Ecosystem Services

ROBUST Community of Practice
Synthesis Report

Maria do Rosário Partidário, Margarida Barata Monteiro and Isabel Loupa Ramos
University of Lisbon - Instituto Superior Técnico

Daniel Keech
University of Gloucestershire – Countryside and Community Research Institute

With contributions from CoP partners

May 2021

With contributions from CoP partners:

Henk Oostindie
Bart van der Mark
Rolf Bergs
Reinhard Hans Henke
Sophie Herrmann
Massimo Rovai
Francesca Galli
Giovanni Belletti
Andrea Marescotti
Maria Pia Caisini
Monica Lazzaroni
Daniel Keech
Damian Maye
Matthew Reed
Gary Kennison
Simon Excell
Carey Ives
James Blockley
Ulla Ovaska
Olli Lehtonen
Toivo Muilu
Maria Partidário
Isabel Loupa Ramos
Margarida Barata Monteiro
Joana Lima
Carlos Pina
Alexandra Almeida
Linda Pereira

ROBUST

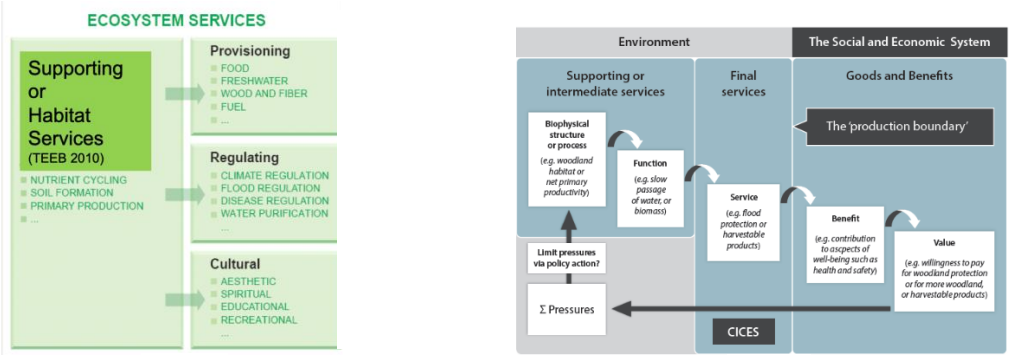
ROBUST receives funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 727988.

Contents

1 Introduction

1.1 Overview of the functional theme

This Community of Practice (CoP) is about Ecosystem Services and its role in establishing rural-urban links and enhancing synergies. '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 (Costanza et al 2017). Figure 1 illustrates the concept of ESS using two different models: the categories of ESS as established by the Millennium Ecosystem Assessment in 2005 and revised by The Economics of Ecosystems and Biodiversity (TEEB) study in 2010, and the cascade model defined by Haines-Young and Potschin (2010) to express the relationship between biodiversity, ecosystem services and human well-being.



a) b)

Figure 1- Concept of Ecosystem Services: a) MEA, 2005 and TEEB 2010; b) Haines-Young and Potschin (2010)

In ROBUST the concept of ecosystem services was adopted as a functional theme 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. The establishment of the scope of the CoP on ecosystem services (named from now on as CoP ESS for short) within ROBUST was driven by an initial selection of general challenges and issues considered relevant to be addressed in the CoP work. That scope is expressed here in the following key topics, which are further explained in section 3 of this report:

- Capacity to offer ecosystem services,
- Payment for ecosystem services,
- Economy-environment connection,
- Social well-being,
- Space/Land,
- Natural environment protection,
- Resilience,
- Governance.

As this report shows further on, these key topics evolved in multiple interactive discussions, with all partners and the six Living Labs (LL) involved. Eventually the final scope of the outcome of the CoP ESS was revealed as five core matching research themes which acted as the Core Research Themes, resulting in Research Briefs as a main output of this CoP.

Synthesis of the Core Matching Research Themes

- Community partnerships
- Multi-scale planning
- Mapping and bundling
- Payment for ESS
- Circular farming

1.2 Aim of the CoP

The aim of the CoP on ESS was to identify, map and integrate the key functional relationships of ESS in:

- spatial and sectoral planning,
- contributing to a redefinition of urban-rural 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.

1.3 Co-ordination and management of the CoP

The overall coordination of the CoP was with IST – Universidade de Lisboa. Partners included the research and practice partners associated to the following LL: Ede Municipality (Netherlands), Lucca Province (Italy), Gloucestershire County (UK), Helsinki City (Finland), Frankfurt Region (Germany), and Lisbon Region (Portugal).

The management of the CoP was shared among partners. IST offered conceptual leadership and partnershad full initiative in implementing the proposed framework, while learnings were a result of the compilation and synthesis of partners' inputs.

1.4 Report aims and structure

The aims of this report are to show the work developed, the exchange of practices and the results of joint research outcomes generated by the collaborative work of CoP partners.

This report is structured in three main parts: the research process and the learning cycle that was followed, the common learnings achieved on the core topics adopted by this CoP and the monitoring and learning evaluation outcomes expressed in performance indicators. Conclusions are drawn that synthesize the main outcomes.

2 The research process and learning cycle

2.1 Composition of the CoP

As above mentioned, the CoP composition included research and practice partners associated to the following six Living Labs: Ede Municipality (Netherlands), Frankfurt Region (Germany), Lucca Province (Italy), Gloucestershire County (UK), Helsinki City (Finland) and Lisbon Region (Portugal). Partners of the CoP are identified in Table 1. Worth noting that the pattern of team composition in different LL varied, with some practice partners joining at different moments of the CoP, depending on the kinds of expertise needed and available as the CoP progressed (contrast between e.g. Glos and other LL).

Table 1- Partners of the ROBUST CoP ESS

Practice Partners Associated	Name
Ede Municipality (Netherlands)	Henk Oostindie (R) Bart van der Mark (P)
Frankfurt	Rolf Bergs (R) Reinhard Hans Henke (P) Sophie Herrmann (P)
Lucca Province (Italy)	Massimo Rovai (R) Francesca Galli (R) Giovanni Belletti (R) Andrea Marescotti (R) Maria Pia Caisini (P) Monica Lazzaroni (P)
Gloucestershire County (UK)	Daniel Keech (R) Damian Maye (R) Matthew Reed (R) Gary Kennison (P) Simon Excell (P) Carey Ives (P) James Blockley (P)
Helsinki City (Finland)	Ulla Ovaska (R) Olli Lehtonen (R) Toivo Muilu (R)
Lisbon Region (Portugal)	Maria Partidário (R) Isabel Loupa Ramos (R) Margarida Barata Monteiro (R) Joana Lima (R) Carlos Pina (P) Alexandra Almeida (P) Linda Pereira (P)

2.2 Timeline of activities / meetings and documented interactions (real and virtual)

CoP ESS activities were initiated at the project kick-off meeting in June 2017. Table 2 lists the various documented interactions, in presence and virtual, indicating the respective date, the documents produced and where they can be found in this report. Figure 2 provides a timeline of core outputs.

Table 2- Interactions, timing and respective documents and outputs

Interactions	Date	Documents and outputs of interactions	Reference in this report
CoP ESS meeting - Ede	June 2017	Meeting Minutes	Annex 7.1
		ESS lens Initial questions and challenges Connections to other CoPs	Figure 3 Table 3 Figure 4
CoP ESS meeting - Lisbon	February 2018	Meeting Minutes	Annex 7.1
		Priority themes and clusters of mutual interest Fit priority themes in WP1 framework CoP focus and top priorities in each LL	 Figure 6 Table 4
CoP ESS meeting - Ljubljana	October 2018	Meeting Minutes	Annex 7.1
		Matching Themes First outline of shared repertoire CoP research agenda priorities and workplan to interact with LL	Table 5 Table 6 Table 7
Mail interaction	March 2019	Shared Repertoire	Annex 7.3
Mail interaction	Jan-June 2019	Research and Innovation Agenda	Annex 7.2
CoP ESS meeting - Helsinki	May 2019	Meeting Minutes	Annex 7.1
		Established Core themes, leads and co-leads	Table 8
Mail interaction	September 2019	Core themes for matching tools	Table 8
CoP ESS meeting Hannover	October 2019	Meeting Minutes	Annex 7.1
		ESP10 conference - core learning points	
CoP ESS meeting - Riga	November 2019	Meeting Minutes	Annex 7.1
		Findings regarding the use of ESS in each LL – how to go in-depth CoP output integrating core themes Book for Springer – first time discussed	Table 9
CoP ESS meeting - online	March 2020	Meeting Minutes	Annex 7.1
		Status and difficulties with CoP – LL links Draft CoP ESS Report Proposed structure for Springer book	
CoP ESS meeting – online (only research partners)	April 2020	Meeting Minutes	Annex 7.1
		CoP ESS conceptual framework	Figure 8
Mail interaction	March – September 2020	Practice briefs	Annex 7.4
CoP ESS meeting – Graz (online)	September 2020	Meeting Minutes	Annex 7.1
CoP ESS meeting – Valencia (online)	April 2021	Meeting Minutes	Annex 7.1
Mail interaction	May 2021	Research briefs	Annex 7.5

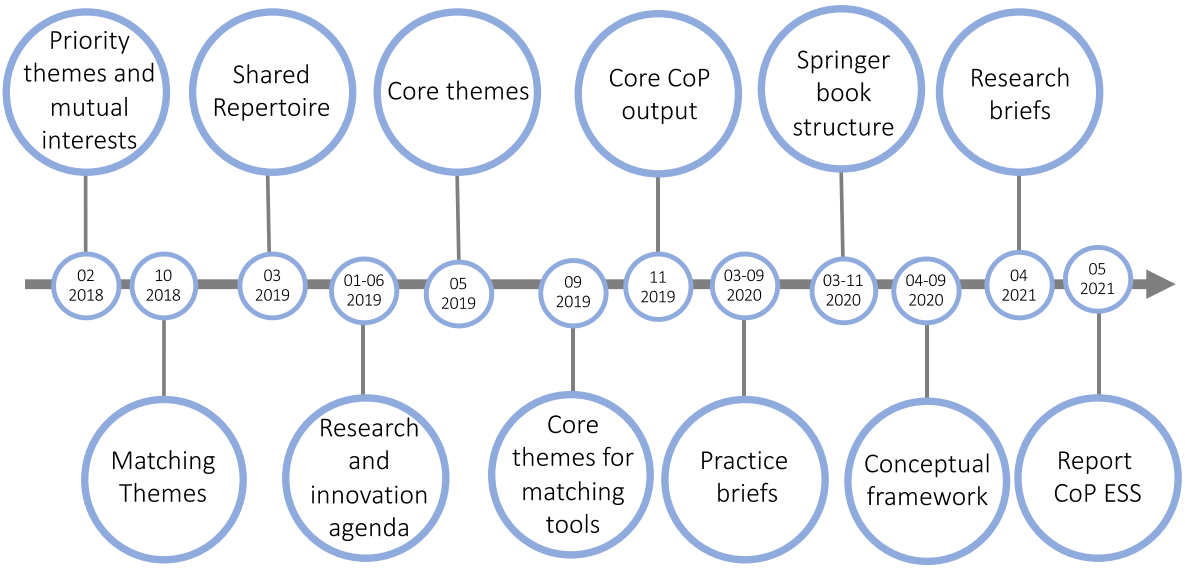


Figure 2- Timeline of core outputs

2.3 Processes for communication / knowledge exchange / learning

The process of interaction and communication among partners of the CoP ESS is reflected in the timeline represented in Figure 2. That timeline does not however include all moments in which bi and multi-lateral interactions took place. Formats were diverse, from consortium meetings dedicated time and space or varied length, to online/virtual meetings (through Skype and Zoom) not only since the pandemic started but even before in-between consortium meetings. Email communication was also engaged.

Tools of CoP Mutual Engagement

Throughout the duration of the project three key initiatives were carried out to enhance knowledge exchange and the CoP ESS learning process:

- A workshop to establish priority themes and cluster mutual interests across partners and LL was conducted with active exchange between partners, contributing to set the CoP focus (Feb 2018, Lisbon meeting)
- A matching exercise was conducted to explore mutual interests and define a shared repertoire of CoP ESS to be used as a reference by all LL and partners(Oct 2018 Ljubljana meeting)
- A world café interactive session was conducted to identify critical questions under the identified matching themes (May 2019 Helsinki meeting)

Other forms of mutual exchange and learning took place in the form of case-initiatives with inspiring examples on ESS delivery, particularly led by Frankfurt LL partners and from Luke (Helsinki) research partners. A field workshop was planned to take place in Lucca, in the Fattoria Urbana Albogatti, on the 2nd April 2020, to address ESS around the following topics: food production, flood regulation, groundwater refill, recreation, and health. This was integrated in the ICLEI initiative 8th Informed

Cities Forum field workshops. Unfortunately, due to the outbreak of the pandemic this initiative had to be cancelled altogether.

Knowledge Exchange events

In addition, the CoP ESS team actively participated in two open conferences: the ESP Conference in Hannover (Nov 2019) and the Leipzig Conference (Oct 2020 as virtual conference) where sessions were organized, papers presented, and discussions held around the role of ESS in rural-urban synergies. A guest pitch talk and participation in workshop was also invited on ESS in ROBUST as part of the European Commission's Rural Vision Week, held in March 2021.

Bi and multi-lateral exchanges were carried on throughout the entire duration of the project as part of the mutual clustering and matching exercises, with core themes being developed as research briefs by a selection of CoP ESS partners that shared mutual interest on such themes.

Outputs and Publications

Key outputs of the CoP ESS are represented in Table 2, with this report, as well as the research and practice briefs, and finally the Springer book becoming the most visible documents that include the multiple activities, exchanges, and learnings of CoP ESS. Both research briefs and practice briefs (short case-studies for dissemination)support the preparation of papers and book chapters.

Publications / Participation in Conferences

1. ESP Conference 2019 - CoP ESS participation
    - Maria Partidario (CoP ESS member) co-hosted a session with Louise Willemen, Twente University, on Governance of ecosystem services for rural-urban synergies: bridging science and decision-making. There were five contributions from CoP partners to this session:
        - Blockley, J. and Keech, D. Rural catchment management for urban flood security? Governance of Natural Flood Management in Gloucestershire, UK
        - Henke, R., Asdonk, K., Herrmann, S., Koşan, A., Planning from Outer Space: Assessing the limits to growth
        - Oostindie, H. and van der Kamp, B., Circular Farming as Guidance for ESS Delivery in the Netherlands
        - Pina, C., Almeida, A., Loupa Ramos, I. and Partidário, M.R., Multi-scale planning for ESS enhancement.
        - Rovai, M., Galli, F. and Andreoli, M., Spatial analysis of ESs as a tool for understanding and promoting rural-urban synergies in planning.
2. URP Conference 2020 – CoP ESS participation
    - Daniel Keech (CoP ESS member) and Theresia Oedl-Wieser (Styrian LL) co-hosted a session (No.23) at the URP conference on circular economies, which included presentations on municipal and entrepreneurial transitions towards a low-waste regional economy.
    - Maria Partidario and Isabel Loupa Ramos (COP ESS members) - presentation on Multi-level governance for building a sustainable and resilient metropolitan region: the case of the Lisbon Metropolitan Area
3. Springer book – final agreement on structure and content

Maria Partidario, Daniel Keech, and Isabel Loupa Ramos are co-editors

CoP ESS partners are co-authors in different chapters

Other CoP chairs and partners involved in writing chapters on how ESS are relevant/recognized in respective CoP

4. Other publications

Reinhard Henke: Refining a basic concept: The Outer-Inner-Space notion as a specification of the Rural-Urban dualism, ROBUST 2020

Henk Oostindie and Daniel Keech: developing a manuscript drawing on the Gloucestershire and Ede LLs to examine ESS governance in urban and rural land use allocation, submitted to the scientific journal Land Use Policy in January 2020 (in review at the time of writing)

Paper on the conceptual methodology adopted in the CoP ESS as laid out in the RIA

Potential paper to build on key messages, elaborating on commonalities and differences – collective paper of the team

3 CoP themes and common learning

3.1 Summary of scoping and identification of a common working framework

Whether we aim towards provisioning, regulating, cultural or even supporting or habitat services, the meaning and relevance of ESS can be observed through multiple lenses. The pluri, inter and transdisciplinarynature of ESS were reflected in ROBUST in the eight lenses elected by CoP partners to lead research in exploring the potential role of ESS in promoting rural-urban structural and functional aspects (Figure 3). Descriptions ofeach eight lenses are provided below.

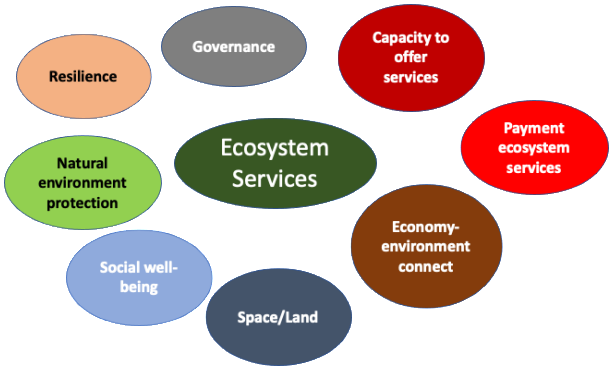


Figure 3- Lenses initially adopted in ROBUST to investigate ESS

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 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 connection: 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 keep the same functions and structure, the degree to which a system is capable of self-organizing; 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.

In ROBUST initial reflections within CoP ESS were motivated by **six "How to"** questions concerning challenges and forms of addressing ESS: how to ensure, how to value, how to generate benefits, how to manage conflicts, how to build resilience and how to manage governance. Table 3 provides a synthesis of the initial questions and challenges identified by CoP partners in a brainstorming session at Ede, in June 2017.

Table 3 - Initial questions and challenges systemized

INITIAL QUESTIONS AND CHALLENGES SYSTEMIZED	
How to ensure **ecosystem services**:	Biodiversity Water quality Flood risk management Distinctive landscapes Waste Air purification Priority habitats such as ancient woodland and limestone grasslands Food provision Cultural services
How to value ecosystem services **(payment)**	Land managers for their role in sustainable land management Financially quantify rural areas' valuable ecosystem services and find ways to ensure they are paid for
How to generate **mutual benefits** from ecosystem services	Harmonization of economic growth and environmental benefits Urban area benefits from the ecosystem services should enhance mutually beneficial relationships Integration of hard infrastructure with the maintenance of landscape values Multiple residence can create impacts on rural social welfare, business opportunities and sustainable regional development Patterns of food provisioning should be related to the provision and quality of ecosystem services, assuring environmental performance in agri-food production Urban regeneration may promote inclusive and diverse cultural opportunities and dynamism in urban areas can stimulate innovation in rural places Rural and urban cultural activities to contribute to regional social well-being, cohesion, and the combating of social exclusion Protection of the natural and historic heritage so that it can be used as an identity value for citizens and the promotion of tourism
How to **manage conflicts** ecosystem services	Management of conflicting goals between urbanization, and environmental management, and landscape conservation Recognize and manage conflicting goals such as the further expansion of economic activity and increasing demands for space Protection of traditional landscape, the regeneration of areas on a path to re-naturalization with the agricultural production Identification of areas with specific rules to follow so as to reduce the conflicts among urban areas and peri-urban or infra urban rural areas and to regenerate the biodiversity
How to build **resilience** with	Increasing overall resilience when connecting the dispersed rural settlements with the capital city Dispersed rural settlements in regional resilience building Preserve and strengthen the uniqueness of available ecosystem services in the light of vulnerability to climate change and the need for adaptive responses that will strengthen their

ecosystem services	territorial resilience
How to **manage governance** with respect to ecosystem services	What Instruments and processes, related actors/players, governance arrangements Rural-urban functions reflected in the hierarchy of local authority levels Novel rural-urban multi-actor/player networks Intercommunal cooperation to avoid land sealing and the exploration of green areas

An earlier point of reflection was also the **interconnections between ESS and the themes of other CoP in ROBUST**. The pluri-, inter- and trans-disciplinary nature of ESS, recognized in the identification of the lenses first adopted to look into the whole theme of ESS (Figure 3), is also explicit in the recognition of interconnections with other CoP, as in Figure 4. Later on these interconnections would be further elaborated in the four chapters of the Springer book section concerning "Across CoP boundaries centred in ESS".

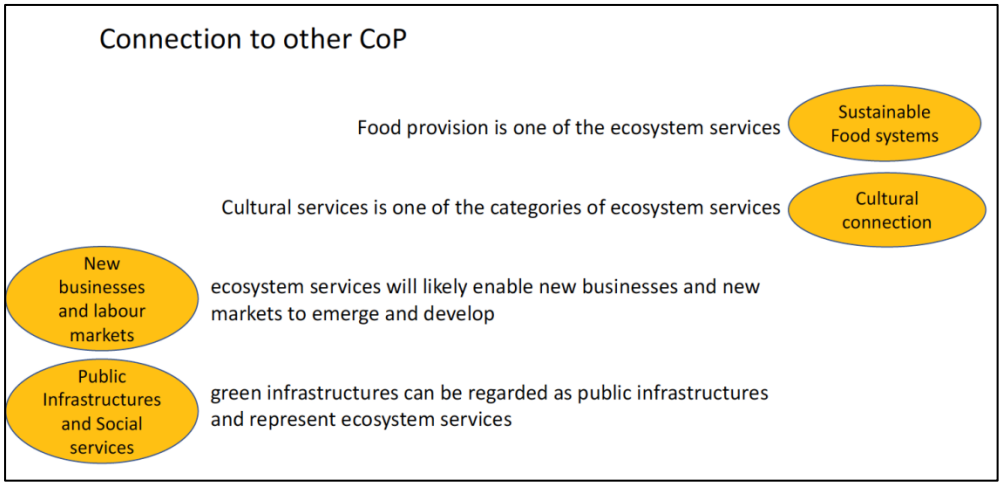


Figure 4 – Connections between CoP ESS and other CoP

3.2 Building a common working framework in the context of WP1 conceptual framework

A first conceptualization of the CoP ESS is shown in Figure 5. It identifies the **CoP ESS priority themes**, attempting to respond to the initial questions and challenges (Table 3) as well as to the initial feed-back resulting from its materialization in the different LL contexts. Above all 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) have the governance models, to encourage alternative practices and policy integrated goals, thus enabling resilience and social-well-being to occur. This conceptual model then evolved to the finally adopted model in September 2020, as represented in Figure 8.

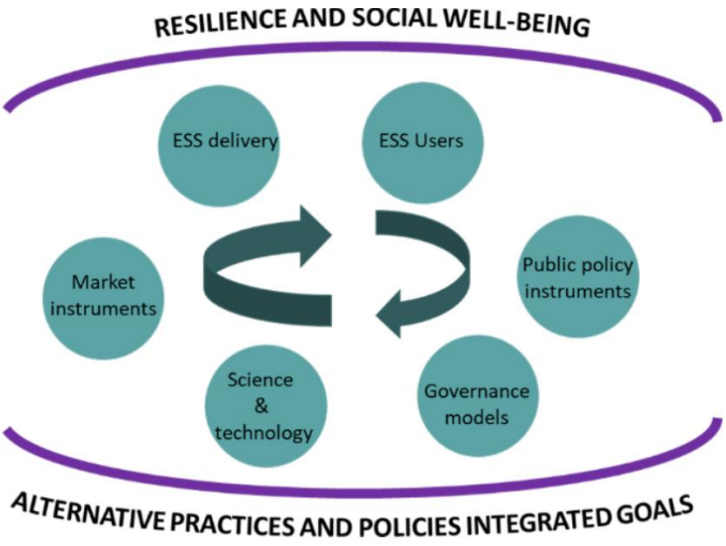


Figure 5 – Initial Conceptual model for CoP ESS

But first this initial model, represented in Figure 5, was further interpreted in light of the WP1 framework to ensure CoP ESS work would inform ROBUST regarding functional rural-urban relations. Figure 6 represents this effort of making the above priority themes fit the ROBUST WP1 framework, relating to new localities, smart development and network governance as related to ESS and its role in enabling rural-urban links and synergies.

The proposed CoP ESS model aims to set a framework that will enhance the value of ESS in the context of the concept model established in WP1, structured in new localities, smart development, and network governance, with ESS value transversal to these components.

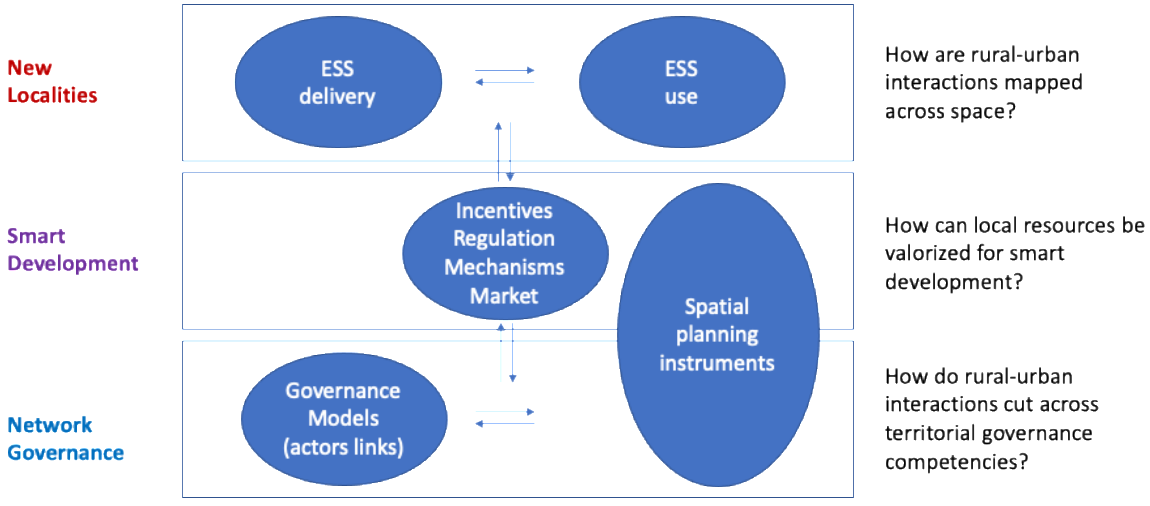


Figure 6 – Making CoP ESS fit ROBUST WP1 framework

The CoP ESS can contribute to ROBUST in terms of functional rural-urban relations, through the WP1 model, in the following way:

New localities – In the adopted CoP ESS concept model, ESS driven development can generate new localities engaging socio-ecological systems relational space and networks associated to the creation of new values, perceptions, and identities.
This may be achieved through:

- Understanding the planning system with a focus on its Outer Space[1] exploring how urban and rural features co-exist, overlap and compete;
- Inclusion of 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.

Smart development - The adopted CoP ESS concept model highlights policy, market, governance and sciences and technology tools to engage the enhancement of socio-ecological systems.
This may be achieved through:

- Review of policy processes, some of which include new governance arrangements;
- Provide actors/players with the (statistical and GIS) information needed to make more informed plans and decisions and commit actors/players to this cooperation.

Network governance - The adopted CoP ESS concept model builds upon collaborative arrangement 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;
- More participatory and integrative municipal spatial planning procedures;
- Co-creating a new experimentalist rural-urban governance space.

3.3 Linking CoP ESS to LL priorities and interests - a methodology

CoP partners earlier motivation to work in this CoP is summarized in Table 4. CoP partners used their LL motto and research objectives (which were developed early in 2019) to express the overarching themes they would like to explore in their LL research agendas concerning ESS. CoP partners also elaborated on their research objectives and indicated types of innovation that could be generated (Table 4).

[1]Outer Space and Inner Space are concepts defined by the Frankfurt/Rhine-Main Regionpractice partner to distinguish urban areas (Inner space) from everything else that is not Inner Space - the Outer Space, which includes all areas with agricultural land use, plus nature reserves and forests.

Table 4- Living lab CoP partner with each Motto, Research objective and Innovation

CoP Partner	Motto	Research objective	Innovation
Ede Municipality	Further developing and integrating Ede's municipal food, environmental and spatial planning policies, by formulating goals and distinguishing key indicators for monitoring its agri-food system and natural capital	Better insights into the opportunities / limitations of integrative municipal spatial planning through the inclusion of Eco-System Service Delivery in ongoing menu card approach as part of National Environment and Planning Act implementation. This novel municipal policy instrument aspires to contribute to more tailor-made, participatory and integrative spatial planning procedures, and approaches	A more participatory, inclusive, and integrative municipal spatial planning with special attention for the inclusion of rural eco-system delivery and the prospects of circular farming futures
Gloucestershire County	To assess the potential and feasibility of circular economy (CE) and natural capital (NC) growth models in the county and their potential for synergies and improved urban-rural linkages	In the ESS theme, the objective is to explore the potential for circularity within integrated water resources management and links with NC agenda.	Experiment with more integrated approaches to water resource management in Gloucestershire, including new public/private arrangements, and foregrounding the opportunities of NC to respond to climate change, economic development, and land use planning.
Frankfurt/Rhine-Main Region	Transitioning from quantitative growth and expansion, to qualitative growth and quality of life: the role of regional land use planning.	Localization, measurement, and evaluation of ecosystem services that are provided by the Outer Space as our natural basis for life (natural capital). → qualitative and quantitative assessment	Not only qualitative but also quantitative assessment of the Outer Space and ecosystem services.
City of Helsinki and Luke (Finland)	Developing resilient rural-urban solutions that enable knowledge networks and multiple locations for life, work and entrepreneurship across the border of Finland (Helsinki) and Estonia (Tallinn)	to determine how ecosystem services can be better accounted for in the land use and building planning system in the Helsinki-Uusimaa region.	New model(s) of governance to enhance the research-based decision-making. This aim is in-built in the objectives, and an irremovable part of all activities.
Lucca Rural-Urban Connections Lab	Developing a local food policy and a territorial plan to reduce urban sprawl, steer synergies between the city and the countryside, and valorise cultural heritage, landscape, and territory.	Identify how territorial planning can contribute to promoting multifunctional and sustainable agriculture and food systems in peri-urban areas, restricting urban sprawl, protecting the environment and landscape.	The elaboration of guidelines will support the improved understanding of ESS relations across urban and rural areas. The development of guidelines will require new mapping tools and data collection, not already available. This innovation aims at reinforcing the current policy competences of the province, as is territorial planning, by providing input to territorial planning processes.
Lisbon Metropolitan Area (LMA)	Territorial cohesion from within: bridging metropolitan communities and economies for improved urban-rural synergies	Investigate solutions that enhance ESS in spatial planning for sustainable land use.	Use Geo-based synergies with several layers (e.g., green infrastructure; stakeholders).

Furthermore, the discussion was how to build into the Living Labs (LL) the principles, issues and the framework developed in the CoP ESS.In some cases it would be the LL experience that would be fed into the CoP activity This would become a matter discussed throughout the duration of the whole project. Several issues and challenges were raised by partners while considering CoP ESS through the lens of their LL. The identification of those issues per LL, and the synthesis of what were common issues shared by the six LL enabled their clustering into themes of **mutual interests** shared by all partners, across the LL, in the CoP ESS (a first identification of mutual interests). To follow-on, each LL were asked to look in detail to the priorities of the other LL, find their mutual interests, choose the appropriate terms, and keep the number of mutual interests to a maximum of six. This was the starting point for the integrative process and cross-related work that was further developed in this CoP.

The feed-back from attempts of applying CoP to the LL acted as leverages of learning and improvement of the CoP in relation to its practical implementation. To assist the CoP implementation in each LL the following methodology was adopted:

- 1. Start with concrete policy issues that are on the LL agenda (e.g., flood risk management) identified by people in the LL
- 2. Link policy issues to ecosystem services (regulating services – flood alleviation and management through soil water retention or infiltration capacity, etc)
- 3. Organize ecosystem services from rural-urban synergies settings (spatial relationship)
- 4. Discuss and agree on how to address benefits and vulnerabilities

To help align the CoP ESS agenda with LL activities of CoP partners, and ensure a constructive and learning outcome for the CoP ESS and LL interaction, a methodology to assist an iterative process between the LL and the CoP was formulated as represented in Figure 7. A pool of alternative practices, policies, planning instruments and governance models was co-created, resulting from the application of the conceptual framework in each of the LL.

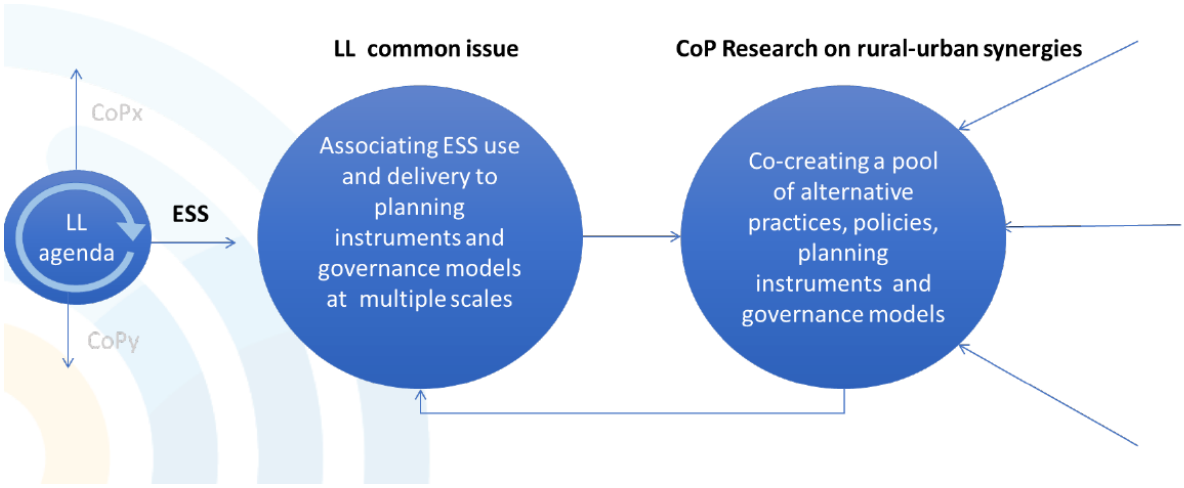


Figure 7 – Methodology to ensure iteration and learning with CoP and LL interaction

Based on this methodology, and previous conceptual model (Figure 5) and adaptation to WP1 framework (Figure 6), a common entry point, or driving line, for all LL was adopted:

Search for strategic approaches to integrate ESS in spatial planning, strengthening, and making a better use of, ESS in balancing planning decisions.

3.4 CoP ESS conceptual framework

The conceptual framework finally adopted by the CoP ESS intends to address the research questions with a multiple loop approach and is represented in Figure 8. In essence ESS expresses a dialogue between users and services delivered within rural-urban contexts. But ESS is closely dependent on the respective socio-ecological systems (SES), its social well-being objectives and the inherent resilience.

In a second loop, using appropriate tools, including multi spatial policy and planning, market instruments, governance networks and science and technological tools, users can influence the socio-ecological systems and its objectives, and consequently ESS outcomes. Placing it into a wider picture – the third loop – desired socio-ecological systems are also dependent on societal values promoted by users, directly or indirectly, through the adoption of innovative multi spatial practices and policies that can enhance rural-urban synergies.

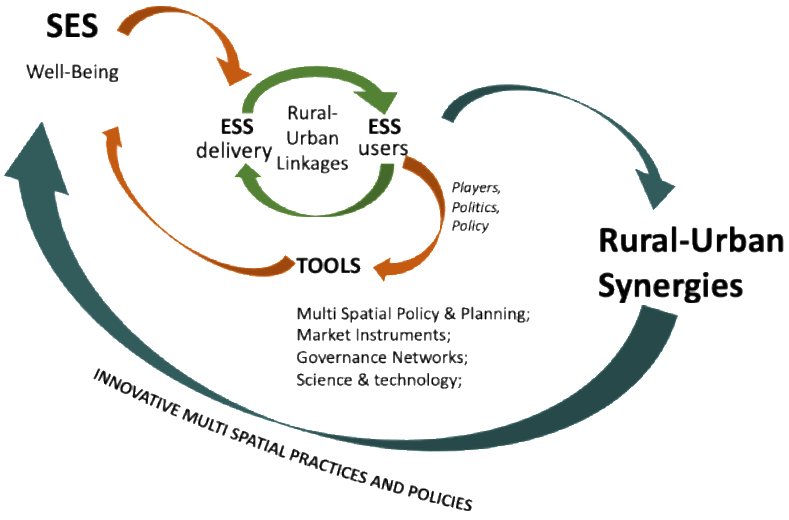


Figure 8 - CoP ESS - Conceptual framework multiple loop approach

This model was materialized, for the purpose of exploring rural-urban linkages and synergies in each LL, with the following research questions:

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 is their role? (e.g., responsibilities in government, producers, inhabitants, students/ researchers)

ESS delivery:
• Which ecosystems deliver which ESS that play a role in rural-urban linkages/synergies??
• How can ESS maps be used? (e.g., matrix approach; monetary valuation; participatory GIS; social-cultural value)

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 kind of tools may enable the enhancement of SES in term of its resilience and contribution to social well-being in case of rural-urban linkages/synergies?

Benefits and Values:
• What are the main benefits and core societal values enabling rural-urban linkages/synergies?

3.5 Repertoire of tools, matching exercise and RIA

Outcomes of rapid appraisals conducted in WP2, including the snapshots as well as the governance and planning instruments, were also a source of elements for analysis.

This gave the CoP ESS a wide range of possibilities for cooperation among partners, further explored in the CoP work by building matching themes and a shared repertoire. A matching session for knowledge transference and sharing took place during one of the consortium meetings in Ljubljana (October 2018). Table 5 represents the outcome of that matching exercise with the CoP matching themes as the key output of interactions between LL partners.

Table 5- CoP ESS Matching Themes

CoP ESS Matching themes						
	Gloucestershire	Frankfurt	Helsinki	Lisbon	Lucca	Ede
Gloucestershire		Payment private schemes 4ESS	GIS mapping ESS	Payment private schemes 4ESS	Payment private schemes 4ESS	Payment private schemes 4ESS
Frankfurt	Multi-scale integration Quick implementations Regional approach		Multi-scale integration	Multi-scale integration Quick implementations Integrate ESS through SP	Multi-scale integration Integrate ESS through SP	Multi-scale integration Integrate ESS through SP
Helsinki	GIS mapping ESS			GIS mapping ESS		GIS mapping ESS
Lisbon	Business models4ESS	Metropolitan approach				ESS based TDR Business models4ESS
Lucca	GIS mapping ESS		GIS mapping ESS	Communities 4 Biodiversity ESS through urban food policy		Communities 4 Biodiversity ESS through urban food policy
Ede	Integrated Goals Business models 4 ESS Soil erosion & degradation			Integrated Goals Business models4ESS		

It was then necessary to develop tools that would enable the mutual engagement of the partners, in different LL, to adopt the common themes. A CoP ESS Repertoire of resources and tools for matching was put together in March 2019 to signalize a synthesis moment in the research process. The Repertoire is in Table 6 and the CoP tools for mutual engagement are described in more detail in Annex 3.

Table 6- Repertoire of Tools for matching

Topic	Partners
Business Models and Eco-System Services	Prepared by Henk Oostindie, WUR
Community for Food and Agro-biodiversity	Prepared by Sabrina Arcuri, Francesca Galli, Massimo Rovai, University of Pisa, Lucca
Private Sector Payment Schemes for Ecosystem Services	Prepared by Carey Stevens, Simon Excell, Gloucestershire County Council; Daniel Keech, University of Gloucestershire/CCRI
GIS mapping of ecosystem services and regional land use planning	Prepared by Luke team, Hesinki
Multi-scale integration and integrate ESS through spatial planning	Prepared by Reinhard Henke, Regional Authority FrankfurtRheinMain
Transfer Development Rights	Prepared by Maria Partidario, IST-UL
Regional planning as a matrix for ecosystem services, Lisbon Metropolitan Area	Prepared by Carlos Pina & Alexandra Almeida, CCDR-LVT

Following from the matching exercise, the CoP ESS research agenda priorities relevant for rural-urban synergies were identified and the Research and Innovation Agenda (RIA) for this CoP developed, (included in annex 2), issued in June 2019, which acted as a referential for all CoP ESS working LL. Table 7 includes the CoP ESS core research agenda priorities.

Table 7 - 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 are key, are they equally important?
3. How different communities use ESS – what can be ESS indicators?
4. What governance models, and planning models, better practices (public and private), enable the delivery of ESS?
5. What participatory measures help to engage people with ESS s users (gardening, bird observation, among others)?
6. How do we discuss the unknowns of ESS (account for uncertainty) as a result of climate change, rural population dynamics, land use changes over time, among other?

The repertoire of tools eventually evolved into **CoP ESS Core Themes** finally adopted in September 2019, after multiple interactions among CoP partners. In this process it is particularly worth noting the dynamic held in the CoP meeting during the Helsinki consortium meeting in May 2019. The CoP ESS met four times during the three days of this 4th consortium meeting.

The first session aimed to clarify detailed aspects and concepts of the CoP RIA (version of 9th April), previously shared and briefly discussed online in April. The second session was dedicated to the presentation of each of the shared repertoire tools that had been identified in the Ljubljana meeting. These presentations were done by each partner leading the respective tool, as identified in table 6. The third session was conducted in a world café format to deepen the discussion on the potential of each of the shared tools in the repertoire. Finally, the fourth session was dedicated to identifying leads, and contributors, of each of Core Themes finally resulting from the discussion.

Figure 9 and Table 8 identify the Core Themes, the Lead partners and partners contributing to the development and preparation of each Core Theme, as well as the research question that led research in each core theme. Core Themes were developed into Research Briefs (Annex 5) by the respective lead and contributor partners.

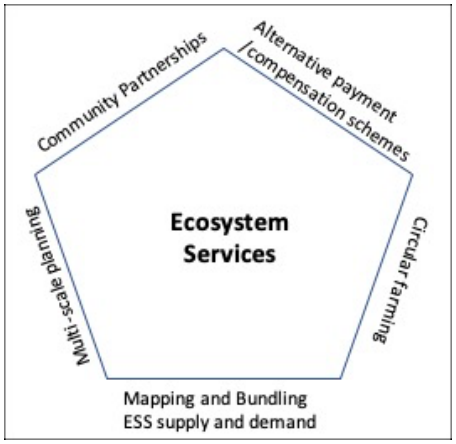


Figure 9 – Core themes

Table 8 - Core themes research questions and partners involved

Core theme	Partners	Research Question
Circular Farming engaging ESS in rural urban synergies	Lead: WU Contributing: Glos	What are the implications for land use planning of land sparing and land sharing in relation to the role ESS plays in rural-urban synergies?
Community Partnerships engaging ESS in rural urban synergies	Lead: UNIPI Contributing: IST+Glos+WU	What cases of community partnerships are there regarding management and the provision of ESS and how effective are they in enabling rural-urban synergies?
Multi-scale planning for ESS in rural urban synergies	Lead: IST Contributing:	How are ESS recognised in policy frameworks (European, national,

Core theme	Partners	Research Question
	WU+UNIPI+LUKE+PRAC	regional, local); and how are ESS considerations applied in land use planning, both upscaling and downscaling?
Mapping ESS supply and demand for rural urban synergies	Lead: UNIPI Contributing: IST+LUKE+PRAC	What different types of mapping are there and how to use them in support of decision-making
Payment and compensation schemes for ESS in rural urban synergies	Lead: Glos Contributing: WU+UNIPI	How do payment/compensation schemes for ESS in European contexts reveal both public and private sector motivations within urban and rural contexts?

Figure 10 recognizes the inter-relationship of the five core themes of CoP ESS that were investigated. It showshow multi-scale planning enables the setting of a policy framework; and how, drawing on land value, through payment and compensation schemes, and ESS mapping; ESS can be integrated in land use planning and become a factor to be considered in land take decisions. Circular Farming represents a possible business model to enhance the valuation of land based on ESS while community partnership represents a possible governance model to ensure that multi-stakeholders' values and priorities are engaged. This can be exemplified with the value of water in regulation services, 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.

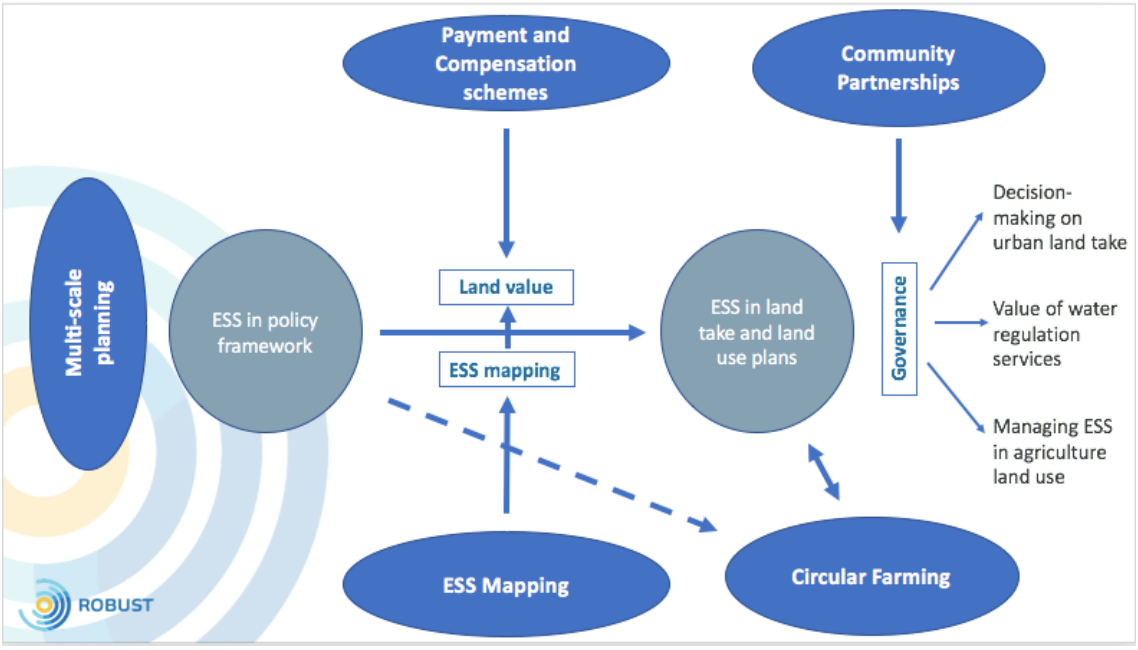


Figure 10 - Mapping the CoP ESS core themes relative contributions to the research

3.6 Lessons learned with how core themes endorse ESS

The lessons learned with the Core Themes on the role ESS play in rural-urban synergies were reported in the Research Briefs (see Annex 5). These are summarized below.

Circular farming

1. Circular farming may contribute in different ways to more synergistic rural-urban relations;
2. The co-existence of different circular farming imaginations points at rather different ideas on how to understand and realize this synergistic potential;
3. Place-based rural-urban synergy lenses interlink this potential strongly with rural land sharing strategies, characterized by a bundling of food production with other ESS (biodiversity, landscape values, sustainable water management, etc.)
4. Other circular farming imaginations start from spatially increasingly blurred and extended rural-urban functional ties, including food systemic interdependencies, and prefer the (further) segregation of food production from other ESS by concentrating on the re-valorisation of waste-flows with various origins and at different scales.
5. Analytically and theoretically the Circular Farming Research Brief outcomes confirm the difficulty to operationalize / work with the synergy notion in line with ROBUST's multi-spatial understanding of rural-urban interdependencies.

Community partnerships

1. We interpret community partnerships as organizational forms which, based on shared principles and values, organize themselves for the management of goods and services useful for the well-being of the community itself. Specifically, the focus is on the production / management of ecosystem services aimed at strengthening urban-rural ties.
2. In many cases, community partnerships, due to their ability to identify innovative and often hybrid solutions between market and volunteering, between formal and informal, are more effective than hierarchical forms (e.g., the State and / or public administrations) due to spending constraints and complex decision-making processes and to the market where the logic of maximizing individual interests often prevails.
3. Community partnerships can be virtual (members who do not have a relationship of proximity) or physical (members who have relationships of proximity and who must share a space, common territory). The research brief focused on the second type.
4. Organizational forms of community partnerships differ and are influenced by the specific environmental and socio-cultural conditions in which they develop. This determines the strengths but also the weaknesses with respect to the sustainable and resilient management of the resource (natural capital) and the mix of ecosystem services provided.
5. The role of public institutions is fundamental to building community partnerships. This can contribute to a favourable regulatory environment, administrative support, financial support,

etc. In the cases analysed, there is a mix of these forms of support. (e.g., community cooperatives are a mix of regulatory environment + financial support).

6. The success of a community partnership depends on the degree of openness/closure (or inclusion / exclusion) (i.e., if too closed, risk of "implosion"; if too open, risk of loss of identity).
7. The effectiveness of a community partnership depends on the territorial scale because social and environmental systems usually have relationships at different scales and, therefore, when managing some common resources that are part of a larger system, there is need for mechanisms to facilitate higher-scale cooperation and policy integration, to avoid inconsistencies.

Multi-scale planning

1. Spatial planning may serve as a keystone governance instrument to explore the spatial implications of combined policies, frameworks and tools, and be understood as a policy mix in itself to ensure effective allocation of resources for safeguarding, restoring and enhancing biodiversity and ESS;
2. Spatial planning informed by ESS can facilitate public participation and stewardship and provide the basis for targeted investments into ESS, assisted by scenario building and strategic environmental assessment to propose targeted strategies to seek synergies, avoid unintended outcomes, and deal with uncertainty;
3. Seek communication channels across multiscale planning for information and knowledge but also for rules (regulations), norms and responsibilities (path dependencies) to promote rural-urban synergies through ESS;
4. Ensure objectives, sectoral policies, spatial and values integration; promising strategies for enhancing the implementation of biodiversity and ESS in spatial planning with connections to rural, regional, and sectorial funding strategies include:
    (i) mapping spatially explicit information on ESS in appropriate detail for decisions at respective scales, find the best scale to start with and recognize interactions with other levels/scales, ensuring coherence across scales;
    (ii) fostering delivery mechanisms that consider planning proposals as part of systematic governance and policy mixes;
    (iii) 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.

Mapping ESS Supply and Demand

1. The concept of ESS and the link between quality of life and services provided by the ecosystems is still not sufficiently understood by decision makers and citizens; It is necessary to increase the awareness and knowledge around these concepts and improve the communicative capacity of ESS maps.

2. A handicap to consistent assessments is the lack of experts' convergence in the evaluation and validation process, due to differences in interpretation, and value judgement, between data used and the level of provisioning of the ESS. Selection of data, as a function of purpose, and identification/definition of the most appropriate method may help to improve consistency in the assessment.
3. The harmonization of expert evaluations is necessary to better understand the reasons behind divergences, particularly in participatory evaluation of ESS by citizens and stakeholders when these express the socio-cultural value of some ESS; the goal is to foster the use of scientific and non-scientific judgments together.
4. Competitive ESS in the same territory can be conflicting or complementary and require trade-offs, but their representation is often disconnected from these considerations. Bundling different ESS might be needed for an effective "synthesis" of the assessment to be used for the decision process.
5. The integration of ESS mapping and evaluation in planning processes should bridge strategic (more cognitive) tools (usually non-binding) with other binding normative tools (that rarely refer to the concept of ESS and their evaluation).
6. Guidelines are needed for the integration of ESS mapping into spatial and urban planning at multiple scales; mapping ESS requires criteria / levels / objectives for rebalancing supply and demand, urban and rural etc, to demonstrate that ESS underline spatial planning in defining a truly sustainable and resilient territorial model.

Payment and Compensation schemes

1. Payment for Ecosystems Services (PES) schemes can be innovative and effective at generating rural-urban synergies in many different locations, landscapes, and stakeholder groups.
2. The nature of rural-urban interdependence is likely to change in the light of climate change and attempts to arrest its advancement, demanding flexibility in PES schemes as data emerge.
3. Links to public sector agendas (agri-environment schemes, water quality, urbanisation, carbon neutrality etc.) delivering public benefit offer useful springboards for private PES schemes linked to cost savings via ESS enhancements. The role of the local / regional state, remains important, both as a contributor of tax-payers' money in some PES schemes and as the democratic representative of citizens who rely on ESS. The state can also play an important role in facilitating and enabling the alignment or prioritisation of multiple ESS through co-designing PES innovations. Consequently, more understanding is needed (through open innovation methods including Living Labs) to tackle challenges around how to develop, maintain and evolve blended ESS finance.
4. PES works best where clear gains are generated through specific practice changes. A question remains about how long the PES may be workable once changes have been appropriated into culture, or if there is a weak market for ESS gains being sought (as in the pioneering days of fair trade).
5. PES innovation may require closer solidarity between rural and urban ESS users-suppliers, especially in understanding ESS co-dependences, as the current relationship still conforms

substantially to urban-based consumption of rural ESS with limited connection to or knowledge of the details of ESS provision.

6. As nature-based solutions to environmental management take hold within policy, more systematic monitoring of the impacts of ESS interventions are needed, and this should be built into PES schemes from the outset.
7. The blurring of public-private boundaries is evident in many existing European PES initiatives, especially 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 need to be involved in consultations to initiate PES schemes from the very outset, and be involved in their implementation, evolution, and evaluation.

3.7 Findings and outcomes in each LL

The following Tables 9 and 10 present the main results with the application of the conceptual framework, and core themes, in each LL represented in the CoP ESS.

Table 9 is more detailed with respect to the outcomes from the application of the conceptual framework. CoP partners were asked to consider the ESS research objectives in their LLs, and to reveal what their investigation provided in terms of:

- Who key ESS users are;
- What particular ESS delivery were prioritized in the LL experiments/innovations;
- What governance arrangement were in-place/required/initiated;
- What tools were used/initiated as a result of LL experiments/innovations;
- Which links with other CoPs in the ROBUST partnership became evident; and finally
- How our joint work stimulated rural-urban synergies.

Table 9 therefore presents the research objectives per LL in the CoP ESS followed by the more relevant rural - urban linkages expressed through the identification of ESS users and ESS deliveries that represent existing but also virtual bonds between rural and urban territories. It also indicates the governance arrangements and the tools, from the matching tools earlier identified, that were used in each LL, and the connections that were recognized with other CoP within ROBUST. Finally, Table 9 suggests, for each LL, what could be an interpretation of rural-urban synergies based on ESS.

Table 10 subsequently summarizes the findings in each LL concerning the role of ESS for rural-urban synergies, and outlines the key learnings in each LL revealing many benefits and opportunities but also methodological and governance gaps that will need to be addressed and adopted to facilitate the potential role of ESS in enabling rural-urban synergies.

Table 9- Core outputs in each LL resulting from the application of the CoP ESS conceptual framework

CoP ESS Partner	Research objective	Rural – Urban linkages		Governance arrangements	Tools	Links to other CoP	Rural – urban synergies
		Ecosystems Services users	Ecosystems Services delivery				
Ede Municipality	Better insights into the opportunities / limitations of integrative municipal spatial planning through the inclusion of Eco-System Service Delivery in ongoing menu card approach as part of National Environment and Planning Act implementation. This novel municipal policy instrument aspires to contribute to more tailor-made, participatory and integrative spatial planning procedures and approaches	Regional rural and urban dwellers + leisure seekers with different backgrounds	Focus on rural land use characteristics, with special attention for how to counterbalance and mitigate actual unbalances in regional agricultural ESS delivery profile	Multi-level governance arrangements that succeed to contribute to more integrative / participatory / synergistic / bundled ESS delivery	A mixture of rural spatial planning with a range of other policy tools, including Triple and Quadruple Helix Innovation approach, CAP-reform experiments around more collective ESS delivery approaches and a better targeting of agricultural' s wider ESS delivery capacity	Especially strong relations with the CoPs for Sustainable Food Systems and Business Models and Labour Markets (albeit somewhat less with latter's labour markets component)	Outputs point at the controversial nature of rural-urban synergies in Ede's setting. It reflects regional stakeholders' different understandings of this key notion, as well the difficulty to agree upon its concrete societal benefits meaning when starting from the multi-spatial perspective that guided our ROBUST WP1 framework.
Gloucestershire County	In the ESS theme, the objective is to explore the potential for circularity within integrated water resources management and links with the Natural Capital agenda in terms of new institutional arrangements to provide ecosystem services in Gloucestershire.	Users are understood, in the current FRM assessment system, as businesses and residents of downstream towns and cities, where population density makes flood risk impact substantial. In fact, however, because NFM delivers multiple benefits, some of which are downstream, but some are at the point of intervention (in the case of habitat management), then rural ESS 'users' are	The main ESS delivered is flood risk management (through rural land use/GI interventions). Other ESS include habitat creation/restoration, water quality improvement, amenity access and community development/involvement.	The LL has helped establish a new sub-group of the Regional Flood and Coastal Committee to oversee strategic NFM investment potential and promote networking between regional NFM practitioners. The group is called the Working with Nature sub-group.	The main tool will be the sub-group, which will advise the RFCC on possibilities for NFM investments over its 5-year funding cycle. Because constituent municipalities have planning authority, the sub-group will also inform municipalities on NFM opportunities within development agreements, using S106 agreements and Community	To Food CoP, as NFM generally has taken place on farmed land. Also to Business Models CoP because urban NFM (Sustainable Urban Drainage Schemes) are linked to urban enterprise flood resilience and environmental performance.	The NFM concept links upstream and generally rural land management to urban food protection. However, SUDS connect urban areas to downstream rural areas, too. Lastly, rural areas themselves are enhanced through NFM, linking urban recreation to rural habitat quality.

CoP ESS Partner	Research objective	Rural – Urban linkages		Governance arrangements	Tools	Links to other CoP	Rural – urban synergies
		Ecosystems Services users	Ecosystems Services delivery				
		also to be considered.			Infrastructure Levy (see CoP output by Excell/Stevens 2019) Useful repertoire tools include community for agriculture and biodiversity; and multi-scale integration in spatial planning. Community champions have proved vital in rural NFM interventions, both in driving demand for nature-based solutions as 'grey' flood infrastructure is predominantly located in urban areas, and to support monitoring and maintenance intelligence of NFM structures. Similar citizen involvement is a key aspect of urban drainage, indicating common, if spatially disconnected community skills and commitments. Multi-scale integration is a key focus of regionalising and connecting catchment-based		

CoP ESS Partner	Research objective	Rural – Urban linkages		Governance arrangements	Tools	Links to other CoP	Rural – urban synergies
		Ecosystems Services users	Ecosystems Services delivery				
					(rather than municipal) flood risk management.		
Frankfurt/Rhine-Main Region	Localization, measurement, and evaluation of ecosystem services that are provided by the Outer Space as our natural basis for life (natural capital). → qualitative and quantitative assessment	- Main focus on Inner Space: The beneficiaries are the people who live in the towns and cities - Outer Space: Farmers and forest manager are the target groups	- Main focus on Outer Space: 13 ESS (Preliminary selection from 27 suitable ESS for the region); ESS from all three main groups (providing, regulating and cultural ESS) were considered - Inner Space: ESS not included in assessment	Complex, mature and widely agreed system in place to foster regional development and to steer land use on the scale of the functional region. Ready to integrate ESS into the formal procedures. Legally based, democratically legitimated, and accountable. Level 1: Regional Land Use Planning procedures defined as an exception to the German rule, not 80 individual Land Use Plan done by 80 towns and cities individually but 1 Regional Land Use Plan done on behalf and with the participation of the 80 municipalities; Level 2: System of 20 regional companies (co-ordinated by the Regional Authority) dealing with elements 2	- Indicator-based mapping (GIS) for ESS supply and demand. - GIS-application for comparing different land use scenarios about the impact on ESS (incl. economic valuation) as a decision-making tool in regional land use planning (e.g., designation of new built-up area);	Business Models and Labour Markets: The value and importance of ESS for the functioning of the region. Public infrastructure and social services: ESS, or the areas providing them, are part of public infrastructure and provide social services.	Understanding of spatial relations and dependencies between Inner and Outer Space in terms of supply and demand for optimised spatial planning → valorisation of ESS services For example: - regional added value through tourism & recreational services or local agricultural goods - saving of societal costs (e. g. health care costs) by taking local climate regulation, etc. into account

CoP ESS Partner	Research objective	Rural – Urban linkages		Governance arrangements	Tools	Links to other CoP	Rural – urban synergies
		Ecosystems Services users	Ecosystems Services delivery				
				to 4 of the Planning Quadriga to complement element 1, the provision of space (=Regional Land use Planning)			
City of Helsinki and Luke (Finland)	To determine how ecosystem services can be better accounted for in the land use and building planning system in the Helsinki-Uusimaa region.	Leisure seekers and multi-local dwellers from local and regional levels, tourists, land use planners	Focus on recreational and green land use planning and mapping on the rural-urban interface in the Helsinki-Uusimaa region, and the conflicting forms of land use (e.g., recreational – traffic – construction)	Promotion of common round table platform for synergetic interaction of rural-urban dwellers and stakeholders, like LAGs' and planning authorities	Interactive workshops, videos and maps on multi-local living, exploitation of the existing rural and urban (policy) networks, integrated GIS tools for mapping ecosystem services	The core theme of the Helsinki LL (multi-locality) is approached context-based also in the CoP Business Models and Labour Markets: ESS as a pulling force for teleworking and multi-local working and CoP Public Infrastructure and Social Services: use of ESS as a promotor for building new facilities for multi-local people in rural areas	Mapping of the ESS in the Helsinki-Uusimaa region makes visible their potential for multi-local people and regional planning, on the other hand the environmental pressure of the use of ESS for both rural and urban land use planners
Lucca Rural-Urban Connections Lab	Identify how territorial planning can contribute to promoting multifunctional and sustainable agriculture and food systems in peri-	urban and peri-urban residents and consumers of the local (and non-local) food system	The focus in our LL is on rural and peri-urban space, land use characteristics and destination. The recovery of abandoned land, aimed	The intermunicipal food policy is the emerging governance arrangement. This integrates, depending on the topic, with land	Within the Intermunicipal Food policy, the "table on local agricultural production" is the tool. Another tool (limitedly	The main connections are with the Food CoP and Culture CoP, the former linked to the destination	1)Strengthen citizens' awareness to consume local food and support farmers to reorient themselves towards more sustainable

CoP ESS Partner	Research objective	Rural – Urban linkages		Governance arrangements	Tools	Links to other CoP	Rural – urban synergies
		Ecosystems Services users	Ecosystems Services delivery				
	urban areas, restricting urban sprawl, protecting the environment and landscape.		at the production of local food, can serve to set up new farms or to enlarge existing ones. Other ESS are linked indirectly: landscape, ecological infrastructures, rainwater management, recreational value for citizens.	use planning.	explored) is the Land Bank, as a tool to match supply and demand of land (here ESs could be a framework for assessment, beyond land rent). Another tool that has been developed is ESs mapping for land use planning.	of rural spaces to agriculture and landscape features (olive groves, vineyards, horticulture etc…), the latter to the typical products and dishes/gastronomy of the area	production models. Matching available and abandoned land with demand for it, with preference to new and old farmers.
Lisbon Metropolitan Area (LMA)	Capture an integrated understanding and shared knowledge of local assets - learning with existing knowledge, and the creation of new knowledge Stimulate mutual dependencies and learning networks, through dialogues and joint initiatives, to enhance the value of local assets. Create innovative institutional frameworks for improved decision-making/governance systems Investigate solutions that enhance ESS in spatial planning for sustainable land use	Regional and local administrations to promote and support the implementation of green infrastructure planning. Schools for the promotion of sustainable food education in children. Tourists and Producers (wine, fruit, vegetables) to realize the value created in the territory by ESS Food market.	Food production and water provision (provisioning services) Water, climate and flood regulation (Regulation services) Recreation and tourism (Cultural services) Biodiversity conservation (support services),	Multi-level and multi-sector agents and organizations sharing knowledge and experiences in an open and transparent format never happened before creating the Urban-Rural Dynamics Laboratory (URDyLab)	ESS mapping ESS based Green infrastructure mapping to support sustainable land use planning, Multi-scale planning Land management Territorial Economy Agro-parks as a new BM	Interconnected approach between Cop ESS, CoP BM and CoP SFS. Connections with CoP Food Systems, re. the provisioning services and cultural services as knowledge and education. CoP Business models, relevant in the role of ESS to the territorial economy, and the creation of the the Metropolitan Network of Agroparks. Connection with Public infrastructures CoP, namely as green	ESS act as bridges between rural, peri-urban and urban through the various services that can be acknowledged to create territorial value The connection of ESS and green infrastructures that establish spatial connections between urban and rural space. Education on sustainable food and healthy canteen food programmes foster the acknowledgement of food production and food producers (Farmers) and rise awareness for local food consumption.

CoP ESS Partner	Research objective	Rural – Urban linkages		Governance arrangements	Tools	Links to other CoP	Rural – urban synergies
		Ecosystems Services users	Ecosystems Services delivery				
						infrastructures. Connection with Culture CoP concerning cultural services, as well as education and knowledge	The Metropolitan Network of Agroparks, with a multifunctional nature, including commercialization and restoration, spreads as nodes along the Metropolitan Green Infrastructure, integrating different components and actors of the food system, providing different services in an innovative way (food supply, leisure, research, education, etc)..

Table 10- Summary of findings regarding the use of ESS in each LL

CoP ESS partner Topic	Summary of findings	Key Learnings
Ede Municipality - Circular farming enables looking at ESS tensions – business models are strategic to shift practices	Circular Farming may contribute in different ways to more synergistic rural-urban relations. At the same time the best way to do some may be subject of stakeholder debate, including its implications for regional land use characteristics and strategic choices (e.g., land sharing versus land sparing) and the importance /necessity to take also distant rural-urban relations and interdependencies explicitly into account in attendant decision making processes	In some areas, including Ede, intensive livestock agriculture has, over time, become a form of economic lock-in which is difficult to reconfigure without structural reforms. Consequently, certain ESS, namely those that are closely associated with livestock agriculture can be prioritised, to optimise economic and environmental harmony of ESS supply and demand. These include water and air quality linked to agro-ecological husbandry; enhanced landscapes and biodiversity through subsidy and commercial PES, which connect and create agricultural habitats; and shared cultural services between rural and urban citizens leading to care for rural landscapes.
Gloucester County - The focus is on water quality and water storage, together with flood regulation and food production. Attention is placed on soil, biodiversity, and minerals, as well as in innovations in governance – mapping + indicators are used	Natural Flood Management is increasingly important as a nature-based intervention which offers multiple socio-ecological benefits. A major challenge remains the definitive isolation and quantification of FRM impacts, which may also depend on other variables. In urban areas, nature-based solutions called Sustainable Urban Drainage Systems and are usually nature-based green infrastructure solutions installed within urbanisation/building developments. A major challenge is the long-term maintenance of these features, as SUDS are not a legal requirement.	The wide diffusion of stakeholders needed to deliver catchment interventions require support networks and incentivisation; as well as cross-border and cross-sector governance. More and longer-term impact analysis is needed to assess the effectiveness of nature-based flood interventions. This includes a better alignment between FRM project funding periods (generally 5-6 years) and the life-span of NFM interventions. The long-term management of urban NFM is sub-optimal and not always enforceable over the lifetime of the intervention.
Frankfurt/Rhine-Main Region -ESS is intended to be used as a tool to reduce land take at regional scale based on mapping + indicators (quantification, and to provide direction to land use planning)	- ESS is a crucial argument to inform decisions about land take - Necessary steps for the application of the ESS concept in spatial planning: 1. Selection of relevant ESS and appropriate indicators.; 2. Decision	- Making the benefits of ESS visible and integrating them into planning practice (GIS-based tools, SEA, landscape planning) is essential for sustainable development.

CoP ESS partner Topic	Summary of findings	Key Learnings
	on scales and system references: Grid area approach, hydrological catchment areas; 3. Assessment of supply and demand, normalisation via 6-step linear scaling (scale 0-5); 4. Monetisation of benefits and costs of ESS changes; 5. Implementation of a web GIS tool - Pilot application needs funds for staff and data - Spatial relations between supply and demand must be considered because even if ESS (supply) is sufficiently available in the Outer Space, it does not necessarily reach the user (demand), e.g., cooling potential and fresh air production of a forest and demand of residents (Inner Space). - For sustainable development, not only should ESS lost due to interventions in nature be compensated, but also future demand of ESS created by the land use change.	- Selection of suitable ESS for the region is crucial (relevance, scale etc.); - Knowledge gaps especially on the demand/user side (including data availability) and monetization. - Need for standards and guidelines to simplify application in practice - German legal planning system needs to adopt ESS in a qualified way to comply with the legal demand to take all available information concerning planning decisions into account
City of Helsinki and Luke (Finland) -Seasonal mobility is the motivation to investigate ESS integration in land use planning as green infrastructure – namely how ESS are threatened / challenged by mobility and seasonality	COVID-19 has increased mobility and multi-locality => showing value in ESS but also increasing pressure on ESS. ESS is much more on the national and regional political agenda because of the increasing interest and pressure on ESS	Due to Covid-19, rural areas and benefits obtained from ESS are on the public and political agenda more than ever – a turn that nobody really expected in rural-urban relations.
Lucca Rural-Urban Connections Lab- The focus is on mapping and valorising food production, as one of the ESs delivered by the rural and peri-urban territory (open spaces) in the plain of Lucca. In this context, this is aimed at strengthening the Intermunicipal Food Policy	Mapping and bundling are a tool for representing the potentialities of ESs supply of peri-urban spaces. The identification of the destination of the different spaces, in terms of agricultural activity in various areas of the territory, etc. provides knowledge useful for territorial planners.	• The ESS concept is not widely known by policy makers and planners, neither by most citizens • it remains implicit and not explicitly used as a tool for knowledge or for the definition of standards (in the domain of territorial planning). More often, single environmental issues are the concern and object of mapping (e.g., hydraulic risk maps, soil permeability maps, etc.). However, a wider and integrated view of the different issues is lacking. • ESs mapping is a tool that aims (but partly succeeds in) integrating specialized knowledge (that normally supports the preparation of planning tools) and to make

CoP ESS partner Topic	Summary of findings	Key Learnings
		other territorial stakeholders aware of the connections between the various issues.
Lisbon Metropolitan Area (LMA) - Using ESS to promote more sustainable land use, reducing land take by exploring ESS based planning and management tools	ESS may become pivotal in spatial planning if linked to proper mechanisms and tools. There is a need to further develop methodological approaches tomultiscale ESS mapping mixing participatory and expert-based approaches, that integrate multiple knowledge bases as suitable to support planning practice Explore sustainable food education to rising ESS awareness.	The power of linking ESS to participatory approaches and new governance models in progressing towards innovative multiscale and cross sectoral and place-based solutions.

Tables 9 and 10 present outcomes and learnings achieved by CoP partners in the work developed in each LL. The next stage was a convergence of perspectives from all partners in the CoP, to cross-related their individual findings. This collective identification of overall findings and learning within our CoP ESS was achieved at a brainstorming meeting, using the MIRO platform, which took place on May, 14th, 2021. The meeting reflected upon the CoP process overall and the conclusions drawn from the LL activity and from other resources developed in the CoP such as our Research Briefs.

This collective process allowed CoP partners to summarise, and cross-relate, key learnings and findings in each LL, turning it into collective findings which are presented in Table 11, to synthesize the overall discussion. This outcomes exercise closed the learning process with CoP ESS.

Table 11 - CoP ESS collective outcomes, structured in findings and learning

Findings - Our CoP findings provide examples that:

- Rural-Urban relations are fuzzy, the notion of synergies in rural-urban is intriguing and subject to interpretation
- It may help if ESS scientific findings are accessible to formal, legal planning procedures, as ESS are not yet established in formal spatial planning procedures; 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, to support the process of bundling.
- There seems however to be a consensus that continuity in a territory must be ensured, with a constant Rural-Urban flow, but circular approaches are better and linear linkages in Rural-Urban should be avoided.
- Urban-rural should be seen as a proxy for the dualism guiding land take decisions in spatial

planning, about developed land and not-yet-developed land, regardless of the areas in question being defined as rural or peri-urban.

- In the cognitive framework of planning tools there are many themes that highlight aspects that are not called ecosystem services but are indirectly related to them; the lack of cross-sectoral "communication" can drive towards a lack of policy coherence.
- The is a need for governance systems to link rural-urban, notably it is important to recognize the interconnection between urban and rural land managers and ensure rural land managers are represented in spatial planning decision-making bodies, or that they are consulted at the outset of any intended interventions which demand land use change; presently governance arrangements do not favour cross-sectoral relations.
- ESS are a crucial argument to inform decisions about land take; planning remains aligned with unsustainable functional land allocations, which stifle circular rural-urban ESS interdependencies and do not capture extra-territorial impacts; actually, the challenge for planners is to use approaches that allow or support them to resist pressures that lead to urbanisation.
- 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 is ensuring longer-term ESS management of ESS is secured within spatial development.
- COVID-19 has increased mobility and multi-locality, showing greater understanding and value in ESS but also resulting in an increased (recreational) pressure on the ESS due to increased demand, perhaps also from new users.
- There is still a tendency to see rural as the exclusive ESS supplier, and urban as the exclusive ESS consumer, assuming that there is a unidirectional flow, limiting the valuation of proximity services.
- ESS mapping at multiple scales makes visible that ESS values are not absolute but relative to scale of analysis, the existing knowledge and the level of governance, challenging cross-border mapping, and scalar integration.
- 'GI as a nature-based, low-carbon solutions, remains highly marginal in water management approaches based on urban flood-impact risks that undervalue the importance of extended and diffuse rural land management arrangements.

Learnings - our CoP core learning points recognize that there is a need for:

- Methodological development to ESS mapping to integrate multiple knowledge bases; the attempt to use mapping comes after a compromise between expert and traditional knowledge - supply and demand need to be made explicit using a multiscale approach.
- Bundling of ESS is important in two ways: (1) patterns of association of ESS avoids double-counting, improves dealing with synergies and trade-offs; and (2) a specific ecosystem providing a set of ESS in systematic way values spatial coincidence of ESS for the same territory (multifunctionality). Identifying bundles is objective and method dependent; integration, or the connection to multi-functional land-use, needs further research.
- Transfer/translate existing information on biophysical process and functions into an ESS conceptual framework.
- Green infrastructure to be valued as a tool to make ESS operational in rural-urban relations and to structure ESS flows.
- Transparency and awareness of the limits of ESS mapping need to be understood and shared by all.
- Governance arrangements are required to make decisions on ESS priorities and conflicts.

- Role of community partnerships in setting new governance arrangements to enhance and promote ESS; the role for communities in taking care/preserving ESS needs to be explored further.
- New governance arrangements for payment for ESS, to ensure they are conducted in more balanced ways to realize synergistic effects.
- Exploring the potential of rural-urban contracts of reciprocity to enhance ESS.
- Compensation for ESS loss can need four times more land than the size of the area transformed from outer space to inner space.
- Integration of regional economic growth and ESS service delivery, by highlighting rural-urban interdependencies.
- Due to Covid-19, rural areas and benefits obtained from ESS are on the public and political agenda more than ever - which nobody really expected but is now likely to persist.
- Need to further explore the scale-specificity of each ESS, it integration ESS flows and value of proximity.

3.8 Recommendations based on findings and learnings with the CoP ESS research

The essence of the CoP ESS research findings and learnings, as above described, is presented in the following bullet points:

- Rural-Urban relations are fuzzy, however ESS are recognized to play a key role in a constant rural-urban flow, where it makes more sense to think of circular approaches in a territory in continuity; urban-rural should be seen as a proxy for the dualism guiding land take decisions in spatial planning, about developed land and not-yet-developed land, regardless of the areas in question being defined as rural or peri-urban.
- There is still a tendency to see rural as the exclusive ESS supplier, and urban as the exclusive ESS consumer, assuming that there is a unidirectional flow, limiting the valuation of proximity services. 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 is ensuring longer-term ESS management of ESS is secured within spatial development.
- ESS are not yet established in formal spatial planning procedures, but ESS 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.
- ESS mapping at multiple scales makes visible that ESS values are not absolute but relative to scale of analysis, the existing knowledge and the level of governance, challenging cross-border mapping and scalar integration.
- The is a need for governance systems to link rural-urban, notably it is important to recognize the interconnection between urban and rural land managers and ensure rural land managers are represented in spatial planning decision-making bodies, or that they are consulted at the outset of any intended interventions which demand land use change.

Given the above, our CoP ESS research highlights the following four recommendations:

- Methodological development for ESS mapping need to integrate multiple knowledge bases, including expert as well as traditional knowledge - supply and demand need to be made

explicit using a multiscale approach; it is also needed to further explore the scale-specificity of each ESS, the ESS flows and value of proximity; bundling of ESS is important to avoid double-counting and improves dealing with synergies and trade-offs; integration, or the connection to multi-functional land-use, needs further research;

- 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 and their in taking care/preserving ESS needs to be explored further; new governance arrangements are also needed for payment for ESS, to ensure they are conducted in more balanced ways to realize synergistic effects; and the potential of rural-urban contracts of reciprocity to enhance ESS need to be further explored;
- Green infrastructure needs to be valued as a tool to make ESS operational in rural-urban relations and to structure ESS flows; 'Short, medium and long-term data is urgently needed to understand the specific and combined impacts of rural and urban flood interventions based on GI enhancement. To support this, maintenance and monitoring of interventions will be needed in the form of: (i) the inclusion of cross-sectoral monitoring partnerships at the initiation stage; (ii) blended and co-produced PES schemes which respond to local commercial interests and subsidies; and (iii) stronger and clearer regulation of long-term GI maintenance within development agreements.
- 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 (cf. figure 8 and 10); we also learned about the integration of regional economic growth and ESS service delivery, by highlighting rural-urban interdependencies.

4 Monitoring and evaluation of learning

Throughout ROBUST, CoP ESS evolved through a process of sharing and learning across the pluri-disciplinarity of both research and practice partners that worked in an interdisciplinary way. At regular moments, coincident in general with the consortium meetings, meetings of the CoP partners would be facilitated in different ways to encourage participations of all partners (brainstorming, world café, and other). Initial expectations with the CoP ESS at start where subsequently structured in five themes agreed by all partners in an interactive way. This enabled the consolidation of the application of the conceptual framework of the CoP ESS in each LL. Finally, an outcomes exercise, reflecting partners' experiences, closed the learning cycle.

Section 2 of this report outlined the process of iteratively and systematically discussing, articulating and elaborating a research agenda for the CoP ESS. In summary, the main steps included:

- Agreement of shared interests
- Development of a conceptual ESS research framework to examine rural-urban links
- Composition of a research agenda with related questions
- Conversion of the agenda into a shared repertoire
- Distillation of the repertoire into two levels of research outputs in standard templates (research briefs and their shorter equivalents, the practice briefs)

Regular internal CoP partners' communications and their timings are provided in table 2, showing the various moments of exchange and learning.

Within ROBUST, the LL form the main experimental arenas for the innovation and were largely driven by the needs of practice partners. By contrast, CoPs, as thematic research fora, shared cross-cutting challenges which emerged from the LL. Section 3 above outlines the process of conceptualisation of the research agenda. The CoP research agenda nevertheless remains focused on the illumination of practical challenges of rural-urban governance in relation to ESS. To try support common understandings, accessible and transferable terminology across research-practice boundaries and to embrace and learn from distinct national and cultural perspectives, CoP ESS made good use of several the participatory methods provided in the WP3 guidance (D3.1). We employed the following techniques:

- Stakeholder mapping (demanding leadership by practice partners)
- World Café (whereby CoP partners hear about multiple local contexts from a LL and question the presenter in detail, for a set period, in rotation);
- Systematic evidence reviews (for the development of the Research briefs);
- Concept mapping (to graphically synthesise group discussions).

The development of the Tools for Matching was an explicit attempt to ensure practice-based considerations were compiled and presented from the different LLs, either through practitioner authorship, or with a high degree of data provision and oversight by practice partners. The Tools exposed some contexts that are highly localised and have only limited transferability. An example of this is Multi-scale Integration of ESS in Spatial Planning, which covers legally contexts behind German spatial planning law. Nevertheless, opportunities are identified linked to governance scale which tie ESS to functions, rather than (more conventionally allocated) land uses:

> *Balancing of interests (of all kind, usually conflicting demands for land use) is a core legal requirement and central to spatial planning. Introducing and applying the idea of ecosystems providing services potentially put them at eye level with other land uses and land use functions. … Too often eco systems are mentally connected to nature reserves … or seen as an add-on… The Regional Authority is in charge of a dedicated instrument of spatial planning which operates on an appropriate level to assess eco system services within a functional region: It is the right scale to, for example, reflect on the regional effects of different ecosystem services and possible translocations*[2].(Henke 2019)

In Garfagnana, Tuscany, the development of a regional food strategy was designed to underpin ESS through the protection of small-scale farming and the preservation of agricultural bio-diversity. This process relied on the development of multi-actor 'food communities' defined in Italian law, to embed multiple ESS in the agri-food chain.

> *'The creation of the Community for Food is a key element for supporting ecosystem services, through the maintenance and dissemination of historical and cultural values of agricultural biodiversity, local knowledge, and traditions. In addition, it represents an opportunity to set up new farm enterprises that are more aware of the necessity to develop multifunctional, more resilient farming models.' (Arcuri, Galli & Rovai 2019).*

These two locally unique examples, prepared with rural-urban ESS functional links in mind, nevertheless offered accessible and transferable insights for all CoP ESS partners.

The focus on a few core themes contributed to establish a collaborative learning process at CoP level. In addition the CoP started with a common entry point which provided some link across different LL teams, even though it was rather spatial planning driven. The fact that different LL operated at different levels, some at metropolitan level others at municipal level might have delayed the collaborative learning process, namely the interaction between the different research and practice partners involved, as well as the reflections upon findings achieved in LL.

The facilitation process

The CoP started off with a strong conceptual and methodological direction to enable CoP partners' full application in the specific LL

Early attention to sharing ideas and discussing joint interests was a useful start to sketching out what became a CoP research agenda. In particular, the matching themes (see table 5) and subsequent matching tools development was a good way to ensure that technical ESS expertise a) was developed together by individual LL teams of practice / research partners and b) complemented expertise and experiences within the CoP. The matching tools were later refined into research briefs. In both cases, writing within templates was a useful mechanism to achieve a consistent approach across the CoP themes.

Communication across CoP partners was good, and we had several opportunities to exchange and elaborate. The participation in two academic URP conferences benefitted from the technical contribution of practice partners and revealed the co-productive potentials of the CoP.

Implementation of CoP ESS in the work developed in the LL is still an ongoing process.

The methodological approach, based on findings exclusively emerging from LL, showed limitation in progressing the scientific knowledge on ESS in ROBUST, but proved its value in identifying and

[2]Translocation: Eco systems threatened by land take transplanted, or: Eco system services provided by eco systems located elsewhere.

bridging science-practice gaps as well as alerting to the relevance of ESS in reinforcing rural-urban linkages.

Evidence of learning processes via the CoP

Testimony from James Blockley

> *"As principal officer for the Gloucestershire Lead Local Flood Authority team, I have been involved in the Community of Practice [ESS] for around two years. During that time, I have found the process to align perfectly to both my own aspirations for the direction of flood risk management in the County and also to wider organisational priorities.*
>
> *In October of 2019, I was fortunate enough to join the CoP for their meeting in Hannover. This provided a real-world context of how local authority delivery and academic strategy can come together for the benefit of shared goals; not just in Gloucestershire, but across the EU.*
>
> *Since then, my involvement at a local level, primarily with the University of Gloucestershire, has brought invaluable perspective and constructive support in promoting awareness and delivery of the 'working with natural processes' methodology and rural-urban synergies across the region.*
>
> *I look forward to remaining involved."*

5 Conclusions - Core messages out of the CoP ESS

- ESS are crucial in ensuring and sharing the benefits across different types of territories and, notably, ESS highlight the ecological interdependence of rural and urban territories.
- Optimising this requires better cross-sectoral (e.g., planning, economic development, and resource management) policy co-ordination within a territory.
- ESS needs to be fully integrated into different scales of spatial planning - local, municipal, and regional - to capture the cross-border reach of ESS (e.g., river catchments, landscapes, and shared public benefit).
- ESS provide substantial economic benefits and economic incentives are needed in the market and public sectors to enhance green enterprise innovation.
- New forms of governance are needed that succeed to involve and engage multiple urban and rural actors' interactions and stimulate collective action.
- There is still a major science-policy-practice gap that needs to be bridged to foster territorial applications.
- Living Lab approaches show potential in creating a common knowledge-base and lexicon on ESS amongst stakeholders across scales and sectors.

6 References

Costanza R, de Groot R, Braat L, Kubiszewski I, Fioramonti L, Sutton P, Farber S, Grasso M, (2017). Twenty years of ecosystem services: How far have we come and how far do we still need to go? Ecosystem Services 28 (2017) 1–16. https://doi.org/10.1016/j.ecoser.2017.09.008

7 Annexes

7.1 Example: Minutes of the CoP during the 7th Consortium meeting

Participants:

Practice Partners Associated	Name
Ede Municipality (Netherlands)	Henk Oostindie Bart van der Mark
Frankfurt	Reinhard Hans Henke Sophie Herrmann
Lucca Province (Italy)	FrancescaGalli MassimoRovai Giovanni Belletti Maria Pia Caisini
Gloucestershire County (UK)	Daniel Keech Matt Reed Gary Kennison James Blockley Carey Ives
Helsinki City (Finland)	Ulla Ovaska
Lisbon Region (Portugal)	Maria Partidário Isabel Loupa Ramos Carlos Pina Alexandra Almeida

Status of CoP synthesis Report

CoP synthesis report in its early April version was mailed to all partners ahead of the meeting. The ToC is as follows:

Chapter 1 and 2 of the report are pretty much done, half of chapter 3, in what joint enterprise concerns, has also been written and various elements pulled together. What is missing is the second half of chapter 3 – stating findings and learnings, as well as chapters 4 and 5.

Annexes are also being pulled together and will include:

- CoP focus and priority themes
- WP2 Snap shots and rapid appraisal on governance
- Results of World Café
- Matching themes and Shared Repertoir
- RIA
- CoP ESS Minutes of various meeting

Brainstorming discussion on findings and learning aspects in this meeting will feed into chapter 3.

CoP report to include a clarification of how the CoP conceptual framework is being implemented through the five core themes, as represented in the CoP ESS outcomes scheme (see figures 1 and 2 below)

CoP report must also produce core messages (perhaps per core theme) based on LL implementation of the conceptual framework. We need to conduct analysis of our results and each partners/LL write short statements to act as core messages

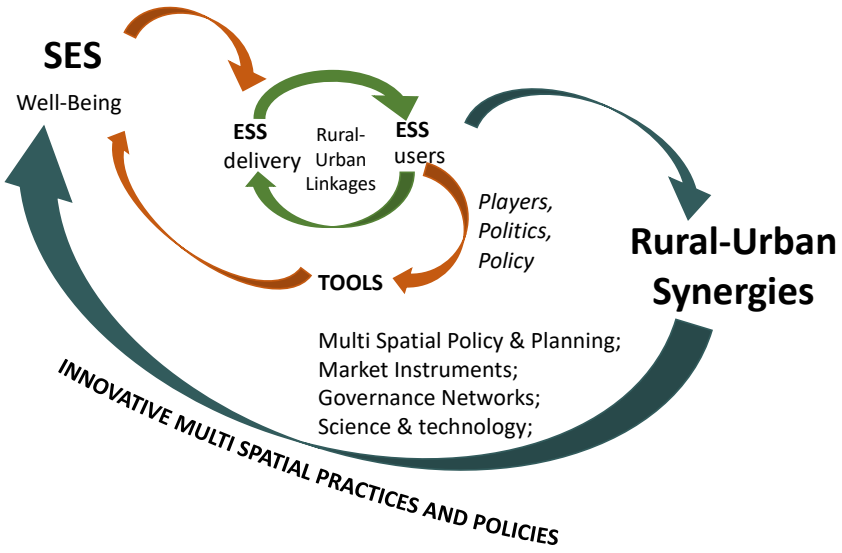


Figure 1 – CoP ESS conceptual framework

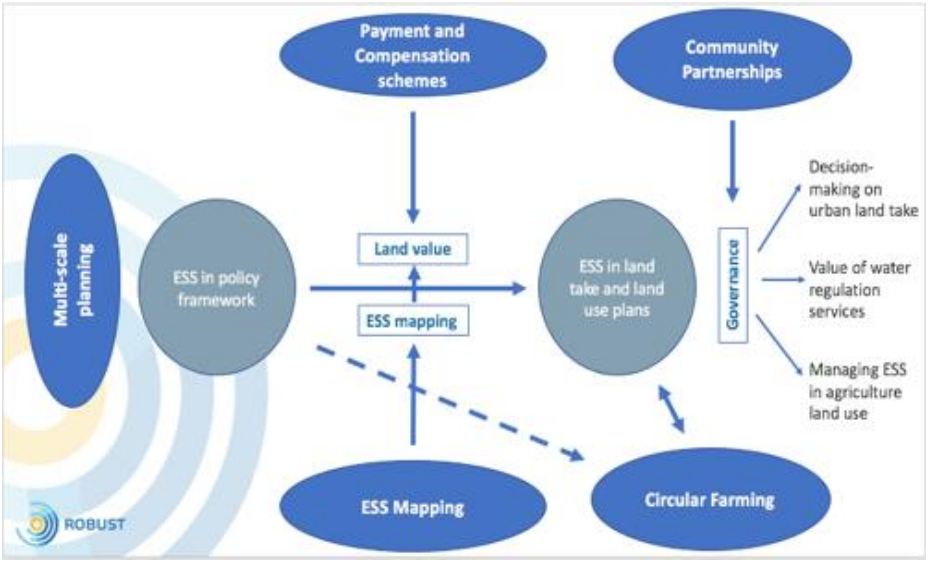


Figure 1 – CoP ESS outcomes scheme

Status of Research Briefs and Practice Briefs

Practice briefs (PB) are fully completed, and the whole lot was mailed to partners before this meeting.

Research briefs (RB): three have been completed (circular economy, payment for ESS, multi-scale planning) and one will be completed end of this week (mapping and bundling ESS). Francesca presented status of both RB. Community partnerships in progress.

Because of different status of RB it was agreed to downgrade the core theme reports on Multi-scale planning and Mapping and Bundling of ESS and keep current versions as preliminary book chapters. RB to adopt similar layout to the practice briefs but excluding the right hand side column, and also limit RB to 10 pages. A first example on multi-scale planning will be provided.

It was agreed all RB should be ready by end of April with:

- circular economy - revisited
- payment for ESS - revisited
- multi-scale planning - downgraded
- mapping and bundling ESS - downgraded
- community partnerships – developed to a possible status.

Reinhard briefly informed about LL report and have subsequently emailed a section of that report with relevance to ESS.

Quality Review process of research and practice briefs

Agreed that this specific overall quality review of RB and PB will not be conducted. RB will receive contributions from previously nominated contributors.

Brainstorm discussion on findings and conclusions

Partners were asked to complete the tables included in the CoP synthesis report as a contribution to the systematization of findings and learning.

One table is to systematize results:

CoP ESS Partner	Research objective	Ecosystems Services and users R-U linkages	Governance arrangements	Tools	Links to other CoP	R-U synergies based on ESS

Another table is to systematize findings:

CoP ESS partner Topic	Summary of findings	Learning points

An incomplete example on the table with results from Lisbon was provided:

Results from each CoP partner (incomplete example)

CoP ESS Partner	Research objective	Ecosystems Services and users R-U linkages		Governance arrangements	Tools	Links to other CoP	R-U synergies based on ESS
Lisbon Metropolitan Area (LMA) (example)	Investigate solutions that enhance ESS in spatial planning for sustainable land use.	Municipalities School children Tourists Producers (wine, fruit, vegetables..) Food market ...	Food production Recreational activities Biodiversity conservation	Multi-level governance Urban-Rural Dynamics Laboratory (URDyLab)	Ecological network Land management Green Infra-structure Territorial Economy Agro-parks	Food Systems Business models Public infrastructure	Territorial value Healthy canteen food programmes ....

Discussion was conducted with the help of a Jamboard (pdf as Figure 3 – thanks Bart). Results have been organized in a word document (thanks Isabel), included as annex, and will be included in the next version of the CoP synthesis report, to be shared 1st of May.

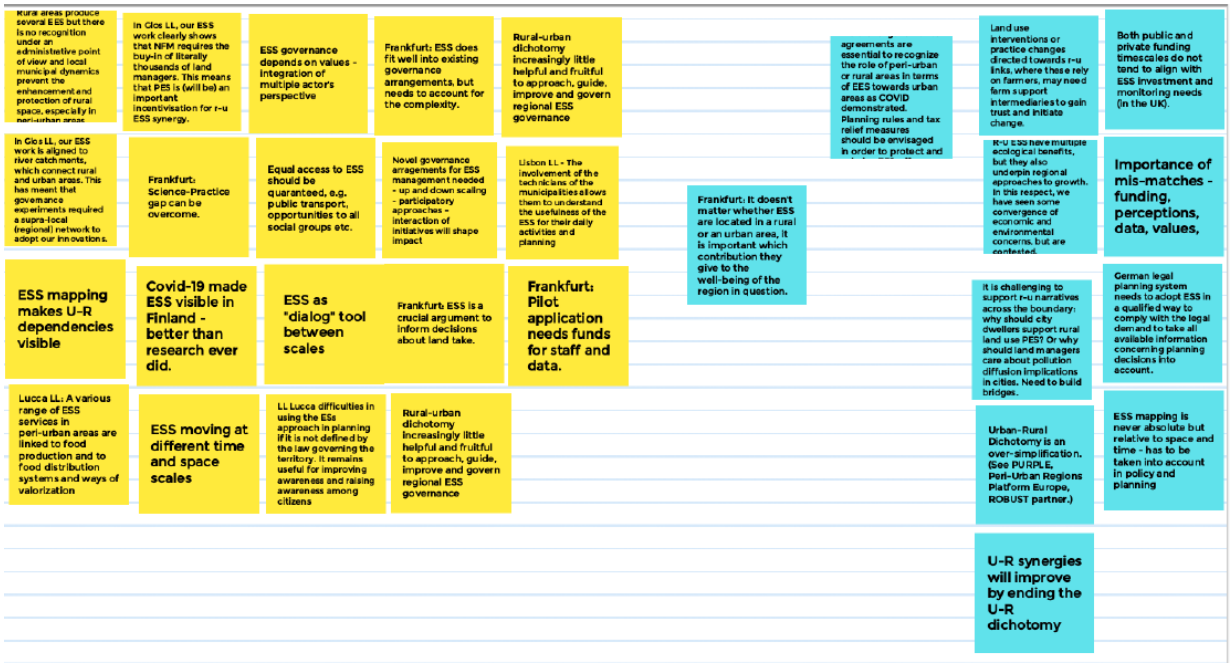


Figure 3 – image of Jamboard results (transcript below)

Springer book

Previously to this meeting an email was sent to all book authors with various information, including the structure of the book that include the identification of which of the 3 co-editors will be the contact point for each chapter.

RB and PB will be the basis for chapters in respectively sections 3 and 4, but they need to be elaborated to a publishable format. PB in particular should reflect on the core work developed in LL throughout this last year, ensuring focus on what is most relevant. Regarding RB, both multi-scale planning and mapping and bundling ESS (as expected end of this week) are already in a format close to what is required for publication, but circular economy, payment for ESS and community partnerships will need to be further developed.

Instructions for authors, together with the Springer information for authors will be sent to all authors shortly.

Relevant timings:

- Submission of first draft chapter by June-to mid July
- Peer review of chapter by September-October
- Final drafts of chapters by early November
- Submission of book chapters to Springer by late November.

Next steps

Complete research briefs by end of April

Partners send completed results and findings for their LL as soon as possible so that it can be incorporated in the new version of the CoP report

CoP final report: 1st May a new draft is sent for partners to comment / end of May a final draft for WP3 coordination.

Mid-May: CoP ESS meet online – date to be arranged through a Doodle (https://doodle.com/poll/cpw5qz5xb9smn8x7?utm_source=poll&utm_medium=link)
Springer book – editors will meet the authors: June-mid July draft chapters.

Jamboard results and chat exchanges

FINDINGS (YELLOW)

- In Glos LL, our ESS work clearly shows that NFM requires the buy-in of literally thousands of land managers. This means that PES is (will be) an important incentivisation for r-u ESS synergy.
- Rural areas produce several EES but there is no recognition under an administrative point of view and local municipal dynamics prevent the enhancement and protection of rural space, especially in peri-urban areas
- In Glos LL, our ESS work is aligned to river catchments, which connect rural and urban areas. This has meant that governance experiments required a supra-local (regional) network to adopt our innovations.
- ESS mapping makes U-R dependencies visible
- Lucca LL: A various range of ESS services in peri-urban areas are linked to food production and to food distribution systems and ways of valorization
- Frankfurt: Science-Practice gap can be overcome.
- Covid-19 made ESS visible in Finland - better than research ever did.
- ESS moving at different time and space scales
- ESS governance depends on values - integration of multiple actor's perspective
- Equal access to ESS should be quaranteed, e.g. public transport, opportunities to all social groups etc.
- ESS as "dialog" tool between scales
- LL Lucca difficulties in using the ESs approach in planning if it is not defined by the law governing the territory. It remains useful for improving awareness and raising awareness among citizens
- Frankfurt: ESS does fit well into existing governance arrangements, but needs to account for the complexity.
- Novel governance arragements for ESS management needed - up and down scaling - participatory approaches - interaction of initiatives will shape impact
- Frankfurt: ESS is a crucial argument to inform decisions about land take.
- Rural-urban dichotomy increasingly little helpful and fruitful to approach, guide, improve and govern regional ESS governance
- Rural-urban dichotomy increasingly little helpful and fruitful to approach, guide, improve and govern regional ESS governance
- Lisbon LL - The involvement of the technicians of the municipalities allows them to understand the usefulness of the ESS for their daily activities and planning
- Frankfurt: Pilot application needs funds for staff and data.

LEARNINGS (BLUE)

- Frankfurt: It doesn't matter whether ESS are located in a rural or an urban area, it is important which contribution they give to the well-being of the region in question.
- Multilevel governance agreements are essential to recognize the role of peri-urban or rural areas in terms of EES towards urban areas as COVID demonstrated. Planning rules and tax relief measures should be envisaged in order to protect and valorize EES offer

- Land use interventions or practice changes directed towards r-u links, where these rely on farmers, may need farm support intermediaries to gain trust and initiate change.
- R-U ESS have multiple ecological benefits, but they also underpin regional approaches to growth. In this respect, we have seen some convergence of economic and environmental concerns, but are contested.
- it is challenging to support r-u narratives across the boundary: why should city dwellers support rural land use PES? Or why should land managers care about pollution diffusion implications in cities. Need to build bridges.
- Urban-Rural Dichotomy is an over-simplification. (See PURPLE, Peri-Urban Regions Platform Europe, ROBUST partner.)
- U-R synergies will improve by ending the U-R dichotomy
- Both public and private funding timescales do not tend to align with ESS investment and monitoring needs (in the UK).
- Importance of mis-matches - funding, perceptions, data, values,
- German legal planning system needs to adopt ESS in a qualified way to comply with the legal demand to take all available information concerning planning decisions into account.
- ESS mapping is never absolute but relative to space and time - has to be taken into account in policy and planning

FROM CHAT

- Henk: Rural-urban dichotomy increasingly little helpful and fruitful to approach, guide, improve and govern regional ESS governance
- maria pia casini: I agree with Maria, esosystemsevicesescuold be a sort of link among a lot of issuese,, but the problem is how to put at the different scale the norms that govern the territory. We have a lot of informations and data set also territorializied, but the problem is haw to make the work
- Matt Reed: The different between rural, ex-urban and peri-urban?
- Carlos Pina: But do we want the governance of the ESS or are the ESS instrumental in the management of the territory?
- ToivoMuilu: The distance and accessibility of people to ESS are more important than the regional types?
- Daniel Keech: In Glos LL we have observed a controversy about food as an optimal rural land use. Can FRM, Lisbon or Helsinki offer any opp to say something about how we need to challenge old spatial assumptions about ESS delivery. Cities can be really good places for (some) food production, liberating (some) rural land for alternative ESS.
- maria pia casini: For me Carlos the ESS are instrumental in the management of the territory, also to reach the goal to give importance annd significance to te rural and peri-urban areas. Also in the direction of
- Reinhard: Daniel: Intensive growth of asparagus and strawberries under plastic sheets is an eyesore, and cannot be really good for the environment.

7.2 CoP ESS Research and Innovation Agenda

Community of Practice on Ecosystem Services (ESS)

CoP coordinator and members	**Coordinator:** IST **Members** (motto and research objectives and innovation related to ESS) **1. Ede Municipality** LL motto: Further developing and integrating Ede's municipal food, environmental and spatial planning policies, by formulating goals and distinguishing key indicators for monitoring its agri-food system and natural capital. Research objective 2: Better insights into the opportunities / limitations of integrative municipal spatial planning through the inclusion of Eco-System Service Delivery in ongoing menu card approach as part of National Environment and Planning Act implementation. This novel municipal policy instrument aspires to contribute to more tailor-made, participatory and integrative spatial planning procedures and approaches Innovation 2: A more participatory, inclusive and integrative municipal spatial planning with special attention for the inclusion of rural eco-system delivery. **2. Gloucestershire County** LL motto: To assess the potential and feasibility of circular economy (CE) and natural capital (NC) growth models in the county and their potential for synergies and improved urban-rural linkages. Research objective 2:In the ESS theme, the objective is to explore the potential for circularity within integrated water resources management and links with the NC agenda in terms of new institutional arrangements to provide ecosystem services in Gloucestershire. Innovation 2 (ESS): Experiment with more integrated approaches to water resource management in Gloucestershire, including new public/private arrangements, and foregrounding the opportunities of NE to respond to climate change, economic development and land use planning. Focal point: Experimental governance. **3. Frankfurt/Rhine-Main Region** LL motto: Transitioning from quantitative growth and expansion, to qualitative growth and quality of life: the role of regional land use planning. Research question: Is the supply of ecosystem services in the Outer Space able to meet the demand from the population in the existing and potentially built-up areas? Research objective 2: Localization, measurement and evaluation of ecosystem services that are provided by the Outer Space as our natural basis for life (natural capital). → qualitative and quantitative assessment Innovation 2: Not only qualitative but also quantitative assessment of the Outer Space and ecosystem services. **4. City of Helsinki and Luke (Finland)** LL motto: "Developing resilient rural-urban solutions that enable knowledge networks and multiple locations for life, work and entrepreneurship across the border of Finland (Helsinki) and Estonia (Tallinn)" Research objective 3:to determine how ecosystem services can be better accounted

	for in the land use and building planning system in the Helsinki-Uusimaa region. 5. Lucca Rural-Urban Connections Lab LL motto: Developing a local food policy and a territorial plan to reduce urban sprawl, steer synergies between the city and the countryside, and valorise cultural heritage, landscape and territory. Research objective 2:Identify how territorial planning can contribute to promoting multifunctional and sustainable agriculture and food systems in peri-urban areas, restricting urban sprawl, protecting the environment and landscape. 6. Lisbon Metropolitan Area (LMA) LL motto: "Territorial cohesion from within: bridging metropolitan communities and economies for improved urban-rural synergies" Research objective 1: Investigate solutions that enhance ESS in spatial planning for sustainable land use.
Developing joint enterprise. Summarise the procedures for and scoping of common goals / issues the CoP will collectively work on, the common learning and matching themes so far identified and the agreed aim/ambitions of the CoP (This work should be complete after two project meetings).	

Entry point: Strategic approaches to integrate ESS in spatial planning associating ESS use and delivery to planning instruments and governance models at multiple scales, to explore the role of ESS in enhancing rural-urban synergies.

Use policy and planning instruments, market instruments, governance models, and science and technology to recognize and value ecosystem services (ESS)in a socio-ecological system (SES) taking into account the synergies and conflicts (e.g. Urban pressure and formal and informal open space) that exist in the territory, ensuring the coherence of multi/scales, /actors, and /sectors.

The starting point is the model established with all LL in the Lisbon CoP ESS meeting, confirmed and further detailed in Ljubljana CoP ESS meeting as the basis for research, and further refined as a proposed final conceptual model as further described.

The conceptual model recognizes the six dimensions that, particularly in the context of rural-urban synergies, express the main concerns of the different LL in addressing ESS towards objectives of resilience and social well-being, in the context of alternative practices and policies integrated goals (Figure 2).

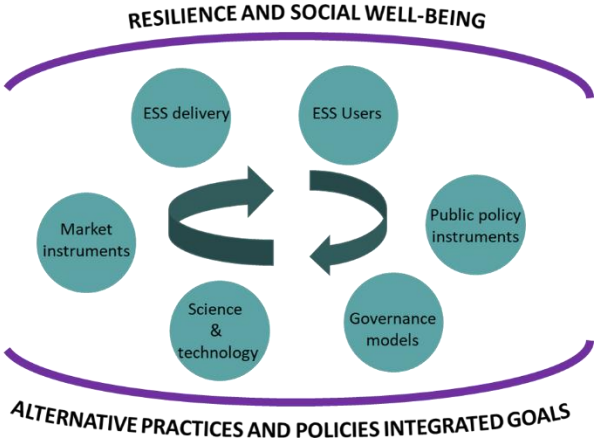


Figure 2: CoP ESS – Conceptual model

This conceptual model can be better explained by a dynamic framework in the form of a multiple loop approach (Figure 3). In SES the dialogue between social (users) and ecological systems (services delivered) can be expressed through the ESS. However, ESS is closely dependent on the

respective socio-ecological systems (SES), its social well-being objectives and the inherent resilience. In a second loop, through the use of appropriate tools, including policy and planning instruments, market instruments, governance models and science and technological tools, users can influence the socio-ecological systems and its objectives, and consequently ESS outcomes. Placing it into a wider picture – the third loop – desired SES are also dependent on the societal values promoted by users, directly or indirectly, through the adoption of alternative practices and integrated goals.

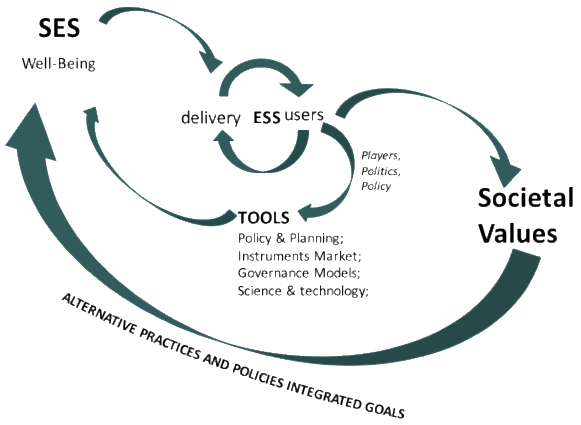


Figure 3: CoP ESS - Conceptual model multiple loop approach

This model can be materialized, for the purpose of exploring rural-urban linkages and synergies, with the following research questions:

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 role? (e.g. government responsables, producers, inhabitans, students/researchers)

ESS delivery:

- Which ecosystems deliver which ESS that play a role in rural-urban linkages/synergies??
- How can ESS maps be used? (e.g. matrix approach; monetary valuation; Participatory GIS; Social-cultural value)

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 kind of tools may enable the enhancement of SES in term of its resilicence and contribution to social-well being in case of rural-urban linkages/synergies?

Values:

- What are the core societal values associated to the identified users when enabling rural-urban linkages/synergies?

Developing mutual engagement. How will the CoP communicate/share learning? Describe agreed plans to communicate as a group; provide a timeline of activities (face-to-face and virtual meetings)

1. Share knowledge
   - Case-initiatives: Inspiring examples on ESS delivery (using template);
   - Bi and Tri (multi) lateral exchanges (within the budget available);
   - CoP repertoire (tools, knowledge, concepts, etc. illustrated with short case studies for dissemination)(Annex 1);
   - Articles (connected with Science discussion) – e.g. CoP methodological approach; outcomes and good practices; case initiatives; mapping ESS; community for biodiversity; etc. – by matching groups.
2. Face to face meetings
   - Project meetings (May2019; Oct2019);
   - Conference session organization related to ESS. Engage other CoP partners in the organization of the session, also to ensure that both academic and practice partners are in line with the proposed session scope.
3. Virtual meetings
   - Internal Communication: shared point; skype meetings; adobe connect;
   - Periodic update CoP work on LL (related with WP7, using template).
4. Core matching themes
   - Core Matching themes for CoP ESS were further developed at the Helsinki meeting as five ways of looking into how ESS plays a role in rural-urban linkages / synergies, and replace the original matching themes matrix, as follows:

Core Themes in CoP ESS

Mapping and Bundling ESS supply and demand
Lead: Uni Pisa
Contributing: IST+LUKE+PRAC

Multi-scale planning
Lead: IST
Contributing: WU+UniPisa+LUKE+PRAC

Circular Farming
Lead: WU
Contributing: Glos

Alternative payment/compensation schemes
Lead: Glos
Contributing: IST+WU+Uni Pisa

Community Partnerships
Lead: Uni Pisa
Contributing: IST+Glos+WU

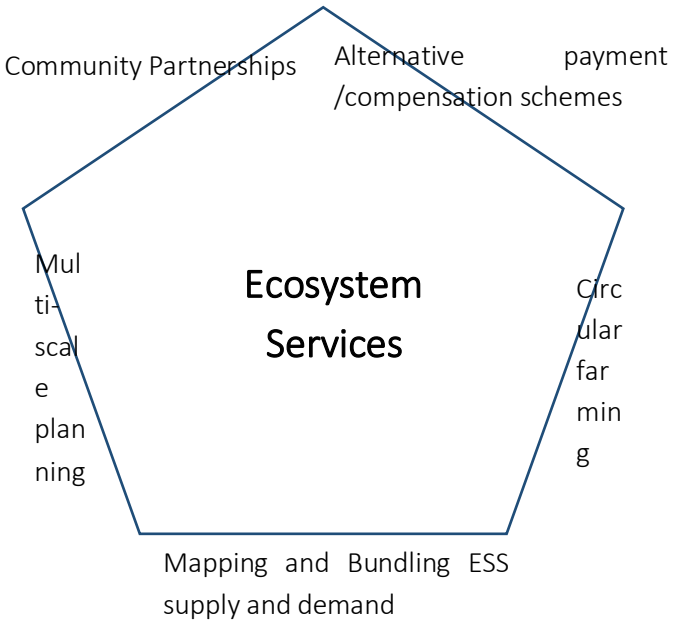
Developing shared repertoire. What resources will be needed to create a shared repertoire? Methods to be employed for sharing research. For example, the development of evidence papers, creating a resource library, the drafting/agreement of joint meeting minutes …

Resources considered basic for mapping ESS:
- Land use / cover map (CLC and other scales).

Communications between members:
- Use of adobe Connect to improve connection and communication between members.

Common five core themes for analysis and comparison

- Represent five ways of looking into how ESS plays a role in rural-urban linkages / synergies



Evidencing learning and assessment. How will learning be monitored in the CoP? What methods will you use and when will learning be monitored? What methods will you use for knowledge exchange/brokerage? Will learning experiences be shared within the group? E.g. discuss the effectiveness of the CoP at a face-to-face meeting and modify plans, if necessary.

Monitoring:

- Newsletter with updates on CoP work (2);
- Sharing good practices and discussions held trough face-to-face meetings(meetings, conference) and written snapshots;
- Questionnaires on the effectiveness CoP development;
- Monitoring assessment and reflection.

Knowledge exchange/brokerage:

- Sharing good practices and discussions held trough face-to-face meetings(meetings, conference– Hannover, October 2019);
- Scientific papers;
- List of relevant publications on CoP theme;
- Science shop.

Sharing experiences:

- Webinars (one for each LL focusing on their repertoire);
- Science shop.

How does the CoP work inform ROBUST re functional rural-urban relations? Key theme/s explored; common indicators to develop/test, etc.

The proposed CoP ESS model aims to set a framework that will enhance the value of ESS in the context of the concept model established in WP1, structured in new localities, smart development and network governance, with ESS value transversal to these components. The CoP ESS can

contribute to ROBUST re functional rural-urban relations, through the WP1 model, in the following way:

New localities – In the adopted CoP ESS concept model, ESS driven development can generate new localities engaging socio-ecological systems relational space and networks associated to the creation of new values, perceptions and identities.
This may be achieved through:

- Understand the planning system with a focus on its Outer Space exploring how urban and rural features co-exist, overlap and compete;
- Inclusion of 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.

Smart development - The adopted CoP ESS concept model highlights policy, market, governance and sciences & technology tools to engage the enhancement of socio-ecological systems.
This may be achieved through:

- Review of policy processes, some of which include new governance arrangements;
- Provide actors with the (statistical and GIS) information needed to make more informed plans and decisions, and commit actors to this cooperation.

Network governance - The adopted CoP ESS concept model builds upon collaborative arrangement 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;
- More participatory and integrative municipal spatial planning procedures;
- Co-creating a new experimentalist rural-urban governance space.

Indicators will be co-created throughout the development of the project.

How does the CoP work inform ROBUST re governance arrangements? Key theme/s explored; common indicators to develop/test, etc.

CoP ESS will inform WP5 contributing with top-down and bottom-up governance arrangements. In bottom-up approaches exploring local organizations, individual / community self-governance, smart connections (e.g. through fair trade) and inclusiveness. In top-down approaches addressing how regulation and support ESS require policies and regulatory arrangements.

Indicators will be co-created throughout the development of the project.

How does the CoP work inform ROBUST re new growth models? Key theme/s explored; common indicators to develop/test, etc.

CoP ESS will inform WP5 ROBUST new growth models by highlighting how smart development generated by ESS can contribute to new growth, linked to smart connections, such as fair trade

Indicators:

- Improved management for specific surface area of land, important for ESS;
- Proportion of important sites for terrestrial and freshwater biodiversity that are covered; by protected areas, by ecosystem;
- Contribution of land use change and reduce of urban sprawl.

Further indicators will be co-created throughout the development of the project.

7.3 Matching themes and Shared Repertoir

	Gloucestershire	Frankfurt	Helsinki	Lisbon	Lucca	Ede
Gloucestershire			GIS mapping ESS	Payment private schemes for ESS	Payment private schemes for ESS	Payment private schemes for ESS
Frankfurt	Multi-scale integration Regional approach		Multi-scale integration	Multi-scale integration Integrate ESS through SP	Multi-scale integration Integrate ESS through spatial planning	Multi-scale integration Integrate ESS through SP
Helsinki	GIS mapping ESS			GIS mapping ESS		GIS mapping ESS
Lisbon	Business models4ESS	Metropolitan approach				ESS based TDR Business models for ESS
Lucca	GIS mapping ESS		GIS mapping ESS	Communities for Biodiversity ESS through urban food policy		Communities for Biodiversity ESS through urban food policy
Ede	Integrated Goals Business models for ESS Soil erosion & degradation			Integrated Goals Business models for ESS		

7.4 Example: Practice brief

Lucca Living Lab

ROBUST

PRACTICEBRIEF

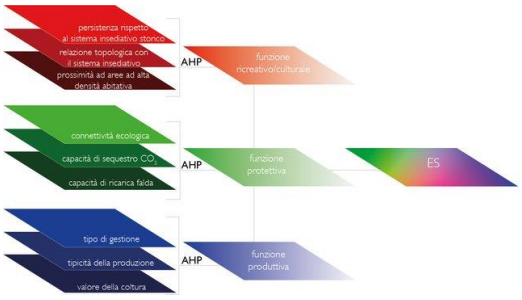
August2020

Author(s)

Massimo Rovai,University of Pisa, Italy
massimo.rovai@unipi.it
Francesca Galli, University of Pisa, Italy
francesca.galli@unipi.it
Maria Pia Casini, Provincia di Lucca, Italy
m.casini@provincia.lucca.it

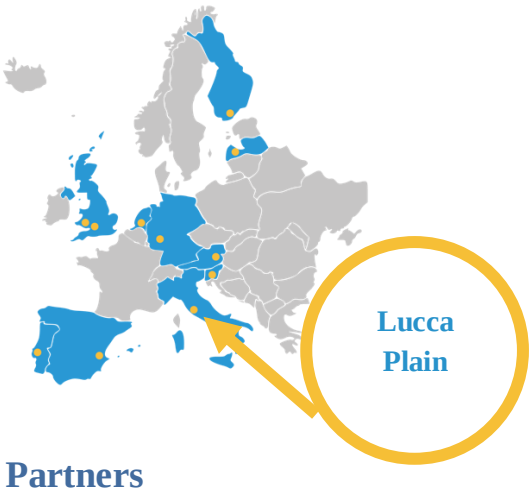
CoP Ecosystem Services

The plain of Lucca hosts around 162,000 inhabitants and is characterized by a mix of rural and urban elements: the urban growth over the past decades has altered the historical settlement leading to urban sprawl. As a consequence, agricultural land has progressively been reduced and subject to increasing abandonment. It is a widespread opinion among planners and citizens, that agricultural land adjacent to urbanized territory is of limited value: the small size of farms, which constraints the possibility for economies of scale and market competitiveness, and the expectations in terms of rents deriving from land use change (e.g. from agricultural to residential) often leads decision makers to considering this space more suitable for construction. Such *modus operandi* has progressively reduced the territory's ability to provide Eco-System Services (ESS) for the well-being of citizens. In this context, our Living Lab takes local food as a central element for strengthening agriculture and enhancing other eco-system services provided by the rural area adjacent to the urban area. Open and agricultural spaces situated in peri-urban areas represent a potential for more beneficial urban-rural relations and play an essential role in reconnecting cities and countryside. This requires the support of appropriate territorial governance tools and the valorisation of ESS is a key endeavour to shed light on the value of open spaces and agricultural land. A method of ESS mapping was proposed and developed to evaluate the "value of the land" using data (environmental, socio-economic, etc.) available in the provincial and regional databases. The ESS have been grouped into food supply, regulation and recreational-cultural services and represented using a red-green-blue colour map, with different shades of colour indicating the prevalence of one group of ESS over the other. This representation allows an intuitive vision of the areas with a greater or lower vocation for the provision of the ESS examined and enables the elaboration of alternative possible scenarios by planners, based on the various instances of the stakeholders and citizens' needs. This method constitutes a tool and an information base for planning the rural areas adjacent to the urban areas, and it being discussed within the preliminary phases of planning processes and instruments development, ultimately to support correct and balanced development of the territory.



Mapping eco-system services in red-green-blue colour maps

Location



Partners

PROVINCIA di Lucca

UNIVERSITÀ DI PISA

UNIVERSITÀ DEGLI STUDI FIRENZE

Results

Main expected results:

- Create knowledge and build awareness on rural values and the value of rural-urban linkages
- Support the adoption of ESS mapping methodology among urban planners
- Provide direction to land use planning, development scenarios for sustainable and resilient territorial development
- Promote innovative forms of multifunctional peri-urban agriculture

Key insights:

- Contain land use and urban sprawl
- Promote awareness of the value of peri-urban open spaces
- Revive local agriculture through a closer link with local consumers
- Guarantee the recreational value of the territory and the rural landscape around urban areas

The main practical recommendation(s)

The Living Lab is based on an active participatory process:

- It favors knowledge exchange in the preparation of territorial planning instruments
- It is a monitoring tool to understand how EEA supply changes over time.
- It nurtures a discussion on the roles that territories play in providing the ESS and suggests projects/plans for the enhancement of peri-urban open spaces and local agriculture

Lucca Living Lab
ROBUST
PRACTICE BRIEF

Stakeholders | Actors

CENTRAL ADMINISTRATION

Province of Lucca

MUNICIPALITIES

Lucca Municipality, Capannori Municipality

ACADEMIA

University of Pisa - Deptartment of Agriculture, Food and Environment.

University of Florence –Department of Economics and Management

LOCAL DEVELOPMENT ASSOCIATIONS

Slow Food

FARMER ASSOCIATIONS

Coldiretti, Confederazione Italiana Agricoltori, Confagricoltura

OTHERS

Local Farms (NICOBIO, CALAFATA, LO SCOMPIGLIO, Coop L'UNITARIA), Agricultural High Schools

More about ROBUST

ROBUST Project Coordinator

Prof.dr.ir. JSC (Han) Wiskerke Professor and Chair of Rural Sociology Wageningen University

info@rural-urban.eu

To learn more about the ROBUST project and to get the latest information about cutting-edge research on rural-urban issues visit www.rural-urban.eu

@RuralUrbanEurope @RuralUrbanEU Rural Urban Europe

Rural-Urban Outlooks: Unlocking Synergies (ROBUST)

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

7.5 Example: Research brief

Lisbon Living Lab

ROBUST

CoP Ecosystem Services

RESEARCH BRIEF

12th May 2021

Lead: IST

Maria R. Partidario (mariapartidario@tecnico.ulisboa.pt)

Margarida B. Monteiro (margarida.monteiro@tecnico.ulisboa.pt)

Isabel Loupa Ramos (isabel.ramos@tecnico.ulisboa.pt)

Joana M. Lima (joanalima@tecnico.ulisboa.pt)

Contributing: Francesca Galli and Massimo Rovai (Uni Pisa) + Reinhard Henke (Regional Authority FrankfurtRheinMain)

Motto: How to use multi-scale planning to promote rural-urban synergies based on ecosystem services?

This research brief concerns multi-scale planning and how it addresses rural-urban synergies through ecosystem services (ESS) from both the scientific and the policy perspectives. It will briefly address the concept, the essence of what the scientific and policy literature says, concluding with knowledge gaps and key learning on how ROBUST LL experiments might contribute to overcoming such knowledge gaps.

1. Concept

Multi-scale planning recognizes planning is undertaken at multiple territorial or geographical scales and that multi-level interactions and interconnections are established across the different scales. This includes multiple levels of decision-making in planning, that can be independent or otherwise maintain interactions or relationships across the different levels. It engages the notions of multi-level governance, involving multiple actors or stakeholders, multiple sectors, policies and processes.

Multi-scale and -level planning hasbeen gaining relevance when addressing ecological systems as in landscape or green infrastructure planning (Cortinovis and Geneletti 2018, Lafortezza 2013). Having in mind the urban and infrastructure focus of spatial planning, ecosystem services (ESS) have found resonance in urban planning or planning for urban development (Cortinovis and Geneletti 2018, Gomez-Baggethun et al. 2013, Grêt-Regamey et al. 2017).

A multi-scale planning approach for integrating ESS is needed notably to promote rural-urban synergies and bridge policy silos. Planning decisions will inevitably impact the state of ecosystems and

its capacity to deliver services, to protect the ecosystems, to enhance their services, valuing them, or otherwise to destroy or reduce its capacity. Broad consideration and integration of ESS value in sectoral and spatial planning is therefore important across multiple geographical scales, as well as within each geographical scale. ESS value also needs to be recognized at multiple levels of decision-making, as well as within each level (Figure 1). This integrated multi-scale and multi-level approach, ranging from European (policies) to local (actions) levels will enhance an interconnected and systemic analysis on the role ESS can play in establishing rural-urban synergies. And also, on the recognition of ESS contributing to territorial economic value created through rural-urban synergies.

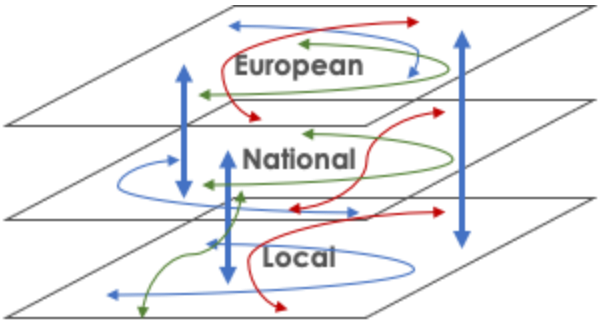


Figure 1 – Multi-scale planning relevant for the systemic analysis of ESS in ROBUST

ROBUST conceptual approach to ESS in multi-scale planning considers four structural topics (Figure 2):

- The **policy framework**as the architecture, and inter-relationship, of different policies that set the context for analysis of ESS value-added in rural-urban synergies;
- The **policy coherence** across the policies considered in the policy framework to direct policy change;
- **Integrated** (spatial and land use) **planning** using ESS in the connection across multi-scale planning based onmulti-levelgovernance;
- The **policy guidance**as the operational side of the policy framework, translating principles and objectives into comprehensive orientations for policy implementationregarding ESS in enhancing rural-urban synergies.

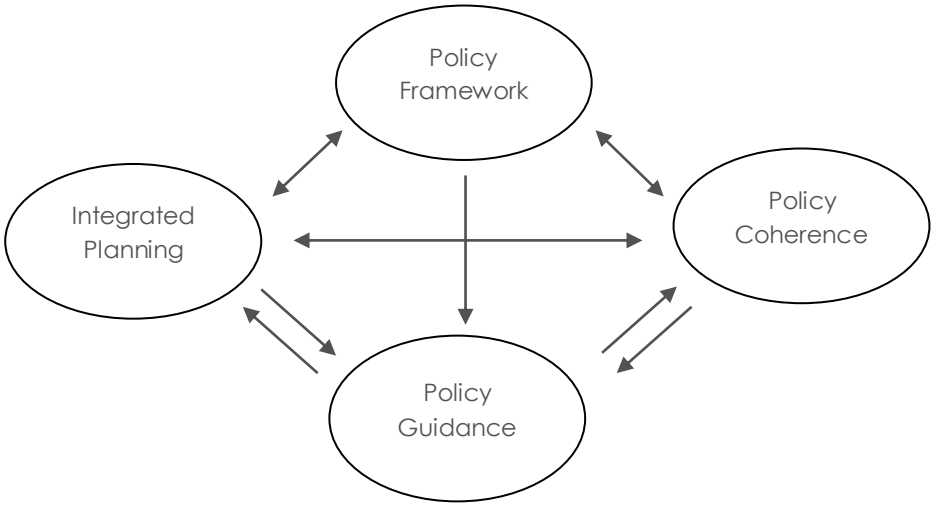


Figure 2 – Multi-scale planning and multi-level conceptual framework (own elaboration)

2. What the scientific literature says

Land use change is a driverof global environmental decline (IPBES 2019) with consequences for land use planning patterns, and a possible powerful means of mitigation and adaptation to global environmental change. “Spatial planning can already be understood as a policy mix in itself, as it combines instruments with different binding force and is applied across governmental levels and sectors complementing one another.” (Schröter-Schlaack and Blumentrath 2011:53).

Research and understanding on patterns of multiple and cross-scale dynamics in linked human-environment systems have advanced substantially in the past decade. There is now 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, a direct relatedness can be observed with ESS mapping (e.g., Burkhard et. al. (2012), Burkhard andMaes 2017, Naidoo et al. 2008, Troy and Wilson 2006, TEEB 2010).

In order to exploit the potential of ESS in multi-scale spatial planning, focus on ESS needs to move beyond ESS mapping, towards understanding land systems dependencies on ESS, the role that ESS are playing, or can potentially play, engaging actors and their knowledge, stakeholders perspectives at multi-levels, enabling broad consideration and integration of ESS value in spatial planning. Local scale stakeholders’ knowledge, in particular, is elementary to explore and understand how functional ESS can be integrated in spatial planning and territorial management.

The concept of multi-scale planning opens up many points of connection with ESS that are here systemized based on a literature review.

MULTI-SCALE PLANNING AND ECOSYSTEM SERVICES

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 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)

In Scholes et al. (2013) two alternative approaches are suggested: ‘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).

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 by definition 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 understand cross-scale effects. (Scholes et al. 2013).

Interactions and interdependencies may occur among and/or within levels, revealing substantial complexity in system dynamics. While by ‘cross-scale’ we mean interactions across different scales, for example, between spatial domains (domains: e.g. climate research, water management, …) and

jurisdictions, 'cross-level' interactions refer to interactions among levels within a scale. "Multilevel" is thus used to indicate the presence of more than one level, and "multiscale" the presence of more than one scale, but without implying that there are important cross-level or cross-scale interactions (Cash et al. 2006).

As multiscale planning depends on multi-level governance of ESS – it directs us to think on structures, formal and informal institutions (as rules, regulations, path dependencies, lock-ins), and the relational side of it in terms of interactions and interdependencies between societal, political and economic actors (following Loft et al., 2015) at different levels of decision (Figure 3).

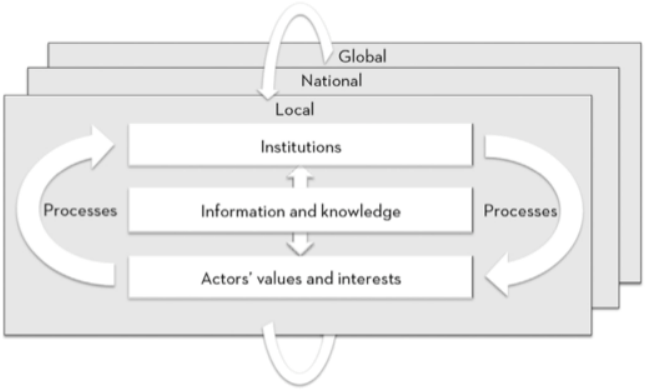


Figure 3. Multi-level governance of ESS (Loft et al. 2015)

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

But an important aspect of such multi-level policy integration is the need to consider possible distributional effects, since different policy designs influence possible distributional outcomes differently (Loft et al. 2015,Schleyer et al. 2015). Distributional effects thus directly relate to equity, rights and fairness issues since a specific policy, without redistributive mechanisms associated, may favor individual, organisation, community needs over others. Non-redistributive issues may arise from payments to landowners for providing ESS, capitalisation in land prices, benefits and costs from improvements in ecosystems quality, etc. The natural capital wealth associated to ESS is distributed among institutional actors, individuals or organisations. The policy-related trade-offs have spatial implications, but also those distributional implications impose the question of what benefits and costs are associated with the changes being push forward by policies for the different actors.

SPATIAL PLANNING AND ECOSYSTEM SERVICES ENHANCEMENT

The literature reveals that spatial planning and ESS show strong dependencies, and that spatial planning can be instrumental in determining ESS delivery and use and enhancing ESS value, however positions change as to how this can be achieved. Hein et al. (2006) found little elaboration on the various spatial and temporal scales at which ESS are supplied, also noted by Raudsepp-Hearne and

Peterson (2016). Hein et al. (2006) is perhaps one of the earliest papers examining the relationship between different spatial scales and values attached to ESS by stakeholders, considering both the ecological scales at which ESS are delivered but also the institutional scales at which stakeholders benefit from ESS. There is common acknowledgement of the spatial disconnections between locations where ecosystem services are produced and where they are delivered. The non-contiguous space is called by Syrbe and Walz (2012) as "service connecting areas". A classic example being the place where water infiltrates and the place where the filtered water is finally harvested.

In Albert's et al. (2020) spatial planning together with other legal and regulatory instruments are considered as the "backbone of policy mixes" for biodiversity and ESS delivery. Spatial planning is thus viewed by these scholars as a key instrument to explore spatial implications of combined policies on biodiversity and ESS, and to design synergistic solution strategies.

Several ESS dependencies on spatial considerations are identified by Albert et al. (2020). A core one is the effect of landscape composition and configuration, and particularly the existing connectivity or otherwise fragmentation, in the delivery of ESS. The delivery of ESS is strongly linked to the spatial distribution and composition of biodiversity, while the disregard of ESS in spatial planning can determine significant negative impacts on the delivery of ESS, namely by land use change causing soil sealing or fragmentation. The authors therefore argue on the importance of spatial planning to incorporate ESS knowledge.

SCALE-SENSITIVE INTEGRATION AND CONTEXT DEPENDENCE OF ECOSYSTEM SERVICES

The social and ecological structures that underpin ESS provision, use or value are observable at a variety of scales. The literature recognizes that the analysis of ESS can be done at multiple scales, from large regions to small parcels of land or individual landscape 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. 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. 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 (for example carbon storage) (Andersson et al. 2015). Likewise the ESS benefit may be generated at local levels, however be of benefit at the global scale (for example climate regulation capacity delivered by wetlands) (Scholes et al. 2013).

ESS are the products of complex interconnected social–ecological systems and are therefore dependent on the interactions and feedback from a multitude of factors and policies functioning at multiple scales (Hein et al. 2016, Scholes et al. 2013). For example, a macroeconomic policy of food price subsidies can cause land use changes at the local level, or even such changes can be cause by the introduction of total decoupling and greening in agricultural land.[i] 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 then 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 in income level.

KEY ROLE OF IMPACT ASSESSMENT INSTRUMENTS IN SPATIAL PLANNING

Spatial planning combined with impact assessment related instruments, such as strategic environmental assessment (SEA), can consider spatial implications of combined policies, and development options, on biodiversity and ESS (Rozas-Vásquez et al. 2018). A strategic analysis of the potential impacts is highly relevant, but also the assessment of options for integrating ESS during the planning process bringing a focus on sustainability and environmental aspects at strategic levels (Partidario andGomes 2013, Rozas-Vásquez et al. 2018). Spatial planning with environmental assessments can explore trade-offs, but also how to conciliate biodiversity conservation and ESS provision policy objectives with sectoral economic objectives and actions often in conflict (Partidario and Gomes 2013, 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 and Gomes 2013). However, there is increasing concern about the (in)adequacy of institutional contexts (including legal procedures in spatial planning and political decision processes) to enable such integration, as well as the lack of a common understanding on SEA and ecosystem services that are limiting the adoption of an integrated framework (Rozas-Vásquez et al. 2017).

SEA, particularly when conducted with a strategic thinking (Partidario and Gomes 2013,Partidário 2009) favours active multi-actor arrangements as a first step towards a successful integration of ESS in spatial planning. Nevertheless, Rozas-Vásquez et al. (2017) findings suggest that a common understanding of SEA and especially of ESS in a context of multiple actors is still at an initial stage (specially in Chile, their area of study). The authors also pin point the lack of institutional guidelines and methodological support is considered the main challenge for integration (Rozas-Vásquez et al. 2017).

3. Policy and practice

As mentioned before, spatial planning can be understood as a policy mix (Schröter-Schlaack & Blumentrath, 2011). Even thought not with a binding nature the European Spatial Development Perspective sets, in 1999, the overall framework for spatial planning, now complemented with the Leipzig Charter and the Territorial Agenda 2030.These most recent documents open up to the need to introduce ES evaluation into planning at multiples scales. One specific characteristic of spatial planning, besides its bye-laws, regulatory-driven character, is its potential to serve as a ‘guiding notion’ to acknowledge land use priorities (Albert et al. 2020), and thus produce meaningful and integrated strategies for future developments.

While not developing a multi-level analysis on the policy instruments here considered, the EU represents a supranational organisation with unique forms of multi-level governance in formulation and implementation of EU policies. This system architecture and coordination presumes the transposition of legal and regulatory instruments and recognition of strategies and communications by its Member States.

In ROBUST, six Living Labs (LL) are working within the ESS CoP. For the purposes of this research brief, we maintain the analysis of policies and practices at the EU level, since those LL are all part of the EU multi-level system architecture and coordination scheme and thus are equally influenced by them.

POLICY AT EUROPEAN LEVEL

Common Agriculture Policy (CAP)

The Common Agriculture Policy (CAP[3]) contains the EU priorities for 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 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 new CAP (2021-2027) recognizes ecosystem services and proposes an increase of investments to guarantee and enhance forest conservation and resilience of agroforest systems very much based on strategic planning and climate-planning instruments. With relevance to multi-spatial planning the following general objectives of the new CAP proposal can be pointed out: a) resilience across the EU territory to enhance food security, b) contribute 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, or e) employment, growth, social inclusion and local development in rural areas, including bio-economy and sustainable forestry.

Environmental Impact Assessment and Strategic Environmental Assessment

Environmental Impact assessment (EIA[4]) and Strategic Environmental Assessment (SEA[5]) are 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 likely to have significant environmental impacts is made. Even though ESS are not explicitly recognized in the SEA or EIA Directives in 2013 EC launched Guidance to incorporate climate change and biodiversity into both EIA and SEA, with ESS being explicitly addressed as important factors for consideration during the assessment and when proposing recommendations.

Green Infrastructure

As indicated in the Green Infrastructure Strategy, 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"[6]. The strategy further states that the consideration of GI in spatial planning helps to reduce the loss of ecosystem services associated with future land take and help improve and restore soil functions.

A multi-scale approach to GI is advocated in seeking coherence, interconnectedness and interdependence in spatial planning solutions and decision-making processes to both rural and urban

[3] Regulation (EU) No 1305/2013 of the European Parliament and of the Council on support for rural development by the European Agricultural Fund for Rural Development (EAFRD).
[4] Directive 2014/52/EC of the European Parliament and of the Council amending Directive 2011/92/CE on the assessment of the effects of certain public and private projects on the environment.
[5] Directive 2001/42/EC of the European Parliament and of the Council on the assessment of the effects of certain plans and programmes on the environment.
6 COM(2013) 249 Green Infrastructure (GI) - Enhancing Europe's Natural Capital

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.

European Green Deal

The European Green Deal is a core package of European strategies to improve the well-being of people, promote climate neutral 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 as the European Climate Law, the 2030 Biodiversity Strategy or the Farm to Fork Strategy, designed to, among other objectives, "increase the value given to protecting and restoring natural ecosystems, to the sustainable use of resources and to improving human health"[7].

The 2030 Biodiversity Strategy is aimed to reverse the trend of 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 a 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 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 is focused on ensuring "food security and safety, reinforce public health and mitigate their [food systems] socio-economic impact"8, with a resilience-oriented perspective. The macro-orientations of this Strategy are multi-sectorial, comprising activities from agriculture and fisheries, to health and transportation. It intends to create a friendly productive system focusing on food, the relationship between supply and demand, and also emphasizes the importance of following up the performance of the production systems to assure the protection and valuation of ESS with promoting strategic changes in land use.

The Climate Law proposes a legally binding target of zero net emissions by 2050.For that it recognises the need to "integrate ecosystem-based approaches to climate change adaptation and mitigation and disaster risk reduction"[9] through strategic multi-sectorial planning. This Law stresses the need to consider climate change related risks, 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 mix and coherence in relation to environmental policies and legislation, with integrative results having to be considered in comprehensive national adaptation strategies and plans.

7 COM(2019) 640 The European Green Deal
8 COM(2020) 381 A Farm to Fork Strategy for a fair, healthy and environmentally-friendly food system
9 COM(2020) 2020/0036 (COD) Proposal for a Regulation of the European Parliament and of the Council establishing the framework for achieving climate neutrality and amending Regulation (EU) 2018/1999 (European Climate Law)

Territorial Agenda 2030

Territorial Agenda 2030 supports the integration of ecosystems and valued areas into Green Infrastructures at all planning levels. Through the promotion of place-based approach, the Territorial Agenda 2030 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-sectorial and multi-level approach to strategic spatial planning that focus on mutual relations and people's well-being in light of the sustainable development goals. This approach addresses the need to consider the functional links between neighboring 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.

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). Guidance principle 7 of "coordinate and integrate planning across governance sectors, levels and decision-making frameworks" suggests a multi-level and multi-spatial planning approach 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, it is recognised the need to define coherent policy objectives and obtain consistent baseline data, while identifying environmental assessment instruments such as SEA and EIA as supporting instruments.

4. Knowledge gaps

Knowledge gaps for a multi-scaling approach to ESS in spatial planning to enable rural-urban linkages and encourage rural-urban synergies include:

- Overcoming the knowledge-to-action gap;
- Understanding policy implementation and mix of different sectoral policies and the key to make it work;
- Identifying the trigger to internalize ESS in spatial/land use planning in rural-urban linkages;
- Learning on how to adapt to context;
- Identification of flows in delivery, supply and demand (where produced and where used);
- Learn how to use the ESS mapping in multi-scale planning;
- Weak understanding of ESS-space interactions which exceeds administrative municipality borders;
- Insufficient spatial information of biodiversity and ESS relations;
- Exploring combination of multi-sectoral, multi-scale and multi-level approaches;
- Ensure that public benefits provided by ecosystems are considered in decision-making;
- Mainstreaming biodiversity and ESS in Strategic Environmental Assessments (SEAs);
- Spatial strategies for safeguarding and enhancing biodiversity and ESS to become implemented;
- Delivery mechanisms for proposed actions need to be fostered that consider planning proposals as part of systematic governance and policy mixes;

10 SWD(2019) 305 EU guidance on Integrating ecosystems and their services Into decision-making

- Knowledge on how information could best be communicated in planning processes.

5. Learnings concerning multi-scale planning in promoting the role of ESS in rural-urban synergies

Based on the above, the following learning points can be highlighted:

1. Spatial planning may serve as a keystone instrument to explore the spatial implications of combined policies, frameworks and tools, and be understood as a policy mix in itself to ensure effective allocation of resources for safeguarding, restoring and enhancing biodiversity and ESS;
2. Spatial planning informed by ESS can facilitate public participation and stewardship and provide the basis for targeted investments into ESS, assisted by scenario building and strategic environmental assessment to propose targeted strategies to seek synergies, avoid unintended outcomes, and deal with uncertainty;
3. Seek the communication channels across multiscale planning for information and knowledge but also for rules (regulations), norms and responsibilities (path dependencies) to promote rural-urban synergies through ESS;
4. Ensure objectives, sectoral policies, spatial and values integration; promising strategies for enhancing the implementation of biodiversity and ESS in spatial planning with connections to rural, regional and sectorial funding strategies include:
   (iv) mapping spatially explicit information on ESS in appropriate detail for decisions at respective scales, find the best scale to start with and recognize interactions with other levels/scales, ensuring coherence across scales;
   (v) fostering delivery mechanisms that consider planning proposals as part of systematic governance and policy mixes;
   (vi) 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.
   (vii)

6. Bibliography

Albert, C., Fürst, C., Ring, I., &Sandström, C. (2020). Research note: Spatial planning in Europe and Central Asia – Enhancing the consideration of biodiversity and ecosystem services. Landscape and Urban Planning, 196(January), 1037;1. https://doi.org/10.1016/j.landurbplan.2019.103741

Andersson, E., McPhearson, T., Kremer, P., Gomez-Baggethun, E., Haase, D., Tuvendal, M., & Wurster, D. (2015). Scale and context dependence of ecosystem service providing units. Ecosystem Services, 12, 157–164. https://doi.org/10.1016/j.ecoser.2014.08.001

Burkhard, B., Kroll, F., Nedkov, S., Müller, F., (2012). Mapping ecosystem service supply, demand and budgets. Ecological Indicators 21, 17–29

Burkhard, B., &Maes, J. (2017). Mapping ecosystem services. In Mapping Ecosystem Services. Sofia, Bulgaria: Pensoft Publishers.

Cash, D. W., Adger, W. N., Berkes, F., Garden, P., Lebel, L., Olsson, P., … Young, O. (2006). Scale and Cross-Scale Dynamics: Governance and Information in a Multilevel World. Ecology and Society, 11(2). https://doi.org/10.5751/es-01759-110208

Chaudhary, S., McGregor, A., Houston, D., & Chettri, N. (2019). Spiritual enrichment or ecological protection?: A multi-scale analysis of cultural ecosystem services at the Mai Pokhari, a Ramsar site of Nepal. Ecosystem Services, 39 (July), 100972. https://doi.org/10.1016/j.ecoser.2019.100972

Cortinovis, C., &Geneletti, D. (2018). Ecosystem services in urban plans: What is there, and what is still needed for better decisions. Land Use Policy, 70(October 2017), 298–312. https://doi.org/10.1016/j.landusepol.2017.10.017

Falk, T., Spangenberg, J. H., Siegmund-Schultze, M., Kobbe, S., Feike, T., Kuebler, D., Settele, J., Vorlaufer, T. (2018). Identifying governance challenges in ecosystem services management: conceptual considerations and comparison of global forest cases. Ecosystem Services; 32: 193-203. DOI: 10.1016/j.ecoser.2018.07.012.

Gomez-Baggethun, E., Å. Gren, D.N. Barton, J. Langemeyer, T. McPherson, P. O'Farrell, E. Andersson, Z. Hamsted, et al. 2013. Urban ecosystem services. In Urbanization, biodiversity and ecosystem services: challenges and opportunities. A global assessment, ed. T Elmqvist, T., M. Fragkias, J. Goodness, B. Güneralp, P.J. Marcotullio, R.I. McDonald, S. Parnell, M. Schewenius, et al., 175–251 pp. Dordrecht: Springer. From http://link.springer.com/book/10.1007%2F978-94-007-7088-1.

Grêt-Regameya A., Altwegg J., Siréna EA, van Striena MJ, Weibel B. (2017) Integrating ecosystem services into spatial planning—A spatial decision support tool. Landscape and Urban Planning, 165: 206-219. https://doi.org/10.1016/j.landurbplan.2016.05.003.

Hein L., Koppen K., de Groot R, Ierland EC 2006 Spatial scales, stakeholders and the valuation of ecosystem services Ecological Economics 57: 209– 228.

IPBES (2019) Summary for policymakers of the global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. In: Díaz J.,Settele E. S. Brondízio E.S., H. T. Ngo, M. Guèze, J.Agard, A. Arneth, P. Balvanera, K. A. Brauman, S. H. M. Butchart, K. M. A. Chan, L. A. Garibaldi, K. Ichii, J. Liu, S. M. Subramanian,G. F. Midgley, P. Miloslavich, Z. Molnár, D. Obura, A. Pfaff, S. Polasky, A. Purvis, J. Razzaque, B. Reyers, R. Roy Chowdhury, Y. J. Shin, I. J. Visseren-Hamakers, K. J. Willis, and C. N. Zayas (eds.). IPBES secretariat, Bonn, Germany.

Lafortezza, R., Davies, C., Sanesi, G., Konijnendijk CC (2013) Green Infrastructure as a tool to support spatial planning in European urban regions, iForest - Biogeosciences and Forestry, Volume 6, Issue 3, Pages 102-108. doi: https://doi.org/10.3832/ifor0723-006

Loft, L., Mann, C., Hansjürgens, B. (2015). Challenges in ecosystem services governance: multi-levels, multi-actors, multi-rationalities. Ecosystem Services; 16: 150–157. DOI: 10.1016/j.ecoser.2015.11.002.

Naidoo, R., Balmford, A., Costanza, R., Fisher, B., Green, R.E., Lehner, B., Malcolm, T.R., Ricketts, T.H., 2008. Global mapping of ecosystem services and conserva- tion priorities. Proceedings of the National Academy of Sciences of the United States 105, 9495–9500

Pahl-Wostl, C. (2019). Governance of the water-energy-food security nexus: a multi-level coordination challenge. Environmental Science and Policy; 92: 356-367. DOI: 10.1016/j.envsci.2017.07.017.

Partidario, M.R. (2009) Does SEA changeoutcomes? Discussion Paper n. 2009-31. Joint Transport Research Centre. OECD. December 2009. https://www.oecd-ilibrary.org/transport/does-sea-change-outcomes_5kmmnc5ln3r0-en.

Partidario, M. R., & Gomes, R. C. (2013). Ecosystem services inclusive strategic environmental assessment. Environmental Impact Assessment Review, 40, 36–46. https://doi.org/10.1016/J.EIAR.2013.01.001

Primmer, E., Jokinen, P., Blicharska, M., Barton, D. N., Bugter, R. (2015). Governance of ecosystem services: a framework for empirical analysis. Ecosystem Services; 16: 158-166. DOI: 10.1016/j.ecoser.2015.05.002.

Raudsepp-Hearne, C., & G. D. Peterson. 2016. Scale and ecosystem services: how do observation, management, and analysis shift with scale—lessons from Québec. Ecology and Society 21(3):16. http://dx.doi.org/10.5751/ES-08605-210316

Reed, R. S., Allen, K., Attlee, A., Doughill, A. J., Evans, K. L., Kenter, J. O., Hoy, J., McNab, D., Stead, S. M., Twyman, C., Scott, A. S., Smyth, M. A., Stringer, L. C., Whittingham, M. J. (2017). A place-based approach to payments to ecosystem services. Global Environmental Change; 43: 92–106. DOI: 10.1016/j.gloenvcha.2016.12.009.

Rozas-Vásquez, D., Fürst, C., Geneletti, D., & Almendra, O. (2018). Integration of ecosystem services in strategic environmental assessment across spatial planning scales. Land Use Policy, 71(September 2017), 303–310. https://doi.org/10.1016/j.landusepol.2017.12.015

Rozas-Vásquez, D., Fürst, C., Geneletti, D., & Muñoz, F. (2017). Multi-actor involvement for integrating ecosystem services in strategic environmental assessment of spatial plans. Environmental Impact Assessment Review, 62, 135–146. https://doi.org/10.1016/j.eiar.2016.09.001

Satake, A., Rudel, T., Onuma, A. (2008). Scale mismatches and their ecological and economic effects on landscapes: A spatially explicit model. Global Environmental Change, 18: 768-775.

Scholes, R. J., Reyers, B., Biggs, R., Spierenburg, M. J., &Duriappah, A. (2013). Multi-scale and cross-scale assessments of social-ecological systems and their ecosystem services. Current Opinion in Environmental Sustainability, 5(1), 16–25. https://doi.org/10.1016/j.cosust.2013.01.004

Schleyer, C., Gorg, C., Hauck, J., Winkler, K. J. (2015). Opportunities and challenges for mainstreaming the ecosystem services concept in the multi-level policy-making within the EU. Ecosystem Services; 16: 174-181. DOI: 10.1016/j.ecoser.2015.10.014.

Schröter-Schlaack, C. &Blumentrath, S. (2011). Direct regulation for biodiversity conservation. In I. Ring, & C. Schröter-Schlaack (Eds.). Instrument mixes for biodiversity policies, POLICYMIX Report, Issue No. 2/2011. Leipzig, Germany: Helmholtz Centre for Environmental Research – UFZ.

Syrbe, R.-U.& Walz, U. (2012) Spatial indicators for the assessment of ecosystem services: providing, benefiting and connecting areas and landscape metrics. Ecological Indicators; 21: 80-88. https://doi.org/10.1016/j.ecolind.2012.02.013.

TEEB, (2010). The Economics of Ecosystems and Biodiversity: ecological and economic foundation. Earthscan, Cambridge.

Troy, A., Wilson, M.A., (2006). Mapping ecosystem services: practical challenges and opportunities in linking GIS and value transfer. Ecological Economics 60, 435–449.