regional government has developed a regulatory instrument for public food procurement that, alongside pilot projects carried out at the municipal level, aims to expand local production in public education centres (i.e., schools). According to on-going research, in 2021 almost 60% of the public education centres in the region offer a healthy menu and 80% have a special

predisposition for more sustainable local food (this percentage coincides with decreasing the consumption of ultra-processed foods).

13.4.2 How Are Emerging Food Policies in València Linked to Ecosystem Services?

The four multi-scalar policies presented in the previous section share a strong focus on ecosystem services. In this section, we reflect upon this focus and potential impact in relation to the four main types of ecosystem services distinguished in Sect. 13.1: provisioning, supporting, regulating, and cultural services. Table 13.3 summarises the emerging food plans in València and their main effects on these four practices of ecosystem services.

In terms of provisioning services, all the food policies illustrate strong evidence on how emerging policies impact ESS. In València, most of the policies are mainly focused on establishing direct provision of food (organic farming plan, València Local Food Plan). This provision is increasingly diversified and many farmers have embraced marketing policies that are oriented towards local and direct selling networks. Moreover, municipalities have weekly established farmers markets. Small-specialised food supermarkets and restaurants are also responding to the food demand with a commitment to offer local and sustainable products. Provisioning practices are directly linked to the increase in organic production and consumption over the last few years in the region.

Table 13.3 Emerging food policies in València and main effects on Ecosystem Services

Strategy	Provisioning	Supporting	Regulating	Cultural
València local food plan	By increasing local food for canteens	New strategies such as the urban beekeeping strategy and measures, such as the land bank	By increasing urban food in the city in empty plots	Urban initiatives for promoting social awareness on sustainable food
València regional law of proximity/ Food public procurement	Increasing demand on local products	Increasing primary production e.g. promoting honey production	Promoting short food supply chains	Training from local councils to farmers
Organic farming plan Territorial Action Plan for the Protection of the Huerta of València	Increasing organic production in the region	Promoting biodiversity	By using sustainable and ecological practices	Increasing social participation in regional and local plans Protecting the traditional agricultural landscape of the València Metropolitan Area

Source: Own elaboration

Regarding the relation between emerging food policies and supporting services, different effects have been identified. There is an emerging movement of small-specialised food supermarkets and restaurants offering local and sustainable products as a result of the promotion of short food chains, for instance through the València regional law of proximity and food public procurement initiatives. These initiatives in turn have led to new local policies aimed at promoting biodiversity and increasing soil fertility. For instance, the land bank initiative, as part of the organic farming plan, aims to match supply and demand for agricultural fields located in the municipality of València and beyond. Moreover, the city council aims to increase urban food production, which has already reduced CO_2 levels in areas with the greatest presence of agricultural spaces. Over the last years, farmers have moved into organic production and diversified their activities to increase their income.

The impact of new food policies and instruments on regulating services is still unclear. Regulating services from emerging food policies in València may derive from some complementary measures such as urban beekeeping initiatives included in the Organic Farming Plan and the València Local Food Plan. At the time of writing, the València council maintains the population of urban bees via the installation of more than twenty research beehives in the city, as an essential contribution to pollination and biodiversity, while bees serve as bioindicator agents of environmental pollution.

It is challenging to empirically demonstrate the effects of the emerging food policies in València on the cultural dimension of Ecosystem Services. The match between food supply and urban demand is visible in the development of agricultural activities by urban actors. There have been efforts to create awareness campaigns (e.g. through public cooking demonstrations on the street and at schools) for promoting sustainable food consumption in craft and traditional food fairs. Regional plans have been elaborated involving a wide range of stakeholders and meetings have served to discuss local food issues, revealing, for instance, that some farmers are unaware of the regulations regarding food production and retailing. To face this challenge, València regional public officials have offered training within the municipalities to address the needs of farmers and smallholders, and provide information about food processing and direct sales regulations. One of the outcomes of this training has been, for instance, a series of design guidelines for the elaboration of food products and of collective processing facilities for the socio-economic revitalization of specific territories. In summary, Table 13.3 presents an overview of the ESS impacts of emerging València policies geared towards food system sustainability.

13.5 Conclusion: The Rural-Urban Interdependence of Food Through ESS Enhancement?

The main aim of this chapter was to analyse the emerging food policies in València in order to show how local and regional food policies can strengthen rural-urban connections in relation to ecosystem services. The emerging food policies in the

València region involved a wide range of plans, instruments and governance arrangements at different territorial scales and focusing on different issues. We specifically examined the main components underpinning four emerging food policies in València: (i) València local food plan; (ii) the Territorial Action Plan for the Protection of the Huerta of València; (iii) the Organic farming plan; and (iv) València regional law of proximity and food public procurement. These were discussed in the context of the València LL as part of the ROBUST project.

The València LL demonstrated attempts to integrate different policies and governance arrangements between regional, inter-municipal and València city administrations, with different policy areas relating to cultural landscapes and agriculture, food security, food culture and supply chain coordination. Research findings showed evidence that local food production enables "positive interest agreements" that can be created from other sectors and new localities. Even so, the structuration of local governments often affects local food production scope and innovative capacity (which is at last partly externally realised) in pursuing food policy development.

In this regard, the LL method has shown utility in developing collaboration and cooperation networks. In València, these networks helped share knowledge and carry out diagnosis and dissemination of food issues in the region. They have supported municipalities hoping to improve the operational and logistical efficiency and combined capacity of smaller-scale and local suppliers.

The existence of an explicit territorial dimension in the new wave of food policies in València has been examined. Although most of these policies include a rural-urban perspective, there is a bias towards the peri-urban area, relegating the more remote areas of the València province to a less prominent role. In any case, this fact is, in part, a consequence of the particular contexts of València, where the city itself is surrounded by extensive peri-urban agricultural areas (La Huerta).

The policies examined in this chapter have a stronger impact in the field of provisioning practices, through the effect on increased production and product diversification. Similarly, their effects in terms of supporting ESS have been found to be significant. Less evident are the effects in terms of regulating ESS, as they do not form part of the direct impacts of policies studied in the case of València. Likewise, the effect on cultural ESS, despite being perceived as important (especially in the Territorial Action Plan for the Protection of the Huerta of València), are difficult to measure and have not been the main element highlighted by the workshops' participants in the València LL.

Rural-urban interdependence of food through improved ESS face several obstacles in València as outlined in relation to the LL workshops. Firstly, there is a need for higher emphasis on collective action and local stakeholders' commitment in order to maintain a viable living rural area. Food traditions and local foods can still be showcased today. Rural tourism and leisure services were regarded as a good income generation option for villages and well-preserved natural areas, although the capacity of rural tourism to promote development must not be overestimated (Overbeek & Terluin, 2006). Mainly, the València case showed that farmers need be better integrated in decisions that affect the delivering, supporting, regulating, and cultural dimension of ESS (cf. chapter on payments for ESS). Proximity in relation

to landscape and territory, and the synergy of food policy and urban planning were critical factors to achieving this end and curbing unsustainable aspects of agri-industrial development.

Despite shortcomings, the potential of food policies which explicitly strengthen rural-urban links should not be underestimated. There is an established range of regional instruments to promote quality food production (e.g. quality schemes such as geographical indication certifications or organic food plans) that can enhance provisioning, regulating and supporting services as well as maintaining the link between urban and rural ecosystems. The promotion of local food consumption is considered an option for territorial development in rural areas as well as a way to link rural and urban areas. Assessing this territorial development potential may require multi-criteria sustainability assessments, new agri-business models, consumption transitions, and social and technological innovations. In this regard, urban food production or circular farming can help to reduce environmental impacts of agriculture and food chains, but may result in a different type of quality of food landscape.

In short, regions need new approaches, through better rural and urban relations, to improve the sustainability of their food systems. We argue that rural-urban synergies are key for delivering more effective food policies with stronger positive impact on ESS. Such initiatives and policies cannot be limited to the local space, as synergies occur at higher territorial scales and, especially, it is the regional scale that can offer the best results in terms of ESS and, therefore, sustainability.

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Chapter 14
Cultural Ecosystem Services and Rural-Urban Relations: Towards a Territorial Wellbeing Approach

Bryonny Goodwin-Hawkins, Sabrina Arcuri, and Isabel Loupa-Ramos

Abstract Human interactions with ecosystems create numerous benefits. Until recently, the cultural benefits of ecosystem services had received less attention than environmental goods and economic opportunities, even though cultural ecosystem services (CES) are recognised as having important roles to play in supporting human well-being. In this chapter, we explore CES through the spatial lens of rural-urban relations, with the aim to move beyond traditional approaches looking at well-being benefits that urban dwellers might derive from rural "containers" of ecosystem services. Rather, we are interested in rural-urban relations as a locus for cultural ecosystem services that reveals complexity and multiplicity, interdependency and inequity. By drawing on three descriptive case studies—Garfagnana (Italy), the Cambrian Mountains (Wales) and Snowdonia (Wales)—we offer different views into the ways that CES emerge at the interface between environmental spaces and cultural practices. In particular, we highlight the potential for trade-offs, inequity and contestation. By reflecting on the complexities that arise from the rural-urban perspective on CES, we contribute to an emerging research agenda on territorial well-being.

Keywords CES · Rural-urban · Well-being · Mutual benefit · Identities · Capabilities · Experiences · Cultural practices

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M. R. Partidario et al. (eds.), *Role of Ecosystem Services in Enabling Rural-Urban Synergies*, Landscape Series 20, https://doi.org/10.1007/978-3-031-98153-1_14

14.1 Introduction

Human interactions with ecosystems create numerous benefits. Until recently, the cultural benefits of ecosystem services had received less attention than environmental goods and economic opportunities, but their role in supporting human well-being is now increasingly acknowledged (Chan, Guerry, et al., 2012b; MA, 2005; Plieninger et al., 2013; Pröbstl-Haider, 2015). Yet, where cultural benefits are acknowledged, they are often abstracted into generic 'goods', with little attention to how they are created, which groups actually benefit and what the trade-offs may exist (Kosanic & Petzold, 2020).

As human dependencies on nature and ecosystem services are inherently spatial (Potschin & Haines-Young, 2011), in this chapter, we examine cultural ecosystem services through one particular spatial lens: rural-urban relations. Rural space typically doubles as 'natural' space, whether imaginatively evoked (Bell, 1992) or intentionally constituted (Figueiredo, 2008), and unsurprisingly (but not inevitably) many studies on cultural ecosystem services draw from rural cases (Kosanic & Petzold, 2020). While this may raise seemingly obvious questions about enabling urban access, the approach we adopt in this chapter moves beyond viewing well-being benefits as simply imbibed from rural spatial 'containers'. Rather, we are interested in rural-urban relations as a locus for cultural ecosystem services that reveals complexity and multiplicity, interdependency and inequity.

To do so, we draw upon examples from the Garfagnana region in Tuscany, the Cambrian Mountains in rural Wales, and Snowdonia National Park, also in Wales. These case studies illustrate, precisely by emerging at the interface between environmental spaces and cultural practices, that cultural ecosystem services reveal conflict and constraint, and reproduce uneven benefits. By reflecting on rural-urban relations through problematising assumptions about cultural ecosystem services, we contribute to an emerging research agenda on territorial well-being (Jones et al., 2020; Knickel et al., 2021; OECD, 2019). This agenda builds upon momentum to value 'good lives' beyond GDP (Stiglitz et al., 2009) by critically examining how well-being benefits are territorially distributed and spatially mediated.

The chapter proceeds as follows. In the first section, we outline how cultural ecosystem services are currently conceptualised and adopt a definition. We then consider rural-urban relations, and introduce mutual benefit as a normative ideal. Turning to our examples, we offer brief descriptive cases that indicate key issues for further exploration. In the final section, we reflect on these issues to discuss the implications for cultural ecosystem services within the broader context of territorial well-being.

14.2 Understanding Cultural Ecosystem Services

Costanza et al. (1997) define ecosystem services as the benefits humans withdraw from nature, as a way of putting monetary value on natural capital stocks and the life-supporting services that humans receive from them. This approach gained momentum through the UN Millennium Ecosystem Assessment (MA), launched in 2001. The MA (2005) did not report solely on the state of nature from an ecological perspective, but emphasised that future generations' well-being depends on present actions to preserve ecosystems. Ecosystem services were thus categorised as: supporting services (e.g. soils and nutrients), provisioning services (e.g. food and fuel), regulating services (e.g. climate and flood regulation), and cultural services. Cultural ecosystem services (CES), primarily contributing to the psychological and social constituents of well-being, were described as the "non-material benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experience, including, e.g., knowledge systems, social relations, and aesthetic values" (MA, 2005, p. 40).

Research on ecosystem services has thrived since the MA, yet research has been strongly based in the natural sciences, leaving CES to lag behind as a specific field of inquiry. Moreover, since CES involve subjective perceptions, attitudes and beliefs (Milcu et al., 2013), dominant economic approaches to assigning monetary value to ecosystem services pose methodological challenges. Researchers and policy-makers may be consequently underestimating the *perceived* value of CES (De Groot et al., 2010). Multiple authors (e.g. Bullock et al., 2018; Chan et al., 2012a; De Groot et al., 2010) acknowledge the 'struggle' of progressing CES knowledge.

Ecosystem service mapping is a case in point. Ecosystems are intrinsically spatial and their mapping has deserved much attention (e.g. Burgess et al., 2016; Maes et al., 2012). Mapping ecosystem services complements measuring their monetary value, including by differentiating between territories supplying services and those demanding (and potentially paying for) them. Yet unlike many material ecosystem services, CES are not solely determined by geographical location. Rather than being measurably affixed *in* place, CES reflect a subjectively felt 'sense *of* place' (Urquhart & Acott, 2014; emphasis added). The methodological difficulties here have tended to be 'overcome' by simplistically "constructing culture so that it remains consistent with existing methods" (Fish et al., 2016, p. 209)—largely through selecting readily gauged indicators, like recreational activities or consumable goods (for a study of the monetary value of recreation ecosystems see, for instance, Lankia et al., 2015). However, effectively confining CES to measurable, mappable amenity proxies has skewed research, neglecting less evident benefits (Bullock et al., 2018; Chan et al., 2012b; Fish, 2011) and "further deepening the gap between counting that which matters to people and that which is easy to measure" (Milcu et al., 2013, p. 5).

Although ecosystem services as a general concept evokes instrumental human 'transactions' with nature, CES invite understandings that are less unidirectional, and more relational and non-linear (Fish et al., 2016). Dependent, as they are, on 'the expressive, symbolic and interpretive interactions between people and the

natural environment' encompassed by cultural practices (Fish et al., 2016, p. 212), CES emerge at the dynamic *interface* between environmental spaces and cultural practices, and are "co-produced and co-created outcome[s] of peoples' interaction with ecosystems" (Fish et al., 2016, p. 209; see also Chan et al., 2012b). To escape both simplistic environmental determinism and overly esoteric views of culture, Fish et al. offer an operational redefinition of CES as: "the contributions ecosystems make to human well-being in terms of the *identities* they help frame, the *experiences* they help enable and the *capabilities* they help equip" (Fish et al., 2016, p. 212; emphasis added). We adopt this definition here. The tripartite structure—identities, experiences, capabilities—enables us to capture difference while equally encompassing dimensions that could be collective and territorial (Jones et al., 2020). In this framework, *identities* may encompass belonging, rootedness, sense of place, which individuals and communities develop according to distinctive features of ecological phenomena. *Experiences* are physical or mental benefits felt through contact with ecosystems, like tranquillity, inspiration, and escape, while *capabilities* pertain to the way ecological phenomena affect people's capacity to understand things and progress, and include knowledge, judgement, and health, among others (Fish et al., 2016). With this in mind, we now 'place' CES in the rural-urban context.

14.3 Placing Cultural Ecosystem Services in Rural-Urban Perspective

Because CES emerge dynamically at the interface between environmental spaces and cultural practices, critical questions arise about *which* identities, capabilities and experiences are enabled, and for *whom*, that need to be unpacked. Following the work of the Horizon 2020 ROBUST project (Rural-Urban Outlooks: Unlocking Synergies), we do so through the lens of rural-urban relations.

Rural areas are frequently associated with landscapes and natural capital, and rural communities typically live in closer proximity to the natural environment than their urban counterparts. From the ecosystems mapping perspective we discussed above, an equivalence between rural space and CES might appear as self-evident. Yet cultural identities, experiences and capabilities do not emerge automatically from rural spatial containers. Scholars have long critiqued the existence of a clear dichotomy between rural and urban, which despite reinforcement from classic social theory (e.g. Tönnies, 1912; Weber, 1921), reflects cultural histories (Williams, 1973) rather than an objective, ontologically prior reality. Recent efforts to 're-materialise' the rural (Woods, 2009) reveal multi-layered rural-urban interdependencies (Wu et al., 2016) and complex flows of people, commodities and capital (e.g. Champion et al., 2009; Lehtonen et al., 2015; Mayer et al., 2016).

At the same time, pre-existing cultural "webs of significance" (Geertz, 1973, p. 5) inevitably continue to intervene in how people perceive rural (and urban) space. Common conceptions of a 'rural idyll' (Bell, 2006; Halfacree, 1993) idealise

rurality as the greener, gentler opposite to urban "noise, worldliness and ambition" (Williams, 1973, p. 1). Through this cultural lens, rural places are not only closer to nature (Bell, 1992) but to simpler "way[s] of life both past and passing" (Nadel-Klein, 1991, p. 110). The rural idyll is routinely debunked in rural studies, and should give us pause in approaching CES unreflectively. There is clearly a risk of equating rurality with well-being in pre-determined ways that romanticise 'wild-scapes' (Bell, 2006) while overlooking the contested ways in which the amenity values afforded to rural space are culturally reproduced (Abrams et al., 2012; Woods, 2011).

Similarly, there is also a need to be wary of construing rural-urban relations as urban-dwellers' ability to access and enjoy CES through recreation and tourism. From functionalist land-use schema (e.g. Christaller, 1933; von Thünen, 1826) to ecological footprint studies (Castán Broto et al., 2012; Rees, 1992), city-centric perspectives already reckon rural space through *urban* food and natural resource needs. The trouble with treating rural-urban relations through an ultimately one-sided logic is that this tends to become a self-fulfilling prophecy, leaving rural areas marginalised (Bock, 2016) and dependent upon urban desires, decisions and finance (Gkartzios & Lowe, 2019).

In this chapter, we draw upon the notion of *mutually beneficial* rural-urban relations as a normative concept. By mutually beneficial, we mean that the distribution of benefits is relatively balanced—though need not be exactly the same, or concern exactly the same benefits. By a normative concept, we mean that we do not assume that mutual rural-urban benefits actually exist nor necessarily constitute a practical goal. Rather, considering how mutual—or not—the well-being benefits arising from CES are between rural and urban spaces allows us to reflect on both potential opportunities and patterns of inequality and contestation.

In the following sections, we present three brief descriptive case studies. All three are located in rural areas, each with differing characteristics and circumstances: Garfagnana (Italy) is a geographically unique region, host to considerable agro-biodiversity, which reflects the region's cultural and culinary heritage; the Cambrian Mountains (Wales) is a sparsely populated and 'less favoured' upland area, where precarious agricultural livelihoods have shaped local communities and inflect their culture; Snowdonia (Wales) is a celebrated national park, where Welsh-speaking culture meets leisure and thrill-seeking visitors from further afield. The first two examples were initially identified during a rapid appraisal of existing data for the ROBUST project. ROBUST researchers engaged with the latter during interviews with local authorities. In all cases, we draw upon a mix of learning from ROBUST and supplementary desk research.

We do not present the cases as empirically rigorous and validated examples. Rather, we use them to highlight the *identities*, *capabilities* and *experiences* emerging from human-environment interactions and reflect on rural-urban mutual benefit. In each case, we focus on one aspect of the tripartite CES definition: identities in Garfagnana, capabilities in the Cambrian Mountains, and experiences in Snowdonia. Reality, of course, is not so clear-cut, and our discussion picks up the comparisons.

The Gold of Garfagnana: Agrobiodiversity and Territorial Identity

Garfagnana forms part of the Province of Lucca in Tuscany, Central Italy. Located in the upper valley of the Serchio river, Garfagnana is enclosed by two mountain ranges: the Apuan Alps to the West and Apennines to the East. Although covering 620 km^2, the region has a very low population density, with capital town Castelnuovo Garfagnana counting less than 6000 inhabitants. Population has been steadily declining for decades (MontagnAppennino, 2016).

The name Garfagnana originates from *faniana* "large forest" in old Umbrian, while the Celtic adjective *gar* stands for "grand, sublime" (Pieroni, 1999). History and geography have given the region cultural peculiarities that it does not share with the rest of Tuscany, including popular knowledge from diverse origins, such as the use of plants for food and medicine (Pieroni, 1999). The local population's attachment to these traditions and resistance to external influences (Pieroni, 1999) have combined with geographical isolation and topography to make Garfagnana home to considerable agro-biodiversity. This cultural asset is recognised by the Community for Food and Agro-biodiversity,[1] established in 2017, and protected by a local division of the Regional Germplasm Bank (Unione Comuni Garfagnana, n.d.). The Bank includes more than 250 herbaceous varieties, and traditional fruit and vines. The Bank also supports 38 '*agricoltori custodi*' (Laboratorio Sismondi, 2017), or seed savers: small, amateur producers, who are committed to reproducing the varieties they are assigned, usually in exchange for a small reimbursement of expenses (Unione Comuni Garfagnana, n.d.).

Cooperation between seed savers and the Germplasm Bank has protected several varieties, notably including a local maize crop called *Formenton otto file* (a name owed to its eight rows of kernels (Lunatici & Pieroni, 2014)). *Formenton* originated from small farmsteads, where it was grown for family consumption. Garfagnana's close, small valleys and high altitude enabled the variety to develop without cross-fertilisation (Arcuri et al., 2019). By the Second World War, however, *Formenton* cultivation had largely given way to hybrid maize varieties, which yielded ten times as much (Lunatici & Pieroni, 2014). In the early 2000s, a retired local farmer began an initiative to recover the *Formenton* landrace. He recalled that the *polenta* prepared from *Formenton*'s yellow flour was once the basis of peasant diets and folk medicine, and remained part of Garfagnana's cultural traditions (Rural, n.d.; Lunatici & Pieroni, 2014).

Several attempts have since been made to qualify the 'gold of Garfagnana' for Geographical Indication (GI) status. Unlike other locality produce from the region, however, the GI application for *Formenton otto file* was not successful. Nevertheless, *Formenton* flour and *polenta* have had a local revival. The product specification developed for the application has helped re-establish traditional methods for harvesting, drying and milling—the latter exclusively stoneground—and facilitated new relationships between *Formenton* producers and the region's remaining mills

[1] A detailed account of the Community for Food and Agro-biodiversity of Garfagnana is available in Chap. 5.

(Arcuri et al., 2019; Lunatici & Pieroni, 2014), one of which dates back to 1736 (Rural, n.d.). Favourable contexts created by a network of motivated small-scale producers and processors, with crucial support from the Germplasm Bank, have combined with the strong sense of identity local people attach to *Formenton* to re-establish a market and preserve cultural heritage for future generations (Arcuri et al., 2019).

Formenton illustrates how the interface between Garfagnana's unique environment and cultural practices, both past and present, generates CES. Identities are particularly apparent here, although capabilities and experiences are traceable too. Practices of seed saving, cultivation and consumption entwine with place-making processes to reproduce a shared sense of belonging, as well as a specific knowledge and related skills. For instance, by reflecting collective knowledge, the Germplasm Bank's ostensibly scientific work is also recognised locally as supporting valuable cultural benefits. Yet, there are different motivations at play in *Formenton*'s revival as a part of Garfagnana identity. Many people in the region preserve, produce, and consume *Formenton* out of personal commitment to local traditions and collective benefits; many are equally aware that cultural heritage offers opportunities to diversify agri-food businesses. However, as much as local pride has cohered new networks and limited commercialisation by a few local enterprises has emerged, resistance to cooperation and lack of individual responsiveness have contributed to the failure of the collective action needed to secure GI status for *Formenton,* and to the loss of wider opportunities for promoting a clearly recognisable product beyond this region.

The rootedness of local identity may further mitigate against mutually beneficial rural-urban relations. Garfagnana residents are the primary beneficiaries of CES from agrobiodiversity, with little role for urban markets. The absence of GI status for *Formenton* has obviously resulted in missed opportunities for commercialisation, but could also have fostered wider appreciation. Arguably, by remaining independent of urban interest and demand, CES may contribute to perpetuating the isolation of Garfagnana's rural communities. In the next case, we look more specifically at the implications of rural-urban relations for developing local capabilities.

A Green Desert? Rebuilding Capability in the Cambrian Mountains

The Cambrian Mountains (*Mynyddoedd Cambria*) form the upland backbone of Wales, accounting for some 10% of Welsh land area, but with a population of just 30,000. The area's natural capital (Joyce, 2013) provides carbon storage in peat soils, and water management services supply over 200 billion litres of water annually to Wales and the English midlands (Manley, 2009). In the 1960s, the Forestry Commission introduced conifer plantation forestry to the area in the belief that few other development options were available (Cambrian Mountains Society, 2008). The economic benefits have proved fairly limited, and habitat loss and soil degradation have resulted (Joyce, 2013). Yet despite long-term efforts to recognise the region for conservation, a proposed National Park designation never came to fruition (Deane, 2011). Perhaps in consequence, the Cambrians do not attract

significant tourist numbers, and tend to be considered a 'green desert', "to be passed through on the way to somewhere else" (Cole et al., 2012, p. 8).

Eighty-five percent of the mountain land is estimated to be in agricultural use (Joyce, 2013), but farming in 'less favoured' uplands has distinct challenges. Even a bare living requires considerable land, and upland communities are particularly vulnerable to fluctuating agricultural returns (Midmore & Moore-Colyer, 2005). Further, with only one main road crossing the mountains, and much of the area inaccessible by vehicle, Cambrians residents face some of the poorest access to public services in Wales (WIMD, 2019). By the early 2000s, amidst concerns about declining, ageing populations and local dereliction (Cole et al., 2012), arguments were being advanced that:

> with the relative decline in the economic significance of production-oriented farming in the [Welsh] hills and uplands, these lands should be transformed into zones where the scope for human intervention is limited (Midmore & Moore-Colyer, 2005, p. 15).

But as Midmore and Moore-Colyer (2005, p. 15) further observe, such arguments "deny the broader cultural importance of hill and upland communities" in Wales, where sheep farming is particularly intertwined with national identity, and farming communities are living heartlands for the minority Welsh language. The strength of cultural identity shaped (continuing) resistance to land uses such as 'rewilding' or expanding forestry for carbon capture—yet for Cambrians communities to find a future, the contribution of CES to enabling capability would be crucial.

Rather than repeatedly lamenting the Cambrians' environment as an economic constraint, local leaders recognised that the region's contributions to culture and well-being needed to be recognised and strategically revalued (Cole et al., 2012; Joyce, 2013). In 2008, the Cambrian Mountains Initiative was established "to ensure a sustainable future for the communities of the Cambrian Mountains area in ways that care for its natural and cultural assets" (Cole et al., 2012, p. 11). Early actions included developing regional branding and produce marketing strategies, which aimed to help farmers gain a premium for traditionally-reared products while supporting sustainable land management practices. Participation grew, and in 2012 Cambrian Mountains Lamb gained Protected Geographical Indication (PGI) designation. Besides regulations for breed, locality and 'fork to farm' traceability, the designation crucially recognised the traditional *Hafod a hendre* seasonal grazing system, and *cefnewid*, or cooperation between farms for shearing and autumn gathering (Council Regulation 1151/2012). The initiative has since seeded producer groups for wool and beef, and the associated 'Cambrian Futures' project continues to work to revalorise the region, including through business support for rural enterprise.

The contributions of CES to enabling capabilities clearly play an important role in the Cambrians. Indeed, recognising the relationship between environment, culture and well-being proved a 'trigger' for new energy and ideas. PGI designation for Cambrian Mountains Lamb has been a particular success, creating a premium for a locality product that is, notably, sold and consumed in urban markets. Unlike *Formenton*, above, marketing Cambrian Mountains Lamb has offered opportunities

to constructively mobilise rural-urban relationships. At the same time, locality produce is consumed at a distance and, branding aside, the Cambrians remain underappreciated for direct visits. Despite the Initiative's ongoing efforts, the lack of a thriving visitor economy poses some limits to capability development, especially for small businesses and new entrepreneurs. As with Garfagnana, CES in the Cambrian Mountains primarily serve local beneficiaries in a relatively peripheral rural area—although as capabilities, CES rely on urban supply chains to maintain these benefits. But what would happen if the Cambrians did become more attractive for urban tourism? Our third and final case study offers potential insights.

Snowdonia (*Eryri*), in upland North Wales, became a National Park in 1951 on the basis of 'outstanding scenic beauty'. Celebrated for Yr Wyddfa (Snowdon), the highest peak in Wales, Snowdonia was the third National Park to be created in the UK, following 1949 legislation to conserve the countryside and provide public rights of way. Today, Snowdonia National Park covers 2132 km^2 and is home to 25,000 people (StatsWales, 2020). The area is a popular destination for hiking and outdoor leisure, and attracts some four million visitors annually (Snowdonia National Park Authority, 2016b)—more than the entire Welsh population of 3.2 million—making tourism a significant part of the local and regional economy.

Yet, the significance of tourism in Snowdonia has raised a number of concerns, not least about the park's carrying capacity. As a local government officer in the region reflected during interviews for the ROBUST project in 2019:

> Look at the pictures from Snowdon … [on] Easter weekend, the queues to get to the top of Snowdon, it's madness … we're going to get letters in [from residents] saying, 'we don't want more tourist developments. We're having too much of this.' You know this is really changing our communities. And you read about it, it's happening all over the world really, isn't it? It's going to be quite an important discussion in the future … [How] do we manage this? Millions of people want to come here and destroy everything.

Common complaints among local residents include undesirable visitor behaviour, overcrowding and the consequent strains on infrastructures, ecosystems and community life. With over half of the resident population speaking Welsh (Snowdonia National Park Authority, 2016a), these concerns further play out against a difference between *Eryri* as a landscape named and known in Welsh language and culture, and Snowdonia National Park as a space claimed for a broader British public to access and 'own'. For example, a campaign to privilege the Welsh name Yr Wyddfa over the Anglicised 'Snowdon' recalls a long history of prejudices against the Welsh language (Llewelyn, 2021), and raises questions over *whose* culture gets to be valued.

This is not only a case of clashing values. The pursuit of visitor experiences in Snowdonia can be problematic in itself. Research with participants undertaking the high-profile Three Peaks Challenge—an endurance event in which the highest respective peaks in England, Scotland and Wales are climbed within a 24-h period, often as a charity fundraiser—has shown how adrenaline-fuelled participants are prone to risky decision-making (Ivaldi & Whitehead, 2021). Ill-prepared tourists requiring rescue after underestimating Snowdonia's rugged terrain and

unpredictable conditions are also a longstanding staple of media headlines.[2] As well as putting visitors in personal danger, stunts and irresponsible behaviours pass on risks to local rescue teams and can fuel further local resentment (e.g. Douglas, 2013).

The COVID-19 pandemic has now raised new conversations about managing visitors to Snowdonia. During 2020, restrictions on mobility within and to Wales drastically reduced visitor numbers. Research on the local impacts found that many local residents perceived the reduction positively: there was less traffic on walking and cycling paths, fewer people in areas of natural beauty, and notably increased use of the Welsh language (Jones et al., 2021). Of course, there were also negative impacts, including lost income and, less obviously, fewer social opportunities, alongside alarming reports of conflict between residents mistaking each other for visitors (Jones et al., 2021). Perhaps unsurprisingly, those who had not lost income and viewed lockdown measures positively were least in favour of reopening the National Park to visitors, while those who emphasised tourism's economic value advocated rapid reopening (Jones et al., 2021).

CES in Snowdonia both create and collide experiences. For some, the sporting and leisure experiences Snowdonia enables are to be consumed, promoted and economically exploited; for others, natural beauty is best enjoyed and respected in quiet solitude. Just as experiences differ and thus can conflict, experiences of risk and injury, rescue and resentment are far from benign. Rural-urban relations mark an ever-present faultline here: simultaneously enabling connection while contributing to contestation. Snowdonia's National Park designation has enabled many to enjoy the natural environment. But while the designation seeks to preserve ecosystems and celebrates CES, the (urban) right to access and use rural space can directly detract from local residents' own well-being. The differences can be stark, but they are also not so simple, with potential conflicts cutting across language and occupation. As this case shows, whether CES are to be shared with a wider collective or kept for a closer community depends very much on how and why CES are valued. With this observation in mind, we now turn to a broader discussion of the issues raised across our three case studies.

14.4 Discussion: Towards a Territorial Wellbeing Approach

Reviving a landrace linked to local identity in Garfagnana, building capabilities among upland farming communities in the Cambrian Mountains, and contested experiences of (over)tourism in Snowdonia National Park—our three cases offer different views into the ways that CES emerge at the interface between environmental spaces and cultural practices. *Difference* is a key point here. Culture is plural, and plays out in polyvalent space. In both Garfagnana and the Cambrian Mountains, for

[2] Examples include "Snowdonia: Teenagers in trainers planned to climb Tryfan in dark" (BBC News 10/1/21), "Snowdon mountain rescues 'unsustainable'" (BBC News 5/9/16) and "Most bizarre Snowdon rescues" (Wales Online 27/3/13).

example, CES entwines with agricultural heritage; yet while *Formenton* is locally celebrated, Cambrian Mountains lamb has become a premium product in markets further afield. At the same time, consumers who enjoy Cambrians' products might be more likely to take their leisure in Snowdonia, where their presence provides income for some but frustration for others. Our cases also echo findings from Bullock et al. (2018) concerning constraints on human-environment interactions, such as crowding, pollution, land abandonment and lack of infrastructure. Though Snowdonia stands out as the most egregious example of stretched capacities, the sparsely populated landscapes in the Cambrians are by contrast places of little accessibility and poor connectivity.

The prevalence of 'well-being' as a warm but fuzzy term in the ecosystem services literature can elide identities, experiences and capabilities that are neither the same across places, communities and groups, nor necessarily engender harmonious outcomes. Taking the concept of mutually beneficial rural-urban relations as a normative frame enables us to further reflect on how—and where—CES fit, facilitate and fracture. In Garfagnana, CES have contributed to local identity, yet potentially at the expense of mobilising connections across space. Although the Cambrians have found ways to connect to urban markets that help sustain local livelihoods, there remains a disjuncture between the urban value placed on consumable products and that afforded to actually *being in* Cambrians landscapes. In Snowdonia, the rural-urban interdependencies embedded in a substantial visitor economy had tipped towards a path dependency that took a pandemic to disrupt. All three cases illustrate rural-urban benefits that are *not* mutual, but uneven. In all cases, too, trade-offs are (potentially) present. Would exporting *Formenton* bring shared benefits to Garfagnana residents—or just to a small group of growers? Would drawing tourists to the Cambrians help the region thrive—or threaten Welsh-speaking communities? Would returning solitude to Snowdonia restore intangible benefits for local people—or destroy the local economy? There are few easy answers.

We draw four critical points for CES from these reflections. The first is that idealised representations of CES must be avoided. CES risks ready reduction to cultural conceptions of the 'rural idyll', which often fail to confront the precarities of community life in environments that are not always benevolent—nor beloved. Indeed, assuming that well-being benefits always already exist in rural space forecloses analysis of who benefits, how and why (Kosanic & Petzold, 2020), while airbrushing inequity and contestation.

Second, and relatedly, idyllic ideals can work to naturalise spatial inequalities. This is particularly so in an age of 'urban triumph' (Meijers & van der Wouw, 2019) in which cities are framed as economic 'engines of growth' and rural places as passive carriages pulled along behind (Shucksmith, 2008). Rural tourism used to be viewed by rural local administration as "life buoy" for local economies. But while there is certainly scope to revalorise rural cultures, CES is not—has proven to be not—a compensation for rural marginalisation, deprivation and decline. No community needs or deserves less from governance and policy-making because nature is nearby.

Third, converting CES into opportunity may problematically commodify well-being as a(nother) rural resource for urban consumption. The tendency within CES literature to count benefits via consumable proxies already frames well-being as, effectively, a rural amenity awaiting access, like a crop awaiting harvest. Tying CES to the 'consumption countryside' (Marsden, 1999) can reinforce rural dependencies and limit local development paths, leaving some communities locked in to tourism geographies that are both "predatory and sticky … naturali[sing] processes of extraction – of land, resources, labour and culture" (Córdoba Azcárate, 2020, p. 12).

Finally, lurking under all these points, there remains a need to assess, demonstrate and quantify the *actual* presence or provision of CES. Again, CES emerge at human-environment interfaces, rather than mere containers. Even within our own case studies, we have made assumptions about the scale and scope of identities, experiences and capabilities for certain groups in certain spaces. It has not been our intention to validate or interrogate these assumptions here. Nevertheless, advancing CES research continues to require that we take the object of our inquiry neither by proxy nor by leap of faith.

Our overall argument therefore is that the well-being benefits provided by CES should not be seen as straightforward or self-evident. In this, we respond to policy trends towards 'well-being economies' (Dalziel, 2019), which rightly advocate good human lives beyond GDP growth (e.g. CEC, 2009; Stiglitz et al., 2009), but in approaching well-being at a territorial scale have tended to treat territory as uncomplicated and well-being as apolitical (Evenhuis, 2021). The territories over which governance and policy seek to work are "not frozen frameworks where social life occurs … [but] made, given meanings and destroyed in social and individual action" (Paasi, 2003, p. 110). As convenient as it may be to order space into "something like a system of pigeon holes, or a filing system, for observations" (Popper, 2002, p. 462), enabling governance to weigh and measure the well-being each 'pigeon hole' contains, good lives in a territorial sense cannot be disentangled from complex, colliding socio-cultural circumstances, nor from spatial relations that are always in flux.

None of this negates the utility of understanding well-being at scale. Rather, we advocate a research agenda on territorial well-being that is at once critically aware and creatively informed. Emerging avenues for research and practice, such as the recent flowering of participatory methods and data visualisation techniques that can capture complexity in new ways, offer the means to gather multiple views and to develop analyses across and between spaces and scales. From a rural-urban perspective, this work could afford new insights and, indeed, promote new synergies.

14.5 Conclusion

Conceptualising ecosystem services acknowledges that biodiversity is essential for supporting human life: from our material needs for food and water, to less tangible 'goods' including self-fulfilment and well-being. This chapter has focussed on

cultural ecosystem services (CES), which emerge at the interface between cultural practices and environmental spaces. But culture is never a neutral category, nor space a simple container from which well-being benefits can be consumed. Our contribution in this chapter has been to call attention to the complexities that arise from CES from a rural-urban perspective.

Valuing warm but fuzzily intangible cultural benefits like 'belonging' plainly poses difficulties for policy and practice. Yet, as we have reiterated here, reducing CES analysis to more easily measurable recreation and tourism activities risks rehearsing limited views of the rural idyll, and skimming by the contested ways in which landscape amenities are consumed and cultural practices reproduced. Well-being benefits for some may not be accessible to others, or even actively impinge. Trade-offs are inevitable, and tensions remain unresolved. CES help frame *identities*, but who has which identities, where are these enacted, and how might conflict occur? CES help enable *experiences*, but who accesses which experiences where, and how are these culturally mediated? CES help equip *capabilities*, but who has which capabilities, how are these gained, and where and why do differences emerge? Acknowledging CES as a social construct, CES of a group or community can be threatened by another group's CES when spatially coinciding. Confronting the complexities inherent to CES appraisal, we have argued, cannot be ignored—especially when these complexities arise from rural-urban relations that are more often uneven than mutually beneficial.

Our intention in this chapter has been to provoke questions rather than illuminate a precise pathway forward. Nevertheless, we challenge current approaches to CES, notably those focused on its monetisation and suggest that CES scholarship could be advanced within a broader research agenda on territorial well-being: an agenda that responds to the real need for policies that value good and common lives on our single planet, without losing sight of critical perspectives.

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Chapter 15
EU Policy Framework for Ecosystem Services Promoting Rural-Urban Synergies

Isabel Loupa-Ramos, Daniel Keech, and Maria Rosario Partidario

Abstract This chapter offers a review of eight selected European Union policies and strategies which, to a greater or lesser extent, engage with ecosystem services (ESS). The review reveals three types of policy reference to ESS. Some policies include explicit objectives and mechanisms designed to underpin different types of ESS; others mention ESS explicitly but without suggesting specific policy actions. Lastly, implicit mentions of ESS functions also appear without any direct mention of the term. Our analysis seeks to examine the extent to which EU policies with an explicit or implicit focus on ESS might better secure rural urban synergies. Findings suggest that EU policies which focus on ESS are more likely to support rural-urban synergies if they have eco-social objectives, for example sustainable agriculture or rural development, as outlined for example in the Farm2Fork Strategy and the Long-Term Vision for Rural Areas. Such policies foresee functioning rural-urban links including producer-consumer relations and the economic interaction of rural and urban dwellers. Policies more narrowly concerned with the biological functioning of ecosystems, such as the Soil Strategy or the Biodiversity Strategy are less synergistic, not least because their arena of operation remains predominantly rural.

Keywords Ecosystem services · Policy framework · EU policies · Rural-urban synergies

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15.1 Introduction

The concept of ecosystem services (ESS) has been high on the policy agenda in recent decades (Van Wensem et al., 2017; Ruckelshaus et al., 2015), emerging from a utilitarian and instrumental use of the concept and notably the possibility of its valuation to support policymaking (see Chap. 2). Nevertheless, a lack of political leadership has been blamed for the continuing loss of biodiversity (IPBES, 2022). Further to the brief policy analysis included in Chap. 4 which covers the role of ESS in multi-level planning, this chapter seeks to reveal the current incorporation of the ESS concept in the European Union (EU) and the policy context for ESS supporting rural-urban synergies. The objective is to develop a coherent policy framework to embrace, and enable, the ideas and intentions concerning Ecosystem Services (ESS) offered in this book. Preceding chapters have elaborated different approaches to frame ESS as a key instrumental concept to enhance rural-urban synergies. Yet for actions to shape and deliver expected outcomes, a coherent policy agenda for ESS, including dedicated initiatives and measures, is required. In this chapter, we briefly review EU policies that cover ESS and explore the extent to which these could nurture the full adoption of ESS in stimulating rural and urban linkages and synergies.

ESS was introduced as a term in the 1970s, and popularised in the global policy agenda via the Millennium Ecosystem Assessment in 2005 (see Chap. 2) Early initiatives that drew attention to services provided by ecosystems and connected to the importance of biodiversity, include the 1997 Business and Biodiversity guide for the private sector, a joint initiative of the World Business Council on Sustainable Development (WBCSD) and the World Conservation Union (IUCN). This was followed, from 2007, by several pan-European and global initiatives leading to the IUCN Countdown 2010, that aimed to arrest biodiversity loss. While mostly induced by the Convention for Biological Diversity Conference of the Parties (CBD-CoP) meetings, ESS has only more recently begun receiving clear recognition, becoming a priority across sectoral policies, albeit with a moderate impact and mostly at the global scale.

A scholarly review was published by Bouwma et al. (2018) to evaluate the adoption of the ESS concept in EU policies. At that time, these authors, also drawing on the work of Helming et al. (2013), stated *"there is no specific EU policy framework addressing ecosystem services, despite the fast increasing use of the concept."* (p. 214). At the time of writing this chapter (2024), there is indeed no dedicated ESS policy, and ESS appears still in piecemeal across a range of EU policies with no systematic to link the protection of ESS capabilities. Of note is the outstanding role played by the IPBES (Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services) global assessment (2019) and value report (2021), providing knowledge on biodiversity and ecosystem services to support policy development.

The investigation previously conducted by Helming et al. (2013) set out with the principal purpose of finding a policy framework that could mainstream the scientific ESS concept into the rationale of policy making. The authors explored the potential

of policy impact assessment using explicit cases, directly addressing ESS, as well as policy cases created for other purposes but with implicit, even unintended, effects on ESS.

Later, the research by Bouwma et al. (2018) revealed that ESS concepts would, with a few exceptions, be embedded only implicitly in existing nature and natural resources policies. To that end, these scholars analysed the use of the ESS concept in twelve policies[1] that dealt directly and indirectly with the use of natural resources or land. The authors examined both binding and non-binding policy instruments.

Their research investigated internal (or vertical) coherence to understand the link between goals, objectives, instruments, and the implementation processes within a particular policy field; and the external (or horizontal) coherence to analyse the overlap or alignment across different policy fields. Their aim was to understand the coherence between the ESS concept and EU policy, understanding policy coherence as *"the extent to which policies complement or are in line with one another or form a meaningful ensemble"* (Nilsson et al., 2012). The research concluded that the ESS concept was not yet fully incorporated in EU policies, but that it was gradually becoming more integrated. While policies on protecting natural resources would address ESS more explicitly and comprehensively, a differentiated uptake of the ESS concept within policy fields was exposed.

In any case, the Bouwma et al. review on the integration of ESS in European policy was less concerned with how to foster rural-urban synergies as with governance arrangements, which is the main subject of this book. In ROBUST, the importance of spatial relationships—both proximate and distal—led to an analysis of EU policies as arrangements for governing rural-urban relationships which extended across the entire range of ROBUST's thematic interests: new business models and labour markets, cultural connections, sustainable food systems, public infrastructure and social services as well as ESS. A key conceptual interest within ROBUST was how the complexity of relational approaches to enhancing place-based links and synergies could be managed. The key to this was network governance understood as a

> *… negotiated, multi-stakeholder process and a collaborative system of decision design and decision making, characterized by significant degrees of self-governing, with attendant resources, commitments and shared power….* (Douglass, 2006)

As stated by Faludi (2009) *"The EU has had an implicit territorial agenda from its inception*". In all policies. In some the agenda is more explicit with direct impacts then in others. The ROBUST policy review (O'Connell, 2021) focused on those policies which had more explicit territorial (place-based) dimensions and involved actors with cross-sectoral and network governance arrangements. Correspondingly,

[1] Green Infrastructure Strategy (2013); Habitats Directive (1992); Biodiversity Strategy to 2020 (2012); Invasive Alien Species Regulation (2014); Water Framework Directive (2000); Marine Strategy Framework Directive (2008); Forest Strategy (2013); Common Agricultural Policy (2013); Thematic Strategy on the Urban Environment (2006); Renewable Energy Directive (2009); Climate Change Adaptation Strategy (2013), and Trans-European Network—Transport (2014)

this chapter highlights the following specific policies: the Territorial Agenda, The Green Deal and the Farm to Fork Strategy which it encircles, and the Long-Term Vision for Rural Areas. In addition, the authors have extended the policy selection to cover four additional policies considered to be central to rural-urban ESS links, namely the Biodiversity Strategy 2030, The Forest Strategy 2030, the Soil Strategy 2030 and the Nature Restoration Law.

In summary, inspired by the review by Bouwma et al. (2018) on the integration of ESS in EU policies, we have further honed our policy selection in light of broad conceptual concerns in ROBUST with rural-urban relationships, and their optimal networked governance. As a result, we present in this chapter a review of eight EU policies that hold particular potential to create rural-urban synergies through ESS policy objectives. The following sections outline the method adopted for the policy reviews, the results of our investigation, and a summary of conclusions on the progress of mainstreaming ESS across the EU policy arena.

15.2 Policy Selection and Analysis

Building on the framework offered by Bouwma et al. (2018), eight specific European Union policies were selected on the basis that they support the strengthening of ecosystems services, either directly or indirectly. The starting point for the selection was the high-level Green Deal, under which all seven of the remaining policies are subordinated in their specificity and environmental focus. Unlike Bouwma et al.'s study, which examined the coherence of ESS in EU policy mechanisms, our study aimed to highlight rural-urban synergy potentials of each policy. The review focused on the main policy documents (Table 15.1), and did not extend to a review of all supporting documents (guidance manuals, plans and programs).

In reviewing each of the policy documents, we sought out explicit mentions of ESS as a distinct term. We also reviewed the reference of particular ESS types

Table 15.1 EU policy documents reviewed

Publication date	Policy
2019	Green Deal
2020	Biodiversity strategy
2020	Farm to fork strategy (F2F)
2021	Soil Strategy 2030
2021	Forest Strategy 2030
2021	Territorial agenda
2021	Long-term Vision for Rural Areas (LTVRA)
2024	Nature restoration law

(Fig. 15.1 below), namely provisioning, regulating, and cultural ESS (see Table 15.2).

In Fig. 15.1, the three categories show implicit references to ESS in the inner ring, explicit but general mentions of ESS in the middle ring, and, in the outer ring, explicit references to specific ESS.

Implicit references to ESS include references to types of ESS function, although the term itself is absent. An example includes the management of water cycles, which is not presented as an ESS in the policy document, but fulfils an ESS function.

Explicit general categorises any direct policy reference to ESS as a term or concept, but which lacks the specification of the ESS or its functionality. An example of this is where ESS is highlighted as an important tool in biodiversity management.

Explicit specific mentions of ESS in policy documents link the term to a specific functional application, for example the sequestration of carbon in a specific context or territory.

Figure 15.1 thus provides a graphic overview of the ways in which ESS appear in the selected eight EU policies. It is clear that all 8 of the policies are related to regulation and maintenance ESS, closely followed by provisioning services, with mention in 7 policy documents. Cultural ESS appears in only five. It is also notable that most of the ESS references are specific (i.e. in the outer ring).

Figure 15.2 (below) shows the extent to which EU policies integrate ESS using a territorial approach, showing higher opportunities for valuing rural-urban synergies.

Figure 15.2 shows that the Green Deal is the least integrative of these policy instruments, potentially due its broader scope, reflected in its policy vision. The Farm to Fork Strategy and the Territorial Agenda are more integrative (to about the same extent, signified by their overlap). Farm to Fork sets out a holistic vision for the whole food system, spatially uniting rural production and urban consumption, while the Territorial Agenda calls directly for rural-urban partnerships in relation to planning. The Green Deal, as a high-level policy, lacks detailed territorial links.

While Fig. 15.1 addresses how policies explicitly or implicitly open space for, or acknowledge ESS, Fig. 15.2 addresses the nature of the policies that have been reviewed, in which some are eco-driven, purely biodiversity or nature oriented, and others have complementary social and economic concerns. Figure 15.2 provides an indication of which policies are more likely to generate synergies as a consequence of ESS references being integrated in the policy documents. However, a low level of rural-urban synergy—for example in the case of the Green Deal, does not suggest that rural-urban links are absent, but rather that there is no synergy specified, nor is spatial or functional synergy facilitated via ESS. For example, the Green Deal highlights the importance of urban biodiversity but makes no mention of how urban biodiversity links to rural surroundings (for example through the proliferation and connection of wildlife corridors).

In some cases, the policies may be antagonistic to rural-urban links rather than enabling synergies—notably the Soil Strategy. This results from the fact that the Soil Strategy advocates land-take in urban areas for development, while protecting rural soil resources, but reducing the opportunities for connections. Consequently, the Soil Strategy appears in Fig. 15.2 as indicating less integration of ESS and therefore a low rural-urban synergy.

Table 15.2 Information on ESS and rural-urban relations considered in the policies analysed

EU policy	How are (ESS) explicitly mentioned in documents?	Ecosystem services			Rural-urban relations
		Provisioning	Regulation and maintenance	Cultural	
BD 2030	6 times explicit Focused on contribution to GDP; restoration targets; soil ecosystem protection from land take; forest economy; protection and restoration of biodiverse areas with high ecosystem services; Reference to IPBES report	New medications; key economic sectors—construction, agriculture, and food and drink	Soil fertility, nutrient cycling and climate regulation		Rural tourism or recreation; Ecological corridors for territorial cooperation
TA 2030	3 times explicit (sections 50, 54, 55)		Mitigation of climate change; Avoid BD loss; Risk mitigation and adaptation	Raise awareness of BD	Explicit mentioning the role of ESS in rural, urban and peri-urban areas and their specificities; The need to progress on urban "rural-urban partnerships" Also "need to promote rural-urban linkages" but in association explicitly with ESS; Reference made to land take

Farm to fork	F2K: No explicit mention of ESS. Acknowledging the benefits of sustainable food systems.	Reduction in pesticides/ fertilizers; enhancement of biodiversity linked to farm and fishery Seed diversity; Action plans on organic farming, carbon farming, agroforestry. Alt proteins; CAP—48.5% of payments linked to ecoschemes by 2023–27 (about 25%)	Close coherence with the Biodiversity Strategy 2030; CAP—member states will need to take account of EU regulations on environment (air, water, energy, biodiversity, pesticides) when setting their CAP Strategic Plans		Increasingly urbanised populations want to feel connected to their food
Soil strategy	6 times explicit Cropland (1/3) and grasslands in the EU provide EUR 76 billion worth of ecosystem services per year. ES inherent to healthy soils and lost with sealed soils. Relation between the use of sustainable soil management practices and safeguard of ecosystem services. The value of the soil capital must be properly reflected in natural capital accounts.	Crop production and grasslands; food and biomass production (agriculture and forestry); source of raw materials	Absorb, store and filter water and transform nutrients and substances, thus protecting groundwater bodies; Provide the basis for life and biodiversity, including habitats, species and genes; Act as a carbon reservoir; Flood peaks and heat event	Provide a physical platform and cultural services for humans and their activities; constitute an archive of geological, geomorphological and archaeological heritage	Urban sprawl and soil sealing consume nature and transform valuable ecosystems into concrete deserts. This often affects the most fertile soils and reduces the potential for farmers and foresters to make a decent living; Integrate the land take hierarchy' into their Urban Greening Plans (related to Biodiversity strategy) and give priority to reusing and recycling land and to quality urban soil

(continued)

Table 15.2 (continued)

EU policy	How are (ESS) explicitly mentioned in documents?	Ecosystem services			Rural-urban relations
		Provisioning	Regulation and maintenance	Cultural	
Long term vision	4 times explicit Rural areas are suppliers ESS and essential in delivering an environmentaly resilient countryside, and the Green Deal (especially sustainable use of natural resources); Rural Pact and Action Plan to integrate multi-scale governance.	Agriculture, fisheries and forestry. Renewable energy. Expansion of the rural bio-and circular economy. These land/water uses directly impact other ESS; Mission on soil health and food	Rural areas underpin biodiversity through sound land use. This in turn aids air and water quality and healthy soils; Peatland restoration and carbon farming; Municipal empowerment of energy transition	Rural areas are the sources of European tradition. Narratives for adding value. Accessible and lively places which offer employment and recreation	Rural areas and their ESS are more vulnerable to climate change than cities; Digital connectivity and mobility implicitly affect ESS supply and overcome rural-urban barriers; governance needs to acknowledge rural-urban interdependencies; Especially through community level local development; soil mission links rural and urban practices
Green Deal	3 times explicit and 2 other times in indirect ways	Food, fresh water and clean air, and shelter	Absorption of CO_2; Mitigate natural disasters, pests and diseases, regulate the climate		Mention the biodiversity strategy with proposals to green European cities and increase biodiversity in urban spaces; to achieve EU GD aims it is essential to increase the value given to protecting and restoring natural ecosystems

Forestry Strategy 2030	20 explicit references to ESS and 35 to services; Refers to importance of soil for forest as a support service; Policy provides financial incentives—boost the forest bioeconomy; payment for ESS; carbon farming practices; Carbon sequestration; Climate benefits	Food supports the economy and the social fabric in rural areas	Carbon stock and sink functions; Protect people land and houses from floods, wildfires, landslides; Pests, diseases; Water regulation; Clean air; Habitats	Explicit reference to: hub for cultural heritage and craftsmanship, tradition and innovation—relevance for tourism; human health; educational programmes Ecotourism as support the economy and the social fabric in rural areas, Nature tourism and nature-based well-being	There is potential for extending forest and tree coverage in the EU through active and sustainable re- and afforestation and tree planting. This concerns mainly urban and peri-urban areas (including e.g. urban parks, trees on public and private property, greening buildings and infrastructure, and urban gardens) and (….) the establishment of ecological corridors)
Nature restoration law	23 explicit references most in the whereas section; Food provision climate related; Provides for targets and restoration measures to recover land areas and ecosystems: 20% land areas and sea areas by 2030 and all ecosystems by 2050; Restoration of urban ecosystems	Food production	Regulation of air, water and climate; Reduction of disease risk; Protection from natural hazards and disasters; Pollination and soil protection		Urban ecosystems are explicitly mentioned

(continued)

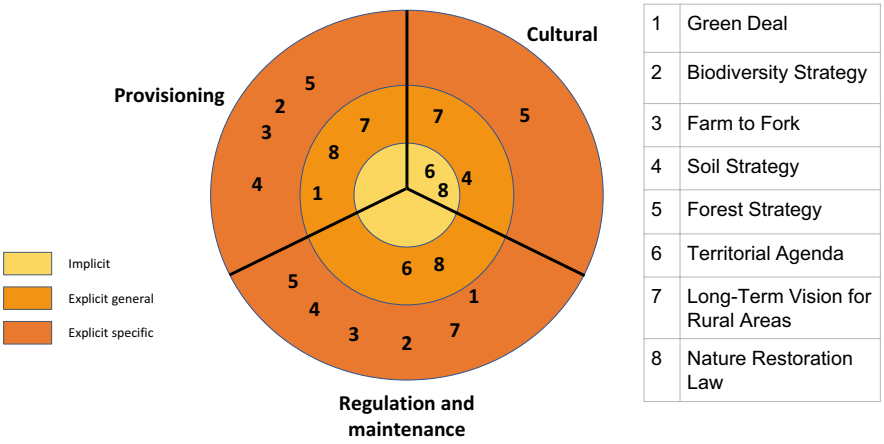

Fig. 15.1 Typology of eight EU policies in relation to ESS

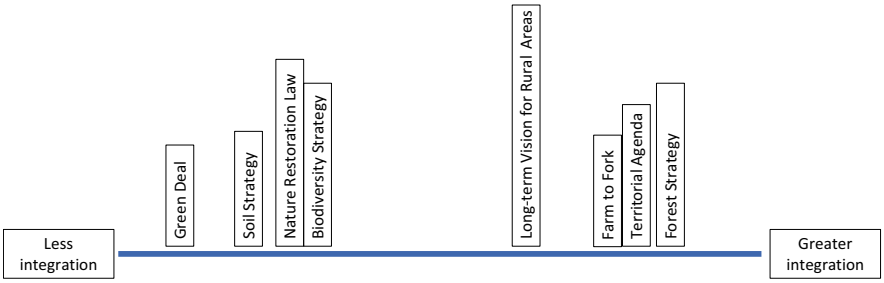

Fig. 15.2 Level ESS integration within EU policies for rural-urban synergies

The Biodiversity Strategy 2030 specifically mentions ESS, but does not envision how ESS enhancement fosters rural-urban synergies. In fact, urban biodiversity concerns are mostly separated from rural biodiversity in the document, thus failing to connect with important linking sectors such as the food industry and construction development. Such spatial synergies appear as urban-to-rural tourism and rural-to-urban mineral flows.

Generally, in Fig. 15.2 the left hand side cluster of policies is closely concerned with ecological functions and flows but they lack some territorial contexts. By contrast, the right hand side cluster of policies is broadly focused on eco-social visions for the countryside and for spatial connectivity.

In the next section the ESS and rural-urban links of each of the eight strategies is briefly described.

15.2.1 Green Deal

Ecosystems provide essential services such as food, fresh water, clean air, and shelter, they mitigate natural disasters, pests and diseases and help regulate the climate. There is a strong connection to biodiversity, speaking of worldwide erosion of biodiversity, caused primarily by changes in how land and sea are used, direct exploitation of natural resources, and with climate change as the third most important driver of biodiversity loss. GD also connects to the EU forest strategy, building on the 2030 Biodiversity Strategy, as a sustainable forest can increase absorption of CO_2 while improving the resilience of forests and promoting the circular bio-economy.

15.2.2 Biodiversity Strategy 2030

ESS are mentioned six times in the Biodiversity Strategy 2030, namely when referring to the contribution of BD to GDP in general and pinpointing forest economy, the protection and restoration of biodiverse areas with high ecosystem services, assessing the health of ESS and the establishment of restoration targets, the protection of soil ecosystem service from land take. Furthermore, "the Commission will increase its support to the Intergovernmental science-policy Platform on Biodiversity and Ecosystem Services".

The Strategy alludes to provisioning services when mentioning biodiversity in the development of new medications, or its contribution to key economic sectors as in construction, agriculture, and food and drink. Connection to regulating services is provided by reference to biodiversity in soil fertility, nutrient cycling and climate regulation. Cultural services are touched upon when referring to tourism and recreation. In the latter case, biodiversity is contextualised in the framework of the added value arising from biodiversity-enhancing agriculture and freshwater restoration. There is no mention of the role of ESS or BD in promoting urban-urban relations. Urban BD concerns are kept in a separate and distinct spatial section of the strategy.

15.2.3 Farm to Fork (F2F)

F2F is a key tool of the European Green Deal (which proposes a carbon neutral continent by 2050). F2F is also closely related to the Biodiversity Strategy 2030. An important departure for F2F from earlier food and agriculture policies is its attention to the whole system, covering not just production, but the entire food chain as well as consumption and the reduction of waste. Reform of the Common Agricultural Policy has been reformed to support and integrate F2F and Biodiversity Strategy objectives, highlighting the ESS potentials of agriculture, although no explicit mentions of ESS appear in the policy document. Key objectives are related to the

reduction of the harmful environmental impacts of agriculture, including pesticide and fertiliser inputs. Rural-urban connections are acknowledged in relation to advancing urbanisation, with evidence that urban consumers want to feel connected to rural areas through the food they eat, and the qualities embedded within it, while waste processing functions of the countryside and peri-urban areas also come into focus. A key target is the increase of the proportion of the CAP allocated to agri-environmental subsidies to almost 50%, including support for organic agriculture. Detailed decisions about the nature of F2F implementation will be taken at national level, underlining the great diversity of agricultural systems and practices (and urbanisation) in member states.

15.2.4 Soil Strategy

ESS is a core element in the concept of healthy soils). The EU Soil Strategy recognises urban sprawl and soil sealing as major threats to healthy soils. ESS associated with soil are fully acknowledged including food and biomass production, provision of raw materials, carbon reservoir, and the protection of groundwater bodies. Soils form the basis for life and biodiversity, including habitats, species and genes, provide a physical platform and enable cultural services for humans. Soils also constitute an archive of geological, geomorphological and archaeological heritage.

The Soil Strategy recognises that coordinating water and soil policies is essential to achieving healthy soils and aquatic ecosystems through better soil and water management, including across borders, and reducing the impact of floods on people and the economy. Soils are generally healthy in unmanaged and natural ecosystems. However, managed ecosystems can also be maintained for healthy soils through the application of sustainable soil management (SSM) practices, including regenerative farming in line with agro-ecological principles, adapted to the wide variability of soil ecosystems and types.

Member States are encouraged to restore, conserve and promote sustainable use of soils in their programmes taking advantage of EU cohesion policy, making full use of the EU guidance on integrating ecosystems and their services into decision-making.

15.2.5 Forest Strategy 2030

ESS are central in this strategy in relation to all types of services. Forests and other wooded land are considered essential for the health and well-being of all Europeans, for climate benefit and for nature protection. Several ESS are specifically mentioned, notably the importance of soil for forest as a support service, but also the services provided by forests such as those related to a climate neutral future and carbon sequestration, food, nature or ecotourism and educational programmes.

Forests are recognized as providing multifunctional sets of goods and services. Emphasis is also placed on the relevance of rewarding forest owners and managers for the provision of ecosystem services. Reference is made to the role of afforestation for climate change and disaster risk mitigation strategies particularly in urban and peri-urban areas (including urban parks, trees on public and private property, greening buildings and infrastructure, and urban gardens) and agricultural areas (including in abandoned areas as well as through agroforestry and silvo-pastures, landscape features and the establishment of ecological corridors). Exposure to green and forested areas can offer physical and mental health benefits.

The strategy points to the urgent need for adaptive forest restoration and ecosystem-based management approaches that strengthen the resilience of EU forests and enable a forest-based bio-economy. It also steers towards avoiding the escalation of socio-economic costs associated with forest disasters. It aims to protect people, land and houses from floods, fires and landslides, and at the same time to preserve the carbon stock and sink function, clean air, water regulation, and habitat functions, and other ecosystem services provided by forests that are vital for human health and wellbeing.

15.2.6 Territorial Agenda 2030 (TA2030)

The EU has no mandate to deliberate on Spatial Planning policy (Faludi, 2009). Thus, coordination in Europe occurs in informal meetings of the Ministers responsible for spatial planning, territorial development and/or territorial cohesion. In 2020, Ministers agreed on the Territorial Agenda 2030 of the European Union. It aims to provide "an action-oriented framework to promote territorial cohesion in Europe". The TA2030 is expected to be implemented within Member "countries at national, regional and local levels, and in cooperation with other countries". The TA2030 makes explicit reference to ESS, notably when covering climate change mitigation, combating loss of biodiversity, and in mitigating climate related risks by building on Nature-based Solution (NBS) and Green Infrastructure (GI).

It also refers to the specificity of ESS in rural-urban relations, by highlighting the role of ESS in framing the specificities of territories (urban, peri-urban, rural) but not associating "the need for rural-urban partnerships" explicitly with ESS, even though concerns with land take are expressed.

15.2.7 Long-Term Vision for Rural Areas (LTVRA)

Rural areas are presented as vital suppliers of ESS within the LTVRA which, on the one hand, highlights the importance of rural areas to European traditions and diversity, and, on the other hand, looks ahead to opportunities for sustainable, resilient and profitable rural land use opportunities (e.g. forestry, agriculture and fisheries).

Key to the realisation of these objectives is soil protection (especially ensuring the end of peat extraction and restoring peat landscapes). Digital connectivity is presented as enabling viable rural livelihoods and low-carbon energy transitions within rural landscapes, the latter specifically foreseeing municipal leadership.

An important mechanism within the LTVRA comes in the form of Rural Pacts, which are cross-sectoral alliances (public-private-civil-research) which allow local stakeholders to discuss, agree and prioritise rural objectives and integrate their implementation across government levels (local/regional, national, EU) and related financial and policy tools. The Rural Pacts rely in turn on effective network governance arrangements.

15.2.8 Nature Restoration Law (NRL)

The NRL is stated that it contributes to the long-term and sustained recovery of biodiverse and resilient ecosystems through the restoration of degraded ecosystems. The NRL also contributes to overarching objectives concerning climate change mitigation and adaptation, land degradation neutrality and food security. It establishes a framework, through targets and measures. It is anticipated that, within these, Member States will put in place effective and area-based restoration measures to restore the quality of at least 20% of land areas and at least 20% of sea areas by 2030, and all ecosystems in need of restoration by 2050.

The NRL covers "urban centres' and 'urban clusters"as territorial units classified in cities and towns and suburbs, adopting the concept of urban ecosystems, therefore potentially contributing to the enhancement of rural-urban synergies through the use of ESS. References to ESS are multiple but general, emphasizing regulation of air, water and climate, and food provision and pollination. Finally, the NRL specifically prioritizes action in the Natura 2000 sites.

15.3 Discussion

Our review covered EU policies which include mention of ESS, or make reference to ESS functions. We ranked these (schematically, in Fig. 15.1) according to their implicit/explicit and specific/general coverage of ESS. The objective of the policy review was to assess the opportunities for EU policies to nurture rural-urban links and synergies by supporting ESS. In the following section, we briefly discuss how each policy could better promote ESS for rural-urban synergies.

It is notable that policies which are environmentally specific in their policy aims are predominantly associated with rural territory. The Biodiversity Strategy 2030 and the Soil Strategy, for example, both focus strongly on extensive areas of rural habitat and land, not least because urban ecological value is quantitatively marginal and urbanisation processes may contribute to capping soils (Maes & Jacobs, 2017).

For instance, the Biodiversity Strategy and Territorial Agenda both emphasise the importance of ecological corridors and linking communities, whereas the Farm to Fork (F2F) strategy and Long-term Vision highlight social and economic connections but lack comprehensive integration of natural processes.

Mentions of urban ecosystems are mainly focused on green spaces in a decontextualized way. Surprisingly, these eco-focused policies do not make explicit the interdependence of rural and urban territories concerning biophysical and ecological processes. Other policies which are more concerned with the confluence of human and natural processes, notably the Forest Strategy, the Territorial Agenda 2030 and the Farm2Fork, are more reliant on rural-urban links, more explicit about their ESS objectives and exhibit these across two of the three ESS dimensions (cf. Fig. 15.1).

In line with the assessments offered in Chap. 14, very little specific contribution to cultural ESS is evident in EU policies. These are ultimately driven by a more targeted and long-established environmental policy framework and less so by a unified European vision on social and cultural aspects in general, including those dependent on ecosystems and their services. Enhanced management of the "superdiversity" of Europe (Abdou & Geddes, 2020) might reposition cultural ESS within more regional and local scales in policy-making.

The European discourse on rural-urban relationships and the need for a new policy agenda that integrates both in a synergistic manner is longstanding but has seen slow positive change over time. Policies sometimes cross-reference each other but are not integrated, meaning they do not capitalise on each other's strengths to enhance performance. Many scholars support the notion that breaking down policy silos and fostering integrated approaches are crucial for enhancing rural-urban synergies (e.g. Schröder, 2020 and Egal and Forster, 2020) argue for an rural-urban continuum in policymaking.

15.4 Conclusions

Our review suggests that, perhaps because policies tend to be dedicated to specific sectors or territories, this policy siloing hinders the development of effective rural-urban synergies that require policy integration. While some policies reference each other, they lack full integration and fail to leverage each other's strengths.

Policy integration is needed vertically, following the natural hierarchy from high level to low level policies, but also horizontally, relating to other similar or complementary policies. And of course operationalizing policy integration strongly depends on understanding and transforming underlying worldviews and mechanisms. Using the *"sticks, carrots, and sermons"* trilogy (David et al., 2024) to analyse policy approaches in vertical integration, it appears that different sectors and policy levels employ varying sets of tools for implementation. While high-level strategic policies, such as those reviewed in this chapter, tend to operate at the "sermon" level, relying on their inspirational nature to leverage lower-level policies where "carrots" (e.g. subsidies) and "sticks" (e.g. taxation) typically apply.

In our perspective, the ecosystem services (ESS) conceptual framework, due to its socio-ecological nature, is well-equipped to act as a transversal unifying feature—a common denominator that could permeate policy silos and connect rural and urban realms, stimulating horizontal integration. Our review displays promising signals. It shows that the ESS framework, despite not being explicitly introduced in a cross-cutting way, is implicit in many policies, particularly those more eco-centered. While territorially focused policies show potential for its integration.

Ultimately, optimising ecosystem services across territories and sectors would impact a wide policy spectrum, from improving environmental policy, to urban planning, and rural development. Thus, to enhance rural-urban synergies, a more cohesive approach across policies is needed, emphasising spatial and functional interdependencies to promote human well-being and advance sustainability transitions.

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Chapter 16
Conclusions

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Abstract This concluding chapter highlights the core messages explored and discussed in the previous 15 chapters of this book and concludes on the relevance of ecosystem services in bridging rural-urban linkages and promoting consequent synergies. Many times the synergies are shown as being absent, other times as potential but in a few cases there is already evidence that synergies are happening. It concludes on the need to establish adequate policy frameworks, business models and governance arrangements to stimulate the recognition of ESS and collaborative arrangements; but also the need to continue promoting the notion of territorial continuity where natural and cultural values and benefits, can flow across and bridge rural and urban territories. These core messages could be explored beyond the European context.

Keywords Ecosystem services · Rural-urban synergies · Connectivity · Policy framework · Business models · Governance arrangements

The structuring idea in this book is the promotion of rural-urban synergies enabled by Ecosystem Services (ESS). Synergies are enabled through rural-urban linkages, but rural-urban linkages alone do not guarantee the creation of synergies. In general, linkages exist whenever there are one-way or two-way relationships. Synergies depend on two-way, reciprocal, relationships or linkages which ensure benefits on both sides.

The literature on ESS reveals multiple ways in which ESS can be studied and analysed, from the physical and chemical or organic mechanisms supporting the service, to the expression in human activities and well-being, often behind value

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M. R. Partidario et al. (eds.), *Role of Ecosystem Services in Enabling Rural-Urban Synergies*, Landscape Series 20, https://doi.org/10.1007/978-3-031-98153-1_16

chains, with or without a market value. While considering ESS in relation to spatial planning processes that shape human activities and supply development actions, this book is dedicated to a more concrete and unique objective that has not been explored in the literature. That is, namely, to examine the role of ESS in rural-urban linkages and, within these, to identify if and where synergies are, or can be, enabled. As a matter of fact, ESS offers a lens to consider rural-urban linkages, but they do not assure synergies.

This book was built upon the collection of numerous arguments and examples that justify the potential role of ESS in connecting rural and urban realities, and in enabling synergies. This is illustrated by theories, concepts and stories developed in the book's 16 chapters, encompassing a total of authors, representing 8 European countries. Several chapters in this book reveal connectivity between rural and urban territories, namely in the cases of multi-local living (Chap. 9) and in rural-urban relations concerning cultural ESS (Chap. 14), but synergies are absent. In each of these two chapters, the cases reveal a one-way relationship. However, when discussing community partnerships for ESS provision (Chap. 5), payments for ESS (Chap. 6), the governance of nature-based approaches to flood risk management in the Lower Severn catchment (Chap. 10) and food policies (Chap. 13), synergies become quite evident. Without doubt, however, the creation of linkages is a trigger to foster synergies.

As emphasised in the Introduction (Chap. 1), all the chapters shared in this book consolidate learnings from the research developed in the context of the ROBUST European Horizon Research and Innovation project. Over five years, from 2016 to 2021, ESS was one of the five core research topics that framed discussions about enhancing rural-urban links and potential synergies. In parallel, similar discussions took place on new business and labour markets, public infrastructures and social services, sustainable food systems and cultural connections. Having developed this investigation in the context of such a large project as ROBUST brought several benefits. One was the variety of territories that offered evidence on the linkages and potential synergies focused on ESS. Another was the establishment of parallel discussions with other Communities of Practice, particularly concerning sustainable food systems and cultural connections, that complemented and allowed reflections with ESS. Table 3.1 in Chap. 1 shares the research and innovation priorities that assisted the community of practice (CoP) dedicated to ESS in the ROBUST project.

The contributions in this book confirm the complementarity between rural and urban territories, recognizing rural-urban linkages with urban activities depending on assets and inputs available principally in rural lands, and sometimes taken for free (for example, Chap. 9 explores the availability of landscapes for leisure activities). However, most chapters reveal that, while linkages exist, they seem to be imbalanced, with rural lands giving and urban lands taking most benefits. There is still a tendency to see the rural as the exclusive ESS supplier, and the urban as the exclusive ESS consumer, assuming that there is a unidirectional flow, limiting the valuation of proximity services. The rural remains within a subsidiary role in

relation to urban needs. Perhaps this is a consequence of privileging an urban perspective when exploring the benefits behind rural-urban linkages.

Regional and territorial development will require a degree of ESS trade-offs. But often some trade-offs may put some services at risk. For example, production services with an associated market may place regulation services at risk, if these are not protected or promoted. This can happen, for example, with forest management, where the production of wood for pulp and paper may put climate regulation at risk, an ESS offered by other types of less productive forests. The balance of benefits therefore needs to be considered. Payment for ecosystem services (Chap. 6) certainly has a role to play, as does recognition of and respect for (dynamic) rural identities in maintaining cultural ESS. Even though populations are concentrated in cities, that is not a reason to relinquish the policy agenda and associated investments in rural territories.

Central to this discussion is the historical debate on the divide between rural and urban areas. Continuity in the territory is not adequately perceived, and the notion of divide persists**.** Some argue this divide enables the safeguarding of natural values in rural areas and stimulates concentrated investment in urban areas. Others see the rural–urban as opposing sides of the same territory that require some form of harmonisation. Economic considerations support key arguments in this debate, based on the price of land and the level of investment, which is much higher in urban areas. In addition, the political polarisation of agro-ecology, as explored in Chap. 11, on land sharing and land sparing, may be also influencing this dividing paradigm. The chapter reflects recent policy and technical arguments that environmentally justify the introduction of (potentially synergistic) circular farming. Nevertheless, many Europeans value and prescribe, as part of their identity and sense of place, a solidly rural arena for food production.

The policy context for dealing with ESS and its role in spatial planning, and in enabling rural-urban synergies, is also a crucial point to be noted in these conclusions. In Chap. 15 we have reviewed eight European policies that were selected as being able to create a policy context for ESS in rural-urban linkages, and which hold the potential to enable synergies. This complements a policy analysis conducted in Chap. 4 relation to spatial planning and ESS. The existing policy framework appears to be insufficient to support the promotion of ESS in spatial planning, particularly in relation to the role of ESS in contributing to rural-urban linkages and synergies. From the analysis conducted, policies lack the necessary supporting and implementation tools, notably in terms of their integrated action. Further research is needed to properly understand to what extent both vertical and horizontal integration could be improved. We also conclude that policies which are predominantly nature-focused or ecologically driven, such as the Biodiversity Strategy 2030, are less effective for promoting ESS in spatial planning than predominantly territorial and/or socio-ecological functional policies, such as the Farm to Fork strategy 2030. The latter are more likely to encourage or relate to synergies (for example via inter-territorial, rural-urban supply chains).

There is an urgent need to consider ESS in a policy context, especially in terms of what is missing and what needs to be changed. For example, farmers need to be

more involved through participation, education and targeted incentives, in the conversation on farming related policies, which are critical in relation to provision and regulation services. Discussion needs to focus on the need for policy tools (for example exemptions and taxes) that better stimulate actions towards the promotion of ESS in spatial planning and, in particular, that enable rural-urban synergies. It is important to associate ESS not only with public expenditure efficiency, but especially to its role and potential in creating sustainable lifestyles within transition processes towards improved well-being. There is still a major gap in valuing ESS, including, but not exclusively, through payment for services. ESS that are not visible, such as the formation of soil or the regulation of climate, fail to be acknowledged and valued, especially if benefits are not immediately evident to the general public.

In concluding this chapter, we share some of the findings and learnings that the CoP ESS achieved as collective outcomes in the ROBUST project and which we consider relevant in closing this book. One first lesson helps to illuminate the lack of policy context – researchers in ROBUST concluded that rural-urban relations are fuzzy, while the notion of synergies is intriguing and subject to interpretation. It may help if ESS scientific findings are accessible to formal, legal planning procedures. Another lesson is that methodological development of ESS mapping must integrate multiple knowledge bases. The attempt to use mapping, as shown in Chap. 3, emerged from a combination and consolidation between expert and traditional knowledge - supply and demand of ESS need to be made explicit using a multiscale approach. To that end, bundling of ESS is important in two ways: (1) recognising patterns of association of ESS can avoid double-counting and improves the management of synergies and trade-offs; and (2) a specific ecosystem which provides multiple services for the same territory is a good indicator of its value given its multifunctionality. Identifying bundles of services can aid the connection to multi-functional land-use but needs to be further investigated.

A consensus is emerging that continuity in a territory must be ensured, with a constant rural-urban flow, with circular approaches rather than linear linkages. Rural-urban should be seen as a proxy for the dualism guiding land take decisions in spatial planning, and discussions about developed land and not-yet-developed land, regardless of the areas in question being defined as rural or urban. Green infrastructure is another way to understand ESS continuity (as shown in Chap. 8), vertically, in terms of its multi-levels of governance and horizontally by reaching out, simultaneously, to rural and urban territories (as in the case of river catchments).

More research and financial tools are needed to understand the optimal composition of blended (state-private) payments for bundled ESS delivery. A vital aspect of this is ensuring that longer-term management of ESS is secured within spatial development. Chapter 12 discusses business models that valorise high cultural and natural values, including enhancing the supply of ESS. Exploring the potential of rural-urban contracts of reciprocity to enhance ESS is also necessary. Chapter 5 provides an example of how community partnerships can establish new governance arrangements that may enhance and promote ESS. The role of communities in taking care/preserving ESS should therefore be explored further.

Finally, there is a need to ensure governance systems that link rural and urban territories, based on a model of collaboration, working together across different actor groupings, to build rural-urban synergies. New governance arrangements and models of organization are required to make inclusive decisions about ESS priorities and conflicts. It is important to recognize the interconnection between urban and rural land managers. Rural land managers must be represented in spatial planning decision-making bodies, or, at the very least, consulted at the outset of any intended interventions which demand land use change. In any case, governance arrangements should be encouraged to favour cross-sectoral relationships.