PHUSICOS

According to nature

Deliverable D3.1

Guiding Framework for Tailored Living Lab Establishment at Concept and Demonstrator Case Study Sites

Work Package 3 – Service Innovation: Stakeholder Participation through Living Labs

Deliverable Work Package Leader:
TUM

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Glossary

KEY CONCEPTS, ABBREVIATIONS AND DEFINITIONS

NATURE-BASED SOLUTIONS (NBSs):

Nature-based solutions are living solutions inspired by, continuously supported by and using nature. They are designed to address various environmental challenges in a resource efficient and adaptable manner and to provide simultaneously economic, social and environmental benefits (EC, 2015a).

LIVING LAB (LL):

A Living Lab is a physical region and interaction space, in which stakeholders form a quadruple helix innovation network of companies, public agencies, universities, users, and other stakeholders in the pursue of collaborating for the creation, prototyping, validating, and testing of new technologies, services, products, and systems in real-life contexts (based on Leminen, 2013).

LIVING LAB FACILITATOR:

A person who is in charge of facilitating and steering the local Living Lab process, which involves identifying, engaging, coordinating and monitoring stakeholders as well as pro-actively guiding the iterative knowledge exchange with the project's work packages and implementation of process outcomes (based on Van der Jagt et al., 2017).

STAKEHOLDER:

All persons, groups and organisations with an interest or "stake" in an issue, either because they will be affected or because they may have some influence on its outcome. This includes individual citizens, companies, economic and public interest groups, government bodies and experts (Ridder et al., 2005:2).

STAKEHOLDER INVOLVEMENT / STAKEHOLDER PARTICIPATION:

Refers to participation of interest groups (i.e. representatives of locally affected communities, national or local government authorities, politicians, civil society organisations and businesses) in a planning or decision-making process (Hauck et al., 2016:1).

CO-CREATION:

Users participate in the development of an innovation (Steen et al., 2017a: 14).

DEMONSTRATOR SITE (DS):

Large-scale demonstrator case study site which serves for the implementation of nature-based solutions (NBSs). In PHUSICOS, these are situated in Gudbrandsdalen, Norway; the Pyrenees, France-Spain-Andorra; and Serchio River Basin, Italy.

CONCEPT CASE (CC):

Small-scale case study site which serves to test specific challenging aspects of NBSs, and to study transferability of lessons learned. In PHUSICOS, the Kaunertal Valley of Austria and the Isar River watershed of Germany are designated as concept cases.

Summary

The overall aim of this Deliverable D3.1 is to provide a Guiding Framework for establishing Living Labs (LL) at the different demonstrator and concept case study sites of PHUSICOS. It intends to support the co-design and implementation of nature-based solutions (NBSs) to reduce hydro-meteorological risks in sensitive European rural and mountainous regions.
The report targets to support four groups in their work on NBSs and LL:

- Facilitators of the PHUSICOS LLs who will organize the processes;
- Local scientific and end-user partners as well as other LL participants of the case study sites who will co-design the NBSs;
- PHUSICOS project partners, such as Work Package (WP) leaders and their collaborating teams, to achieve a coherent understanding and implementation of key concepts; and finally
- A broader audience such as scientists, planners, professionals, and politicians working in the larger field of co-designing measures for NBSs planning, land use or disaster risk management wishing to employ LL approaches to find innovative ways of developing and implementing solutions inspired by nature.

The report consists of five chapters. The first chapter starts with the purpose and aim of the deliverable. It outlines relevant EU policies of both NBSs and participatory approaches and the emergence of the LL concept as an important EU strategy for innovation. The chapter also points out knowledge gaps in NBSs and LL approaches for both practice and research. Chapter 2 describes the methodology and theoretical foundation of the Guiding Framework. Chapters 3.1 and 3.2 explain the concept of LL and its evolvement as well as how LLs are set up and work from a theoretical point of view. Besides reflecting theory and literature, chapter 3.3 provides snapshots of example case studies on participatory processes and co-design approaches. Using the cases from Nocera Inferiore (provided by IIASA/ETHZ), the Green Surge Project (TUM) and the Isar River (Isar Concept Case / TUM), these examples show how the people involved addressed and solved the given challenges, which pitfalls have been experienced and how good solutions, compromises and consensus on actions were achieved. Chapter 4 provides practical guidance how to establish LL processes. This chapter offers a working definition and hints for their setup. Eight core principles for LL work are suggested; each principle following one of the letters in the word PHUSICOS. In addition, the chapter looks at important features of LL stakeholder identification and a facilitator's tasks to master the LL processes in a successful way. To conclude, chapter 5 provides an outlook on future steps and deliverables for the LL work in PHUSICOS.

The report is part of a series to be developed by WP3 with follow-up deliverables addressing tools and stakeholders (D.3.2 Starter Toolbox of Stakeholder Knowledge Mapping) in more detail and monitoring and evaluation procedures (D.3.3-3.6 Monitoring & Evaluation scheme) to ensure the individual Lab's quality management and user satisfaction.

1 Introduction

PHUSICOS, meaning 'According to nature', in Greek φυσικός, is a four-year Innovation Action project that started in May 2018 and is funded by the European Union’s Horizon 2020 research and innovation programme (Grant agreement No. 776681). The project consortium comprises 15 organizations from 7 countries (Norway, Germany, Austria, Italy, France, Spain and Andorra) and includes end-user partners from local and regional administrative units.

The main objective of PHUSICOS is to demonstrate that nature-based or nature-inspired solutions (NBSs) for reducing the natural hazard induced by extreme weather events in particularly vulnerable areas such as rural mountain landscapes are technically viable, cost-effective and implementable at regional scale. PHUSICOS's underlying premise is that nature itself is a source of ideas and solutions for mitigating the risk caused by changing climate. As nature's designs are often elegant, effective and frugal, implementing NBSs, including hybrid green/blue/grey infrastructure, can provide ecological, social and economic resilience for society.

Multi-stakeholder participation is an overarching issue of PHUSICOS and, as such, forms a foundation to foster innovation at all levels and at all case study sites. Specifically, WP3 (Service innovation – Stakeholder participation through Living Labs) is dedicated to employ a Living Lab approach as key mechanism of local stakeholder involvement for the purpose of successfully accompanying the intended NBSs’ design, planning, implementation and evaluation.

In pursue of this goal, this report outlines a framework for initiating participatory processes and establishing Living Labs at the project’s demonstrator and concept case study sites (see Chap. 1.3).

1.1 Nature-Based Solutions & Participation: A progressive interaction

Many definitions of nature-based solutions (NBSs) exist (Skipper, 2017) and most of them source from political organizations such as the United Nations (UN), the International Union for Conservation of Nature (IUCN), the European Commission (EC), and the United Nations Educational, Scientific and Cultural Organization (UNESCO) (see Tab. 1.1). In PHUSICOS, the definition formulated by EC (2015a) is used.

Table 1.1. Overview of the most common definitions of nature-based solutions

European Commission (EC, 2015a)	Nature-based solutions are living solutions inspired by, continuously supported by and using nature. They are designed to address various environmental challenges in a resource efficient and adaptable manner and to provide simultaneously economic, social and environmental benefits.
European Commission (EC, 2015b)	Nature-based solutions aim to help societies address a variety of environmental, social and economic challenges in sustainable ways. They are actions which are inspired by, supported by or copied from nature.
European Commission (EC, 2018)	Nature-based solutions are designed to bring more nature and natural features and processes to cities, landscapes and seascapes. These innovative solutions also support economic growth, create jobs and enhance our well-being.
International Union for Conservation of Nature (IUCN, 2018)	Nature-based solutions are actions to protect, sustainably manage, and restore natural or modified ecosystems that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits.
United Nations and UNESCO (UN, 2018)	Nature-based solutions are inspired and supported by nature and use, or mimic, natural processes to contribute to the improved management of water. An NBS can involve conserving or rehabilitating natural ecosystems and/or the enhancement or creation of natural processes in modified or artificial ecosystems.

A broad spectrum of ecosystem-related measures is gathered under the umbrella of NBSs, which addresses societal challenges and provides both ecological and social functions. According to IUCN (2018), NBSs can be grouped into five types (see Tab. 1.2):

Table 1.2. Types of nature-based solutions (after IUCN, 2018)

NBS type	Example
Ecosystem restoration	River restoration Forest restoration
Issue-specific ecosystem-improvement	River mitigation Climate adaptation services Ecosystem-based disaster risk reduction
Infrastructure	Green Infrastructure
Ecosystem-based management	Integrated water resources management Integrated forest management Land and Resource Management Planning
Ecosystem protection	Protected area management

Hereby, they should follow a set of principles (IUCN, 2018):

- **Nature conservation**: NBSs should enhance the resilience of ecosystems, their capacity for renewal and the provision of services.
- **Site-specificity**: NBSs should be developed considering the natural and cultural contexts.
- **Societal benefits**: NBSs should support the achievement of society's development goals and safeguard human well-being in a fair and equitable way, namely promoting transparency and participation.
- **Diversity:** NBSs should not be fixed solutions but enable the socio-ecological system to evolve and to achieve a long-term resilience.
- **Scale**: NBSs should be implemented, as far as possible, considering the whole system.
- **Trade-off**: NBSs should address the trade-offs between short-term and local economic benefits and long-term ecosystem service provision.

Traditional engineering approaches for risk reduction are 'reactive' in that they start with technology to minimize the negative impacts of natural hazards. The starting point of NBSs, on the other hand, is the natural environment and the community. They therefore present opportunities for co-creating structural solutions that not only reduce risk, but also improve ecosystem function and social capacity, reduce economic vulnerability and retain a sense of place.

This inherent point of departure means that nature-based solutions can hardly be decoupled from a sound stakeholder involvement. Naumann & Kaphengst (2015) concluded from their screening of 90 NBS-related projects and expert consultation throughout Germany that the majority of success factors identified for the planning, conceptualization and implementation of NBSs are directly linked to participation (see Tab. 1.3).

Table 1.3. Success factors for planning, conceptualization and implementation of nature-based solutions (after Naumann & Kaphengst, 2015)

Project planning	Project conceptualization	Project implementation
Connect project to relevant local strategies and processes	Select suitable stakeholders and project partners	Be open-minded towards other world views
Secure local policy support	Build synergies between relevant sectors and involve them	Personal contact and discussions
Involve key actors and local community	Promote suitable mechanisms for communication	Guarantee an adequate participation of relevant stake-holders in decision-making
Promote positive public awareness among relevant stakeholders	Identify local contact partners and supporters	Achieve local ownership for the project
	Co-develop a target group-oriented approach with local stakeholders	Receive strong commitment of local partners and stakeholders
	Provide sound scientific data basis	Enable sound project management and teamwork of project partners

The **"Why"** behind stakeholder involvement being paramount to NBSs planning and implementation takes on a clear shape when considering its possible benefits (e.g. Arbter et al., 2007; Čolić et al., 2013; Hauck et al., 2016):

Benefits to planning processes

- Multiple perspectives,
- Transparency, fairness and openness,
- Efficiency and effectiveness (time, resources), and
- Pre-warning system by early detection of conflicting interests.

Benefits to results

- Combination of experiential with scientific knowledge,
- Increased credibility of information,
- Increased acceptance, legitimacy and salience, and
- Creation of ownership.

Benefits to involved parties

- Establishment of a constructive dialogue between public sector, private sector, civil society and knowledge institutions,
- Networking,
- Promotion of knowledge-sharing and learning across and between cases, and
- Increased social capacity.

Nevertheless, practice shows that these anticipated benefits might not always be reached to the desirable extent and that drawbacks are possible. In fact, the quality of decisions made through stakeholder participation very much depends on the nature of the process bringing forward these decisions (Reed, 2008).

The **"How"** behind stakeholder involvement for NBSs planning and implementation thus needs careful attention to make it a successful concept in reality. A frequent flaw is to go for a mere "toolkit approach" instead of handling stakeholder involvement as a process being "underpinned by a philosophy that emphasizes empowerment, equity, mutual trust and learning." (Reed, 2008:2417).

Decisive features to achieve the integration of local and scientific knowledge to innovative NBSs are, among others, the definition of clear objectives for stakeholder involvement from the project's outset; a systematic representation of relevant stakeholders; the consideration of highly skilled facilitation as well as the institutionalization of the related participatory processes.

The Guiding Framework outlined in this report will look into these aspects in more detail, and provide orientation on how nature-based solutions and stakeholder involvement might work together effectively in PHUSICOS.

1.2 Living Labs to implement nature-based solutions: Mind the gap!

In the European Union, several strategic policy documents have highlighted the relevance of human and social aspects for a better design and implementation of Research, Development and Innovation (RDI) projects (EC, 2017). Furthermore, the combination of expert and stakeholder dialogues to resolve complex questions in the realm of socio-ecological systems has become increasingly mandatory in projects dealing with natural hazards, green infrastructure, and other neighbouring fields (Scolobig et al., 2016). One way to solve these challenges and to find new innovative solutions is seen in the collaboration among different public and private actors, as well as citizens, in so-called Living Labs. The origin of this concept roots back to Professor William J. Mitchell of the Massachusetts Institute of Technology (MIT), who first formulated it in 1990. Since then, it has rapidly been identified by the global community as effective approach to enable a high creative solution design (Huutoniemi et al., 2010; Bekkers et al., 2011; Linnerooth-Bayer et al., 2016a; Scolobig et al., 2016). In Europe, however, the Living Lab concept attracted only little interest initially, and its uptake remained limited to scattered initiatives (e.g. Röcker et al., 2004; Hoving, 2003; Markopoulos, 2001; van Berlo, 1998) (see Chap. 3.1). The application of Living Labs in real-life settings and 'real' experimentation emerged in Europe around 2005 based on the Nordic countries' experience of involving users (Edwards-Schachter et al., 2012).

A decisive turn of the European RDI strategy was taken in 2006, when participants of the Conference "Networked Business and Government: Something Real for the Lisbon Strategy" committed to the Helsinki Manifesto (2006) diagnosed a decreasing economic competitiveness of the European Union and urged needs for strong action to be taken. Among others, an important change was the recognition of the Living Lab approach as a progressive form of experimental and inclusive mode of planning, project design and implementation for innovations by the European Council (EC, 2017). Consequently, European RDI policies shifted from top-down towards bottom-up approaches characterized by user-driven innovation (see Chap. 3.1).

Since 2007, 409 Living Labs projects and initiatives have been counted by the European Network of Living Labs (ENoLL). In 2018, this network links 150 active members including 20 of the 28 EU Member States (www.enoll.org). Due to their characteristics and positive spill overs, Living Labs are increasingly attracting the attention of policy makers, businesses and scholars. Currently, European research agendas and related programs such as Horizon 2020 further promote the use of the Living Lab approach (EC, 2017). However, while Living Labs are already frequently used in urban areas to find sustainable solutions, few examples for their application can be found in rural or disaster risk research in mountain areas (Scobolig et al., 2016).

The same pertains for nature-based solutions (NBSs). Although the European Commission has been actively investing in NBSs since 2007 to drive cost-effective development, provide sustainability, create new jobs and enhance the natural capital rather than depleting it (Lafortezza et al., 2018), related projects with NBS focus are most often dedicated to the urban sector (see Tab. 1.4).

Table 1.4. EU research and innovation projects in 7th Framework Programme investigating nature-based solutions (after EC, 2018a)

Project	Topic	Focus	Area
TURAS	Sustainable cities	Green walls and roofs Urban brownfields Social agriculture Novel design	Urban
GREEN SURGE	Urban Green Infrastructure addressing major urban challenges	Link between green spaces and people, biodiversity and green economy NBS identification	Urban
OPERAs	Ecosystem science for Policy and Practices	NBS application Urban hybrid dunes Coastal protection Recreation and biodiversity	Urban

While NBSs address many of the world's challenges, such as contemporary water management issues (e.g. water for agriculture, sustainable cities, disaster risk reduction and water quality) (UN, 2018), current water management practice remains heavily dominated by 'grey' infrastructure (UNESCO, 2018). NBSs still lack adequate proof-of-concept for their replication and up-scaling, which holds particularly true for mitigating the risk posed by hydro-meteorological events in rural and mountainous regions. The Horizon 2020 Expert Group on 'Nature-Based Solutions and Re-Naturing Cities', for instance, listed over 300 potential measures that could be applied when constructing NBSs (based on Sutherland et al., 2014). However, only 50 measures were specifically related to disaster risk reduction and only one of those 50 possible interventions addressed the risk in mountainous regions and landslide hazards.

Thus, there is an obvious need to demonstrate the capacity of NBSs to provide solutions that are aligned with natural landscapes and adaptable to cope with changing conditions in the face of climate-induced natural hazards, especially in European mountainous regions.

PHUSICOS linking NBSs and the Living Lab approach

The excellence of PHUSICOS resides in bridging this apparent knowledge gap on NBSs and their efficiency in reducing risk caused by hydro-meteorological hazards (flooding, erosion, landslides, etc.) in European rural mountain areas. The decision to realize stakeholder involvement by the application of the Living Lab methodology lies at the core of the PHUSICOS project's approach at the local scale (see Fig. 1.1). PHUSICOS Living Labs will create an interface environment between scientists, public organizations, private companies, and end-users leading to new ways of designing and achieving sustainable hazard and risk management with social and economic resilience in focus. This will contribute to solve important research questions (see Appendix A) and generate new insights to key impact factors supporting a functioning Living Lab approach in the context of sustainable land use planning, NBS implementation and climate change mitigation.

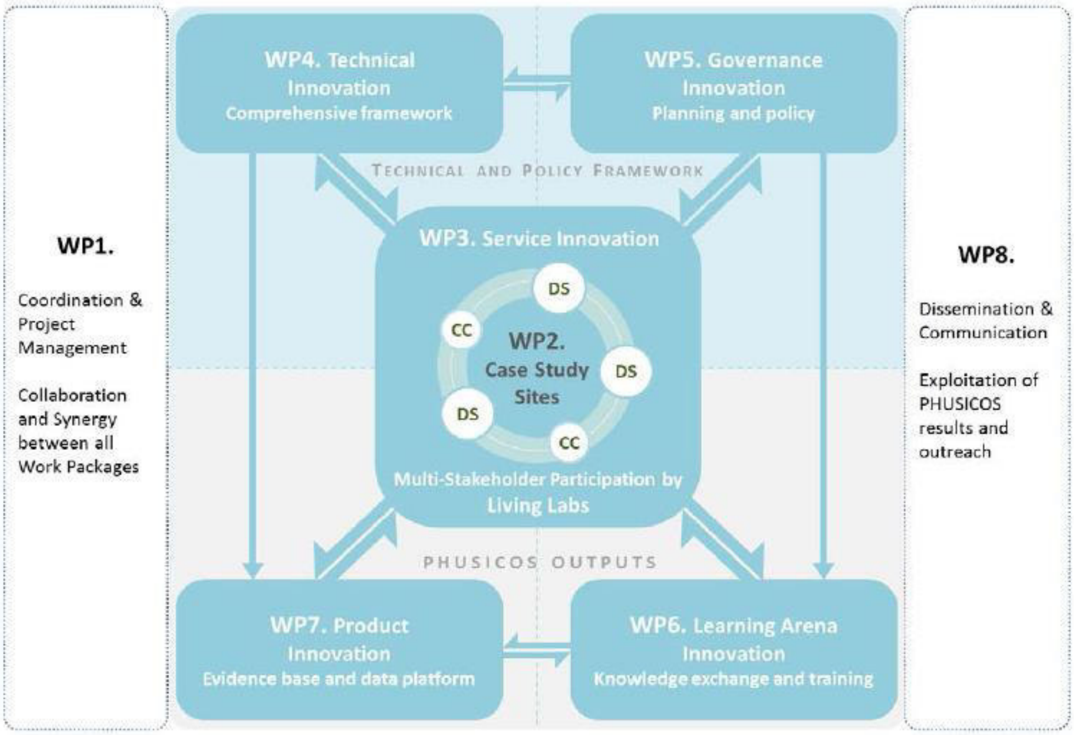


Figure 1.1. Illustration of the PHUSICOS work plan and project structure including all work packages (WPs), their respective innovation actions and highlighting the Living Lab approach at the core of the PHUSICOS project structure.

1.3 Purpose of this deliverable: Guiding whom, for what and how?

This Guiding Framework for tailored Living Lab establishment at demonstrator and concept case study sites is one of the first deliverables of the PHUSICOS project. It is intended to kick-off the service innovation activities of Work Package 3 (WP3) and be the point of departure for the initialization of relevant participatory processes at the local demonstrator and concept case study sites of PHUSICOS.

Three main demonstrator sites (the Pyrenees in Spain-France-Andorra, the Valley of Gudbrandsdalen in Norway, and Serchio River Basin in Italy) have been selected as large-scale demonstrator sites based on the following selection criteria: they i) are representative of hydro-meteorological hazards, vegetation, topography and infrastructure throughout rural and mountainous regions in Europe; ii) have guaranteed external financing and are currently in the process of implementing disaster risk reduction measures; iii) are open to broader implementation of NBSs; and iv) include end-user participation to ensure the long-term implementation of NBSs after the completion of PHUSICOS.

In addition to the three demonstrator sites, PHUSICOS will test specific challenging aspects of NBSs in two small-scale complementary concept cases (the Kaunertal Valley in Austria and the Isar River Basin in Germany). The selection criteria for the concept cases were similar to the demonstrator sites, without the required participation of end-users as a partner. The concept cases will focus on selected innovation actions.

Guiding Whom, for What…?

The key target groups of this deliverable are the following (see Fig. 1.2):

- First, the Guiding Framework is meant to be an instrument of orientation for the facilitators in charge of establishing and managing the Living Labs and corresponding participatory processes at the demonstrator and concept case study sites throughout the PHUSICOS project's duration.
- Closely related to the facilitators, the framework is targeted to inform the Living Lab participants of the case study sites (e.g. local scientific and end-user partners, companies and NGOs) about the PHUSICOS Living Lab approach, its underlying principles, demand for resources, capacity and operationalization.
- Furthermore, the present deliverable addresses all PHUSICOS project partners, such as Work Package leaders and their collaborating teams, in order to ensure a coherent understanding and implementation of key concepts related to the Living Lab approach used in this project.
- Last but not least, the framework can be of use for upscaling the PHUSICOS' concept to a broader scale. Consequently, it is also addressed to academia, professionals, and politicians working in the larger field of co-designing measures for NBS planning, land use or disaster risk management employing Living Lab approaches.

…and How?

In order to suit this diversity of the Guiding Framework's potential users, it intends to provide a practicable compilation of information, critical reflection and further hints that may be utilized according to individual interests, capacities, backgrounds and needs.

Since a "one-fits-all-toolkit-approach" neither would correspond to the individual and very diverse conditions of local case study sites, nor fulfil the demands of a sound stakeholder involvement process (Reed, 2008), this deliverable sets out to be a framework in the strict sense.

Accordingly, it is not conceptualized as a step-by-step-guide to build up a Living Lab with the help of a fixed scheme. Instead, it offers a framework in which the PHUSICOS case study sites find room for their individuality, i.e. to develop their own Living Lab approaches tailored to their needs and ambitions.

Figure 1.2 shows the content structure and target groups of this Guiding Framework:

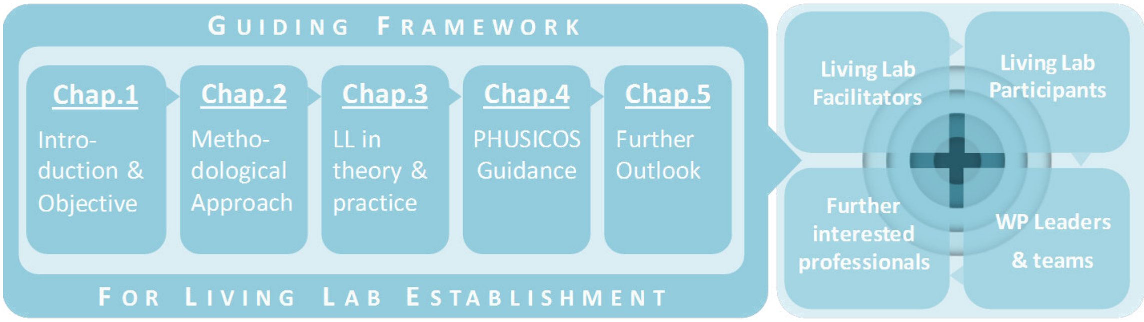


Figure 1.2. Content structure and target groups of the PHUSICOS Guiding Framework for tailored Living Lab establishment at demonstrator and concept case study sites. Design: Christian Smida

Following the present introduction and justification of the Living Lab approach for co-designing nature-based solutions in PHUSICOS (see Chap. 1) the methodological approach which forms the basis for this framework is outlined (see Chap. 2).

The next section focuses on making transparent possible pitfalls, as well as success factors from Living Lab processes in theory and practice (see Chap. 3), and translates them into a set of key recommendations and further guidance for the PHUSICOS Living Labs (see Chap. 4).

In this way, it is hoped that the Guiding Framework's recipients are enabled to intertwine valuable lessons learned with their own Living Lab design processes (see Chap. 5) in the pursue of co-creating local NBSs for risk reduction in the face of natural hazards.

2 Methodological Approach

The presented Guiding Framework for tailored Living Lab establishment at demonstrator and concept case study sites has been elaborated based on lessons learned and insights from experiences in research and practice. For achieving a suitable guidance for PHUSICOS, three main research questions have been identified by the experts in charge of the design of this Guiding Framework (see Appendix A):

- What is the State-of-the-Art of the LL approach in the context of landscape planning, NBS implementation and climate change mitigation?
- Which experiences using the LL approach have been made?
- Which LL approach and participatory processes are suitable to co-design and implement NBSs against hazards being relevant to PHUSICOS partners?

In order to answer these main research questions, a methodological approach resting on two core elements has been designed: a) a literature review and b) a case study analysis (see Fig. 2.1).

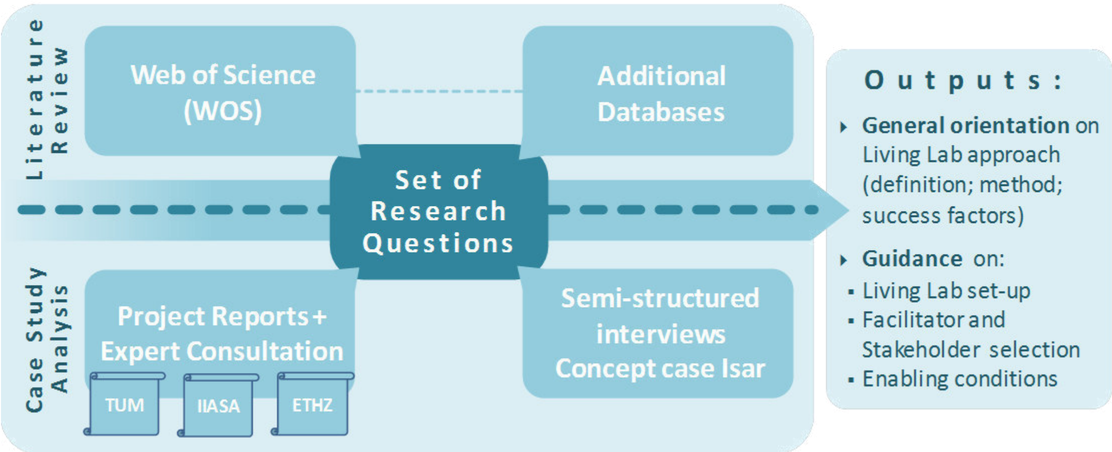


Figure 2.1. Overview of the methodological approach to inform the Guiding Framework. Design: Christian Smida

First, a literature review was performed in order to collect a broad spectrum of knowledge on the Living Lab approach in general, and to later identify the available knowledge in the context of landscape planning and nature-based solution implementation (see Chap. 2.1).

Second, a case study analysis enabled a practice-oriented approach and the integration of insights not being covered by the literature review. Experiences made by PHUSICOS partners and the Concept Case Isar were analysed to identify key impact factors to functioning Living Lab procedures, and to mainstream them into the further PHUSICOS lab design process (see Chap. 2.2).

The combination of the two components of the methodological approach thus served to provide a sound overview on the Living Lab concept, supported the formulation of a working definition for PHUSICOS, and oriented the outline of a proper guidance on the Living Lab set-up at the demonstrator and concept case study sites.

2.1 Literature review

In order to collect and critically analyse multiple research studies and papers (Bilotta et al., 2014) a systematic literature review was performed based on a total of four publication pools (see Fig. 2.2). The inclusion set of publications (N=209) (see Appendix B) was split between three experts to perform a qualitative content analysis (Mayring, 2007). Text passages that provided answers to the respective research questions (see Appendix A) were extracted, systematized, and aggregated into core statements in order to develop the resulting Guiding Framework.

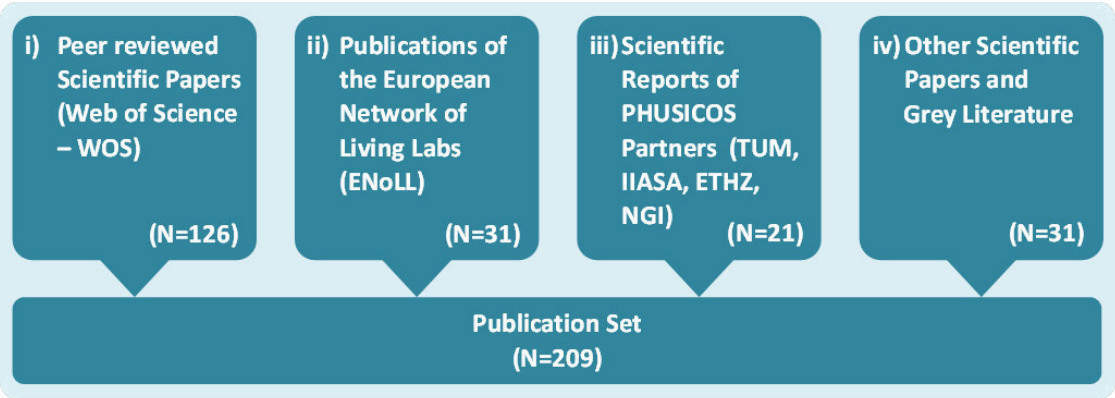


Figure 2.2. Publication pools for the employed literature survey. Design: Christian Smida

i) **Peer-reviewed scientific papers** were collected from Web of Science (WOS) (Clarivate Analytics, Philadelphia, USA) according to a pre-defined set of search terms. The resulting 507 publications were then selected using the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) method (Moher et al., 2009). The titles and abstracts of the articles were screened for relevance. The full text of the 126 articles of the inclusion set was collected, assessed for eligibility and integrated into the literature analysis.

In a second step, additional material was acquired to fill gaps of the resulting literature list informed by WOS, namely:

ii) **Publications of the European Network of Living Labs** (ENoLL). The European Network of Living Labs (ENoLL) provides a platform for best practice exchange, learning and support. On its website (https://enoll.org/), publications from the members and good practice cases are freely available. Scientific papers and Living Lab-related methodologies published online were listed and screened according to the same method applied to the WOS titles. The full text of the 31 publications was collected and integrated into the literature analysis.

iii) **Scientific Reports of PHUSICOS partners**. Next to the WOS and ENoLL titles, further scientific publications were selected using the distinct consultation of experts with long-term expertise in the design of participatory and transdisciplinary processes. These experts were sourced from the circle of PHUSICOS partners working on WP3, namely the Technical University of Munich (TUM, Germany), the International

Institute for Applied Systems Analysis (IIASA, Austria), the Swiss Federal Institute of Technology in Zurich (ETHZ, Switzerland), and the Norwegian Geotechnical Institute (NGI, Norway). Titles indicated by the experts as being of relevance to the PHUSICOS project context were included in the literature review (N=21).

iv) **Other scientific publications and grey literature**. The pooling and consultation of further scientific publications and grey literature was used to provide additional insights into contemporary transdisciplinary research; stakeholder identification and analysis; NBS planning; practitioner guidelines related to the design of participatory and Living Lab processes; and manuals on planning cultures. These titles (N=31) were collected based on long-term expertise from TUM team colleagues and by using the snowball system.

2.2 Case study analysis

With the intention to combine the extracted scientific viewpoints from the employed literature review with insights "from the ground", a case study analysis was conducted. The selection of its scope and content was hereby oriented by the following deliberations: the three months available for providing the present deliverable restricted the options of doing a long-term analysis of ongoing case studies. In this context, the existence of lessons learned from previous EU and other projects being available within reach of the PHUSICOS partners seemed a proper way of generating the insights from practice under the given conditions. For this reason, the following three case studies were selected for further analysis:

Nocera Inferiore - case study provided by IIASA/ETHZ

The case study of the town Nocera Inferiore (Italia) is a showcase provided by IIASA/ETHZ, being built on intensive research work done by the Work Package partners in the realm of stakeholder consultation and disaster risk management. This case study was done in the Large-scale integrating Collaborative research project SafeLand (2010-2012; www.safeland.no) funded by the Seventh Framework Programme for research and technological development (FP7) of the European Commission, and is described in detail in SafeLand Deliverable 5.7. The case has been novel in representing one of the first public participatory processes to address landslide risk in Europe, and thus should be of interest to PHUSICOS partners facing this hazard.

GREEN SURGE project - case study provided by TUM

The Chair for Strategic Landscape Planning and Management of the Technical University of Munich (TUM, Germany) was one out of 24 partners of the GREEN SURGE project (2013-2017; www.greensurge.eu). It was a collaborative project funded by the European Commission Seventh Framework Program (FP7) aiming to identify, develop and test ways of linking green spaces, biodiversity, people and the green economy in the context of land use conflicts, climate change adaptation, demographic changes, and human health and wellbeing. Although dealing with nature-based solutions in the urban sector, GREEN SURGE offers highly interesting lessons with regard to the applied stakeholder involvement approach in five European cities.

Isar concept case – case study provided by TUM

The Isar river restoration project in Munich (Germany) is one of the concept cases of the PHUSICOS project. It is recognized as a good practice to follow (Böhm et al., 2006; Binder, 2010) and achieved the first German award for river development ('Gewässerentwicklungspreis') in 2007. The ex-post-analysis of this concept case provides a good practice framework of a successfully implemented flood risk management plan and related river restoration, and identifies key success factors being of relevance to other PHUSICOS case study sites.

The case study analysis was based on a review of project documentation with regard to the set of defined research questions (see Appendix A) and aimed at identifying key success factors. Additional clarifications were done by consulting experts of the related case studies Nocera Inferiore and GREEN SURGE. For the Isar concept case, semi-structured interviews (Bernhardt et al., 2005; Kondolf et al., 2007; Morandi et al., 2014) (see Appendix C), were performed in order to provide in-depth insights to the case. According to Grunert & Ellegaard (1992) the term key success factors can be used in four different ways: a) as a necessary ingredient for a success, b) as a unique characteristic of successful project, c) as a heuristic tool to sharpen thinking, and d) as major skills and resources required to be successful in a given context. Key success factors of the case study have been identified following the last definition.

3 Living Labs in theory and practice

What is a Living Lab and how does it work (or not work)?

This chapter intends to give a comprehensive overview of the current state-of-the-art of the Living Lab concept in theory and practice. It employs a broad literature review to fulfil this task, illustrating relevant results based on practical experiences from project work "on the ground" (see Chap. 2).

The main goal of this chapter is to build a proper foundation for the PHUSICOS Living Lab guidance (see Chap. 4). It aims to:

- clarify the term "Living Lab" and its manifold interpretations from different perspectives;
- explain the main methodological components of a Living Lab process; and
- extract key challenges and success factors from practical experiences, distilling them into a first set of recommendations ("Do's & Don'ts") for further Living Lab design in PHUSICOS.

3.1 Living Lab concepts in literature: a review

In the field of social sciences and participatory processes, the idea of Living Labs (or Living Laboratories) emerged in the early 1990s. William J. Mitchell, a professor at the Massachusetts Institute of Technology (MIT), introduced the concept of 'Living Lab' (Dutilleul et al., 2010) suggesting that to improve creativity and innovation potential, and reduce risks, products should be developed by involving the user in developing and testing the solutions. He presented the Living Lab as a wired space, e.g. a room or a city, where the designers, developers and researchers observe users and find inspiration.

First Living Labs focused mainly on new ICT tools as intended by Mitchell originally. The concept received interest from many disciplines and the idea of Living Labs expanded to other fields, such as sustainable energy, health care, and safety (van Geenhuizen, 2013). Therefore, a broad spectrum of definitions has been formulated (see Tab. 3.1). Likewise, the Living Lab concept's meaning is multi-faceted (Dutilleul et al., 2010; Voytenko et al., 2016).

According to literature, a Living Lab can be understood as …

…**a participatory process**: a Living Lab is a product development process intensively involving users;

…**an innovation system**: a Living Lab is an organized and structured multi-disciplinary network fostering interaction and collaboration;

…**a place**: a Living Lab is a trusted and neutral place where stakeholders meet to create innovations.

…**an in vivo monitoring procedure**: a Living Lab is an evaluation procedure of the social response to a technology or product (or stressor) involving experimentation in real-life setting. This understanding is broadly applied in natural sciences, but with omission of the social parameters.

Other terminologies such as Real-world Laboratories (RwL), Transition and Transformation Labs (TL), Urban Living Labs (ULL/ULivL), Urban Transition Labs (UTL) etc., share many similarities with the Living Lab approach. However, they differ from the Living Lab concept in several aspects (see Tab. 3.1 and 3.2).

Furthermore, the Living Lab terminology is often used to label traditional participatory processes. A clear distinction of these terms, as presented for example by Schäpke et al. (2018) is crucial to avoid misunderstandings and to ensure the robustness in terms of comparison.

Table 3.1. Overview of common definitions of the Living Lab term mentioned in international literature

Author	Definition
Living Lab *as…*	
…a participatory process	
Leminen et al. (2012)	Living Lab is "a user-centric methodology to sense, prototype, validate, and refine complex home technology in a real-life context".
Almirall and Wareham (2011)	Living Lab "has the overarching purpose of supporting user-centred innovation processes for different types of clients and stakeholders (e.g. cities) in real world contexts".
Wendin (2015)	Living Lab is a concept to "support the creation of experience-based development of innovations in real-life, user-driven and open environments".
Schuurman in Evans et al. (2017)	"A Living Lab is a multi-stakeholder organization set-up to carry out innovation projects that follow the principles of open and user innovation and focus on real-life experimentation."
… an innovation system	
JPI Urban Europe (2013)	Urban Living Labs are "a forum for innovation, applied to the development of new products, systems, services, and processes, employing working methods to integrate people into the entire development process as users and co-creators, to explore, examine, experiment, test and evaluate new ideas, scenarios, processes, systems, concepts and creative solutions in complex and real contexts".
Ståhlbröst (2012)	"A Living Lab is an orchestrator of open innovation processes focusing on co-creation of innovations in real-world contexts by involving multiple stakeholders with the objective to generate sustainable value for all stakeholders focusing in particular on the end-users".
Bergvall-Kåreborn et al. (2015)	"A Living Lab is a user-centric innovation milieu built on every-day practice and research, with an approach that facilitates user influence in open and distributed innovation processes engaging all relevant partners in real-life contexts, aiming to create sustainable values".
…a place	
Evans et al. (2017)	"A Living Lab is a place where citizens, artists, technologists, businesses and public sector organizations can come together to co-create ideas, tools and technologies that will address local challenges."
Carter in Evans et al. (2017)	"Living Labs are creative spaces for sharing technical and creative skills".
Leminen (2013)	Living Labs are "physical regions or virtual realities, or interaction spaces, in which stakeholders form public-private-people partnerships (4Ps) of companies, public agencies, universities, users, and other stakeholders, all collaborating for creation, prototyping, validating, and testing of new technologies, services, products, and systems in real-life contexts".
…an in vivo monitoring procedure	
Larson and Topping (2003)	A Living Lab is "an apartment-scale shared research facility where new technologies and design concepts can be tested and evaluated in the context of everyday living".
…and Real-world Laboratories (RwL) in comparison	
Renn (2018)	"RwLs are normally directed towards a specific transformation goal (such as a new mobility concept). They are organized around a political intervention in close cooperation with decision makers and implementing agencies, and they include stakeholders during the research process. The idea of RwLs is to find strategies for transformation towards sustainable practices on a small scale that can inform larger-scale policies in the future".
Jahn and Keil (2016)	RwLs are a "set up of a research infrastructure or a space in which scientific actors and actors from civil society cooperate in the joint production of knowledge in order to support a more sustainable development of society".
Gross et al. (2005)	A RwL is then understood as a place in time in which specific actors mutually invent and conduct realworld experiments.

Despite the fuzzy terminology, more consensuses can be found on the goals and characteristics of the concept (see Tab. 3.2). For example, the most frequently mentioned characteristics of the Living Lab approach are:

Innovation and increased creativity: by increasing the number of persons in charge of the design, the creativity potential will raise. It is suggested that gathering a broader spectrum of participants (different lifestyles, ages, expertise, emotional experiences, etc.) creates new and fresh ideas.

User-centred: The Living Lab approach is commonly defined as user-centred, meaning that users are not only consumers but also active prosumers of content. In many other project designs and set-ups, users are at the bottom end of a top-down experiment. The Living Lab approach instead puts users in the position as a co-creator. Two co-designs can be differentiated: a) the product is designed *with* the user, meaning that the users are equal contributors to the design, and b) the product is designed *by* the users themselves, meaning that users actively design the solutions or product with the help of other actors. In this case, experts and researchers just facilitate the process.

Real-life context: Activities of the Living Lab take place in a real-life setting to gain an overview of the context and avoid a laboratory bias. Furthermore, the prototypes and products have to be tested by the end-users in their real-life settings.

Quadruple Helix participation: Stakeholders cooperate in a Living Lab in a quadruple helix innovation network (Concilio, 2016), intertwining their competences from four sectors: public organizations, private companies, users (or end-users), and knowledge institutions (academia) (see Fig. 3.1).

While the latter two are also characteristic for other participatory processes (e.g. Real-world Laboratories), the stronger focus on user-based knowledge and the goal of innovation are specific to a Living Lab (Almirall et al., 2012).

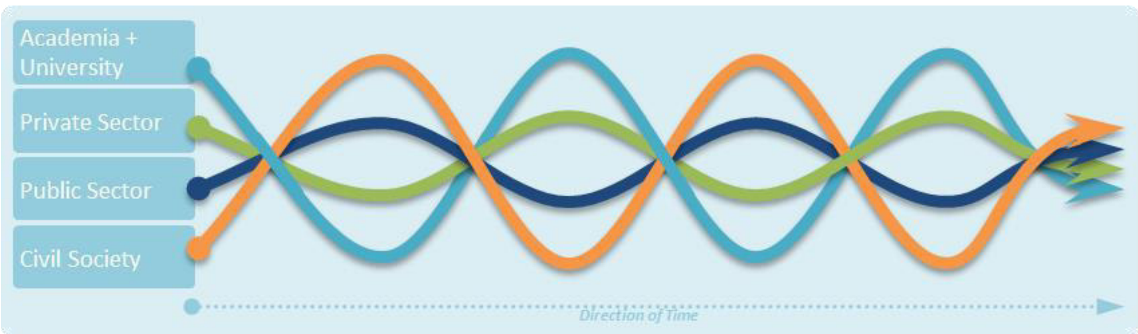


Figure 3.1. The quadruple helix innovation network model as key characteristic of the Living Lab approach. Design: Christian Smida

Table 3.2. Living Lab identification matrix based on the literature review of around 200 publications, using frequently mentioned characteristics

Characteristics	Living Labs									RwL
Authors	Ståhlbröst et al. (2015)	Ståhlbröst and Holst (2012)	Evans et al. (2017)	Bergvall-Kåreborn et al. (2015)	Almirall and Wareham (2011)	Voytenko et al. (2016)	Paskaleva et al. (2015)	Steen & van Bueren (2017b)	Bergvall-Kåreborn and Ståhlbröst (2009)	after Schäpke et al. (2018)
User-centred process and co-creation	x	x	x	x	x	x	x	x	x	
Real-world context	x	x	x	x	x	x	x	x	x	x
Quadruple helix	x	x	x	x	x	x	x	x	x	x
Neutral meeting place and trusted environment	x					x				
Trans- and/or Multidisciplinarity	x			x		x	x			x
Openness	x	x		x		x			x	
Value		x		x						
Influence		x		x					x	x
Sustainability		x		x		x			x	x
Realism		x		x					x	
Empowerment of users									x	
Spontaneity									x	
Experiment										x
Learning and reflexivity										x

The closer look at literature shows that various initiatives and projects label processes as 'Living Labs' by adopting different parts of the multi-faceted concept. However, considering the core characteristics such as user-centered approaches, co-design and quadruple helix innovation, not all of the described processes are indeed real Living Lab processes. For example, a study conducted by Steen et al. (2017a,b) compared 90 participatory innovation projects in Amsterdam and reported that only 12 projects were Living Labs in a strict sense following the above-mentioned criteria.

As a result, major challenges can be identified to establish a Living Lab in a strict sense, especially to enhance for innovation actions and user based knowledge. How to achieve a solid co-design of the solution? How to organize the user-centred quadruple helix participation principle while safeguarding openness, trust, spontaneity and realism? How to ensure that Living Lab participants will not end-up in a consultative process only? How to guarantee that their process of establishing shared interests and articulating them goes hand in hand with the development of research and innovation?

The following sections provide hints and answers to these questions.

3.2 The step-by-step process towards the co-production of innovations

The process of a Living Lab to stepwise co-design an innovation can be described with a number of different approaches and divided in different phases (see Tab. 3.3). However, the following general trends can be identified.

Table 3.3. Synthesis of the Living Lab phases mentioned in literature

Author	Phase 1	Phase 2	Phase 3	Additional Phases
Nedopil et al. (2013)	Understanding	Conceptualization	Testing	Business Modelling
Evans et al. (2017)	Exploration	Experimentation	Evaluation	
Holst & Ståhlbröst (2012)	Planning and appreciating opportunities	Design	Evaluation	
Ståhlbröst (2012)	Concept design	Prototype design	Innovation design	Commercialization
Ståhlbröst et al. (2013)	Planning and Concept design	Prototype design and beta test	Design of final solution through real-life test	
Menny et al. (2018)	Design	Implementation	Evaluation	
Geibler et al. (2016)	Preliminary and in-depth investigations	Prototype development	Test	
Steen et al. (2017a)	1. Initiation 2. Plan development	3. Co-creative design 5. Refinement	4. Implementation 6. Evaluation	7. Dissemination 8. Replication

Phase 1: Understand, Investigate, Plan, Explore

The first phase of a Living Lab process concerns the contextual understanding, namely:

- The frame of the project/product/innovation: Which innovation are we designing and to respond to which demand?
- The target of the innovation: Who are the end-users? What are their needs, habits, fears, problems, and visions?
- The potential actors of the co-design: Who are the stakeholders? How do they interact with the end-users?
- The state-of-the-art of the knowledge and of the technology: Which solutions (even unknown by the end-users) already exist? Which value does the designed product/innovation have?

The goal is i) to establish a common understanding among the interdisciplinary project team members. During this first phase, it is important to collect real data and to avoid stereotypes (Nedopil & Glende, 2013); and ii) to identify opportunities and goals of the project to assure the usefulness of the intended innovation, but also the opportunities and goals of the user integration. Authors like Nedopil and Glende (2013) strongly encourage integrating at least the end-users into this phase to avoid misunderstandings, assure the right definitions of the needs and goals, identify end-users, stakeholders and markets, save on costs avoiding blind alley, and integrate ethical issues. For this purpose, a broad spectrum of methods can be used, e.g. observation, participation and in-depth interviews (Evans et al., 2017). Sometimes this phase is split in two distinctive parts: the planning stage, that excludes end-users but plans their involvement, and the appreciating opportunities stage that integrates end-users (Holst & Ståhlbröst, 2012).

Phase 2: Creative Co-design and Refinement

The second phase of the Living Lab process addresses the creation of the innovation specifying details and assuming the benefits.

This creative part of the Living Lab work is composed of various levels, and can be supported by a variety of methods to create a concept, e.g. the Walt Disney method, Brain writing and Story-boards (Nedopil et al., 2013). The integration of the actors during this phase enables the Living Lab to design solutions based on a broader pool of experiences and creative potential (Nedopil & Glende, 2013). Furthermore, the cooperation in solution development increases the innovation's acceptance.

Phase 3: Evaluation and Testing

The third phase of the Living Lab process is dedicated to the evaluation of the designed solution. Single components (e.g. aesthetic, material) and prototypes or the final product should be tested for usability, benefits and acceptance (described as the emotional aspects of use). While the evaluation of the final innovation requires a real-life implementation of the solution (Steen et al., 2017a), some single components of the solution can be tested in the laboratory or in simulations (Nedopil & Glende, 2013).

An improvement or decline of the user satisfaction can be assessed comparing the pre-measurement status with a future or post-measurement status. The testing phase occurs iteratively throughout the design process. Methodologies, tools, solution components and products are applied and tested in the course of the project (Smith et al., 2015). Results of a single component evaluation are integrated as an input of the conceptualization. Early tests have been defined as a success factor and for cost-effectiveness of the design procedure (Nedopil & Glende, 2013). The integration of the actors during this phase avoids design mistakes and ensures a better user satisfaction.

All these steps are repeated until the full satisfaction of the end-users is reached. The results of the testing phase show if the Living Lab outcome should head-back to the first phase or if the innovation developed is an adequate solution.

Additional Phases

Additional phases have been described in literature. For example, the "Business modelling" phase defined by Nedopil and Glende (2013) aims to assure that the solution remains affordable.

Another example is the phase "Commercialisation" described by Ståhlbröst and Holst (2012) which targets to introduce the innovation to buyers and evaluates the potential market. This phase proceeds in parallel to the second and third phase and focuses on the marketing strategy rather than on the product details. User integration eases the understanding of the buying and paying process.

Involvement

Different types of users have been identified from the literature review: primary end-users are individuals who use the product; secondary end-users are people and organisations in direct contact with primary end-users (e.g. neighbours, representatives of users), and tertiary end-users are institutions and private or public sector organisations which do not use the product but pay for or enable it. Their involvement into each design phases can differ (see Tab. 3.4).

Table 3.4. Actor involvement and user types during the different phases of a Living Lab co-design process

Actors	Phase 1	Phase 2	Phase 3	Additional Phases
Primary End-Users	+	+++	++	
Secondary End-Users	++	+++	+	
Tertiary End-Users and Stakeholders	(+)	(+)	(+)	+
Academia	+	+	+	+
Private sector		+		+

While primary end-users should be integrated in all phases; tertiary end-user implication can be limited to an additional phase. As secondary end-users may offer more open-mindedness to a described problem and be more creative to design an innovation, primary end-users should remain the major partner of the co-design procedure (Nedopil & Glende, 2013).

The establishment of a Living Lab requires listing of participant (i.e. end-users, academia, public and private sector) enrolment, a kick-off meeting, dialogue support, and a stakeholder innovation network that co-decides the solution which will be designed in detail and for which development plans are created (Steen et al., 2017a; Smith et al., 2015; Scolobig et al., 2016).

3.3 Learning from Experiences: Challenges and Success Factors of a Living Lab

In spite of the prominence the Living Lab methodology has gained in recent years, which is reflected by its contemporary ranking on EU research agendas (see Chap. 1.2), it offers several challenges. These can be grouped into four main clusters:

Challenges related to i) the Living Lab concept itself; ii) the involved Living Lab agents; iii) the Living Lab process; and iv) the Living Lab outcomes.

In the following sections, these challenges will be outlined briefly, and connected to success factors and possible solutions based on the knowledge derived from literature and project evaluations. To enable more in-depth insights into practical experiences "from the ground", the theoretical considerations are illustrated by three snapshots from the case studies of Nocera Inferiore town (Italy), the GREEN SURGE project and the Isar River (Germany) (see Chap. 2 for explanation of case study selection).

Challenges and Success Factors related to the Living Lab concept

Living Labs and related concepts represent a relatively new format of transformative research. As such, it has to be considered that quality standards of the concept and even definitional criteria are still fuzzy and in evolution (Pregernig et al., 2018).

Consequently, this **"opaqueness" and "lack of methodological deepening**" goes hand in hand with the observation that stakeholders being enrolled or interested in a Living Lab process often tend to "struggle with what they are supposed to do" (Steen et al., 2017b:22). This is well in-line with the finding by Tress et al. (2006a) that the increased interest in integrative research concepts in general is faced with a lack of common understanding that builds a key barrier to successful integration in European landscape projects.

A way to cope with this challenge is to establish a **clear, common and accessible project terminology**, including easy-to-handle working definitions of integrative concepts such as the Living Lab approach (e.g. Tress et al., 2005; Van der Jagt et al., 2017). This is important not only for the involved research teams, but even more for users participating in a Living Lab. In this context, it might be better to avoid the abstract "lab language" in the pursuit of a project's acceptance (Engels et al., 2018a). Other success factors are to foster contextualized guidance and to offer sufficient opportunities to a Living Lab project team to exchange on relevant key terms and achieve a common understanding. Finally, one must be aware of the existence of **multiple and divergent perspectives as an inherent characteristic** of a Living Lab, especially when working in a contested terrain (Scolobig et al., 2016; Linnerooth-Bayer et al., 2016b), rather than expecting a harmonious vision on a common goal as a point of departure (Engels et al., 2018a).

Snapshot: Participation for Landslide Risk Mitigation Nocera Inferiore, Italy

Landslides in Nocera Inferiore town, Southern Italy.
Credit: Anna Scolobig

Background description

The town of Nocera Inferiore in the Campania region of southern Italy is facing a diversity of natural hazards, such as earthquakes, volcanic eruptions, floods and landslides. According to official statistics, almost 10% of the 46.000 residents are at risk from landslides (Italian National Institute, 2001 cited in Scolobig et al., 2016). In March 2005 the highest risk area of the town, Monte Albino slope, suffered from a landslide due to heavy rainfall causing three deaths and extensive property damage (Scolobig et al., 2016).

Involvement Drivers

In 2008, a €24.5 million risk mitigation project prepared by the Regional Emergency Commissariat was rejected by the Municipal Council in support of citizens and local associations. This rejection rooted partly in the fact that the project's costs were not fully covered by regional funds; besides, technical weaknesses were detected: whether and how to renovate the hydraulic network was one issue; another one was the dissent with not having considered investments in non-structural and environmentally friendly measures (Scolobig et al., 2016). This stalemate signalled the need for a more inclusive and transparent landslide policy process. After the quick appointment of another two Emergency commissioners, the transfer of partial responsibility for risk mitigation to the local municipal authorities and the set-up of a €7 million budget earmarked for a new risk mitigation plan, the municipal authorities were open to involve the citizens of Nocera Inferiore town (Linnerooth-Bayer et al., 2016b; Scolobig et al., 2016). In 2010, decisions about risk mitigation for Monte Albino were still missing. At this point, research found an entry point to unlock this situation and initiate the transition from practiced one-way information of public decision-makers by external technical experts to a two-way exchange of stakeholder views and co-production of options on landslide risk mitigation (Scolobig et al., unpublished).

Conceptual approach

The three-year participatory process (2012-2014) consisted of a workshop series with selected residents of Nocera Inferiore and additional options for participation open to the public. Taking the theory of plural rationality as starting point, a literature review, interviews and a questionnaire survey were employed to elicit stakeholder discourses on the landslide risk problem and its solution. Geotechnical experts from the University of Salerno and the local municipal authorities provided three technical mitigation option packages - each within a given budget constraint and complying with Italian law. Following a series of five workshops, the range of public perspectives was synthesized into a final agreement. The decisive key was "Compromise instead of consensus" to bring forward joint recommendations in this "contested terrain" (Scolobig et al., 2016).

Participatory process design

The participatory process of Nocera Inferiore included three segments:
i) Making transparent the plurality of public voices (consultation);
ii) fostering an active stakeholder engagement aimed at a compromise, and
iii) supporting outreach activities to open a door to those who were not enrolled as active participants in the formal process (co-design and information process).
After a sound preparatory work, three discourses were described:
"Safety first", emphasizing the importance of expert-driven safety, e.g. by top-down passive mitigation measures;

"Careful stewardship of the mountain", putting a focus on active and naturalistic engineering measures, and on the equitable sharing of risk; and

"Rational choice", centring on trade-offs and the individuals' rights to decide for themselves (Linnerooth-Bayer et al., 2016b; Scolobig et al., 2016).

Based on these three discourses, a participatory process was initiated as a second step, combining public participation and expert input. The process was kicked-off by a public meeting counting on the presence of over 100 residents and officials that served to inform the broader public. At this point, a group of 16 volunteers was selected to be the active core of the process.
The up-following five participatory meetings were facilitated by the researchers, and employed different formats, such as working groups, expert presentations and consultations (Scolobig et al., 2016).
In parallel course to the process, several meetings took place, which served e.g. to discuss the compromise proposal and collect feedback on it. As outreach activities, a website and corresponding online group were utilized, allowing the broader public to contribute their views to the process. Minutes of meeting were regularly shared in order to make the information available to the interested public, and to derive additional inputs. Further media attention was reflected e.g. by press releases, student-produced videos and an International Summer School.

Preparatory Work	Meeting 1: Identification of risk mitigation perspectives	Meeting 2: Expert presentations	Meeting 3: Working groups	Meeting 4 & 5: Discussion of the compromise proposal
▪ Desk study ▪ 43 semi-structured interviews ▪ 2 Focus groups ▪ Questionnaire survey with 373 residents	▪ Creation of common space ▪ Elicit participants' perspectives on landslide problem and solution	▪ Expert presentations of 3 risk mitigation options consistent with participants' perspectives	▪ Like minded participants discuss the options and identify priorities	▪ Presentation of a compromise proposal prepared by the research team ▪ Identification of next steps ▪ Feedback questionnaire
Parallel activities: website, online discussion group, 3 videos, contacts with local authorities and media, independent meetings organized by participants				

Key steps of the Participatory process adopted in Nocera Inferiore town, Italy. Based on: Scolobig et al., 2016

Challenges to overcome

To the involved interdisciplinary research team, it was especially demanding to support the process given data restrictions and large uncertainties. Moreover, the communication of risk to local stakeholders was a barrier to take. Finally, the thorough comprehension of the institutional set-up of landslide policy making in Italy was a bottleneck. To the relevant risk mitigation experts of the University of Salerno and the municipal authorities, the process meant to switch from the traditional provision of technical solutions to policy-makers, to the co-production of useable knowledge. Furthermore, there were some process-related challenges to master, such as the design and choice of facilitation methods, especially for conflict mitigation (Linnerooth-Bayer et al., 2016a).

Innovative features

The case of Nocera Inferiore was novel in that it adapted traditional analyses to a multi-stakeholder setting, bringing together citizens and experts to co-produce landslide risk mitigation options (Linnerooth-Bayer et al., 2016a). Compared to similar processes, it is distinct by the explicit elicitation and structuring of multiple stakeholder worldviews, building on the theory of plural rationality (Linnerooth-Bayer et al., 2016a). Finally the process itself meant a turn from trying to achieve a classic "best consensus solution", towards a compromise. In this way, the process resulted in fair recommendations, featuring an early warning system combined with natural engineering measures (Linnerooth-Bayer et al., 2016a).

Outcomes

The involved parties rendered several benefits from the process. To policy-makers, the identification of the points of agreement and disagreement among the participants was a big gain. With glance at technical achievements, the process generated new options for mitigating risk. Likewise, the experts profited from the residents providing an active forum for them, building a stimulus to develop novel solutions. The participants' knowledge increased during the process, testified by the expression of an improved awareness upon the process' evaluation (Scolobig et al., unpublished).

In a nutshell, the process successfully managed to capacitate citizens and experts for a joint exchange of views on landslide risk mitigation options. The participants found an agreement on important priorities, e.g. the improvement of the warning system, the implementation of an integrated monitoring and territorial survey system, and emphasis on natural engineering risk mitigation measures. These outcomes show that it is worthwhile to kick-off and commit to a process that considers, and not fears conflicting citizen perspectives.

Credit:

This case study is contributed by Anna Scolobig (ETHZ) and JoAnne Linnerooth-Bayer (IIASA). It is sourced from their extended research work described in:

Linnerooth-Bayer J and A Patt (2016a): Introduction to the special issue on rethinking participatory processes: the case of landslide risk in Nocera Inferiore. Nat Hazards (2016) 81:S1-S6. Doi: 10.1007/s11069-016-2219-y

Linnerooth-Bayer J, Scolobig A, Ferlisi S, Cascini L and M Thompson (2016b): Expert engagement in participatory processes: translating stakeholder discourses into policy options. Natural Hazards 81 (1): 69-88. Doi: 10.1007/s11069-015-1805-8

Scolobig A., Thompson M., Linnerooth-Bayer J. (2016): Compromise not consensus. Designing a participatory process for landslide risk mitigation, Natural Hazards 81 (1): 45-68. Doi: 10.1007/s11069-015-2078-y

Scolobig A and J Linnerooth-Bayer: To protect or to relocate. Unpublished.

Challenges and Success Factors related to Living Lab agents

Closely connected to the demanding nature of integrative concepts, is the challenge to deal with the **heterogeneity of a Living Lab stakeholder group**. Typical bottlenecks in this context are cognitive and motivational barriers. While the first make communication more difficult and are linked to knowledge asymmetries, the latter ones easily undermine collaboration efforts (Dutilleul et al., 2010). Related phenomena are the drop-out of members, practitioners changing priorities over time (Van der Jagt et al., 2017) or difficulties on behalf of the involved researchers to understand and effectively handle power relationships of stakeholders (Van der Jagt et al., in review).

Strategies to master this highly relevant challenge are, for example, to consciously set aside sufficient time for the development of a common vision, internal communication and clarification processes and the selection of a joint key topic to work on (Pregernig et al., 2018; Van der Jagt et al., 2017). As practice shows, a sensible balance between time and efforts reserved for co-design and for research is decisive for the satisfaction of all involved parties. Especially if project goals are highly ambitious, it is recommendable to do the co-design with a smaller core team only (Pregernig et al., 2018).

Scope setting – be it of regional and/or thematic nature – is thus a relevant success factor of a Living Lab (Van der Jagt et al., 2017; Pregernig et al., 2018). Furthermore, as demonstrated by the case studies of Nocera Inferiore and Isar, it might be wise to **work with, and not against the divergent interests** of a heterogeneous stakeholder group (Scolobig et al., 2016; Linnerooth-Bayer et al., 2016b; Engels et al., 2018a). For being able to do so, a key to success is **professional facilitation**. Herein, a relevant lesson from Living Lab field work is that researchers should be **familiar with the community** in which the lab takes place (Renn, 2018).

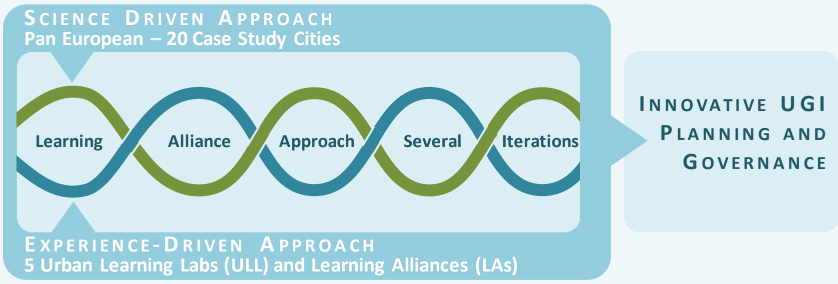
A common bottleneck related to the stakeholder group of a Living Lab is **user engagement and incentivation**. As Mulder et al. (2009:2) stated, "Living Labs seem to operate on the implicit assumption that users are cheap/unpaid contributors, motivated by the mere anticipation that their participation will solve their problems." In this context, it is important to make transparent the benefits to all agents at the very outset, and especially to deliberately involve users in the ideation and evaluation of a Living Lab process (Dutilleul et al., 2010). Another hill to climb is to achieve a sound **social inclusiveness and stakeholder representation**, instead of only getting the "usual suspects" on board of the process or working with "watered-down-versions" (Hauck et al., 2016:3) of stakeholder participation (Reed, 2008; Van der Jagt et al., in review). Especially salient stakeholders with high degrees of power and interest are meaningful when it comes to identifying the key problems and solutions in a community (Van der Jagt et al., in review). To do this problem identification without them might hamper a Living Lab substantially, or lead to implementation hindrances as a consequence. Promising ways out are to invest sufficient time and resources in a sound screening and selection of stakeholders (Renn, 2018), and employ a suitable set of **stakeholder identification and analysis tools** for this purpose (Smith et al., 2015). Furthermore, the consideration of proper incentives, such as **funding** options, plays an important role (Van der Jagt et al., 2017).

Snapshot: Co-creating Urban Green Infrastructure, GREEN SURGE project

Background of the project

GREEN SURGE was a project funded by the 7th Framework Program of the European Union (2013-2017). Its main target was to study opportunities and barriers to the implementation of Urban Green Infrastructure (UGI) in the European urban sector. More specifically, it intended to provide fora of joint working and transdisciplinary research for co-producing knowledge on: i) The functional linkages between green space components, biocultural diversity and the provision of ecosystem services; ii) the testing of tools for UGI planning, delivery and governance; and iii) the analysis of synergies and trade-offs between societal demands for ecosystem services provided by urban green spaces and economic development as well as human well-being at city level (http://greensurge.eu/wp7/).

To reach this goal, it applied a “double-helix” collaborative learning approach, representing the idea of an iterative exchange of top-down knowledge gained within the different project work packages, with bottom-up knowledge contributed by local Learning Alliances (LAs) and Urban Learning Labs (ULLs). These were established in the five cities Bari (Italy), Berlin (Germany), Edinburgh (United Kingdom), Ljubljana (Slovenia) and Malmö (Sweden).



The “double-helix” project approach of GREEN SURGE. Based on: Van der Jagt et al., 2017

Conceptual approach

GREEN SURGE applied a nested approach with Learning Alliances acting as platforms for intensive knowledge exchange between researchers and stakeholders, and Urban Learning Labs linking up the Learning Alliances with the broader stakeholder landscape. This explicit combination of two different kinds of platforms for stakeholder exchange in each case study city was novel, and chosen in the pursue of enabling an intensive joint work on particular UGI challenges by means of Learning Alliances on the one hand; and improving their legitimacy by building synergies towards existing initiatives on behalf of events and workshops promoted by the Urban Learning Labs on the other hand (Van der Jagt et al., in review).

The decision to go for Learning Alliances instead of Urban Living Labs was taken on the background of the project’s intention to contribute to a more integral management of UGI in European cities, instead of creating or testing them in real-life contexts (Van der Jagt et al., in review).

Participatory process design

The "double helix" model of knowledge exchange was operationalized in GREEN SURGE along four milestones (Van der Jagt et al., 2017):

A) LA process initiation,

B) Effective facilitation and coordination,

C) Iterative knowledge exchange and experimentation, and

D) Implementation of the LA process outcomes.

Key features of the GREEN SURGE approach to knowledge co-creation were to allow for a preparatory stage of trust-building between local stakeholders and researchers, and predefining only few criteria for the key topic selection. Another feature was the distinct decision to establish regular meeting schedules and share process summaries with the project consortium in regular intervals to foster the iterative nature of knowledge exchange. In order to guarantee the consideration of different scales, the Learning Alliances had to regard diverse groups of UGI stakeholders (NGOs, local government, community groups, etc.) and to take care of salient stakeholders' inclusion possessing senior decision-making powers. Finally, the combination with the Urban Learning Labs provided the necessary connectivity with existing networks (Van der Jagt et al., in review).

Encountered Challenges

The application of the pioneering "double-helix" model in GREEN SURGE brought along several challenges to overcome: most importantly and concerning the Learning Alliances, a high variability and unevenness in pace and intensity of science-practice knowledge-exchange was experienced across the five cities. As the milestone analysis pointed out, the biggest hurdle to take was the stage of initiation (A) This was partly due to a lack of funding for LA partners, and also a deficient comprehension of possible research benefits to the local processes.

With regard to the second milestone of the process, the effective facilitation and coordination (B), facilitators were sometimes hampered by utilizing support tools, and especially saw themselves challenged by the maintenance of a regular meeting schedule with the involved stakeholders.

Bottlenecks for the iterative knowledge exchange and experimentation (C) were especially the obvious mismatch of the project's research agenda with local policy priorities, shifts in political leadership or support of previously agreed topics and time constraints. As for the final milestone, the implementation of the process outcomes (D), challenges consisted in the gain of political backing for ideas developed through the Learning Alliance process and the need to ensure long-term continuity of green spaces.

From researchers' perspective the main challenges encountered in engaging with local stakeholder platforms were that the labs often became the "receiving end" due to the time-intensive need to establish their shared interests, while the research agenda was already set and followed (Van der Jagt et al., 2017). Furthermore, facilitators were partly unable to support a constructive dialogue with local stake-holders due to language barriers, lack of stakeholder engagement skills, time constraints; and a complex project terminology.

Finally, researchers felt also restricted by limited opportunities to build a shared understanding with local stakeholders due to limited time budgeted for iterative knowledge exchange.

Outcomes

Despite the encountered challenges, the process evaluation showed that GREEN SURGE had clear impacts on urban green spaces and UGI planning throughout the five case cities. Most notably, ways of thinking about UGI and on resources to deliver them were influenced. Process participants got motivated to test new planning concepts, and practitioners were more self-confident in effectively planning UGI. In the LAs, characterized by a fixed membership and repetitive meetings, attitudinal changes could be observed more clearly than in the ULLs that met infrequently. The benefits of researchers circled mostly around their improved ability to access local knowledge and new partnerships (Van der Jagt et al., 2017).

Key recommendations for effective co-creation processes

Apart from its achievements, the GREEN SURGE project resulted in a set of important insights being of interest for professionals working at the science-practice interface also beyond the urban sector. For the design of effective co-creation processes, the experiences made during four years of work and research with the LAs and ULLs highlight the following factors to be of key importance (Van der Jagt et al., 2017):

Meeting schedule and funding: it is advisable to take care of a predefined regular meeting schedule and balanced funding to partners for incentivizing and keeping up stakeholder engagement throughout the process;

Focus and stakeholder set-up: a lab initiative should develop a shared vision and a key topic to work on at the outset of its process. A clear definition of and consensus on the precise knowledge needs on behalf of local stakeholders are thus important prerequisites to kick-off knowledge co-creation work. To select and keep the relevant stakeholders committed, sound stakeholder identification, analysis and monitoring tools should be applied;

Sharing results: should take place frequently, transparently – and most relevant – in accessible language, considering practitioner capacity;

Tailored tools: the application of tools and methods should fit to local needs. The focus should thus be rather shifted from developing new tools, to supporting lab initiatives in the application of existing methods;

Sound facilitation and time: the necessity of a professional facilitation of co-creation processes should not be under-estimated, i.e. a proper consideration of professional facilitation and training to non-expert facilitators is advisable. Stakeholder engagement is time-intensive; projects should budget time for it.

Credit

This case study builds on the extended research work of the GREEN SURGE team, explicitly of Work packages 7/ 8, described in:

Van der Jagt A, Anton B, Reil A, DeBellis Y, Fischer L, Kowarik I, Cvejić R, Mårsén A. (2017) Cities and Researchers learning together: What does it take? Evaluating the process of iterative knowledge exchange and out-comes generated in each of the Urban Learning Labs and Learning Alliances. GREEN SURGE Deliverable 8.7.

Van der Jagt A, Smith M, Ambrose-Oji B, Konijnendijk C C, Giannico V, Haase D, Lafortezza R, Nastran M, Pintar M, Železnikar Š and R Cvejić (in review): Co-creating urban green infrastructure connecting people and nature: A guiding framework and approach. (In review).

Challenges and Success Factors related to the Living Lab process

Risk of failure is inherent to an innovation process. However, recognition of key success factors should increase the success potential. One of the most critical factors is the quality of **facilitation**. Language barriers; time constraints; deficient skills or own interests and agendas may stand in the way of being a proper facilitator of a Living Lab. As the intensive review study on stakeholder participation for environmental management decisions by Reed (2008) underpins, sound facilitation does not mean to have a toolbox at hand only; it calls for the skilled initialization and steering of a process based on trust, mutual learning and open-mindedness, for the adaptation of tools to the very specific needs and interests of different stakeholders, and for avoiding stakeholder fatigue (Reed, 2008; Hauck et al., 2016). Important preconditions to conquer these issues are i) to **consciously design** the intent, scope and intensity of **participation early and systematically**; ii) to set **clear rules** on how decisions will be made in the Living Lab (Pregernig et al., 2018); iii) to care for **professional facilitation**, additional expertise or at the very least training of non-expert facilitators; and iv) to provide a **regular meeting schedule** being agreed upon and used as "red line" by the facilitator. Transparent sharing of minutes of meeting at regular intervals with stakeholders outside the process increases the legitimacy of the Living Lab's work (Scolobig et al., 2016; Van der Jagt et al., 2017).

Another key factor is the balance of the researcher-practitioner interface. A challenge being encountered here is the **adaptation of the research agenda** of the involved knowledge institutions **to the needs of local stakeholders**. This decisive matching process can easily be hampered in the face of fully packed and timely-bound research agendas. As local knowledge demands can "hardly be ascertained ahead of a project" or be elicited in a rush at the outset of a Living Lab, there is the danger that the processes of research development and local demand building do not go hand in hand (Van der Jagt et al., 2017: 48). Strategies to attain the matching are to carefully plan for local **demand assessments early on** and to put **sufficient time** in the project agenda to allow for abundant contact between researchers and non-academic partners.

An additional important milestone on the way to a successful Living Lab process is the **achievement of an iterative knowledge exchange on eye-level**. Experiences from the ground show that it can be questionable for practitioners and policy-makers to get on board of a process of knowledge exchange with stakeholders that do not necessarily have to be consulted. Furthermore, as observed in the Isar case study and described in literature, especially non-academic participants may be frustrated to learn that their influence on the research agenda is not very far-reaching (Van der Jagt et al., 2017). From researchers' perspective, the value of different knowledge types is not always appreciated. Besides, it is demanding for some partners to possess the necessary flexibility to new knowledge provision even after initial solutions are already agreed upon (Van der Jagt et al., in review). To address the user's role correctly thus means not to "use the users as ginny pigs for experiments" (Eriksson et al., 2005:3), but instead to get access to their ideas and knowledge on eye-level (Schneidewind et al., 2018).

Snapshot: Isar Plan – A Living Lab for the Isar River restoration, Germany

Case site description

The Isar River sources in Austria, drains the Northern Alps, flows north crossing the city of Munich, and after 291 kilometres joins the Danube River. It is a typical alpine river with changing river bed, extensive gravel banks, and many river branches (Küster et al., 2011). It is the fourth largest river in Bavaria but was never built for navigation. Major hydro-morphological modifications had begun in the 1920s with the construction of 43 hydroelectric power plants. Grey infrastructure implemented to improve economic use capacities (e.g. hydro-electrical production) and to protect cities against flood risks fixed the river in a linear channel with trapezoidal cross-section, comprising the main channel, forelands, flood meadows and flanking flood embankments. Furthermore, the river water was diverted several times, and the Sylvenstein Reservoir was built in the Upper Isar to mitigate flood risk, to ensure constant water supply for hydroelectric power plants and cooling water for nuclear and thermal power plants. As a result of these hydro-morphological modifications (Mallach, 1997), the Isar River went on losing its natural torrential river character and its floodplain became settled by growing cities (Zinsser, 1999).

Project drivers

In the 1980s, the state of Bavaria in cooperation with city governments and other relevant stakeholders started to cooperate in the design and implementation of an impressive river restoration (Hornung, 2008; Lieckfeld, 2003). One of the leading project initiatives called the "Isar Plan" was initialized benefiting from several local driving forces:

First, a hydrological modelling procedure identified major gaps within the flood protection strategy. For example, hydraulic calculation proofed freeboard deficiencies of up to one meter meaning that the dams would not secure the capital city of Munich against the HQ100 flood. On this background, the local water agencies were urged to design an efficient flood protection concept (Uli, 1988).

Second, the poor water quality had been denounced by the European Union (Döring et al., 2010). The Isar River supported many recreational uses, but the water quality was not sufficient to enable swimming activities according to the European regulations. Local authorities were concerned about health safety of the citizens and demanded the authorities in charge to assure recreational uses.

Third, the residual water quantity flowing the river bed was not sufficient to support ecological and social functions (Heckmann et al., 2017). Most of the river water had been diverted inside a parallel channel to supply the hydro-electrical power plants. The river fell dry during summer, impairing diversity and recreational uses. User associations and environmental NGOs under the umbrella of the Isar Allianz complained by the authorities in charge (Mallach, 1997).

Finally, the landscape aesthetic had been damaged by the grey infrastructure interventions and caused e.g. decrease of the cultural identity and pride (Rädlinger, 2011). The association Isartal stated a decrease of the overall landscape quality and demanded the restoration of the wild river characteristics of the Isar River.

These drivers resulted in the set-up of an 11-years participatory process that led to the design of the "Isar Plan" project (1999-2011), budgeting €35 million for the restoration of 8 kilometers of the Isar.

Stakeholder set-up and participatory process

The "Isar Plan" was a forerunner in many aspects. For example, while at this date only few participation approaches had been used for large-scale planning, the project applied a Living Lab approach including the quadruple helix actor system (see Chap. 3.1) into the planning and implementation of the project.

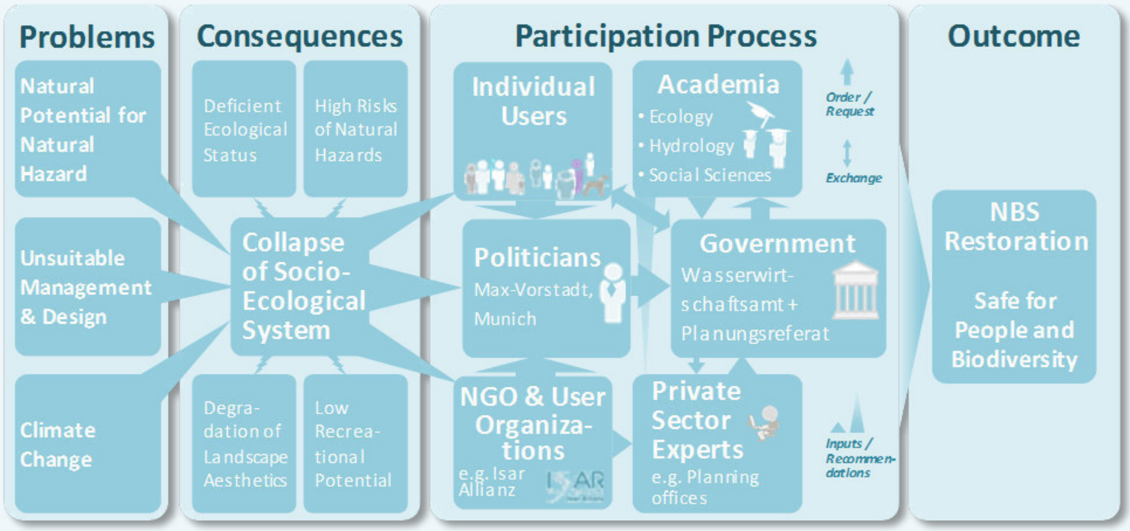
The Public sector was in charge of the project (Rädlinger et al., 2012), being represented by the Water Agency and the Munich City government. Their involvement assured taking into account legal constraints. Although many employees participated in the planning process, two leaders (one of each institution) carried out the Living Lab procedure. The public sector frequently invited and received "uninvited" academia, users and the private sector partners to join the planning team. Users participated in two different ways and intensities in the planning process. First, NGOs of nature conservation associations and user organizations (e.g. Canoeing Association) were invited by the authorities in charge to participate but also lobbied and pressured the authorities using press releases. They gathered into the "Isar Allianz" which played the role of building a bridge between NGOs with different interests and the public sector representatives. However, its influence was limited by legal aspects, as the "Isar Allianz" in its function as NGO did not have a legal status to interfere with planning processes.

Second, the public sector initiated and financed the "Münchner Forum" as an outreach entity to deliver project information, using exhibitions, conferences, brochures, etc., and to collect citizen opinions through workshops, round tables, interviews and opinion surveys.

As for Academia, both universities of Munich, namely the Technical University of Munich (TUM) and the Ludwig Maximilians University (LMU), joined the planning process for specific tasks. For example, during the first phase of the project, the Chair and Institute of Landscape Architecture provided support to identify project goals. During the co-design phase, the Chair of Hydraulic and Water Resources Engineering modeled the river to investigate sediment transport and flow distribution in the case of different prototypes. During the evaluation phase, many Chairs were consulted to identify suitable indicators and monitoring procedures (Angerer et al., 2009).

The Private sector also joined the planning process. First, negotiations between NGOs, authorities and energy producers occurred in the early step of the project to establish a new exploitation contract and let more water in the river for the ecological recovery and consequently to divert less water reducing economic benefits. Second, planning offices were invited during workshops to design feasible solutions considering the various demands.

Interestingly, the participatory process was not planned, designed and implemented following a fixed frame, but rather matured during project implementation of the "Isar Plan". During the first phase of the project, goals were set and opportunities explored.



Composition of the Isar Living Lab and relations between its key components. Design: Christian Smida

The authorities in charge initiated a consultative process, inviting organizations of importance for a workshop ("Isar Colloquium").

Then the co-design of the detailed solution was based on biannual to weekly workshops and meetings. The frequency of the meetings depended on the advancement of the planning process. In parallel to this phase, intensive informative and consultative processes were applied by the "Münchner Forum". Despite of close cooperation, a part of the project was rejected by the users shortly before its implementation. Upon rejection, even more intensive co-design procedures were undertaken, achieving a consensus few months later.

Challenges

The co-design process of the Isar River restoration faced many challenges. The three most important were the following ones:

First, nature-based solutions (NBSs) conflicted with the long-term history of grey infrastructure implementation. Doubts from all actor groups existed and had to be overcome.

Then, technical challenges were important. In the late 1990s, little experience on NBSs existed and many prototypes had to be tested to assure efficiency. Furthermore, restricted space and budget were strong limiting factors.

Moreover, interest conflicts had to find a common ground. Even between NGOs for nature conservation interests diverted. Thanks to a sound facilitation work of the Isar Allianz leaders, associations committed to work on a common vision diminishing historical conflicts.

Finally, planners had to face the reality that the Isar River itself was an active partner of the co-design procedure. During the project, the design of the restoration had to be adapted to correspond to river changing processes as reaction to its new morphological status.

Project outcomes

The project reached its goals assuring flood protection, improving the river ecological status, and achieving a good water quality. By applying a Living Lab approach during 11 years, the recreational potential of the riverine area was increased, and the alpine river character reestablished (Binder, 2010; N. Döring & Jochum, 2006; Sartori, 2010).

A special role in the overall process can be seen in the NGOs and especially in the Isar Allianz to bring forward the Isar River restoration. Besides, the openness of the involved public authorities to share power and take into consideration citizens voices on abundant occasions, contributed to the success of the Isar Plan.

The Isar restoration did not begin and will not stop with this project (Renner et al., 2012). Further local initiatives restored other river sections, and a major project downstream is in the early stage of an even more intensive participatory process initiating a large Living Lab approach based on the experiences made during the Isar Plan project (Benker et al., 2012).

Credit

This case study builds on a literature review and stakeholder interviews.

Binder, W. (2010). The Restoration of the Isar South of Munich. Wasserwirtschaft, 100(3), 15-19.

Döring, N., & Binder, W. (2010). Die neue Isar/1 - Renaturierung, kulturelle Öffnung und Ideen-Fluß, Geschichtliches wie Literarisches (R. Sartori Ed.). Munich, Germany: buch & media.

Rädlinger, C. (2011). Neues Leben für die Isar. Munich, Germany: Schiermeier

Zech, U. (1988). Isar Plan - Bericht über das Isar-Colloquim. Munich, Germany: City of Munich.

Zinsser, T. (1999). Der Isar-Plan. Neues Leben für die Isar. Infoblatt Wasserwirtschaftsamt München, 3.

The authors thank all interviewees and gratefully acknowledge the constructive meetings and interviews with Niko Döring, Rolf Renner, Walter Binder and Klaus Bäumler.

Isar River Restoration (Aude Zingraff-Hamed, May 2015)

On the way to achieve the desired process of "give and take" one important step is thus a clear formulation **of roles and expectations** of all partners at the outset. Likewise, it is advisable to jointly identify and **define knowledge demands and learning goals** of Living Lab participants when starting into a knowledge co-creation endeavour. Once these learning objectives are set, they might be included in the monitoring and evaluation system of a Living Lab process, giving the opportunity to adapt the process accordingly in case of failures or user dissatisfaction (Singer-Brodowsky et al., 2018). To avoid that users become the "receiving end" of a Living Lab process (Van der Jagt et al., 2017:42), a strong commitment of all involved work packages to engage with Living Lab participants is key. This should go hand-in-hand with the willingness to slip into "new shoes" and to join the necessary **two-way dialogue** to new knowledge production (see Snapshot Nocera Inferiore).

Challenges and Success Factors related to Living Lab outcomes

At the very end of a Living Lab process, the desired outcomes are agreed innovative solutions, their **implementation and further uptake** (Steen et al., 2017a).

As for the implementation of Living Lab outcomes, reported challenges centre on the long-term continuity of established stakeholder partnerships, and the necessary societal, financial and political support being in place to turn innovative solutions into reality (Van der Jagt et al., 2017). Success factors in this context include a careful **contextualization** of the Living Lab **work to given local strategies and policy frameworks** from the very beginning. Likewise, the **continuous networking** of the Living Lab on both horizontal and vertical levels with relevant stakeholders outside the process should not be overlooked.

Finally, the **evaluation of the Living Lab impacts** in terms of process and its outcomes can be a demanding endeavour. As the literature review for this Guiding Framework indicates, there is still need for research in this aspect. Nevertheless, to demonstrate a Living Lab's impact, a sound **monitoring and evaluation scheme** should be designed and applied accordingly. In GREEN SURGE (see Snapshot) good experiences were made e.g. with tools to assess process inclusiveness and stakeholder empowerment over time (Van der Jagt et al., 2017; Van der Jagt et al., in review).

In a nutshell

Despite its promising advantages, such as a high potential for innovation and systematic learning, reduced risks of policy and business failures and more sustainable solutions due to the integration of stakeholders' requirements (Steen et al., 2017a), the Living Lab approach bears several challenges to those who apply it when starting a knowledge co-production process.
The three case studies introduced in this chapter as snapshots demonstrate that each Living Lab process is unique in its concept, stakeholder constellation, and outcomes (see Tab. 3.5). They all show impressively, however, that individual recipes could be found within each process to deal with the demands, and that the resulting solutions were worthwhile the employed efforts.

Table 3.5. Living Lab challenges and key factors of the 3 Snapshot cases to achieve an efficient participatory process at a glance

Snapshot Case Title	Challenges	Key Factors
Nocera Inferiore town, Italy	× Data uncertainties × Complex and changing institutional landscape × Design and choice of suitable facilitation methods, especially for conflict mitigation × Switch from one-way consultancy to two-way knowledge co-production	✓ Relevant drivers in place: stalemate and plan rejection as entry points ✓ Compromise instead of consensus solution; working with conflicting stakeholder views ✓ Financial backing by EU SafeLand project and earmarked funds ✓ Variety of participation options: Core group for co-design process combined with outreach activities
Green Surge Project, EU	× Matching of research agenda with local needs × Achieve iterative knowledge exchange on "equal grounds" × High variability and unevenness in intensity and pace of science-practitioner knowledge exchange across 5 cities × Facilitation: language barriers; time constraints; accessible language	✓ Selection of key topic to work on at the outset of Learning Alliance process ✓ Allow for time of joint vision development ✓ Employ regular meeting schedules ✓ Tailor made tools of stakeholder analysis and monitoring ✓ Combination of two stake-holder involvement fora: horizontal and vertical stakeholder networking
Isar River restoration, Germany	× Long-term history of grey infrastructure implementation × Space and budget limitations × Deficient practice with Nature-based solutions × Common vision development among multitude of actors × Major interest conflicts	✓ Powerful drivers in place ✓ Well organized cooperation ✓ Open-minded stakeholders with power to move the process ahead ✓ High motivation of NGOs ✓ Financial backing: ear-marked budget for Isar Plan ✓ Variety of participation options: Combination of small circles and broader public (Munich Forum; Isar Colloquium; etc.) ✓ Trusted stakeholders

As the review of experiences reported from theory and practice illustrates, there is a rich and encouraging pool of lessons available to be utilized for the design and establishment of new Living Lab processes.

3.4 The 10 Do's and Don'ts of a Living Lab

Upon analysis of contemporary theory and practice, this chapter synthesizes the identified key insights into a practicable list of 5 success factors ("Do's) and 5 shortcomings ("Don'ts") being common when applying a Living Lab approach.

In this way, the target groups of the present Guiding Framework receive a quick-and-easy overview on key issues to be considered when establishing and running a Living Lab process.

DO

…invest sufficient time in a Living Lab's preparatory stage, undertaking a sound demand assessment; governance analysis; stakeholder identification and analysis; common goal and scope setting; participatory strategy design and work plan elaboration.

DO

…take care of a robust and legitimate stakeholder set-up for your Living Lab, regarding representatives from public and private sectors; knowledge institutions and citizenship, orientated by strong commitment, diversity of backgrounds, and counting on a reasonable mix of players with different positional power-degrees (including key players, primary and secondary stakeholders; overlooked ones; potentially interested ones).

DO

…formalize your Living Lab, as it can mean a step ahead in terms of empowerment and legitimacy, also with view on the process outcomes. Where possible, link the Living Lab to already existing initiatives and networks, and align the process to them. Support the identity of your Living Lab, e.g. by website presence and a name.

DO

…pro-actively work towards a synchronization of local demand articulation and research development processes, so that scientific knowledge provision will match with local demands and expectations.

DO

…establish and commit to clear rules at the outset of your Living Lab process. Take especially care of an unambiguous role clarification of all agents and provide a regular meeting schedule for your process. Enable abundant opportunities for stakeholder exchange, and share process steps and documents in regular intervals with relevant stakeholders outside of the Living Lab process.

DON'T
…utilize a Living Lab as a forum of constructing acceptance for an already existing solution, but allow for a true co-creation of new, innovative solutions from scientific and non-scientific partners' knowledge.

DON'T
…take user engagement for granted. There must be a clear gain, tangible benefits and suitable drivers in place for all involved Living Lab participants to get committed, and to keep up momentum of stakeholder engagement throughout the process. Invest time and efforts to carve out these incentives early on.

DON'T
…overlook the need of skilled facilitation for a Living Lab process. Eventual language, cognitive and motivational barriers need to be handled by a professional, who is familiar with the context the Living Lab is operating in, and trained to manage the science-practitioner interface.

DON'T
…underestimate the time needed for a sound Living Lab process. Working in real-world contexts means to be dependent on societal, political and cultural proper times which cannot be accelerated.

DON'T
…fear or work against the plurality of perspectives, but address them in a suitable manner. This may call for leaving traditional pathways of seeking for the one "best solution" in harmony, and to work on a worthwhile process of negotiating a compromise instead.

The compilation of this list of "Do's and Don'ts" was based on the literature review and case study analysis described for this Guiding Framework (see Chap. 2). It especially leans on the reflections of Axelsson, 2010; Dutilleul et al., 2010; Engels et al., 2018a; Engels et al., 2018b; Hauck et al; 2016; Linnerooth-Bayer et al., 2016b; Menny et al., 2018; Parodi et al., 2018; Paskalevka et al., 2015; Reed, 2008; Renn, 2018; Scolobig et al., 2016; SDC, 2012; Tress et al., 2006b; Van der Jagt et al., 2017.

4 PHUSICOS Living Lab guidance

What matters when setting up and running a Living Lab?

4.1 Building a PHUSICOS working definition of Living Lab

As outlined in the previous chapter (see Chap. 3), the success of a transdisciplinary project – and thus also of a Living Lab process – is closely connected to a clear and unambiguous terminology. Transparency and a common understanding of key terms and concepts are important preconditions for a fruitful and efficient project delivery and decisive to achieve the desired outcomes (Tress et al., 2006a, b; Steen et al., 2017b).

Following this argumentation and the obvious "opaqueness" of the Living Lab term being witnessed by the abundant literature on definitions (see Chap. 3.1), this Guiding Framework suggests a set of concrete principles for the set-up, implementation and quality management of the PHUSICOS Living Labs at demonstrator and concept case study sites.

The proposed set of principles has been inspired by the deliberations by Steen et al. (2017b), Ridder et al. (2015) and Van Well (2018), and is rooted in the literature review employed for this deliverable (see Chap. 2). A summary of these principles is provided in Table 4.1, with a more detailed explanation of each principle in the text below.

Table 4.1. The set of defining principles of a PHUSICOS Living Lab (LL)

P	**Purpose**	LL work aims at innovation and learning for replication, being guided by a clear scope and key topic of joint interest to work on.
H	**Heterogeneity**	LL work rests on heterogeneity of the stakeholder group and considers it as strength. It includes the 4 core partners: public sector, private sector, users and knowledge institutions, which all possess decisional power.
U	**User-Centred**	LL work starts from a clear articulation of user demands, and involves them by combining different levels of participation.
S	**Sensitivity**	LL work is sensitive to the local context it is embedded in, including relevant local policy, governance and socio-cultural factors.
I	**Iteration**	LL work is based on a culture of feedback, evaluation and continuous improvement.
C	**Co-Creation**	Users participate not only in the implementation, but in the full development of the intended innovation.
O	**Open-Mindedness**	LL work is characterized by a strong open-mindedness of all LL participants towards the co-production of joint new knowledge.
S	**Sustainability**	LL work is directed towards sustainable outcomes and enduring partnerships.

The PHUSICOS Living Lab set of principles is meant to orientate the target groups of this Guiding Framework, explicitly the local facilitators at the demonstrator and concept case study sites, in the design of their individual Living Lab processes. It intends to provide transparency on how a Living Lab is understood and conceptualized in the framework of PHUSICOS, and thus builds a common ground to start from at the outset of the project.

As stated in the introduction (see Chap. 1.3), it is not only the Guiding Framework which needs to be operationalized and filled with individuality by the case sites themselves. It is also the set of principles, which will only fulfil its purpose by a sound transfer into local contexts: literally, by translating the Living Lab principles into the case study languages (Norwegian; French, Spanish & Catalan; Italian; German), but also in a wider sense, by elaborating on them according to individual needs.

The PHUSICOS Living Lab principles are defined as follows:

P for Purpose:
A PHUSICOS Living Lab aims to foster innovative nature-based solutions (NBSs) to face natural hazards and improve resilience against climate change in European mountainous regions. To achieve this goal, it defines a clear and realistic scope for its work process at the outset, and invests time and efforts to identify a key topic of joint local interest to work on throughout – and ideally beyond – the project's duration.

H for Heterogeneity:
A PHUSICOS Living Lab profits from the identification and commitment of a wide range of diverse and heterogeneous relevant stakeholders, being representative of the community it is operated in in terms of gender, age, disciplines, power and culture. It guarantees social inclusiveness to the best possible extent by the application of tailored stakeholder identification and analysis tools for compiling the stakeholder group, and makes sure the Living Lab includes participants from the 4 core sectors: public, private, users and knowledge institutions, which all possess decisional power.

U for User-Centred:
A PHUSICOS Living Lab is aware that user demands are at the core of its work. Thus, its point of departure is a sound and clear assessment of local demands related to NBSs, accepting also an eventual plurality of perspectives. Furthermore, users are engaged as active and committed partners of the Living Lab, allowing for different levels of participation by combining tailored methods appropriately.

S for Sensitivity:
A PHUSICOS Living Lab makes sure that its NBS-related outcomes are in-line with relevant local policy and governance frameworks, and that it regards socio-cultural factors to the desired extent. It is thus closely connected to its local context, while intertwining its activities also vertically with stakeholders outside its local Living Lab process, and taking care of the necessary sharing and upscaling of its results.

I for Iteration:
A PHUSICOS Living Lab operates based on a culture of feedback, evaluation and continuous improvement. This is achieved by employing tailored monitoring and evaluation tools to assess the Living Lab participants' satisfaction throughout the process, and to utilize the results for its successful steering. Furthermore, iteration is achieved by establishing and maintaining an iterative knowledge exchange between Living Labs and all work packages on eye-level, and by matching local demand articulation with research agendas. Time is calculated for these important processes at the science-practitioners' interface; opportunities of exchange (e.g. field trips; workshops) are utilized; eventual language and other barriers are sought to be overcome by professional facilitation.

C for Co-Creation:
A PHUSICOS Living Lab allows for user engagement in all stages of the NBS development. That said, Living Lab participants are enabled to build up ownership for the innovative solution they are heading for, accompanying the NBS step by step through its stages, and may have a word in its selection; co-design; implementation and performance evaluation.

O for Open-Mindedness:
A PHUSICOS Living Lab is characterized by a strong open-mindedness of all participants towards the co-production of joint new knowledge on NBSs. Academic and non-academic knowledge types are equally appreciated, recognizing that only hybrid knowledge can lead to the desired innovative solutions to reduce the risk associated with natural hazards in the face of climate change. Willingness and commitment are in place to give up traditional roles and mechanisms, and to enable joint and mutual learning.

S for Sustainability:
A PHUSICOS Living Lab works towards NBS outcomes which contribute to increasing the local community's overall sustainability. Partnerships being established to operate the Living Lab seek to be enduring, ideally beyond the project's duration.

In the following sections (see Chap. 4.2-4.4), the set of PHUSICOS Living Lab principles are further operationalized, putting an explicit focus on the first important steps in preparing a PHUSICOS Living Lab.

Chapter 4.2 PURPOSE focuses on the necessity of purpose- and scope-setting of the Living Lab process, chapter 4.3 PEOPLE describes the key demands concerning the facilitator profile and possible tools for stakeholder identification and analysis, and finally chapter 4.4 POLICY hints at the relevant socio-cultural factors when planning for a Living Lab.

4.2 PURPOSE: Having a clear goal and scope of stakeholder involvement

Before starting into the more detailed planning of the individual PHUSICOS Living Lab process at demonstrator and concept case study sites, a fundamental preparatory step is to define the exact goal and scope of the intended stakeholder involvement. Practice experiences from Living Lab processes clearly indicate that an over-stretched agenda, a missing spatial or thematic scope, or falsely selected and changing topics over time might be obstacles to achieving an effective Living Lab process (Pregernig et al., 2018; Van der Jagt et al., 2017).

Next to the definition of a precise Living Lab scope and purpose, there is also the need of reflecting upon and carefully planning the stakeholder participation process itself. As Reed (2008) observed in the framework of his studies on stakeholder participation parameters of environmental management projects, the nature of the participatory process is decisive for the quality of the resulting solutions. Consequently, the determination of the further Living Lab participation strategy, including tailoring levels and tools of stakeholder engagement, can only take place when targets are clearly set by the owners of the individual Living Lab process. Herein – and turning the PHUSICOS Living Lab principles (see Chap. 4.1) into action – it should be observed that this goal and scope setting is ideally conceptualized in an iterative manner and based on a sound dialogue with (potential) Living Lab participants early on. Table 4.2 offers a set of guiding questions to assist the local case study teams in setting a clear scope and goals of their PHUSICOS Living Labs. It might be operationalized on occasion of a brain-storming session, and further refined upon a more comprehensive state-of-the-art assessment (see Chap. 5) of the site prior to the Living Lab kick-off.

Table 4.2. Parameters and Key questions for scope setting of a PHUSICOS Living Lab

Parameter	Key Questions
Overall goal of the Living Lab	Why is a Living Lab process needed and meaningful to the local case study site?
Purpose of the Living Lab	Which purpose shall the Living Lab serve more precisely? Shall it support… NBS selection / design / planning / implementation / performance evaluation?
Scope of the Living Lab	Which spatial / temporal / thematic scope shall the Living Lab have?
Intended participation goals	When in the NBS process and to which extent is stakeholder involvement intended, and for which aims more precisely?
Intended role distribution	Which roles shall Living Lab stakeholders have in the process?
Scope for influence	What is the scope for influence the Living lab is intended to have upon the NBS implementation process? (open/restricted?)
Needs and knowledge demands	What are the (assumed) needs and knowledge demands of the local end-users and remaining Living Lab participants in detail?
Key topics	What are the (assumed) key topics of joint interest for the Living Lab to work on? What are the (hitherto) priorities of the actors in charge of the Lab process?

Furthermore, it is worthwhile to dedicate time to a proper analysis of the context the Living Lab will be operating in (see Chap. 4.4). This can help to detect important lessons from the past, identify relevant policy factors to consider and build a bridge for future synergies to nest the Living Lab to later on. Table 4.3 proposes a set of example questions which can support such a contextual analysis.

Table 4.3. Parameters and Key questions for describing the contextual setting of a PHUSICOS Living Lab

Parameter	Key Questions
Drivers	What are the exact drivers of the local Living Lab process and the choice for NBS solutions?
History / Expertise with stakeholder involvement processes for NBS	Which hitherto experiences have been made with stakeholder participation processes at the case site (or in neighbouring locations) in the realm of NBS?
Local stakeholder network characteristics and history	What does the local stakeholder arena look like? Are there any noteworthy conflicts or stalemates? What has been done to resolve these conflicts? Results?
Policy and governance framework	Which are the relevant local / regional policy and governance frameworks for the intended Living Lab process to support NBS implementation at the site?
Potential for nested approach	Are there any existing initiatives which the Living Lab could be linked to?

As soon as goal, scope and contextual setting are determined, it is time to think of the participation strategy. Stakeholder participation can have many faces, and be put into action at different levels, ranging from information and consultation, over involvement and collaboration up to empowerment (Ambrose-Oji et al., 2011; Hauck et al., 2016; Tress et al., 2006a). As the case study analysis has shown (see Chap. 3.3), the combination of different participation levels is promising for the success of a Living Lab. Therefore, it is not the "The more, the better"-principle that is decisive in the design of a suitable Living Lab participation strategy (Hage et al., 2010:262 cited in Menny et al., 2018). More importantly, one has to be sensitive about the local context and tailor the user engagement strategy accordingly. A lean co-design process, for instance, might be the right choice for a complex issue at stake, whereas a focused topic allows for a larger group of stakeholders to be involved (Pregernig et al., 2018).
To the PHUSICOS Living Labs at the demonstrator and concept case study sites, this means that clear decisions have to be taken at the outset, based on a sound scope and target setting, on how user engagement levels should look like precisely throughout the NBS's development stages(see Fig. 4.1)(see Chap. 5). Only then, the appropriate tools for stakeholder involvement can be chosen.

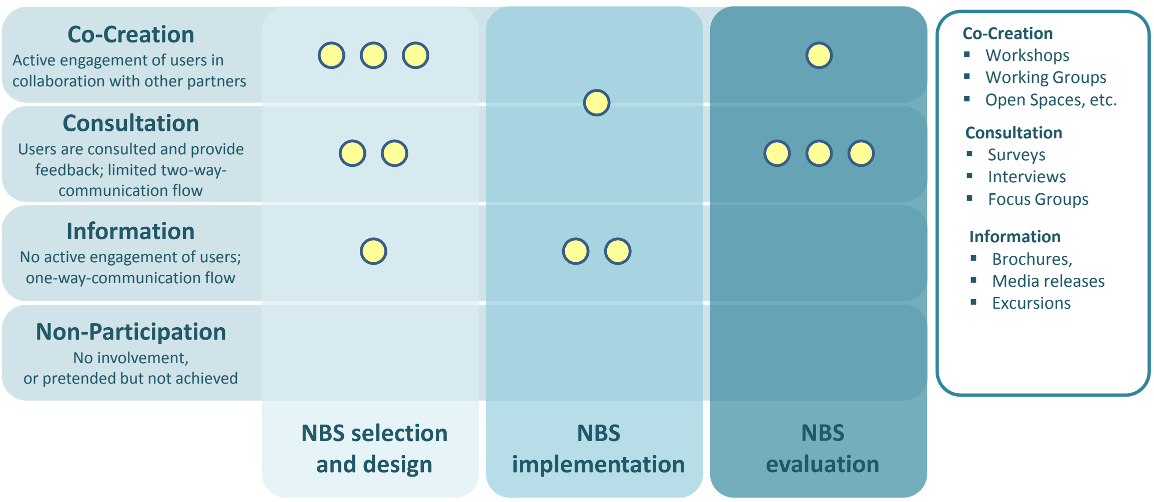


Figure 4.1. Combining levels of user engagement along the NBS development as strategy of a PHUSICOS Living Lab. Yellow circles represent different involvement methods (after Menny et al., 2018). Design: Christian Smida

4.3 PEOPLE: Having the right stakeholders and facilitator(s) on board

After having defined a clear purpose and scope, a fundamental task in the preparatory stage of setting up the PHUSICOS Living Lab is to dedicate sufficient time to the question: "Who should participate in the Living Lab?" This question has two important dimensions: on the one hand, it relates to the stakeholder group being of interest as participants of the local Living Lab process for the co-design of the intended nature-based solution (NBS); on the other hand it also refers to the facilitator(s) in charge of steering the future Living Lab process.

Although Living Lab literature gives some generic orientation on the stakeholder group's compilation, such as the demand on stakeholders being associated with the 4 core sectors (public and private sector, users and knowledge institutions), and informs important features on actor roles, an "ideal set-up" cannot be derived for the PHUSICOS Living Labs (see Fig. 4.2) (Steen et al., 2017a, b; Evans et al., 2017).

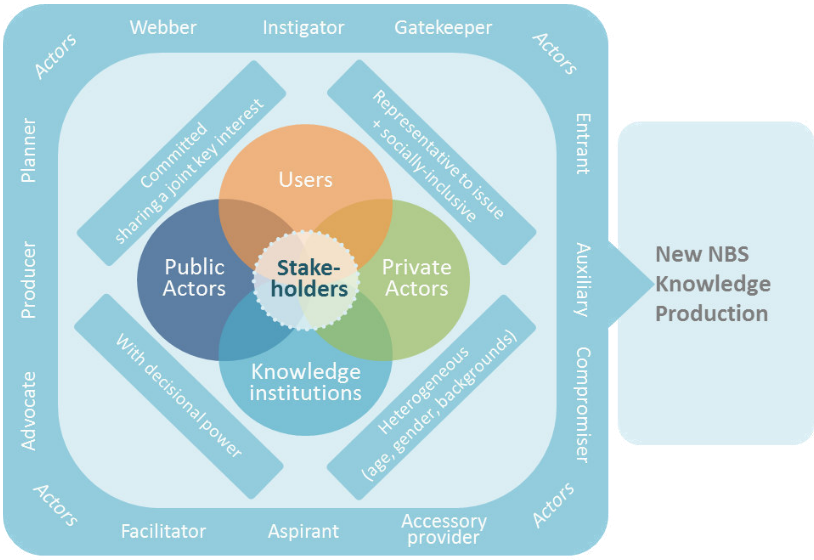


Figure 4.2. Generic orientation for the Stakeholder group composition of the PHUSICOS Living Lab. (Inspired by Steen et al., 2017b and Nyström et al., 2014). Design: Christian Smida

Other features mentioned in literature as being of major importance to the well-functioning of a Lab's stakeholder group are i) its strong commitment and sharing of a common key interest; ii) its representativeness to the issue and its social-inclusiveness; iii) its heterogeneity (age; gender; culture; background; perspectives) and iv) its capacity and power to decision-making (e.g. Reed, 2008; Reed et al., 2009; Engels et al., 2018b; Dvarioniene, 2015; Van der Jagt et al., 2017). Apart from this bigger picture, a closer look at the three case studies analysed for this Guiding Framework (see Chap. 3.3) suggests that open-minded and highly committed municipal authorities as well as strong NGOs and citizen initiatives acting on a formalized basis can make a mark in a Living Lab process. Nevertheless, as already stated for the participation strategy in the previous section (see Chap. 4.2), the stakeholder composition of the PHUSICOS Living Lab is equally context-bound and thus has to be decided upon by the local case study teams at the demonstrator and concept case sites in an individual manner.

A practicable set of guiding questions can serve as a point of departure for the further process of stakeholder identification and analysis for the Living Lab (see Tab. 4.4):

Table 4.4. Parameters and Key questions for identifying stakeholders of a PHUSICOS Living Lab (inspired by Hauck et al., 2016; SDC, 2012 and Zimmermann, 2006)

Parameter	Key Questions
Arena	What is the geographical focus of the planned NBS intervention, and which stakeholder arena is connected to it?
Primary stakeholders (beneficiaries and burden)	Who is directly affected by the planned NBS? Who benefits from the NBS? (= beneficiaries) Who is adversely affected by the NBS? (= burden)
Secondary stakeholders	Who is indirectly affected be the planned NBS? Who could have any interest to support or block the NBS?
Key players	Who are key actors related to the NBS? Who possesses power in terms of legitimacy; networks and/or resources?
Veto Players	Who are real and/or potential veto-players of the planned NBS intervention?
Supporters	Who are real and/or potential supporters of the planned NBS intervention?
Type of knowledge meaningful to PHUSICOS WP	Who are the relevant knowledge keepers to be able to contribute to the intended PHUSICOS interventions by Work Packages 4-7?

The stakeholder identification could be done by a simple brainstorming exercise executed by the local case study teams; ideally, relevant stakeholders will already take part to further refine and complete the enlistment upon snow-ball system (Ridder et al., 2005). In this way, overlooked and potentially interested stakeholders can be detected additionally.

In terms of tools for stakeholder identification, next to listings, common techniques are systematic sheets and matrices (see Appendix D) or mappings (see Appendix E). While matrices are suitable to document results of observations, brainstorming sessions and especially semi-structured interviews, mappings provide a comprehensive overview of stakeholder landscapes. In GREEN SURGE (see Chap. 3.3; Snapshot), a combined matrix-mind map approach was applied for stakeholder identification, using a matrix to compile relevant stakeholders by particular themes, and mind maps to capture the related stakeholder landscapes around them (Smith et al., 2015).

Once the stakeholders are identified, the next important task is their analysis. Herein, different aspects may be in focus, such as the power and interest related to the issue at stake; attitudinal aspects; outreach; mandates and strategic objectives; or alliances (Zimmermann, 2006; SDC, 2012). As diverse as the possible characteristics under investigation might be, such is the variety of existing tools for stakeholder analysis (Reed et al., 2009). Common techniques are the Power-Interest-Matrix (see Appendix F), Venn or spider web diagrams. Different methods can be selected to conduct a stakeholder analysis: while some of the tools are easy to handle in the framework of brainstorming sessions or focus groups, others might call for external expertise. An issue to consider is that stakeholder analysis should not only be of interest when preparing the PHUSICOS Living Lab set-up, but likewise be integrated into monitoring and evaluating the stakeholder constellation during the Living Lab process. By doing so, changes over time can be detected and documented efficiently (Van der Jagt et al., in review).

Following the stakeholder analysis, the local case study teams can proceed with further steps (see Fig. 4.3) such as the fine-tuning of the (previously drafted) participation strategy and appropriate tool selection for stakeholder involvement, the recruitment of stakeholders and their incentivation. Finally, it is worthwhile to do some planning for the case of unforeseen events, e.g. the drop-out of Living Lab participants, conflicts, or the need of external facilitation, prior to the Living Lab's kick-off (Nedopil et al., 2013).

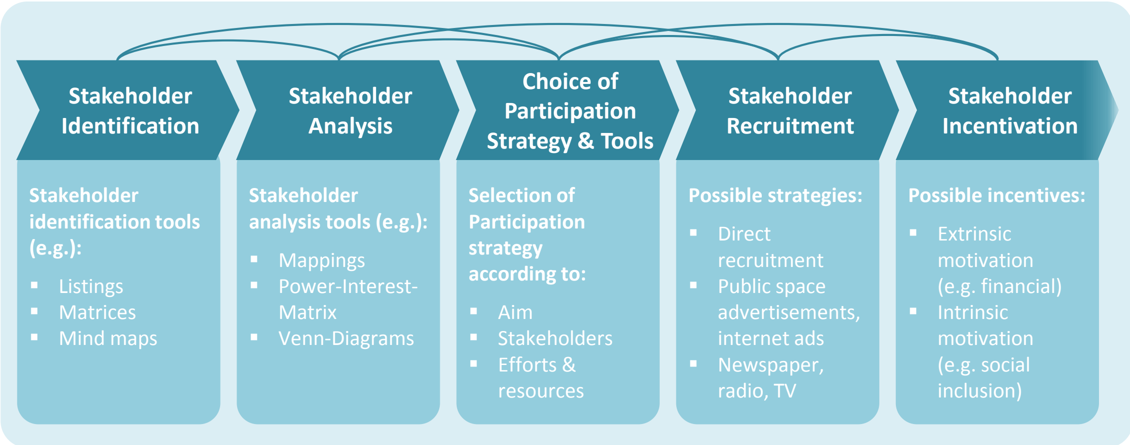


Figure 4.3. Important steps for the selection and compilation of the PHUSICOS Living Lab stakeholder groups prior to the Kick-off (inspired by Paskaleva et al., 2015; Nedopil et al., 2013; Ridder el al., 2005). Design: Christian Smida

As for the facilitator of the PHUSICOS Living Lab, an important likewise challenging question to answer is: "Who is the right one?" Literature provides abundant descriptions for this position: "border crossers or skilled social actors who are travelling in different cultural and institutional worlds" (Canzler et al., 2017: 27); "the animator as catalyst [creating] conditions conducive to effervescence of innovative ideas" (Gadille et al., 2013:3); "knowledge brokers" (Concilio, 2016) or "the pilot manager [being in charge for] planning, coordinating and implementing real world tests that are centred on users and affectees" (Ståhlbröst et al., 2015:8).

Whatever the name for the facilitator of a Living Lab may be, there is a clear consensus on skills to possess and tasks to fulfil. Next to a strong catalyst function (Gadille et al., 2013), a sound familiarity with the community the Living Lab is operating in seems to be a plus to tackle language barriers and deal with eventual socio-cultural factors (Pregernig et al., 2018). Nevertheless, this "familiarity" should not be misinterpreted with having an own stake in the issue at hand (Dutilleul et al., 2010; Van der Jagt et al., 2017). To get stakeholders motivated for the Living Lab process and to steer them towards a successful knowledge co-creation, the facilitator should be an agent of trust for all involved Living Lab participants, and be capable to master the science-practitioner interface (see Chap. 3.3). As project practice indicates, the provision, management and follow-up to a regular meeting schedule of the Living Lab participants belongs to the facilitator's key tasks. Furthermore, the transparent sharing of meeting documents with external stakeholders, management of outreach activities as well as continued monitoring and evaluation of the Living Lab process should be at the top of the facilitator's agenda (e.g. Van der Jagt et al., 2017).

Table 4.5 offers a set of guiding questions to orientate the facilitator selection.

Table 4.5. Parameters and Key questions for the facilitator selection of a PHUSICOS Living Lab (inspired by Tress et al., 2006a; Tress et al., 2006b; Concilio 2016)

Parameter	Key Questions
Professional qualification	Does the facilitator possess a professional background being suitable to the issue and intended tasks? Does the facilitator possess long-term experience in initializing and steering stakeholder involvement processes of the kind being relevant to PHUSICOS? If not: What are the specific training demands? Does the facilitator possess experiences in collaborative transdisciplinary projects?
Familiarity with the local case study	Does the facilitator possess a sound familiarity with the community the Living Lab process will operate in? Does the facilitator command the necessary language skills? Does the facilitator know how to deal with the relevant socio-cultural factors?
Trustworthiness	Is the facilitator a suitable "Broker" and agent of trust from the viewpoint of the Living Lab participants? Does the facilitator have any own stake in the Living Lab process? If so, which? Does the facilitator possess sufficient "weight" towards key players involved in the process?
Stakeholder group size	Is it possible to steer the intended Living Lab process by one person only? If not: Who can act as co-facilitator(s) and external expertise?

As for the leadership skills that a PHUSICOS Living Lab facilitator should possess in order to motivate the stakeholder group, a metaphor described by Reed et al. (2009:1947) specifies them as follows:

"Imagine a group of people putting up a tent (the phenomenon of interest) on a hill-side, each with a different kind of peg or stake (metal ones, different coloured plastic ones, wooden ones, angled ones etc.). Each person is holding a different stake (their interest), and trying to drive their points home as they push their stakes into the ground. But stakeholders who have mallets have the power to drive their points home more effectively than others. Working alone, the tent might take on the shape determined by the guy-ropes secured by the mallet-holders and is likely to collapse in the first wind. But knowing who they are and working with them, the mallet-holders can work together to position their stakes so the tent stays up. They may even be able to help some of the other stakeholders who do not have mallets to secure their stakes. By working together in this way, it is far more likely that the tent will withstand the storm."

In a nutshell: In order to make sure that the "right" stakeholder group and facilitator(s) are joining the PHUSICOS Living Lab process at demonstrator and concept case study sites, the local case study teams have several important tasks to complete to prepare for the Living Lab kick-off (see Chap. 5). They have to select the facilitator and eventually specify training or external expertise demands, identify and analyse stakeholders, take decisions concerning role distribution, inner and outer circle of Living Lab participants and Lab control, fine-tune the selected stakeholder involvement strategy and define suitable tools for all NBS development stages, as well as recruit and incentivize stakeholders. Finally, it should be clarified whether and how a formalization of the Living Lab (e.g. by signing a MoU) would be doable and desirable to increase its future legitimacy.

4.4 POLICY: Observing the terrain you trek in – Socio-cultural factors of NBS planning

EU directives and national regulations express the strong will to promote nature-based solutions and make them more effective by including all stakeholder voices in their framing, design and execution (Verweij and Thompson, 2006). The EU report on supporting the implementation of Green Infrastructure (EU, 2016) names three factors to ameliorate NBS implementation: i) a better use of integrated spatial planning processes, ii) improved capacity building of decision-makers, and iii) better institutional cooperation. However, despite of strong European Guidance and Frameworks, local governance strongly influences planning processes, planning trends, and the implemented measures (Zingraff-Hamed et al., 2017).

Awareness of socio-cultural factors such as planning traditions in different countries, hierarchical structures of institutions and stakeholder roles, their self-understandings and world-views, helps to remove barriers and find ways to overcome them. Although the challenges of hydro-meteorological hazards in mountainous areas are quite similar across Europe, and the EU policies that aim to solve them such as regional land management planning, local knowledge and cooperation might be the most important factors to implement NBSs in a successful manner. With the PHUSICOS case study areas in Norway, France-Spain-Andorra, Italy, Austria and Germany, a cross-section of common goals and regional social, cultural, policy, legal and regulatory aspects can be assessed. This gives the opportunity to find out which approaches and local tailor made solutions might best serve the implementation and promotion of NBSs or compromise solutions.

Planning policies and planning cultures

A key factor for implementation of NBSs is planning and its related processes. In Europe, several different planning cultures exist. According to Knieling and Othengrafen (2009), planning culture can be understood as institutional or shared planning practices of a society and refers to the interpretation of planning tasks, recognizing and addressing problems using rules, procedures and tools. It is a result of attitudes, values, general rules, standards and beliefs, including traditions, habits and customs as well as constitutional and legal frameworks of the people involved. Planning cultures reflect national socio-political styles and influence NBS planning and implementation of Living Labs more than EU policies.

In Europe, five different planning families can be identified (Newman and Thornley, 1996): Scandinavian, Germanic, British, Napoleonic and Eastern European. These families are shaped by the political styles in the respective countries. A gradient of flexibility can be observed. While the Scandinavian type (e.g. Norway) is characterized by decentralist and flexible style, the Germanic family (e.g. Germany, Austria) shows low flexibility but strong regional differences. Also the Napoleonic approach is less flexible and centrally oriented (e.g. Italy, France, with some tendency towards a more decentralist planning in Spain). This means, that in the Scandinavian family, planning is more consensus-oriented. The strong uptake of Living Lab approaches by Scandinavian countries, having been a driving factor in the establishment of the Living Lab concept on European political levels, reflects this planning culture. Stimulated by it, countries in Northern and North-western Europe have a higher degree of openness to engagement of various non-governmental actors (Van der Jagt et al., 2016b; Dryzek et al., 2002 cited in Van der Jagt et al., 2016b). Mediterranean countries tend to have a more regulatory planning approach. However, the economic crisis after 2008 opened up spaces and arenas for Living Lab approaches to create room for new ideas and opportunities at least in the field of urban areas (e.g. Moro and Puerari, 2015).

Living Labs often need to touch the border of normative and regulating systems in order to test new ideas and innovation processes (Concilio, 2016). Therefore, they might be in conflict with usual planning practices. However, this relaxation of regulations and normative systems in Living Lab processes can provide favourable conditions for creativity and innovation (Concilio, 2016).

In planning urban areas, Living Labs have proved to be successful in this regard. They provide a broad spectrum of different knowledge actors and specialist competences for the achievement of a certain goal related to the problems experienced in the urban environment (Concilio, 2016). Due to the small scale of the arena, barriers to innovation can be easier removed, changes are of a local nature and undesired outcomes can be therefore reversed with fewer implications. With a lack of proof-of-concept on Living Labs in rural and mountain areas as well as in the field of disaster risk management, it will be a field of interest in the future, to understand how these processes will take on a larger scale with more scattered stakeholders and less specialist competences on site.

Participating People and Stakeholders

Another factor for successful work in Living Lab processes is to understand participating stakeholders, their respective roles and role interpretations. Claude et al. (2017) point out the importance of structures as a potential barrier in Living Lab processes. Communities, administrations and universities are vertically structured hierarchical organizations that influence their role, and participants of these institutions are embedded in them. Differences in the organizational cultures therefore can make the progress difficult, since Living Lab governance explicitly erases frameworks of organizations to create space for innovation. This ensures that stakeholders meet as equals, no matter of their background or hierarchical position.

Living Labs and co-production have a focus on the empowerment of users and participation (Nesti, 2017). These ideas of co-production often are a new and undefined approach to policy-making, when officials, experts and citizens work together and ultimately, might be part of producing new policies (Ryan, 2012: 321). These tasks require that professionals and public managers have to develop new skills, such as networking and coordination capacities. Galiano et al. (2014) mention a number of institutional and organizational culture issues to be observed. Especially politicians tend to underestimate the benefits of such approaches and sometimes lack awareness of the opportunities being offered. Also assigning the communication to a specific sector of the institution might hinder effective work of an institution in Living Labs.

Additional socio-cultural issues should be observed to avoid dissatisfaction of stakeholders participating in Living Labs, or ultimately, a failure of Living Labs.

One key element is that Living Labs are often driven by utilizers and providers (Leminen et al., 2013, see Chapter 3.1). Emerging from a political will of authorities or other actors from the public sector, it can be difficult for participants to develop ownership for “their” project (Claude et al., 2017). Furthermore, actors may lose their interest when the issues in Living Labs become too political or too technical.

Since participation requires time by administrators and citizens, the question arises: "How can the participants be made to feel rewarded for their time and input (Galiano et al., 2014: 61)?”. According to Dutilleul et al. (2010), Living Labs need to achieve and sustain the necessary levels of user mobilisation and cooperation in the absence of stronger incentives. Motivations can be own needs and the possibility for adopting innovative solutions and ideas. Passion arises also from being a co-creator of solutions or products as well as their direct usability. Moreover, an atmosphere of equity and trust, the option to achieve previously defined, personal learning goals as well as transparent knowledge sharing without asymmetries are key preconditions for a functioning Living Lab process (see Chap. 3.3).

A careful consideration of these aspects during the preparation, setup and management of a Living Lab, e.g. by means of a contextual and governance analysis as well as a tailored monitoring and evaluation system (see Chap. 4.2 and 5), can help to regard the socio-cultural aspects of NBS planning and ultimately, create user satisfaction and a satisfying participation in innovation actions on the long run. As outlined in chapter 4.3, a key role in this context plays the Living Lab facilitator, who should not only possess the necessary analytical skills, but also the stakeholders’ trust and a sound experiential know-how of the local institutional landscape being relevant to the NBSs at stake.

5 Further Outlook

What are the next steps to set up and run a Living Lab under individual conditions?

The present Guiding Framework was developed with the intention to kick-off the service innovation activities of Work Package 3 and thus to be the point of departure to initialize the relevant participatory processes at the local demonstrator and concept case study sites of PHUSICOS. On this background, this report offers a first guidance to the local case study teams and their relevant partners in their important task to set up and steer their individual Living Lab processes for the innovative development and implementation of nature-based solutions in the face of natural hazards during the coming years.
PHUSICOS will enter quite "new terrain" by putting the Living Lab approach at the core of its innovation action interventions in the realm of NBSs. Although counting on abundant experiences especially in the urban sector already, not much is known on the functioning of Living Labs in rural and mountainous regions of Europe (see Chap. 1.2 and Chap. 3). Thus, the local case study teams in Norway, France-Spain-Andorra, Italy, Austria and Germany have an important function in shedding light on the question on how to best tailor the individual Living Lab process to local demands, and to move the Living Lab concept forward to new grounds as innovators.

Consequently, this Guiding Framework is meant to offer guidance and direction by clear principles (see Chap. 4.1), yet explicitly promotes the freedom of own creativity according to local demands. Based on the conviction that a "one-fits-all"-scheme would not be able to address the local case studies' diversity to a satisfying extent, this deliverable was consciously not conceptualized as a "step-by-step"-guide. It rather presents a sound state-of-the-art analysis on the Living Lab approach from theoretical and practical perspectives, and extracts lessons learned, which might inspire the PHUSICOS Living Labs' future work, and beyond. It further points at important components and analytical steps that must be completed when preparing for a Living Lab process (see Chap. 4).

As the overview in Figure 5.1 illustrates, the Guiding Framework is the first of several stepping stones, which Work Package 3 will provide to the local case study teams on their way to establish and steer their individual Living Lab processes. After its delivery, it will be the responsibility of the local PHUSICOS Living Lab facilitators to further shape and elaborate on important parameters of their Living Labs prior to their kick-off, such as scope and goal setting, context analysis, stakeholder identification and analysis, design of the individual participation strategy and user involvement levels, recruitment of Living Lab participants, incentive design and preparation of local demand articulation (see Fig. 5.1, "LL Set-Up"). To deliver these tasks efficiently, the PHUSICOS Living Lab facilitators will receive coaching upon demand, and be supported by a state-of-the-art assessment conceptualized by WP3 and WP5 partners. Furthermore, a Facilitator Orientation Day in the framework of the next consortium meeting in November 2018 will offer a platform to clarify open questions and exchange experiences between the local case study sites.

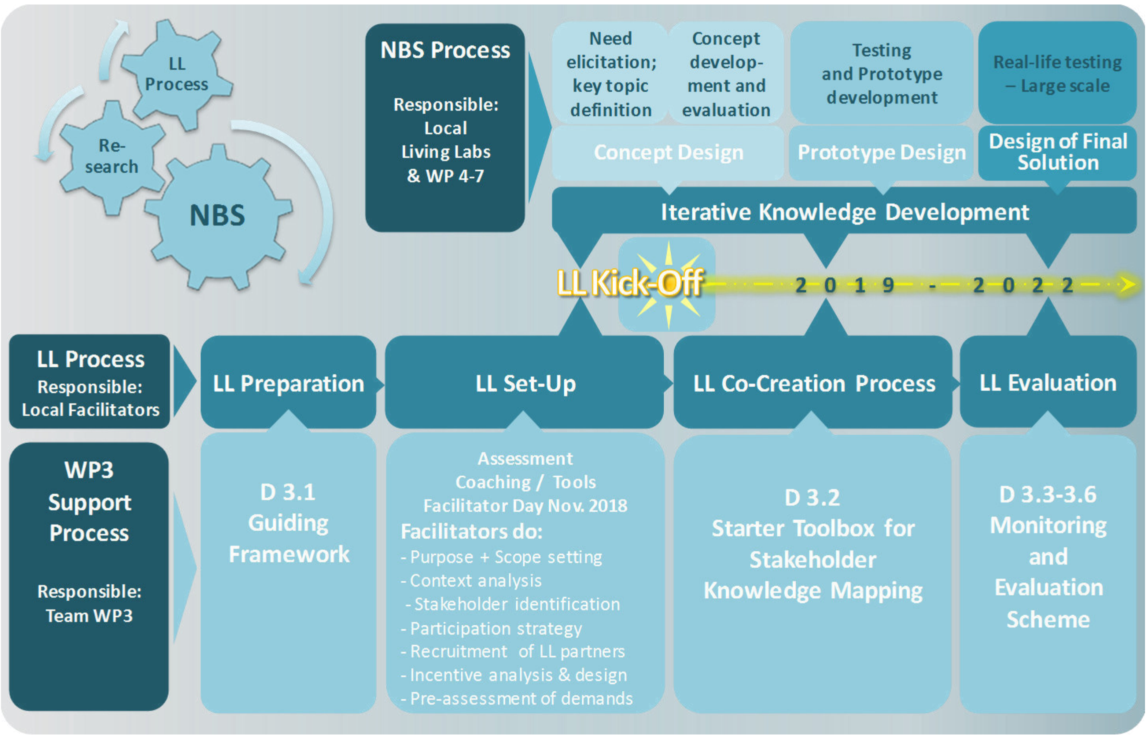


Figure 5.1. Overview to the PHUSICOS Living Lab process in its contextual embedding of NBS development (top), Local facilitators' tasks (middle and below) and WP3 support services (below). A crucial step to take will be the successful synchronization of the Living Lab work with the Research process and NBS development. (Inspired by Ståhlbröst 2012). Design: Christian Smida

For the further Living Lab co-creation process, PHUSICOS facilitators will be provided a Starter Toolbox for Stakeholder Knowledge Mapping to co-design NBSs (D3.2), being followed by a Monitoring & Evaluation scheme (D3.3-3.6) to ensure their individual Lab's quality management and user satisfaction.
Nevertheless, it should not be overlooked that the PHUSICOS Living Labs cannot succeed in isolation. A decisive step to take for achieving a successful Living Lab approach application for NBSs development and implementation at all demonstrator and concept case study sites will be the sound synchronization of three processes: the Living Lab establishment and work; the research process and the NBS development. Opportunities to match these three processes efficiently, illustrated in Figure 5.1 as gears, should thus be pro-actively sought for by all PHUSICOS partners, including local Living Labs and end-users, research teams, and other relevant stakeholders.

Focusing on the near future of the Living Labs' set-up stage at demonstrator and concept case study sites, Tables 5.1 and 5.2 summarize the next necessary steps to do by the local PHUSICOS teams and their designated facilitators, and connect them to a precise timeline. In this way, a clear orientation shall be provided on important tasks, responsibilities, available supporting tools, and related deadlines of relevance to the local Living Labs' kick-off and their further operationalization. The presented Living Lab set-up timeline is a proposal elaborated by the WP3 team on the basis of milestones and deliverables defined in the PHUSICOS project's DoA. Individual timeframes within these corner stones are thus of preliminary status, and need to be confirmed by the local project teams and facilitators of the demonstrator and concept case study sites.

Table 5.1. Proposed Tasks and Timeline for PHUSICOS Living Lab set-up at case study sites prior to Kick-Off

Nr	Tasks	Sub-Tasks	In Charge	Supporting Tools	Timeframe & Deadline
I	**Living Lab Preparation**				
1	**Guiding Framework Operationalization**	× Delivery to partners × Translation (optional)	LPC/LPT	D.3.1	Immediate August 2018
2	**Facilitator Selection**	× Candidate check for matching w/demand × Facilitator definition × Identification of necessary support (facilitation experts), contracting (optional)	LPC/LPT	D.3.1: Chap. 4.3, Tab. 4.5 Facilitator contact sheet (→ WP3)	Immediate August 2018
3	**Local State-of-the-Art Assessment to support tailored Living Lab Set-up**	× Preparation of data and inputs × Active participation and contribution to assessment	LPC/LPT LLF and WP3/5	Assessment sheet (to be provided by WP 3/5 partners)	September-November 2018
4	**Living Lab Scope Setting**	× Purpose and scope definition × Spatial scope definition × Key topic selection × Draft of Stakeholder involvement strategy	LPC/LPT LLF	D.3.1: Chap. 4.2, Tab. 4.2	August-September 2018
5	**Context and Governance Analysis**	× Context description × Policy frameworks and governance × Screening of existing initiatives to connect Living Lab	LPC/LPT LLF	D.3.1: Chap. 4.2, Tab. 4.3 Chap. 4.4	August-September 2018
6	**Stakeholder Identification and Analysis**	× Identification of Stakeholders × Analysis of Stakeholders × Interviews, Focus groups, Brainstorming	LPC/LPT LLF	D.3.1: Chap. 4.3, Tab. 4.4 <u>Identification:</u> Appendix D, E1 <u>Analysis:</u> Appendix E2, F	August-September 2018
7	**Finetuning of Stakeholder Involvement Strategy**	× Adaptation to aim × Adaptation to intended stakeholders × Selection of tools	LPC/LPT LLF	D.3.1: Chap. 4.2, Fig. 4.1 + external support	October-November 2018
8	**Stakeholder Recruitment and Incentivation for Living Lab participation**	× Definition of recruitment channels (direct; via media) × Recruitment of stakeholders × Incentive design	LPC/LPT LLF	D.3.1: Chap. 4.3, Fig. 4.3 Chap. 4.4	October-November 2018
9	**Stakeholder Demand Assessment (preliminary)**	× Preparation of Demand assessment × Pre-Assessment (Brainstorming)	LPC/LPT LLF	Tool support by WP3 upon demand	November – December 2018
10	**Preparation of Living Lab Work Plan (Draft)**	× Draft of Living Lab Meeting schedule and Workplan	LLF	Tool support by WP3 upon demand	November – December 2018

Legend: LPC = Local Project Coordinator / LPT = Local Project Team / LLF = Living Lab Facilitator

Table 5.2. Proposed Tasks and Timeline for PHUSICOS Living Lab set-up at case study sites after Kick-Off

Nr	Tasks	Sub-Tasks	In Charge	Supporting Tools	Timeframe & Deadline
II	**Living Lab Kick-Off**				
11	**LL Kick-Off-Preparation**	× Clarification of: Participants; • Logistics; • Moderation; • Date of Kick-Off; Workshop design × Decision upon Living Lab formalization (e.g. MoU, etc.) × Program definition for Kick-Off × Participant invitation	LLF		November-December 2018
12	**LL Kick-Off and Follow-Up**	× Execution of local Living Lab Kick-off-Workshop × Elaboration of Kick-Off Workshop Protocol and delivery to WP3	LLF	Tool support by WP3 upon demand	By M9 = 31.01.2019 <u>Deadline</u> for Protocol delivery to WP3: 25.01.2019
III	**Living Lab Operationalization on NBS**				
13	**Baseline Assessment upon LL Operationalization**	× Assessment of NBS acceptance × Assessment of Awareness on natural hazards and NBS for DRR × Assessment of Knowledge demands and expectations to WP4-7	LLF + LL partici-pants	Tool support by WP3 upon demand	By M12 = 30.04.2019 <u>Deadline</u> for Assessment results delivery to WP3: 30.04.2019
14	**Stakeholder Knowledge Mapping with WP4-7**	× Preparation of Knowledge mapping workshops × Tool selection upon demand × Training (optional) × Knowledge mapping	LLF + LL partici-pants + WP4-7	D.3.2 Starter Toolbox for Stakeholder Knowledge Mapping (provided by WP3 in M6 = 31.10.2018)	Start: M12 = April 2019
15	**Assessment of User Satisfaction with Living Lab procedures**	× Adaptation of Monitoring and Evaluation Scheme to local needs × Assessment of User satisfaction × Result sharing with WP3	LLF + LL partici-pants	D.3.3 Monitoring and Evaluation scheme (1) (provided by WP3 in M12 = 30.04.2019)	Start: M15 = July 2019

Legend: LPC = Local Project Coordinator / LPT = Local Project Team / LLF = Living Lab Facilitator
★ relevant deadlines, events, milestones

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References

Almirall, E., Lee, M., & Wareham, J. (2012) Mapping Living Labs in the Landscape of Innovation Methodologies. Technology Innovation Management Review, 2(9), pp. 12-18.

Almirall, E., & Wareham, J. (2011) Living Labs: arbiters of mid- and ground-level innovation. Technology Analysis & Strategic Management, 23(1), pp. 87-102.

Ambrose-Oji, B., Tabbush, P., Carter, C., Frost, B., & Fielding, K. S. (2011) Public engagement in forestry: A toolbox for public participation in forest and woodland planning. Edinburgh: Forestry Commission. 29 p., online: https://www.forestresearch.gov.uk/tools-and-resources/public-engagement-in-forestry-toolbox-and-guidance/toolbox/toolbox-toolsheets/ , accessed July 29, 2018

Arbter, K., Handler, M., Purker, E., Tappeiner, G., & Trattnigg, R. (2007) The Public Participation Manual. Shaping the future together (Federal Ministry for Agriculture and Forestry, the Environment and Water Supply & Austrian Society for Environment and Technology Ed.) Vienna, Austria: 64 p.

Arnstein, S. R. (1969) A ladder of citizen participation. Journal of the American Institute of Planners, 35(4), pp. 216–224.

Axelsson, R. (2010) Integrative research and transdisciplinary knowledge production: a review of barriers and bridges. Journal of Landscape Ecology, 3(2), pp. 14-40.

Bekkers, V., Edelenbos, J., & Steijn, B. (2011) Innovation in the public sector: Linking capacity and leadership. Basingstoke, UK: Palgrave Macmillan. 360 p.

Bergvall-Kåreborn, B., Eriksson, C. I., & Ståhlbröst, A. (2015) Places and Spaces within Living Labs. Technology Innovation Management Review, 5(12), pp. 37-47.

Bernhardt, E. S., Palmer, M. A., Allan, J. D., Alexander, G., Barnas, K., Brooks, S., Carr, J., Clayton, S., Dahm, C., Follstad-Shah, J., Galat, D., Gloss, S., Goodwin, P., Hart, D., Hassett, B., Jenkinson, R., Katz, S., Kondolf, G. M., Lake, P.S., Lave, R., Meyer, L., O'Donnell, T. K., Pagano, L., Powell, B. & Sudduth, E. (2005) Ecology - Synthesizing US river restoration efforts. Science, 398, pp. 636-637.

Bilotta, G. S., Milner, A. M., & Boyd, I. (2014) On the use of systematic reviews to inform environmental policies. Environmental Science & Policy (42), pp. 67-77.

Binder, W. (2010) The Restoration of the Isar South of Munich. Wasserwirtschaft, 100(3), pp. 15-19.

Canzler, W., Engels, F., Rogge, J. C., Simon, D., & Wentland, A. (2017) From “living lab” to strategic action field? Bringing together energy, mobility and Information Technology in Germany. Energy Research and Social Science, 27, pp. 25-35.

Claude, S., Ginestet, S., Bonhomme, M., Moulene, N., & Escadeillas, G. (2017) The Living Lab methodology for complex environments: Insights from the thermal refurbishment of a historical district in the city of Cahors, France. Energy Research & Social Science, 32, pp. 121-130.

Concilio G (2016) Urban Living Labs: Opportunities in and for Planning. In: Concilio G., Rizzo F. (eds) Human Smart Cities. Urban and Landscape Perspectives. Springer, Cham: Germany, 21-40

Čolić, R., Mojović, D., Petkovic, M., & Čolic, N. (2013) Guide for Participation in Urban Development Planning, Belgrade: Ambero consulting, representative office in Belgrade, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, GIZ Office Serbia. 90 p., online: http://www.urbanlandmanagement.rs/wp-content/uploads/2013/10/Guide-for-participation-in-urban-development-planning.pdf, accessed July 29, 2018

Dryzek, J., Hunold, C., Schlosberg, D., Downes, D., & Hernes, H.-K. (2002) Environmental Transformations of the State: The USA, Norway, Germany and the UK (Vol. 50). pp. 659-682

Dutilleul, B., Birrer, F. A. J., & Mensink, W. (2010) Unpacking European Living Labs: Analysing Innovation's Social Dimension. Central European Journal of Public Policy, 4(1), pp. 60-73.

Dvarioniene, J., Gurauskiene, I., Gecevicius, G., Trummer, D. R., Selada, C., Marques, I., & Cosmi, C. (2015) Stakeholders involvement for energy conscious communities: The Energy Labs experience in 10 European communities. Renewable Energy, 75, pp. 512-518.

EC (2000) Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy. Brussel, Belgium: 72 p.

EC (2015a) Call for ideas for large-scale demonstration projects - Outcome report HORIZON 2020 'Climate action, environment, resource efficiency and raw materials'. Brussel, Belgium: 21 p.

EC (2015b) Nature-Based Solutions & Re-Naturing Cities. Brussel, Belgium: 74 p.

EC (2017) The European Agenda for Research and Innovation 2014-2020. Brussel, Belgium: European Commission Retrieved from http://s3platform.jrc.ec.europa.eu/living-labs.

EC (2018a) Innovating with Nature. Brusel: 4 p.

EC (2018b) Nature-Based Solutions, online: https://ec.europa.eu/research/environment/index.cfm?pg=nbs , accessed July 30, 2018

Edwards-Schachter, M. E., Matti, C. E., & Alcantara, E. (2012) Fostering Quality of Life through Social Innovation: A Living Lab Methodology Study Case. Review of Policy Research, 29(6), pp. 672-692.

Engels, A., & Walz, K. (2018 a) Dealing with Multi-Perspectivity in Real-World Laboratories. Experiences from the Transdisciplinary Research Project Urban Transformation Laboratories. Gaia-Ecological Perspectives for Science and Society, 27(S1), pp. 39-45.

Engels, F., & Rogge, J.-C. (2018 b) Tensions and Trade-Offs in Real-World Laboratories – The Participants' Perspective. Gaia-Ecological Perspectives for Science and Society, 27(S1), 28-31.

Eriksson, M., Niitamo, V. P., & Kulkki, S. (2005) State-of-the-art in utilizing Living Labs approach to user-centric ICT innovation – a European approach. Lulea, Sweden: 13 p., online: https://pdfs.semanticscholar.org/2edd/5e0fef9f7f9fd0262dea937cb997b3ab8d5f.pdf, accessed July 29, 2018

EU (2016) Supporting the Implementation of Green Infrastructure. Final Report. European Commission, Directorate-General for the Environment. Contract ENV.B.2/SER/2014/0012.

Evans, P., Schuurman, D., Ståhlbröst, A., & Vervoort, K. (2017) Living Lab Methodology - Handbook (K. Malmberg & I. Vaittinen Eds.) Manchester, UK: U4IoT Consortium. 76 p.

Gadille, M., & Siarheyeva, A. (2013) Limits to the construction of an open innovation network: the case of pre-setup of a living lab in a small urban area. Matera: Ikam-Inst Knowledge Asset Management. pp. 2026-2046

Galiano A., Impedovo D., & Pezzuto M. (2014) OpenKnowledge and OpenGovernment: the experience of the municip@zione Living Lab project Journal of e-Learning and Knowledge Society, v.10, n.2, pp. 53-64.

Geibler, J. v., Echternacht, L., Stadler, K., & Trier, E. (2016) Erfahrungen mit strategischen Initiativen zu Living Labs in anderen Ländern und EU. Wuppertal, Germany.

Gross, M., Hoffmann-Riem, H., & Krohn, W. (2005) Realexperimente. Ökologische Gesaltungsprozesse in der Wissensgesellschaft. Bielefeld, Germany. 5 p.

Hage, M., Leroy, P., & Petersen, A. C. (2010) Stakeholder participation in environmental knowledge production. Futures, 42, 254-264.

Hauck, J., Saarikoski, H., Turkelboom, F., & Keune, H. (2016) Stakeholder involvement in ecosystem service decision-making and research. OpenNESS Synthesis Paper 'Stakeholder involvement'', online: https://repository.uantwerpen.be/docman/irua/2fab9a/147202.pdf, accessed July 30, 2018

Holst, M., & Ståhlbröst, A. (2012) Checklist for Planning the Intervention. Luleå, Sweden: 5 p.

Hoving, D. (2003, April 23–26) Enhancing the quality of life in a living lab Moerwijk (The Hague) Paper presented at the The New Media, Technology and Everyday Life in Europe Conference, London, UK., online: http://www.lse.ac.uk/media@lse/research/EMTEL/Conference/papers/Hoving.doc , accessed July 30, 2018

Huutoniemi, K., J. T. Klein, J. T., Bruun, H., & Hukkinen, J. (2010) Analyzing interdisciplinarity: typology and indicators. Research Policy, 39(1), pp. 79-88.

IUCN. (2018) Nature-based Solutions, online: https://www.iucn.org/commissions/commission-ecosystem-management/our-work/nature-based-solutions , accessed July 20, 2018

Jahn, T., & Keil, F. (2016) Reallabore im Kontext transdisziplinärer Forschung. Gaia-Ecological Perspectives for Science and Society, 25(4), pp. 247-252.

JPI. (2013) Call JPI Urban Europe Strategic Research and Innovation Agenda (SRIA) European Commission. p. 64, online: http://www.diva-portal.org/smash/get/diva2:925088/FULLTEXT01.pdf , online: accessed July 30, 2018

Knieling, J., & Orthengrafen, F. (2009) Planning Cultures in Europe. Decoding Cultural Phenomena in Urban and Regional Planning: Aldershot. 329 p.

Kondolf, G. M., Anderson, S., Lave, R., Pagano, L., Merenlender, A., & Bernhardt, E. S. (2007) Two decades of river restoration in California: What can we learn? Restoration Ecology, 15, pp. 516-523.

Lafortezza, R., Chen, J., van den Bosch, C. K., & Randrup, T. B. (2018) Nature-based solutions for resilient landscapes and cities. Environmental Research, 165, pp. 431-441.

Larson, K., & Topping, R. (2003) PlaceLab : A House_n + TIAX Initiative. Cambridge, Massachusetts, USA: 5 p.

Leminen, S. (2013) Coordination and Participation in Living Lab Networks. Technology Innovation Management Review, 3(11), pp. 5–14.

Leminen, S., Westerlund, M., & Nyström, A.-G. (2012) Living Labs as Open-Innovation Networks. Technology Innovation Management Review, 2(9), pp. 6-11.

Linnerooth-Bayer, J., & Patt, A. (2016) Introduction to the special issue on rethinking participatory processes: the case of landslide risk in Nocera Inferiore. Nat Hazards, 81, pp. 1-6.

Linnerooth-Bayer, J., Scolobig, A., Ferlisi, S., Cascini, L., & Thompson, M. (2016) Expert engagement in participatory processes: translating stakeholder discourses into policy options. Natural Hazards, Volume 81, Supplement 1, pp 69–88

Markopoulos, P. (2001, 31 March-5 April 2001) Towards a Living Lab research facility and a ubiquitous computing research programme. Paper presented at the Conference on Human Factors in Computing Systems, Seattle, Washington, USA. 2 p.

Mayring, P. (2007) Qualitative Inhaltsanalyse (Vol. 9): Beltz, Weinheim, Basel. p. 135

Menny, M., Voytenko Pagan, Y., & McCormick, K. (2018) Urban Living Labs and the Role of Users in Co-Creation. Gaia-Ecological Perspectives for Science and Society, 27(S1), pp. 68-77.

Moher, D., Liberati, A., Tetzlaff, J., & Altman, D. (2009) "Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement". Annals of Internal Medicine, 151, pp.264-269

Morandi, B., Piégay, H., Lamouroux, N., & Vaudor, L. J. (2014) How is success or failure in river restoration projects evaluated? Feedback from French restoration projects. Journal of Environmental Management, 137: pp. 178-188

Moro, A., & Puerari, E. (2015) Ecosystem innovation as trigger of new paths and practices for urban space. Matera: Ikam-Inst Knowledge Asset Management. pp. 1886-1897

Naumann, S., & Kaphengst, T. (2015) Erfolgsfaktoren bei der Planung und Umsetzung naturbasierter Ansätze zum Klimaschutz und zur Anpassung an den Klimawandel. BfN-Skripten 406, Bonn-Bad Godesberg: 22 p.

Nedopil, C., & Glende, S. (2013) Toolbox - Methods of User Integration for AAL Innovations (Y. gmbh & A. Association Eds.) Luxembourg, Luxembourg: Ambiant Assisted Living Association. 30 p.

Nedopil, C., Schauber, C., & Glende, S. (2013) Guideline: The Art and Joy of User Integration in AAL Projects (A. A. Karina Marcus, Brussels, Z. Geja Langerveld, The Hague, I. Theresa Chavarria, Madrid, & T. Jackie Marshall-Balloch, Swindon Eds.) Luxembourg, Luxembourg: Ambient Assisted Living Association. 51 p.

Nesti, G. (2017) Living Labs: A New Tool for Co-production? In A. Bisello, D. Vettorato, R. Stephens, & P. Elisei (Eds.), Smart and Sustainable Planning for Cities and Regions: Results of Sspcr 2015 (pp. 267-281) Cham: Springer Int Publishing Ag., pp. 267-281

Parodi, O., Waitz, C., Bachinger, M., Kuhn, R., Meyer-Soylu, S., Alcantara, S., & Rhodius, R. (2018) Insights into and Recommendations from Three Real-World Laboratories. An Experience-Based Comparison. Gaia-Ecological Perspectives for Science and Society, 27(S1), pp. 52-59.

Paskaleva, K., Cooper, I., Linde, P., Peterson, B., & C. Götz (2015) Stakeholder Engagement in the Smart City: Making Living Labs work. In: Rodriguez-Bolívar M P (ed)(2015): Transforming City Governments for Successful Smart Cities. Public Administration and Information Technology Vol 8, Springer International Publishing, Switzerland: pp. 115-142

Pregernig, M., Rhodius, R., & Winkel, G. (2018) Design Junctions in Real-World Laboratories. Analyzing Experiences gained from the Project Knowledge Dialogue

Northern Black Forest. Gaia-Ecological Perspectives for Science and Society, 27(S1), pp. 32-38.

Reed, M., Graves, A., Dandy, N., Posthumus, H., Hubacek, K., Morris, J., Prell, C., Quinn, C., & Stringer, L. (2009) Who‘s in and why? A typology of stakeholder analysis methods for natural resource management. Journal of Environmental Management, 90, pp. 1933-1949.

Reed, M. S. (2008) Stakeholder participation for environmental management: a literature review. Biological Conservation, 141(10), pp. 2417–2431.

Renn, O. (2018) Editorial: Real-World Laboratories – the Road to Transdisciplinary Research? Gaia-Ecological Perspectives for Science and Society, 27(S1), 1 p.

Ridder, D., Mostert, E., & Wolters, H. A. (2005) Learning together to manage together. Improving participation in water management. Harmonizing Cooperation in Planning (HarmoniCop) comp., ed. and designed by the HarmonyCop Team ; core ed. team: D. Ridder, E. Mostert, H.A. Wolters ; Osnabrück, Germany: University of Osnabrück. 99p.

Röcker, C., Prante, T., Streitz, N., & van Alphen, D. (2004, 22–24 November 2004) Using Ambient Displays and Smart Artefacts to Support Community Interaction in Distributed Teams. Paper presented at the OZCHI Conference 2004, University of Wollongong, Australia.

Ryan, B. (2012) Co-production: Option or obligation? Australian Journal of PublicAdministration, 71(3), pp. 314-324.

Schäpke, N., Bergmann, M., Stelzer, F., & Lang, D. J. (2018) Labs in the Real World: Advancing Transdisciplinary Research and Sustainability Transformation. Mapping the Field and Emerging Lines of Inquiry. Gaia-Ecological Perspectives for Science and Society, 27(S1), pp. 8-11.

Schneidewind, U., Augenstein, K., Stelzer, F., & Wanner, M. (2018) Structure Matters: Real-World Laboratories as a new type of large-scale research infrastructure. A framework inspired by Gidden’s Structuration Theory. Gaia-Ecological Perspectives for Science and Society, 27(S1), pp. 12-17.

Scolobig, A., & Linnerooth-Bayer, J. (unpublished) To protect or to relocate.

Scolobig, A., Thompsen, M., & Linnerooth-Bayer, J. (2016) Compromise not consensus: designing a participatory process for landslide risk mitigation. Natural Hazards, 81(S1), pp. 45–68

SDC (2012) Stakeholder Analysis and Mapping. Bern, Switzerland: Swiss Development Cooperation 8 p.

Singer-Brodowsky, M., Beecroft, R., & Parodi, O. (2018) Learning in Real-World Laboratories. A systematic Impulse for discussion. Gaia-Ecological Perspectives for Science and Society, 27(S1), 23-27.

Skipper, M. (2017) 'Nature-based solutions' is the latest green jargon that means more than you might think. Nature, 541, 133-134.

Smith, M., Van der Jagt, A., & Ambrose-Oji, B. (2015) Local learning alliances established in five urban learning labs -GREEN SURGE Deliverable 7.1. Brussel, Belgium: http://greensurge.eu/working-packages/wp7/filer/D7_1_GREEN_SURGE_revised_v2.pdf. 36 p.

Ståhlbröst, A., & Holst, M. (2012) The Living Lab Methodology Handbook. Luleå, Sweden: SmartIES. 76 p.

Ståhlbröst, A., Padyab, A., Sällström, A., & Hollosi, D. (2015) Design of Smart City Systems from a privacy perspective. IADIS International Journal, 13(1), pp. 1-16.

Steen, K., & van Bueren, E. (2017a) Urban Living Labs. A living lab way of working. Amsterdam, Netherland: Amsterdam Institute for Advanced Metropolitan Solutions. Delft University of Technology. p. 91, online, https://www.ams-amsterdam.com/wordpress/wp-content/uploads/AMS-Living-Lab-Way-of-Working_small.pdf; accessed July 30, 2018

Steen, K., & van Bueren, E. (2017b) The Defining Characteristics of Urban Living Labs. Technology Innovation Management Review, 7(7), pp. 21-23.

Sutherland, W. J., Aveling, R., Brooks, T. M., Clout, M., Dicks, L. V., Fellman, L., Fleishman, E., Gibbons, D. W., Keim, B., Lickorish, F., Monk, K. A., Mortimer, D., Peck, L. S., Pretty, J., Rockström, J., Rodríguez, J. P., Smith, R. K., Spalding, M. D., Tonneijck, F. H., & Watkinson, A. R. (2014) A horizon scan of global conservation issues for 2014. Trends in ecology & evolution, ISSN: 1872-8383, Vol: 29, Issue: 1, pp. 15-22

Tress, B., Tress, G., & Fry, G. (2005) Researchers' experiences, positive and negative, in integrative landscape projects. Environmental Management, 36(6), 792-807.

Tress, B., Tress, G., & Fry, G. (2006 a) Defining concepts and the process of knowledge production. In B. Tress, Tress, G., Fry, G., Opdam, P. (Ed.), From landscape research to landscape planning: Aspects of integration, education and application. Dordrecht, Germany, Springer. pp. 13-26

Tress, B., Tress, G., & Fry, G. (2006 b) Ten steps to success in integrative research projects. In B. Tress, Tress, G., Fry, G., Opdam, P. (Ed.), From landscape research to landscape planning: Aspects of integration, education and application. Dordrecht, Springer, pp. 241-258

UN. (2018) The United Nations World Water Development Report 2018: Nature-Based Solutions for Water. Paris, France: 154 p.

UNESCO. (2018) 2018 UN World Water Development Report, Nature-based Solutions for Water, online http://www.unesco.org/new/en/natural-sciences/environment/water/wwap/wwdr/2018-nature-based-solutions/ , accessed July 20, 2018

Van Berlo, A. (1998, 23–25 June 1998) A "smart" model house as research and demonstration tool for telematics development. Paper presented at the TIDE Congress on Technology for Inclusive Design and Equality (TIDE 98), Improving the Quality of Life for the European Citizen, Helsinki, Finland.

Van der Jagt, A., Anton, B., Reil, A., DeBellis, Y., Fischer, L., Kowarik, I., Cvejić, R., & Mårsén, A. (2017) Cities and Researchers learning together: What does it take? Evaluating the process of iterative knowledge exchange and outcomes generated in each of the Urban Learning Labs and Learning Alliances. GREEN SURGE Deliverable 8.7. Brussel, Belgium, online: http://greensurge.eu/urban-learning-labs/ p .63, accessed July 30, 2018

Van der Jagt, A., Elands, E., Ambrose-Oji, B., Gerohási, E., Møller, M. S., & Buizer, M. (2016b) Participatory Governance of Urban Green Spaces: Trends and Practices in the EU. Nordic Journal of Architectural Research, 3, pp. 11-40.

Van der Jagt, A., Smith, M., Ambrose-Oji, B., Konijnendijk, C. C., Giannico, V., Haase, D., Lafortezza, R., Nastran, M., Pintar, M., Železnikar, Š., & Cvejić, R. (in review) Co-creating urban green infrastructure connecting people and nature: A guiding framework and approach.

Van Geenhuizen, M. (2013) From ivory tower to living lab: accelerating the use-of university knowledge. Environment and Planning C-Government and Policy, 31(6), pp. 1115-1132.

Van Well, L. (2018) Living Lab Co-Design Requirements Guiding Paper. Work package 1: Co-Design; Deliverable 1.1. Project EVOKED – Enhancing the value of climate data. Brussel, Belgium: 22 p. and appendices

Verweij, M., & Thompson, M. (2006) Clumsy Solutions for a Complex World: Governance, Politics and Plural Perceptions: Palgrave/Macmillan. 255 p.

Voytenko, Y., McCormick, K., Evans, J., & Schliwa, G. (2016) Urban living labs for sustainability and low carbon cities in Europe: towards a research agenda. Journal of Cleaner Production, 123, pp. 45-54.

Wendin, K., Åström, A., & Ståhlbröst, A. (2015) Exploring differences between central located test and home use test in a living lab context. International Journal of Consumer Studies, 39(3), pp. 230-238.

Zimmermann, A. (2006) Instrumente zur Akteursanalyse – 10 Bausteine für die Gestaltung von Kooperationssystemen (GTZ Ed.) Eschborn, Germany: Deutsche Gesellschaft für Technische Zusammenarbeit. 59 p., online: http://www2.giz.de/wbf/4tDx9kw63gma/Akteursanalyse_Instrumente.pdf, accessed July 30, 2018

Zingraff-Hamed, A.; Greulich, S.; Wantzen, K.M.; Pauleit, S. (2017) Societal Drivers of European Water Governance: A Comparison of Urban River Restoration Practices in France and Germany. Water, 9, 206. Available online in open source www.mdpi.com/2073-4441/9/3/206

Appendices

Appendix A

Research questions on the Living Lab approach

Contents

Research questions and Sub-questions

The research questions listed in this table have been identified by the three experts in charge of the design of the Guiding Framework using a brainstorming method. The objective of the session was to list all the major questions that have to be answered prior to and by the Guiding Framework. The list is of informative character and a supplement to the methodological approach described in this framework (see Chap. 2).

Table Appendix A.1. Research questions and related sub-questions

Research Questions	Sub-Question
What is the State-of-the-Art of the Living Lab approach?	What is a LL and what is the difference to other participatory approaches? In which thematic fields and for which purpose are LL being carried out? Which experiences do exist on the LL approach in the realm of landscape planning, NBS and adaptation to Climate Change? In which geographical areas has the LL approach been applied? In which contexts do LL appear (urban, rural settings)? Are there differences between LL in urban and rural settings to be notified?
Which experiences using the Living Lab approach have been made?	**Framework conditions and success factors** Which success factors can be recognized for LL? Which limitations/barriers are encountered (and how are they solved)? Which (institutional) framework conditions are favorable? Which not? Which influence do socio-cultural factors (planning cultures) have on the LL approach resp. the establishment of a LL? **Actors** Which stakeholder compositions do exist / which are favorable to a LL? How are stakeholders being identified and motivated (incentives) for a LL? Which tasks, know-how and skills does a LL facilitator need? Which institutional backing and finance should a LL facilitator have? **LL operationalization and quality management** Which tools for LL steering are in use and have been successful? Which tools of stakeholder participation / other tools have been successful in LL implementation?
Which Living Lab approach and participatory processes are suitable to co-design and implement NBS against hazards being relevant to PHUSICOS partners?	**How does planning culture influence participatory planning processes?** Which planning cultures do exist in PHUSICOS case study sites? Did planning culture influence the participatory process implementation? What affects the willingness to participate in a LL? Which socio-cultural effects should be considered to plan a LL? **How to identify stakeholder compositions to create a LL?** Which are the stakeholders in the context of the project PHUSICOS? Which stakeholders are important for a LL approach? Which stakeholders are important for our case study sites? Which stakeholder compositions do exist at the case study sites?

Appendix B

Inclusion set

Contents

Inclusion set

The following publications composed the inclusion set used for the literature review. The full text of each of these publications has been analysed by the experts in charge of the Guiding Framework design. They performed a qualitative content analysis (Mayring, 2007) using the research questions listed in Appendix A.

i) **Peer-reviewed scientific papers** were collected from Web of Science (WOS) (Clarivate Analytics, Philadelphia, USA) und selected using the PRISMA method.

Ahlava, A., Suominen, J., & Rossi, S. (2017). Controlling Risks Through Flexibility and Urban Integration: The Regeneration of Otaniemi Campus in Finland. In W. L. Filho, L. Brandli, P. Castro, & J. Newman (Eds.), Handbook of Theory and Practice of Sustainable Development in Higher Education, Vol 1, 21-35

Ahmed, S., Swaine, B., Milot, M., Gaudet, C., Poldma, T., Bartlett, G., Mazer, B., Le Dorze, G., Barbic, S., Rodriguez, A. M., Lefebvre, H., Archambault, P., Kairy, D., Fung, J., Labbe, D., Lamontagne, A., & Kehayia, E. (2017). Creating an inclusive mall environment with the PRECEDE-PROCEED model: a living lab case study. Disability and Rehabilitation, 39(21), 2198-2206. doi:10.1080/09638288.2016.1219401

Albors-Garrigos, J. (2015). Bringing Your Customers to the Lab: Barriers and Facilitators for Consumer Coinnovation. In D. F. Kocaoglu, T. R. Anderson, T. U. Daim, D. C. Kozanoglu, K. Niwa, & G. Perman (Eds.), Picmet '15 Portland International Center for Management of Engineering and Technology, 689-698. New York: Ieee.

Allan, C., Dezuanni, M., Mallan, K., Dezuanni, M., Foth, M., Mallan, K., & Hughes, H. (2018). Digital Storytelling for Community Participation: The Storyelling Social Living Lab. London: Bloomsbury Publ Inc.

Almirall, E., & Wareham, J. (2010). Living Labs: Arbiters of Mid- and Ground-Level Innovation. In I. Oshri & J. Kotlarsky (Eds.), Global Sourcing of Information Technology and Business Processes (Vol. 55, 233-249). New York: Springer.

Almirall, E., & Wareham, J. (2011). Living Labs: arbiters of mid- and ground-level innovation. Technology Analysis & Strategic Management, 23(1), 87-102. doi:10.1080/09537325.2011.537110

Andersen, T. O., Bansler, J. P., Kensing, F., & Moll, J. (2017). From Prototype to Product: Making Participatory Design of mHealth Commercially Viable. In A. M. Kanstrup, A. Bygholm, P. Bertelsen, & C. Nohr (Eds.), Participatory Design & Health Information Technology (Vol. 233, 95-112). Amsterdam: Ios Press.

Anthopoulos, L., & Fitsilis, P. (2013). Evolution Roadmaps for Smart Cities: Determining Viable Paths. Nr Reading: Acad Conferences Ltd.

Ayvari, A., & Jyrama, A. (2017). Rethinking value proposition tools for living labs. Journal of Service Theory and Practice, 27(5), 1024-1039. doi:10.1108/jstp-09-2015-0205

Baccarne, B., Mechant, P., & Schuurman, D. (2014). Empowered Cities? An Analysis of the Structure and Generated Value of the Smart City Ghent. In R. P. Dameri & C. RosenthalSabroux (Eds.), Smart City: How to Create Public and Economic Value with High Technology in Urban Space (pp. 157-182). Berlin: Springer-Verlag Berlin.

Bajgier, S. M., Maragah, H. D., Saccucci, M. S., Verzilli, A., & Prybutok, V. R. (1991). Introducing students to community operations-research by using a city neighbourhood as a Living Laboratory. Operations Research, 39(5), 701-709. doi:10.1287/opre.39.5.701

Bansal, S., Pandey, V., & Sen, J. (2017). Redefining and Exploring the Smart City Concept in Indian Perspective: Case Study of Varanasi. In F. Seta, J. Sen, A. Biswas, & A. Khare (Eds.), From Poverty, Inequality to Smart City (pp. 93-107). Singapore: Springer-Verlag Singapore Pte Ltd.

Bergamasco, A. G. (2011). Planning Cultures in Europe. Decoding Cultural Phenomena in Urban and Regional Planning. European Planning Studies, 19(5), 917-919. doi:10.1080/09654313.2011.561045

Bergvall-Kareborn, B., Howcroft, D., Stahlbrost, A., & Wikman, A. M. (2010). Participation in Living Lab: Designing Systems with Users. In J. PriesHeje, J. Venable, D. Bunker, N. L. Russo, & J. I. DeGross (Eds.), Human Benefit through the Diffusion of Information Systems Design Science Research (Vol. 318, pp. 317-+). Berlin: Springer-Verlag Berlin.

Bertoldi, F., Schaffers, H., Ruland, R., Schoepfer, E., Rossi, A., & Fusco, L. (2008). Stimulating Innovation in the Frascati Living Lab through Supporting Business Incubation. In P. Cunningham & M. Cunningham (Eds.), Collaboration and Knowledge Economy: Issues, Applications, Case Studies, Pt 1 (Vol. 5, pp. 723-730). Amsterdam: Ios Press.

Bevilacqua, C., & Pizzimenti, P. (2016). Living Lab and Cities asSmart Specialisation StrategiesEngine. In F. Calabro & L. DellaSpina (Eds.), 2nd International Symposium New Metropolitan Perspectives - Strategic Planning, Spatial Planning, Economic Programs and Decision Support Tools, through the Implementation of Horizon/Europe2020 (Vol. 223, pp. 915-922). Amsterdam: Elsevier Science Bv.

Bhana, R., Majeed, A., Shah, H., Ul Haq, A., Goode, R., & Adigbo, S. (2016). Living Labs (LILA): A community driven approach to technology transfer and internationalising entrepreneurship. Bucharest: Natl Univ Political Stud & Public Adm, Fac Commun & Public Relations.

Bifulco, F., Tregua, M., & Amitrano, C. C. (2017). Co-governing Smart Cities through Living Lab. Top evidences from EU. Transylvanian Review of Administrative Sciences(50E), 21-37. doi:10.24193/tras.2017.0002

Bisello, A., Vettorato, D., & Stephens, R. (2015). Smart and Sustainable Planning for Cities and Regions (P. Elisei Ed.). Cham, Switzerland: Springer International Publishing.

Bliek, F., van den Noort, A., Roossien, B., Kamphuis, R., de Wit, J., van der Velde, J., Eijgelaar, M., & Ieee. (2010). PowerMatching City, a living lab smart grid demonstration 2010 Ieee Pes Conference on Innovative Smart Grid Technologies Europe. New York: Ieee.

Boersma, P. D., Vargas, H., & Merlen, G. (2005). Living laboratory in peril. Science, 308(5724), 925-925. doi:10.1126/science.1114395

Bonifazi, A., Sannicandro, V., Attardi, R., Di Cugno, G., & Torre, C. M. (2016). Countryside vs City: A User-Centered Approach to Open Spatial Indicators of Urban Sprawl. In O. Gervasi, B. Murgante, S. Misra, A. Rocha, C. M. Torre, D. Tanier, B. O. Apduhan, E. Stankova, & S. Wang (Eds.), Computational Science and Its Applications - Iccsa 2016, Pt Iv (Vol. 9789, pp. 161-176). Cham: Springer Int Publishing Ag.

Budweg, S., Schaffers, H., Ruland, R., Kristensen, K., & Prinz, W. (2011). Enhancing collaboration in communities of professionals using a Living Lab approach. Production Planning & Control, 22(5-6), 594-609. doi:10.1080/09537287.2010.536630

Buhl, J., von Geibler, J., Echternacht, L., & Linder, M. (2017). Rebound effects in Living Labs: Opportunities for monitoring and mitigating re-spending and time use effects in user integrated innovation design. Journal of Cleaner Production, 151, 592-602. doi:10.1016/j.jclepro.2017.03.001

Buitendag, A. A. K., & Van Der Walt, J. S. (2011). Presenting a framework for the utilisation of the Grounded Theory research methodology to aid in knowledge discovery as part of an Agricultural Living Lab. Prague 5: Czech Centre Science & Soc.

Bulkeley, H., Coenen, L., Frantzeskaki, N., Hartmann, C., Kronsell, A., Mai, L., Marvin, S., McCormick, K., van Steenbergen, F., & Palgan, Y. V. (2016). Urban living labs: governing urban sustainability transitions. Current Opinion in Environmental Sustainability, 22, 13-17. doi:10.1016/j.cosust.2017.02.003

Burbridge, M. (2017). If living labs are the answer - what's the question? A review of the literature. In L. Ding, F. Fiorito, & P. Osmond (Eds.), International High-

Performance Built Environment Conference - a Sustainable Built Environment Conference 2016 Series (Vol. 180, pp. 1725-1732). Amsterdam: Elsevier Science Bv.

Bygholm, A., & Kanstrup, A. M. (2017). This Is not Participatory Design - A Critical Analysis of Eight Living Laboratories. In A. M. Kanstrup, A. Bygholm, P. Bertelsen, & C. Nohr (Eds.), Participatory Design & Health Information Technology (Vol. 233, pp. 78-92). Amsterdam: Ios Press.

Caniglia, G., Schapke, N., Lang, D. J., Abson, D. J., Luederitz, C., Wiek, A., Laubichler, M. D., Gralla, F., & von Wehrden, H. (2017). Experiments and evidence in sustainability science: A typology. Journal of Cleaner Production, 169, 39-47. doi:10.1016/j.jclepro.2017.05.164

Canzler, W., Engels, F., Rogge, J. C., Simon, D., & Wentland, A. (2017). From "living lab" to strategic action field: Bringing together energy, mobility, and Information Technology in Germany. Energy Research & Social Science, 27, 25-35. doi:10.1016/j.erss.2017.02.003

Caprotti, F., & Cowley, R. (2017). Interrogating urban experiments. Urban Geography, 38(9), 1441-1450. doi:10.1080/02723638.2016.1265870

Cardullo, P., Kitchin, R., & Di Feliciantonio, C. (2018). Living labs and vacancy in the neoliberal city. Cities, 73, 44-50. doi:10.1016/j.cities.2017.10.008

Carillo-Aparicio, S., Heredia-Larrubia, J. R., & Perez-Hidalgo, F. (2013). SmartCity Malaga, a real-living lab and its adaptation to electric vehicles in cities. Energy Policy, 62, 774-779. doi:10.1016/j.enpol.2013.07.125

Celino, A., & Concilio, G. (2012). Learning and innovation in Territorial Living Lab. Matera: Ikam-Inst Knowledge Asset Management.

Cerreta, M., & Panaro, S. (2017). From Perceived Values to Shared Values: A Multi-Stakeholder Spatial Decision Analysis (M-SSDA) for Resilient Landscapes. Sustainability, 9(7), 20. doi:10.3390/su9071113

Charvat, K., Horak, P., & Horakova, S. (2008). Living Lab (LL) Business Models for Local Development. Amsterdam: Ios Press.

Claude, S., Ginestet, S., Bonhomme, M., Moulene, N., & Escadeillas, G. (2017). The Living Lab methodology for complex environments: Insights from the thermal refurbishment of a historical district in the city of Cahors, France. Energy Research & Social Science, 32, 121-130. doi:10.1016/j.erss.2017.01.018

Cleland, B., Mulvenna, M., Galbraith, B., Wallace, J., & Martin, S. (2012). Building Sustainable eParticipation Strategies Using Living Labs. Nr Reading: Acad Conferences Ltd.

Coenen, T., Donche, V., & Ballon, P. (2015). LL-ADR: Action Design Research in Living Labs. In T. X. Bui & R. H. Sprague (Eds.), 2015 48th Hawaii International Conference on System Sciences (pp. 4029-4038). Los Alamitos: Ieee Computer Soc.

Concilio, G. (2016). Urban Living Labs: Opportunities in and for Planning. Cham: Springer International Publishing Ag.

Cosgrave, E., Arbuthnot, K., & Tryfonas, T. (2013). Living Labs, Innovation Districts and Information Marketplaces: A Systems Approach for Smart Cities. In C. J. J. Paredis, C. Bishop, & D. Bodner (Eds.), 2013 Conference on Systems Engineering Research (Vol. 16, pp. 668-677). Amsterdam: Elsevier Science Bv.

Cossetta, A., & Palumbo, M. (2014). The Co-production of Social Innovation: The Case of Living Lab. In R. P. Dameri & C. RosenthalSabroux (Eds.), Smart City: How to Create Public and Economic Value with High Technology in Urban Space (pp. 221-235). Berlin: Springer-Verlag Berlin.

Daniels, S. E., & Walker, G. B. (1995). Managing Local Environmental Conflict amidst National controversy. International Journal of Conflict Management, 6(3), 290-311. doi:10.1108/eb022767

Davy, B. (2013). Planning cultures in Europe. Decoding cultural phenomena in urban and regional planning. Planning Theory, 12(2), 219-222. doi:10.1177/1473095212451041

De Bonis, L., Concilio, G., Marsh, J., & Trapani, F. (2012). Towards a Deep Integration of Socio-Economic Action and Spatial Planning. Matera: Ikam-Inst Knowledge Asset Management.

De Bonis, L., & Trapani, F. (2017). For a "Living (Lab)" Approach to Smart Cities. In E. R. Sanseverino, R. R. Sanseverino, & V. Vaccaro (Eds.), Smart Cities Atlas: Western and Eastern Intelligent Communities (pp. 143-158). Cham: Springer International Publishing Ag.

De Klerk, L. (2007). Comparative planning cultures. Tijdschrift Voor Economische En Sociale Geografie, 98(1), 136-138. doi:10.1111/j.1467-9663.2007.382_1.x

Del Vecchio, P., Elia, G., Ndou, V., Secundo, G., & Specchia, F. (2014). To What extent the practice on Living Labs match with the theoretical framework? The case of VINCENTE Living Lab for the creation of technology entrepreneurship. In S. Terzi, B. Katzy, & S. Cunninghman (Eds.), 2014 International Ice Conference on Engineering, Technology and Innovation. New York: Ieee.

Delinchant, B., Wurtz, F., Ploix, S., Schanen, J. L., & Marechal, Y. (2016). GreEn-ER Living Lab A Green Building with Energy Aware Occupants. Setubal: Scitepress.

Dell'Era, C., & Landoni, P. (2014). Living Lab: A Methodology between User-Centred Design and Participatory Design. Creativity and Innovation Management, 23(2), 137-154. doi:10.1111/caim.12061

Di Lecce, V., Soldo, D., Quarto, A., Giove, A., Di Lecce, F., & Ieee. (2014). Dialogue disambiguation in Living Labs experience The Puglia Tremor System. New York: Ieee.

Duma, S., Bud, I., Gusat, D., Pasca, II, Bud, A., & Sgem. (2015). Analyses of “AURUL” tailing pond surface rehabilitation by using regional resources. Science and Technologies in Geology, Exploration and Mining, SGEM 2014, Vol I (pp. 33-40). Sofia: Stef 92 Technology Ltd.

Dupont, L., Morel, L., Hubert, J., & Guidat, C. (2014). Study case: Living Lab Mode for urban project design Emergence of an ad hoc methodology through collaborative innovation. In S. Terzi, B. Katzy, & S. Cunninghman (Eds.), 2014 International Ice Conference on Engineering, Technology and Innovation. New York: Ieee.

Dvarioniene, J., Gurauskiene, I., Gecevicius, G., Trummer, D. R., Selada, C., Marques, I., & Cosmi, C. (2015). Stakeholders involvement for energy conscious communities: The Energy Labs experience in 10 European communities. Renewable Energy, 75, 512-518. doi:10.1016/j.renene.2014.10.017

Edwards-Schachter, M. E., Matti, C. E., & Alcantara, E. (2012). Fostering Quality of Life through Social Innovation: A Living Lab Methodology Study Case. Review of Policy Research, 29(6), 672-692. doi:10.1111/j.1541-1338.2012.00588.x

Ernst, L., de Graaf-Van Dinther, R. E., Peek, G. J., & Loorbach, D. A. (2016). Sustainable urban transformation and sustainability transitions; conceptual framework and case study. Journal of Cleaner Production, 112. doi:10.1016/j.jclepro.2015.10.136

Evans, J., Jones, R., Karvonen, A., Millard, L., & Wendler, J. (2015). Living labs and co-production: university campuses as platforms for sustainability science. Current Opinion in Environmental Sustainability, 16, 1-6. doi:10.1016/j.cosust.2015.06.005

Frank, A. I., Mironowicz, I., Lourenco, J., Franchini, T., Ache, P., Finka, M., Scholl, B., & Grams, A. (2014). Educating planners in Europe: A review of 21st century study programmes. Progress in Planning, 91, 30-94. doi:10.1016/j.progress.2013.05.001

Friedmann, J. (2005). Globalization and the emerging culture of planning - Abstract. Progress in Planning, 64, 181-+. doi:10.1016/j.progress.2005.05.004

Gadille, M., & Siarheyeva, A. (2013). Limits to the construction of an open innovation network: the case of pre-setup of a living lab in a small urban area. Matera: Ikam-Inst Knowledge Asset Management.

Gatta, V., Marcucci, E., & Le Pira, M. (2017). Smart urban freight planning process: integrating desk, living lab and modelling approaches in decision-making. European Transport Research Review, 9(3), 11. doi:10.1007/s12544-017-0245-9

Gourova, E., Teneva, T., & Kyoseva, T. (2013). Involving Students in Ideas Generation - a Bulgarian Case. In P. Teirlinck, S. Kelchtermans, & F. DeBeule (Eds.), Proceedings of the 8th European Conference on Innovation and Entrepreneurship (pp. 287-295). Nr Reading: Acad Conferences Ltd.

Graham, I. D., Kothari, A., McCutcheon, C., & Integrated Knowledge, T. (2018). Moving knowledge into action for more effective practice, programmes and policy: protocol for a research programme on integrated knowledge translation. Implementation Science, 13, 15. doi:10.1186/s13012-017-0700-y

Guzman, J. G., del Carpio, A. F., Colomo-Palacios, R., & de Diego, M. V. (2013). Living Labs for User-Driven Innovation A Process Reference Model. Research-Technology Management, 56(3), 29-39. doi:10.5437/08956308x5603087

Hansen, S. S. (2017). The Campus as a Living Laboratory: Macalester College Case Study. In W. L. Filho, M. Mifsud, C. Shiel, & R. Pretorius (Eds.), Handbook of Theory and Practice of Sustainable Development in Higher Education, Vol 3 (pp. 223-239). Cham: Springer International Publishing Ag.

Haukipuro, L., Vainamo, S., & Arhippainen, L. (2014). Citizen and Employee Involvement in Public Service Development Through User-driven Methods. In S. Terzi, B. Katzy, & S. Cunninghman (Eds.), 2014 International Ice Conference on Engineering, Technology and Innovation. New York: Ieee.

Heuts, E., & Versele, A. (2016). RenoseeC: renovating with a social, ecological and economic benefit through a collective approach. In J. Kurnitski (Ed.), Sustainable Built Environment Tallinn and Helsinki Conference SBE16 Build Green and Renovate Deep (Vol. 96, pp. 540-550). Amsterdam: Elsevier Science Bv.

Ho, D. K. L., & Lee, Y. C. (2012). The Quality of Design Participation: Intersubjectivity in Design Practice. International Journal of Design, 6(1), 71-83.

Hua, Y. (2013). Sustainable campus as a living laboratory for climate change mitigation and adaptation: the role of design thinking processes. Cheltenham: Edward Elgar Publishing Ltd.

Jakobi, T., Schwartz, T., & Ieee. (2012). Putting the user in charge: end user development for eco-feedback technologies Impressions from a Living Lab based design case study 2012 Sustainable Internet and Ict for Sustainability. New York: Ieee.

Jorna, F., & Veenstra, M. (2015). Setting up Smart cities Ecosystems – Essential building Blocks. Lisboa: Iadis-Int Assoc Development Information Society.

Kasemir, B., & Stulz, R. (2013). Foreword: a shared exploration of 'living laboratories' for sustainability. Cheltenham: Edward Elgar Publishing Ltd.

Katzy, B., Mensink, W., & Sikkema, K. (2007). Living Labs - Implications for the Public Innovation Agenda. In P. Cunningham & M. Cunningham (Eds.), Expanding the Knowledge Economy: Issues, Applications, Case Studies, Pts 1 and 2 (Vol. 4, pp. 858-865). Amsterdam: Ios Press.

Konig, A. (2013). Conclusion: a cross-cultural exploration of the co-creation of knowledge in living laboratories for societal transformation across four continents. Cheltenham: Edward Elgar Publishing Ltd.

Kronsell, A., & Mukhtar-Landgren, D. (2018). Experimental governance: the role of municipalities in urban living labs. European Planning Studies, 26(5), 988-1007. doi:10.1080/09654313.2018.1435631

Kudva, N. (2007). Comparative planning cultures. Journal of Urban Affairs, 29(3), 336-337. doi:10.1111/j.1467-9906.2007.00346_4.x

Kviselius, N. Z., Ozan, H., Edenius, M., & Andersson, P. (2008). The Evolution of Living Labs-Propositions for Improved Design and Further Research. Wuhan: Wuhan Univ Technology Press.

Lange, B. (2017). Open workshops and post-growth economies: collaborative places as forerunners of transformative economic developments? Zeitschrift Fur Wirtschaftsgeographie, 61(1), 38-55. doi:10.1515/zfw-2016-0029

Lange, D., & Honfi, D. (2017). Novel techniques and approaches for risk based application of resilience concepts to critical infrastructure: An introduction to the IMPROVER project. Boca Raton: Crc Press-Taylor & Francis Group.

Lepik, K. L. (2010). Cross-Border Cooperation Organisation's Role in Enhancement of Knowledge and Innovation in a Region. Nr Reading: Academic Conferences Ltd.

Liedtke, C., Welfens, M. J., Rohn, H., & Nordmann, J. (2012). LIVING LAB: user-driven innovation for sustainability. International Journal of Sustainability in Higher Education, 13(2), 106-118. doi:10.1108/14676371211211809

Madhusudan, M. D., Shanker, K., Kumar, A., Mishra, C., Sinha, A., Arthur, R., Datta, A., Rangarajan, M., Chellam, R., Shahabuddin, G., Sankaran, R., Singh, M., Ramakrishnan, U., & Rojan, P. D. (2006). Science in the wilderness: the predicament of scientific research in India's wildlife reserves. Current Science, 91(8), 1015-1019.

Madrigal, L. O., Escudero, C. J., Frances, L. S., & Escribano, V. V. (2017). Innovative cooperation processes: analysis and potential of Living Labs networks. Informes De La Construccion, 69(548), 12. doi:10.3989/id.55071

Majeed, A., Bhana, R., Ul Haq, A., Shah, H., Williams, M. L., & Till, A. (2017). Living Labs (LILA): An Innovative Paradigm for Community Development-Project of "XploR" Cane for the Blind. In R. Benlamri & M. Sparer (Eds.), Leadership, Innovation and Entrepreneurship as Driving Forces of the Global Economy (pp. 31-46). Cham: Springer International Publishing Ag.

Mangyoku, M., Verilhac, I., Pallot, M., Aragall, F., Serra, A., Sanchez, L., & Vuontisjarvi, H. R. (2014). IDeALL: Investigating Design-for-All and Living-Lab Methods for Engaging Users in Value Co-creation. In S. Terzi, B. Katzy, & S. Cunninghman (Eds.), 2014 International Ice Conference on Engineering, Technology and Innovation. New York: Ieee.

Masseck, T. (2017). Living Labs in Architecture as Innovation Arenas within Higher Education Institutions. In M. Amer, A. Sotoca, F. Nasselli, N. Mohareb, & C. Alalouch (Eds.), International Conference - Alternative and Renewable Energy Quest (Vol. 115, pp. 383-389). Amsterdam: Elsevier Science Bv.

McCormick, K., Anderberg, S., Coenen, L., & Neij, L. (2013). Advancing sustainable urban transformation. Journal of Cleaner Production, 50, 1-11. doi:10.1016/j.jclepro.2013.01.003

Meijer, A., & Thaens, M. (2018). Urban Technological Innovation: Developing and Testing a Sociotechnical Framework for Studying Smart City Projects. Urban Affairs Review, 54(2), 363-387. doi:10.1177/1078087416651936

Melis, G. (2017). Collaborative Planning Through Visualization: Learning from Urban Living Labs. In C. Certoma, M. Dyer, L. Pocatilu, & F. Rizzi (Eds.), Citizen Empowerment and Innovation in the Data-Rich City (pp. 91-104). Cham: Springer International Publishing Ag.

Mikela, C. M., & Lukac, D. (2011). Review on Living Labs Their predecessors, their principles and the diversity of their applications. In A. DeNicola & P. Lorenz (Eds.), Colla 2011: The First International Conference on Advanced Collaborative Networks, Systems and Applications (pp. 28-33). Wilmington: Iaria Xps Press.

Mirijamdotter, A., Stahlbrost, A., Sallstrom, A., Niitamo, V. P., & Kulkki, S. (2006). The European Network of Living Labs for CWE - User-centric Co-creation and Innovation. In P. Cunningham & M. Cunningham (Eds.), Exploiting the Knowledge Economy: Issues, Applications and Case Studies, Pts 1 and 2 (Vol. 3, pp. 840-847). Amsterdam: Ios Press.

Moro, A., & Puerari, E. (2015). Ecosystem innovation as trigger of new paths and practices for urban space. Matera: Ikam-Inst Knowledge Asset Management.

Nesti, G. (2017). Living Labs: A New Tool for Co-production? In A. Bisello, D. Vettorato, R. Stephens, & P. Elisei (Eds.), Smart and Sustainable Planning for Cities and Regions: Results of Sspcr 2015 (pp. 267-281). Cham: Springer Int Publishing Ag.

Nystrom, A. G., Leminen, S., Westerlund, M., & Kortelainen, M. (2014). Actor roles and role patterns influencing innovation in living labs. Industrial Marketing Management, 43(3), 483-495. doi:10.1016/j.indmarman.2013.12.016

Osmond, P., & Little, C. (2002). The UNSW Ecoliving Program - integration of teaching, research and community outreach for urban sustainability. In C. A. Brebbia, J. F. MartinDuque, & L. C. Wadhwa (Eds.), Sustainable City Ii: Urban Regeneration and Sustainability (Vol. 14, pp. 549-558). Southampton: Wit Press.

Pal, A. (2008). Comparative planning cultures. International Journal of Urban and Regional Research, 32(1), 227-228. doi:10.1111/j.1468-2427.2008.00775_2.x

Paskaleva, K., Cooper, I., Linde, P., Peterson, B., & Gotz, C. (2015). Stakeholder Engagement in the Smart City: Making Living Labs Work (Vol. 8). Berlin: Springer-Verlag Berlin.

Perera, N. (2007). Comparative planning cultures. Urban Geography, 28(7), 702-704. doi:10.2747/0272-3638.28.7.702

Platz, M., Herselman, M., & Rapp, J. (2016). A Living Lab for Optimising the Health, Socio-economic and Environmental Situation in El Salvador. In J. M. Gomez & B. Scholtz (Eds.), Information Technology in Environmental Engineering (pp. 125-138). Cham: Springer Int Publishing Ag.

Polk, M., Kain, J. H., & Holmberg, J. (2013). Mistra Urban Futures: a living laboratory for urban transformations. Cheltenham: Edward Elgar Publishing Ltd.

Sabat, A. M., Florek-Paszkowska, A. K., Batko, R., & Szopa, A. (2017). The Role of Living Labs in the Process of Creating Innovation. Hersey: Igi Global.

Saloma, C., Mangaser, L., & Hidalgo, C. (2017). Expecting the unexpected: the role of surprise in community-driven development. Community Development Journal, 52(4), 702-719. doi:10.1093/cdj/bsv067

Sanyal, B. (2005). Comparative Planning Cultures (b. Sanyal Ed.). New York, USA: Routledge.

Schaffers, H., Guzman, J. G., & Merz, C. (2008). An Action Research Approach to Rural Living Labs Innovation. In P. Cunningham & M. Cunningham (Eds.), Collaboration and Knowledge Economy: Issues, Applications, Case Studies, Pt 1 (Vol. 5, pp. 617-624). Amsterdam: Ios Press.

Schaffers, H., van Bemmelen, J., Horak, P., & Merz, C. (2007). Creating and Managing Synergies in a Network of Rural Living Labs. In P. Cunningham & M. Cunningham (Eds.), Expanding the Knowledge Economy: Issues, Applications, Case Studies, Pts 1 and 2 (Vol. 4, pp. 874-881). Amsterdam: Ios Press.

Schliwa, G., & McCormick, K. (2016). Living labs Users, citizens and transitions. Abingdon: Routledge.

Schumacher, A. J., & Feurstein, B. K. (2007). Living Labs - a new multi-stakeholder approach to user integration. Godalming: Springer-Verlag London Ltd.

Schuurman, D., Baccarne, B., Coorevits, L., Georges, A., & Logghe, S. (2014). Knowledge exchange for innovation development in open innovation systems. Tijdschrift Voor Communicatiewetenschap, 42(4), 378.

Schuurman, D., De Moor, K., De Marez, L., Evens, T., & Ieee. (2010). Investigating User Typologies and their Relevance within a Living Lab-Research Approach for ICT-Innovation 43rd Hawaii International Conference on Systems Sciences Vols 1-5 (pp. 1597-1606). Los Alamitos: Ieee Computer Soc.

Schuurman, D., Lievens, B., De Marez, L., & Ballon, P. (2012). Towards Optimal User Involvement in Innovation Processes: A Panel-centered Living Lab-approach. New York: Ieee.

Segarra-Ona, M., & Peiro-Signes, A. (2017). Putting Social Innovation into Action: The Case of the Ecotourism at the Dominican Republic. In V. Katsoni, A. Upadhya, & A. Stratigea (Eds.), Tourism, Culture and Heritage in a Smart Economy (pp. 385-394). Cham: Springer International Publishing Ag.

Sharp, D., & Salter, R. (2017). Direct Impacts of an Urban Living Lab from the Participants' Perspective: Livewell Yarra. Sustainability, 9(10), 15. doi:10.3390/su9101699

Thornley, A. (2007). Comparative planning cultures. Journal of Planning Education and Research, 26(3), 372-373. doi:10.1177/0739456x06297929

Tirziu, A. M. (2017). Promoting Social Innovation in Rural Areas through Living Labs. Bologna: Filodiritto Publisher.

Torrens, J., Johnstone, P., & Schot, J. (2018). Unpacking the Formation of Favourable Environments for Urban Experimentation: The Case of the Bristol Energy Scene. Sustainability, 10(3), 28. doi:10.3390/su10030879

Trapani, F. (2016). Palermo: Living Labs for Urban Regeneration. Cham: Springer International Publishing Ag.

Usoro, A., & Majewski, G. (2010). A case Study of Knowledge sharing in Finnish Laurea Lab as a Knowledge intensive organisation. In S. Chu, W. Ritter, & S. Hawamdeh (Eds.), Managing Knowledge for Global and Collaborative Innovations (Vol. 8, pp. 27-40). Singapore: World Scientific Publ Co Pte Ltd.

Van Geenhuizen, M. (2013a). From ivory tower to living lab: accelerating the use-of university knowledge. Environment and Planning C-Government and Policy, 31(6), 1115-1132. doi:10.1068/c1175b

Van Geenhuizen, M. (2013b). Valorization of university knowledge: what are the barriers and can 'living labs' provide solutions? Cheltenham: Edward Elgar Publishing Ltd.

Veeckman, C., & van der Graaf, S. (2014). The City As Living Labortory: A Playground for the Innovative Development of Smart City Applications. In S. Terzi, B. Katzy, & S. Cunninghman (Eds.), 2014 International Ice Conference on Engineering, Technology and Innovation. New York: Ieee.

Viseur, R. (2016). A Sector-Selection Methodology for Living Labs Implementation. New York: Assoc Computing Machinery.

Vontas, A., Protogeros, N., & Ieee. (2009). Evaluating Living Labs Core competences and assets 2009 3rd Ieee International Conference on Digital Ecosystems and Technologies (pp. 103-107). New York: Ieee.

Voytenko, Y., McCormick, K., Evans, J., & Schliwa, G. (2015). Exploring Urban Living Labs for Sustainability and Low Carbon Cities in Europe. Paper presented at the Conference: AAG Annual Meeting, Chicago, USA.

Voytenko, Y., McCormick, K., Evans, J., & Schliwa, G. (2016). Urban living labs for sustainability and low carbon cities in Europe: towards a research agenda. Journal of Cleaner Production, 123, 45-54. doi:10.1016/j.jclepro.2015.08.053

Wu, J. G., Xiang, W. N., & Zhao, J. Z. (2014). Urban ecology in China: Historical developments and future directions. Landscape and Urban Planning, 125, 222-233. doi:10.1016/j.landurbplan.2014.02.010

Zheng, Y. S., Fu, Z. Y., & Zhu, T. P. (2015). Innovation Research on Service Design Collaboration Paths Oriented to Smart Cities - A Case Study in Living Lab Hci International 2015 - Posters' Extended Abstracts, Pt Ii (Vol. 529, pp. 592-597). Berlin: Springer-Verlag Berlin.

ii) **Publications of the European Network of Living Labs** (ENoLL) selected using the PRISMA method.

Bergvall-Kåreborn, B., Eriksson, C. I., & Ståhlbröst, A. (2015). Places and Spaces within Living Labs. Technology Innovation Management Review, 5(12), 37-47

Evans, P., Schuurman, D., Ståhlbröst, A., & Vervoort, K. (2017). Living Lab Methodology - Handbook (K. Malmberg & I. Vaittinen Eds.). Manchester, UK: U4IoT Consortium. p. 76

Holst, M., & Ståhlbröst, A. (2012a). Checklist for Concept Design. Luleå, Sweden: p. 5

Holst, M., & Ståhlbröst, A. (2012a). Checklist for Concept Evaluation – Utility and Usefulness Evaluation. Luleå, Sweden: p. 5

Holst, M., & Ståhlbröst, A. (2012b). Checklist for Innovation Evaluation - User Experience Evaluation. Luleå, Sweden: p. 6

Holst, M., & Ståhlbröst, A. (2012b). Checklist for Planning the Intervention. Luleå, Sweden: p. 5

Holst, M., & Ståhlbröst, A. (2012c). Checklist for Prototype Design. p. 5

Holst, M., & Ståhlbröst, A. (2012d). Checklist for Prototype Evaluation – Usability Evaluation. Luleå, Sweden: p. 4

Holst, M., & Ståhlbröst, A. (2012e). Checklist for the Discover Needs IN Phase. Luleå, Sweden: p. 5

Holst, M., & Ståhlbröst, A. (2012c). Checklist for the Discover Needs OF Phase. Luleå, Sweden: p. 5

Leminen, S. (2015). Living Labs as Open Innovation Networks - Networks, Roles and Innovation Outcome. (Dortor), Aalto University, Helsinki, Finnlands. p. 243

Leminen, S., & Westerlund, M. (2017). Categorization of Innovation Tools in Living Labs. Technology Innovation Management Review, 7(1), 15-25.

Nedopil, C., & Glende, S. (2013). Toolbox - Methods of User Integration for AAL Innovations (Y. gmbh & A. Association Eds.). Luxembourg, Luxembourg: Ambiant Assisted Living Association. p. 30

Nedopil, C., Schauber, C., & Glende, S. (2013). Guideline: The Art and Joy of User Integration in AAL Projects (A. A. Karina Marcus, Brussels, Z. Geja Langerveld, The Hague, I. Theresa Chavarria, Madrid, & T. Jackie Marshall-Balloch, Swindon Eds.). Luxembourg, Luxembourg: Ambient Assisted Living Association. p. 51

Ståhlbröst, A., Bergvall-Kåreborn, B., & Eriksson, C. I. (2015). Stakeholders in Smart City Living Lab Processes. Paper presented at the Twenty-first Americas Conference on Information Systems, Fajardo, Puerto Rico. pp. 1-11

Ståhlbröst, A., Bergvall-Kåreborn, B., Holst, M., & Sällström, A. (2013). Handbook on Living Lab and the FormIT methodology (P. Olofsson Ed.). Luleå, Sweden: Centre for Distance-spanning Technology and Social Informatics at Luleå University of Technology. p. 64

Ståhlbröst, A., & Holst, M. (2012). The Living Lab Methodology Handbook. Luleå, Sweden: SmartIES. p. 76

Ståhlbröst, A., Padyab, A., Sällström, A., & Hollosi, D. (2015). Design of Smart city systems from a privacy perspective. IADIS International Journal, 13(1), 1-16.

Stembert, N. (2017). Co-Creative Workshop - Methodology Handbook (K. Malmberg, C. Reale, & K. Zhang Eds.). Manchester, UK: U4IoT Consortium. p. 35

iii) **Scientific Reports of PHUSICOS partners,** namely the Technical University of Munich (TUM, Germany), the International Institute for Applied Systems Analysis (IIASA, Austria), the Swiss Federal Institute of Technology in Zurich (ETH, Switzerland), and the Norwegian Geotechnical Institute (NGI, Norway).

Ambrose-Oji, B., Buijs, A., Gerőházi, E., Mattijssen, T., Száraz, L., Van der Jagt, A., Hansen, R., Rall, E., Andersson, E., Kronenberg, J., & Rolf, W. (2017). Innovative Governance for Urban Green Infrastructure: A Guide for Practitioners. Brussel, Belgium: p. 92

Buijs, A., Elands, B., Havik, G., Ambrose-Oji, B., Gerőházi, E., Van der Jagt, A., Mattijssen, T., Steen Møller, M., & Vierikko, K. (2016). Innovative Governance of Urban Green Spaces. Brussel, Belgium: p. 177

Buizer, M., Buijs, A., & Elands, B. (2017). Analytical framework. Brussel, Belgium: p. 27

Buizer, M., Elands, B., Mattijssen, T., Van der Jagt, A., Ambrose, B., Gerőházi, E., Santos, A., & Steen Møller, M. (2015). The Governance of Urban Green Spaces in selected EU-Cities. Brussel, Belgium: p. 97

Davies, C., Hansen, R., Rall, E., Pauleit, S., Lafortezza, R., De Bellis, Y., Santos, A., & Tosics, I. (2015). Green Infrastructure Planning and Implementation. Brussel, Gelgium: p. 134

Hansen, R., & Rall, E. (2014). Analytical Framework. Brussel, Belgium: p. 33

Hauck, J., Saarikoski, H., Turkelboom, F., & Keune, H. (2016). Stakeholder involvement in ecosystem service decision-making and research. In M. a. K. J. Potschin (Ed.), OpenNESS Ecosystem Services Reference Book. Brussel, Belgium: European Commission. p. 5

Hübner, R. (2018). 4.3.9 - Partizipation zur Akzeptanzsteigerung und Weiterentwicklung der Agroforstwirtschaft. Munich, Germany: p. 10

Linnerooth-Bayer, J., & Patt, A. (2016a). Introduction to the special issue on rethinking participatory processes: the case of landslide risk in Nocera Inferiore. Natural Hazards, 81, 1-6.

Linnerooth-Bayer, J., Scolobig, A., Ferlisi, S., Cascini, L., & Thompson, M. (2016b). Expert engagement in participatory processes: translating stakeholder discourses into policy options. Natural Hazards, 81(S1), 69–88.

Primmer, E., Schleyer, C., Bela, G., Bouwma, I., Görg, C., Keune, H., Mortelmans, D., & Saarikoski, H. (2016). Institutional Analysis. Brussel, Belgium: www.openness-project.eu/library/reference-book

Scolobig, A., Thompsen, M., & Linnerooth-Bayer, J. (2016). Compromise not consensus: designing a participatory process for landslide risk mitigation. Natural Hazards, 81(S1), 45–68.

Smith, M., Van der Jagt, A., & Ambrose-Oji, B. (2015). Local learning alliances established in five urban learning labs. Brussel, Belgium: p. 1

Tress, B., Tress, G., & Fry, G. (2005). Researchers' experiences, positive and negative, in integrative landscape projects. Environmental Management, 36(6), 792-807.

Tress, B., Tress, G., & Fry, G. (2006a). Defining concepts and the process of knowledge production. In B. Tress, Tress, G., Fry, G., Opdam, P. (Ed.), From landscape research to landscape planning: Aspects of integration, education and application (pp. 13-26). Wageningen, Netherlands: Heidelberg, Springer.

Tress, B., Tress, G., & Fry, G. (2006b). Ten steps to success in integrative research projects. In B. Tress, Tress, G., Fry, G., Opdam, P. (Ed.), From landscape research to landscape planning: Aspects of integration, education and application (pp. 241-257). Wageningen, Netherlands: Heidelberg, Springer.

Van der Jagt, A., Anton, B., Reil, A., DeBellis, Y., Fischer, L., Kowarik, I., Cvejić, R., & Mårsén, A. (2017). Cities and Researchers learning together: What does it take? Evaluating the process of iterative knowledge exchange and outcomes generated in each of the Urban Learning Labs and Learning Alliances. . Brussel, Belgium: p. 63

Van der Jagt, A., Botzat, A., DeBellis, Y., Cvejić, R., & Mårsén, A. (2016a). Iterative place-based knowledge gathering in urban learning labs. Brussel, Belgium: p. 86

Van der Jagt, A., Elands, E., Ambrose-Oji, B., Gerohási, E., Møller, M. S., & Buizer, M. (2016b). Participatory Governance of Urban Green Spaces: Trends and Practices in the EU. Nordic Journal of Architectural Research, 3, 11-40.

Van der Jagt, A., Viergever, K., Barbour, S., & Bellamy, C. (2015). Functional Urban Learning Lab interface developed. Brussel, Belgium: p. 15

Van Well, L. (2018). Living Lab Co-Design Requirements Guiding Paper. Brussel, Belgium: p. 10

iv) **Other scientific publications and grey literature**.

Axelsson, R. (2010). Integrative research and transdisciplinary knowledge production: a review of barriers and bridges. Journal of Landscape Ecology, 3(2), 14-40.

Bauer, T. (2018). Research on Real-World Laboratories in Baden-Württemberg. GAIA-Ecological Perspectives for Science and Society, 27(S1), 4.

Čolić, R., Mojović, D., Petkovic, M., Čolic, N.. 2013. Guide for Participation in Urban Development Planning, Belgrade: Ambero consulting, representative office in Belgrade, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, GIZ Office Serbia. 90 p., online: http://www.urbanlandmanagement.rs/wp-content/uploads/2013/10/Guide-for-participation-in-urban-development-planning.pdf, accessed July 29, 2018

Defila, R., & Di Giulio, A. (2018). Transdisziplinär und transformativ forschen: Eine Methodensammlung (Di Giulio A Ed.). Basel, Schweiz: Springer Open. p 392

Echternacht, L., Geibler, J. V., Stadler, K., Behrend, J., & Meurer, J. (2016). Methoden im Living Lab: Unterstützung der Nutzerintegration in offenen Innovationsprozessen (Entwurf Methodenhandbuch). Wuppertal, Germany: p. 101

Engels, A., & Walz, K. (2018a). Dealing with Multi-Perspectivity in Real-World Laboratories. Experiences from the Transdisciplinary Research Project Urban Transformation Laboratories. GAIA-Ecological Perspectives for Science and Society, 27(S1), 39-45.

Engels, F., & Rogge, J.-C. (2018b). Tensions and Trade-Offs in Real-World Laboratories – The Participants' Perspective. GAIA-Ecological Perspectives for Science and Society, 27(S1), 28-31.

Eriksson, M., Niitamo, V. P., & Kulkki, S. (2005) State-of-the-art in utilizing Living Labs approach to user-centric ICT innovation – a European approach. Lulea, Sweden: 13 p.

Hirsch Hadorn, G., Hoffmann-Riem, H., Biber-Klemm, S., Grossenbacher-Mansuy, W., Joye, D., Pohl, C., Wiesmann, U., & Zemp, E. (2008). Handbook of Transdisciplinary Research (G. H. Hadorn Ed.). Dordrecht, Netherlands: Springer.

Hoffmann, V., Thomas, A., & Gerber, A. (2009). Transdisziplinäre Umweltforschung (A. Gerber Ed.): Oekom-Verlag.

Kirchner-Heßler, R., Gerber, A., & Konold, W. (2007). Nachhaltige Landnutzung durch Kooperation von Wissenschaft und Praxis (R. Kirchner-Heßler Ed. Vol. Teil I+II). Munich, Germany: Oekom Verlag München.

Mauser, W., Klepper, G., Rice, M., Schmalzbauer, S., Hackmann, H., Leemans, R., & Moore, H. (2013). Transdisciplinary global change research: the co-creation of knowledge for sustainability. Current Opinion in Environmental Sustainability, 5, 420-431.

Menny, M., Voytenko Pagan, Y., & McCormick, K. (2018). Urban Living Labs and the Role of Users in Co-Creation. GAIA -Ecological Perspectives for Science and Society, 27(S1), 68-77.

Messerli, B., & Messerli, P. (2008). From Local Projects in the Alps to Global Change Programmes in the Mountains of the World: Milestones in Transdisciplinary Research. In Hadorn G.H. et al. (Ed.), Handbook of Transdisciplinary Research (pp. 43-62). Dordrecht, Germany: Springer.

Meurer, J., Erdmann, L., Geibler, J. V., & Echternacht, L. (2015). Arbeitsdefinition und Kategorisierung von Living Labs. Siegen, Germany: p. 29

Parodi, O., Waitz, C., Bachinger, M., Kuhn, R., Meyer-Soylu, S., Alcantara, S., & Rhodius, R. (2018). Insights into and Recommendations from Three Real-World Laboratories. An Experience-Based Comparison. GAIA-Ecological Perspectives for Science and Society, 27(S1), pp. 52-59.

Pregernig, M., Rhodius, R., & Winkel, G. (2018). Design Junctions in Real-World Laboratories. Analyzing Experiences gained from the Project Knowledge Dialogue Northern Black Forest. GAIA -Ecological Perspectives for Science and Society, 27(S1), 32-38.

Renn, O. (2018). Editorial: Real-World Laboratories – the Road to Transdisciplinary Research? GAIA -Ecological Perspectives for Science and Society, 27(S1), p. 1.

Rogga, S., Zscheischler, J., & Gaasch, N. (2018). How much of the Real-World Laboratory is hidden in current Transdisciplinary Research? GAIA-Ecological Perspectives for Science and Society, 27(S1), 18-22.

Schäpke, N., Bergmann, M., Stelzer, F., & Lang, D. J. (2018a). Labs in the Real World: Advancing Transdisciplinary Research and Sustainability Transformation. Mapping the Field and Emerging Lines of Inquiry. GAIA -Ecological Perspectives for Science and Society, 27(S1), 8-11.

Schäpke, N., Stelzer, F., Caniglia, G., Bergmann, M., Wanner, M., Singer-Brodowski, M., Loorbach, D., Olsson, P., Baedeker, C., & Lang, D. J. (2018b). Jointly Experimenting for Transformation? Shaping Real-World Laboratories by Comparing Them. GAIA -Ecological Perspectives for Science and Society, 27(S1), 85-96.

Schneidewind, U., Augenstein, K., Stelzer, F., & Wanner, M. (2018). Structure Matters: Real-World Laboratories as a new type of large-scale research infrastructure. A framework inspired by Gidden's Structuration Theory. GAIA-Ecological Perspectives for Science and Society, 27(S1), pp 12-17.

Singer-Brodowsky, M., Beecroft, R., & Parodi, O. (2018). Learning in Real-World Laboratories. A systematic Impulse for discussion. GAIA-Ecological Perspectives for Science and Society, 27(S1), pp 23-27.

Stadler, K., & Geibler, J. V. (2016). Operationalisierung des Living Lab Ansatzes in der Praxis (InnoLab Ed.). Wuppertal, Germany: Wuppertal Institut.

Steen, K., & van Bueren, E. (2017a). Urban Living Labs. A living lab way of working (D. U. o. Technology Ed.). Amsterdam, Netherland: Amsterdam Institute for Advanced Metropolitan Solutions. p. 91

Steen, K., & van Bueren, E. (2017b). The Defining Characteristics of Urban Living Labs. Technology Innovation Management Review, 7(7), 21-23.

Teufel, B., & Erdmann, L. (2015). Akteurs- und Netzwerkanalyse. Karlsruhe, Germany: p. 13

Tress, B., Tress, G., Fry, G., & Opdam, P. (2006) From landscape research to landscape planning: Aspects of integration, education and application. Heidelberg, Germany: Springer, 13-26.

Wagner, F., & Miller, E. (2018) The Background and History of Real-World Laboratories Funding in Baden-Württemberg. GAIA-Ecological Perspectives for Science and Society, 27(S1), p. 5

ZALF - Inter 3 GmbH Institut für Ressourcenmanagement und ZALF (2015) Innovationsgruppen für Nachhaltiges Landmanagement. Munich, Germany: p. 4

Appendix C

Semi-structured interview guideline Isar

Contents

Semi-structured interview guideline for Isar concept case study

In order to perform an in-depth analysis of the Isar Concept Case Study, stakeholders who participated in the participatory process have been interviewed during the first week of July 2018. The following questions were addressed during the interviews. The list is of informative character and supports the methodological section (see Chap. 2).

Table Appendix C.1. List of questions addressed during the interviews

Thematic	Questions (in German)	Translation of the questions (in English)
Interviewee	Was war/ist Ihre Rolle bzw. Funktion bei der Isar-Renaturierung? Wie gut kennen sie die einzelnen Bausteine bei diesem Prozess? Wie sind Sie bei der Planung beteiligt gewesen?	Did you play a role in the Isar restoration planning process? Are you well aware about the project and its planning process? Did you participate in the design?
Participants	Wie wurden bei der Isar Renaturierung die Einbindung unterschiedlicher Interessens- und Akteursgrupppen realisiert? Wie waren die Arbeitsgruppen zusammengesetzt? Wie liefen die Arbeitstreffen ab? Welche Methoden wurden angewendet? Hätte man etwas anders machen können? Was hat den Aufbau dieser Arbeitsgruppen begünstigt und welche Faktoren haben den Prozess behindert? Wer hat teilgenommen? (Nutzer, Experten, Behörden, Wissenschaftler). Waren alle wesentlichen Interessengruppen dabei? Wer hat Ihrer Meinung nach gefehlt?	How did the different stakeholders participate in the planning process? How were composed the different work groups? How unfolded the workshops? Which methods were applied? Could they do something differently/better? Which were the drivers and barriers to the participation process? Who participated to the planning process? (user, expert, public authorities, academia) Did all the potential stakeholders participate in the planning process? Who did not but should participate?
Stakeholder recruitment	Wurden Sie angesprochen oder sind Sie selbst aktiv geworden, um teilnehmen zu können? Wie sollte die Ansprache Ihrer Meinung nach erfolgen? Wie wurden Akteursgruppen und Personen, die eingebunden werden sollten, identifiziert?	Did you volunteer or did somebody propose you to get involve in the planning process? How should stakeholder be selected for the Living Lab? How were the participants of the participation process identified?
Stakeholder cooperation	Wie hat die IsarAllianz/Isar Colloqium/Munchner Forum an der Planung mitgearbeitet? Haben die IsarAllianz und das Isar Colloqium zusammengearbeitet?	How influenced the IsarAllianz/Isar Colloqium and the Münchner Forum the planning process? How interacted the IsarAllianz/Isar Colloqium and the Münchner Forum during the planning process?
Facilitator	Wer hat die Veranstaltungen moderiert? Wer hat diese Person bestimmt? Welchen fachlichen Hintergrund hatte diese Person?	Who was the Moderator/Facilitator? Who nominated him/her? Which expertise did a facilitator should have?
Retrospective	War Ihrer Meinung nach der an der Isar verfolgte Ansatz rückblickend ein Erfolg? Was würden Sie anderen LL empfehlen?	Do you think that the Isar experience was a success? What would you recommend to the other LL?

Appendix D

Template Stakeholder identification matrix

Contents

Matrix example that can be used for stakeholder identification and description in PHUSICOS

Template Stakeholder identification and description matrix

Table Appendix D.1. Template Matrix for Stakeholder identification and description (based on Menny et al., 2018)

STAKEHOLDER (Name / Institution)	INSTITUTIONAL LOGIC / ACTION LOGIC	INTEREST IN PROJECT	STRATEGY OF INCLUSION	CHALLENGES	PLANNED RESPONSES TO CHALLENGES
PUBLIC SECTOR					
PRIVATE SECTOR (Business & Industry)					
USERS (e.g. interest groups)					
KNOWLEDGE INSTITUTIONS					

Appendix E

Templates Stakeholder mapping

Contents

PHUSICOS

E.1 Stakeholder Mind Map: Concept and Illustrative Example

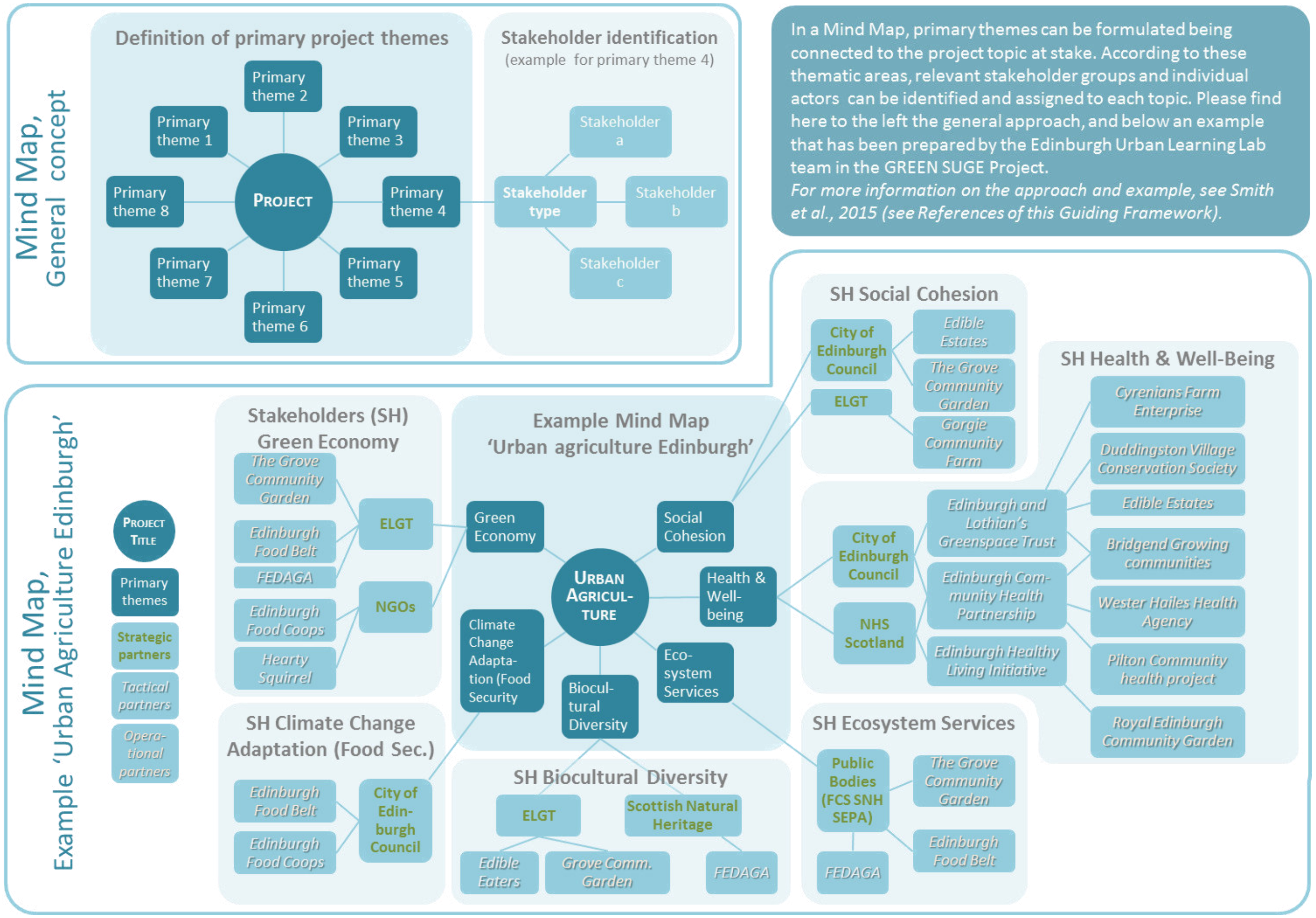

Figure Appendix E.1. Conceptual approach and illustrative example of a Stakeholder Mind Map for the purpose of stakeholder identification in PHUSICOS. Based on Smith et al., 2015. Design: Christian Smida

E.2 Stakeholder Landscape Map: Conceptual Tool Description

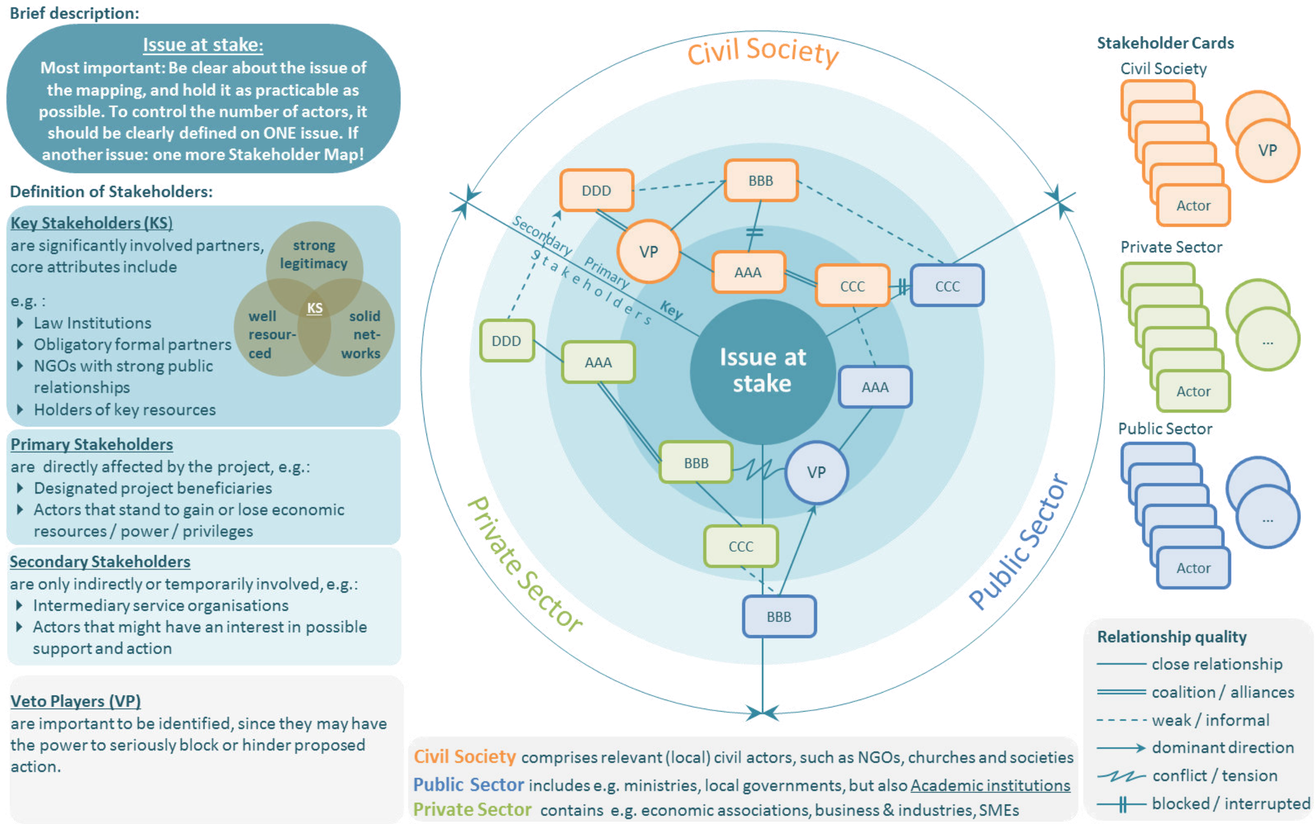

Figure Appendix E.2. Conceptual approach / Tool description of a Stakeholder Map visualizing different qualities (and affiliations) of stakeholders as well as their relationships to each other. The elaboration of a comprehensive stakeholder landscape mapping may serve for stakeholder identification and analysis purposes. Based on SDC, 2012. Design: Christian Smida

Appendix F

Template Power-Interest-Matrix

Contents

Matrix example to be used for stakeholder analysis in PHUSICOS

Template Power-Interest-Matrix

Example for a Power-Interest–Matrix (or: Influence-Interest-Matrix) that illustrates the relevant Key Players, Subjects, Context setters and Crowd actors, allocated in the matrix according to their relevant power position and interest in the project (here: example of the Integrated Management of Floodplains / RELU Project). The participation strategy of a project should take into consideration the allocation of stakeholders to the four segments, and choose tools of stakeholder involvement accordingly.

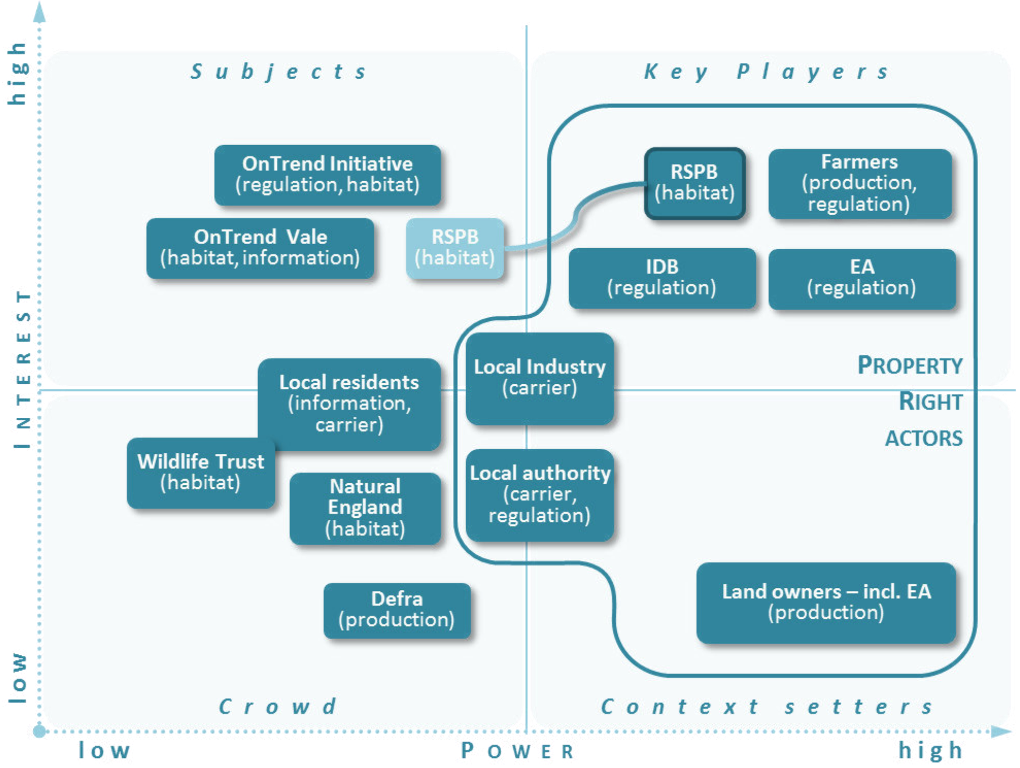

Figure Appendix F.1. Example illustrating the Stakeholder analysis tool "Power-Interest-Matrix" that can be used for Stakeholder analysis purposes in PHUSICOS. Based on Reed et al., 2009. Design: Christian Smida

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