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Summary of data collection on TSL predecessors

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Abstract

This Deliverable includes a database of projects and structures that may be seen as precursors of Transition Super Labs. In addition, based on desk research selected projects are described in more detail in order to evaluate, assess, and compare their conceptual framework and methodological approach for accelerating the transition towards climate neutrality. This contributes to the development of the new and still evolving concept of Transition Super Labs. The results are a prerequisite for a common understanding about the methodological approach and the conceptual grounding of evaluation and impact assessment within the TRANSFORMER project.

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Executive Summary

The concept of Transition Super Labs (TSL) is based on the realization that the urgency and complexity of climate change require an approach which allows to simultaneously develop and test a portfolio of large-scale systemic solutions for climate neutrality. However, the TSL concept is a new and still evolving concept which is only vaguely outlined yet. Therefore, this Deliverable aims at elaborating a working definition, identifying common characteristics of TSLs and evaluating, assessing, and comparing projects and structures that may be seen as precursors of Transition Super Labs. This will contribute to the development of the methodological framework of the TSL concept and provide the conceptual grounding of evaluation and impact assessment within the TRANSFORMER project.

The challenges of implementing TSLs—defined in this Deliverable as *Large-scale Living Labs for systemic transformation*—guided the selection and evaluation of TSL predecessors. To this regard, over 70 projects that have certain characteristics of a TSL or are of interest to the TRANSFORMER project with regard to their methodological approach were collected in a database. Seven of these TSL predecessors were selected and evaluated.

The cases were selected, because they all chose a portfolio approach that aims at large-scale systemic solutions for a sustainable transformation and they all applied—at least some of the—methodologies that characterise a TSL. They vary in their geographic scale (city, region and whole country) and their thematic focus, but they all provide valuable insights with regard to the identified methodological challenges of implementing TSLs.

The gained knowledge about the experiences of the selected cases contributes to the conceptualization of the TSL approach and the development of a suitable methodological framework for the TRANSFORMER project.

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1 Introduction

The human induced climate change threatens the lives and livelihoods of billions of people and other life forms on this planet. It is therefore regarded as one of the biggest challenges of our time.[1] Incremental changes and single solutions will not be sufficient to address the urgency and complexity of this historical challenge. It rather requires systemic solutions which rapidly and fundamentally change "the way in which energy, resources, goods and services are produced and used"[2].

However, many of the concepts and projects that are designed to contribute to such a transformation often quickly "fall apart when theory collides with technical, environmental and socioeconomic realities"[3]. That is why there is a growing conviction among scientists and politicians that the complexity of such a fundamental transformation requires an approach, which allows to simultaneously develop and test—together with affected stakeholders—a portfolio of large-scale systemic solutions for climate neutrality. This is the core idea of the *Transition Super Lab* (TSL) approach, which is applied in the TRANSFORMER project: the development and implementation of "a real-life laboratory where systemic innovation for the transition to a fully decarbonised economy is tested at scale in locations where particularly difficult transition efforts will be required"[4].

However, the TSL approach is a new and still evolving concept. In order to further develop and conceptualize the approach, the first important step is to learn from projects and structures that may be regarded as precursors of TSLs. Therefore, the main objective of this Deliverable is to identify TSL predecessors in order to evaluate, assess, and compare their conceptual framework and methodological approach for accelerating the transition towards climate neutrality. These findings are going to contribute to the development of the methodological framework of the TSL concept and are a prerequisite for the conceptual grounding of evaluation and impact assessment within the TRANSFORMER project.

Two questions guide and structure this Deliverable. The basic question that needs to be answered first is: *(1) How can TSLs be characterized and what kind of projects and structures can be regarded as their predecessors?* Building upon this, a second question will be investigated: (2) *What is the conceptual framework and methodological approach of the TSL predecessors to accelerate the transition towards climate neutrality?*

In order to answer these research questions, this Deliverable will be structured as follows: in a first step, the TSL concept will be described and characterised in order to define what kind of projects and structures can be regarded as predecessors of TSLs (Chapter 2). Based upon that, the methodology of this analysis will be explained (Chapter 3). In chapter 4, the database will briefly be described, followed by an evaluation of selected TSL predecessors (Chapter 5). This Deliverable concludes with a summary of the results and an assessment of the need for further research and conceptual development of the TSL approach (Chapter 6).

[1] IPCC 2022

[2] Directorate-General for Research and Innovation 2018, 20

[3] ibid., 165

[4] ibid., 165

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2 Conceptualization of Transition Super Labs and criteria for identifying TSL predecessors

As mentioned in the introduction, the TSL approach is a new and still evolving concept. In order to answer the first research question—*How can TSLs be characterized and what kind of projects and structures can be regarded as their predecessors?*—this chapter reviews existing literature about TSLs[5], elaborates a working definition and identifies common characteristics. The derived criteria serve to identify projects that can be regarded as TSL predecessors.

The concept of Transition Super Labs was introduced by the *High-Level Panel of the European Decarbonisation Pathways Initiative.* It is based upon "compelling evidence that rapid decarbonisation of advanced industrialised societies can only be achieved through systemic solutions"[6]. The complexity of such a fundamental systemic change in order to rapidly transform whole cities, large economic clusters (such as mining areas) or even regions, requires a completely new approach: an instrument which combines the evidence-based success of fast and effective decarbonisation processes with real-life and large-scale development and testing of portfolios of low carbon, cost-effective and proven technological and non-technological solutions. Therefore, the adaptation of Living Lab methodologies to a large-scale and with a focus on systemic transformation can be regarded as the core characteristic of a TSL (see Figure 1):

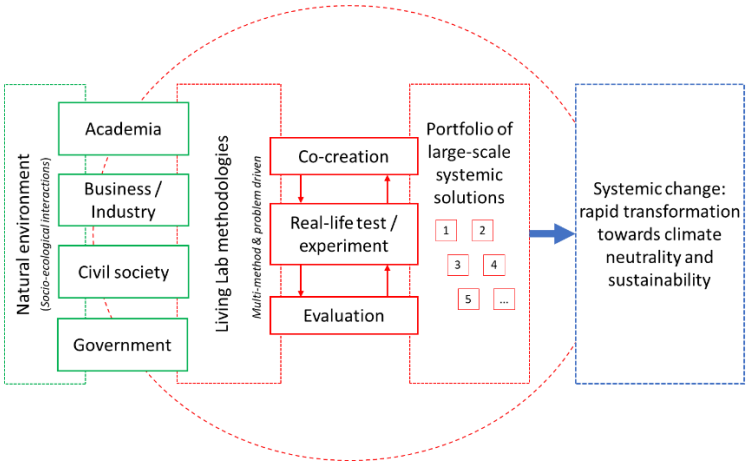

Figure 1: Elements of a Transition Super Lab. Source: own design

1. Adaptation and application of Living Lab methodologies
2. Aiming at large-scale systemic solutions for a rapid sustainable transformation
3. Applying a portfolio approach of measures (experiments) and using multiple leverage points for systemic change simultaneously

In the following overview (Table 1), the characteristics of TSLs are briefly explained and criteria for the identification of TSL predecessors are identified. Based on this scheme, TSL predecessors will be selected and evaluated.

[5] So far, the concept of TSLs is only vaguely outlined and there is—especially with regard to governance and operational level—no literature available yet. The following elaborations are therefore mostly based on three sources: Directorate-General for Research and Innovation 2018, Dunlop et. al 2021 and Schönwälder 2021.

[6] Directorate-General for Research and Innovation 2018, 165

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Table 1: TSL characteristics and criteria for the identification of TSL predecessors. Source: own compilation.

TSL characteristic	Explanation of the TSL characteristic	Criteria for the identification of TSL predecessors
Adaptation and Application of Living Lab methodologies	A **Living Lab** can be described as "a real-life test and experimentation environment where users and producers co-create innovations"[7]. The idea of the TSL concept is, to adapt Living Lab methodologies in order to take this "experimental setting" to a large-scale level focusing on systemic change. In this regard, three main activities of a Living Lab are of particular relevance for the TSL approach: - Co-Creation (or co-design) - Experimentation (real-life testing) and - Evaluation	Application of **Living Lab** methodologies (→ co-creation, experimentation, evaluation)
	Co-Creation means, that innovations are not driven by a single-inventor but are a collaborative development of multiple actors. Applied to a TSL, this means that all relevant stakeholders from the quadruple helix (academia, industry, government and civil society) are involved in the co-creation process: This co-creation process starts with the definition of the problem and an analysis on how it is connected to the current system.[8] Based upon that, a vision is developed and possible scenarios for the transformation process are explored. This enables the stakeholders to identify and implement feasible strategies and solutions ("experiments") to achieve the desired transformation goals.[9] In TSLs, the participation of civil society is at the core of the co-creation process so that the challenges of transition can be fully understood and feasible transformation scenarios can be developed. The participation of citizens is also crucial to create a "sense of ownership"[10] for the	All relevant stakeholders from academia, industry, government and civil society are actively involved in the **co-creation** process. Civil society plays a prominent role in the co-creation process. They are not only consulted, but actively involved in designing the transformation process.

[7] Schuurman 2015, 133. To this regard, Living Labs operate as intermediaries among the stakeholders (citizens, companies, academia and government institutions; Bahei-El-Din & Hassan 2017, 47).

[8] E.g. mobility-related greenhouse gas emission and air pollution and their multiple and complex connections to the whole socio-technical (mobility) regime.

[9] Schäpke et al. 2018, 86-88; cf. Bergmann et al. 2021; Schuurman 2015

[10] Dunlop et. al 2021, 12

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TSL characteristic	Explanation of the TSL characteristic	Criteria for the identification of TSL predecessors
	transformation and "for improving the legitimacy of public policymaking"[11].	
	The complexity of changing whole societal systems requires an approach that focuses on **experimenting** and testing different potential solutions in order to understand the cause and effect relationships of sustainability-related issues. To this regard, experimentation (in combination with → evaluation and simultaneous learning) serve two purposes: "They contribute to transformation by experimenting with potential solutions" and they "produce evidence about the social robustness of solutions, as well as about their scalability and transferability"[12]. It is therefore of crucial importance for a TSL that all stakeholders "[d]evelop a shared understanding of purpose and character of experimentation"[13] and about their—intended or unintended—societal impacts[14].	Focusing on a **real-life experiment** (real-life test)
	Evaluation is an essential element of the Living Lab methodology. It consists of a systematic assessment of objectives, methods, processes and impacts according to predetermined criteria.[15] As TSLs are designed to experiment on different possible solutions and leverage points at the same time (→ portfolio approach), the evaluation process is essential to understand, which (combination of) solutions have the desired effect and are therefore most efficient for a rapid transformation process. However, evaluation is not only necessary for assessing the impact or efficiency of a technological innovation or a policy. "Iterative and reflexive monitoring and evaluation needs to be an integral part of sustainability transition experiments to support individual and organizational	Focusing on a constant and comprehensive **evaluation** throughout the whole innovation process. Iterative and group-specific learning processes for all stakeholders are an essential objective of the project.

[11] Schönwälder 2021, 489

[12] Schäpke et al. 2018, 86-87; cf. Bergmann et al. 2021, 545

[13] Bergmann et al. 2021, 550

[14] ibid., 549

[15] Luederitz et al. 2017, 64; cf. Schuurman 2015, 133

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TSL characteristic	Explanation of the TSL characteristic	Criteria for the identification of TSL predecessors
	learning promoting ongoing change and up-scaling impact"[16]. A TSL therefore should provide learning possibilities for all stakeholders during the whole innovation process.	
Aiming at large-scale systemic solutions for a rapid sustainable transformation	**Large-scale systemic solutions** aim at transforming whole regions and non-sustainable economic systems and not just replacing "wasteful components by more efficient ones."[17] Locations, in which a transition can be particularly difficult, are regarded as especially promising for the TSL approach. According to the *High-Level Panel of the European Decarbonisation Pathways Initiative* this is especially the case in locations like: - "mining-industrial complexes that need to be transformed quickly without destroying their value-creation potential; - conventional agricultural regions that are suitable for conversion into climate-neutral/negative bioeconomies and can also become havens for biodiversity and sustainable tourism; - metropolitan areas where novel concepts of mobility, construction and operation can be combined, most notably by making use of the powerful tools provided by digitalisation and artificial intelligence."[18] Large-scale systemic solutions imply two things: 1) as a systemic approach is regarded as a key element for the TSL concept[19], socioecological factors connected to "the natural environments of society and the economy […] should be seen as drivers for knowledge production and innovation"[20]. Therefore, the *quintuple innovation helix framework* is applied in the TRANSFORMER project.	Focusing on a **large-scale transformation**: whole city, economic sector (such as mining, mobility agriculture sector), region or even a country Specifically focusing on **systemic solutions**

[16] Luederitz et al. 2017, 62

[17] Directorate-General for Research and Innovation 2018, 165

[18] ibid., 165; cf. Xexakis & Trutnevyte 2019, 13.

[19] Directorate-General for Research and Innovation 2018, 165; Schönwälder 2021, 488

[20] Carayannis et al. 2012, 1. This applies especially to the above mentioned "conventional agricultural regions" in which the urgently needed transition can be particularly difficult: Including the natural environment in the knowledge and

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TSL characteristic	Explanation of the TSL characteristic	Criteria for the identification of TSL predecessors
	2) the systemic approach also implies, that a focus on multiple leverage points would be conducive to simultaneously transform more than one societal system (e.g. transportation and industrial production), thus accelerating the transformation process (→ Portfolio approach).	
Applying a portfolio approach of measures (experiments) and using multiple leverage points for systemic change simultaneously	The idea of choosing a portfolio approach of connected experiments for the concept of a TSL and engaging "multiple levers of change simultaneously"[21] is based on the work of Daniela Meadows and inspired by the "Deep Demonstrations" initiated by the EIT Climate-KIC. Using levers for change is based on the idea that "a small shift in one thing can produce big changes in everything"[22]. Regulations or financial incentives are for example leverage points, which are frequently used for achieving (systemic) change. The underlying assumption of choosing a portfolio approach of experiments is, that no single solution will be able to address the complexity of transforming whole regions and societal systems.[23] A rapid transformation therefore requires the testing of a variety of diverse and inherently different solutions simultaneously to see which are the most efficient, especially if connected with each other. This means, that TSLs should focus on a portfolio of transformation solutions (experiments) and engage multiple leverage points at the intersection of socio-technical regimes simultaneously in order to achieve a rapid and more efficient transformation.[24]	Using a **portfolio** of related experiments and engaging **multiple leverage points** for a sustainable transformation simultaneously

innovation model is conducive for the development of *green technology innovations* ("eco-innovations") and "eco-entrepreneurship" (ibid., 5) and thus of crucial importance for promoting a transformation to climate neutrality and sustainability.

[21] EIT Climate-KIC 2019b, 12

[22] Meadows 1999, 1

[23] EIT Climate-KIC 2019b; cf. Dunlop et. al 2021, 12

[24] Such as the above-mentioned regulations or financial incentives for supporting the deployment of hydrogen technology in order to simultaneously change the transportation and the industrial production system. However, one of the most effective leverage points with regard to a fundamental systemic change is to change the "mindset or paradigm out of which the system—its goals, structure, rules, delays, parameters—arises" (Meadows 1999, 3). Raising awareness for the urgent need of a fundamental change in order to promote a shift in mindset of the people is therefore regarded as an important aspect for a successful systemic transformation (Wamsler & Brink 2018, Wamsler et al. 2020).

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The above depicted overview is supposed to provide a first outline of the new and still evolving concept of TSLs. Even though this concept and its elements are still up for (academic) debate, the overview gives a general idea about the concept and key characteristics of a TSL. Based upon these characteristics, a TSL can be described as a *Large-scale Living Lab for systemic transformation*.[25] However, what "large-scale" means in practice (city, regional or national scale) and which "scope" the systemic transformation has to encompass to qualify as a TSL (partial/incremental or complete/radical transformation), is still up for debate.

With regard to the TRANSFORMER project, the TSLs will focus on systemic innovation by identifying and using leverage points which connect different socio-technical regimes.[26] The scalar focus of the TRANSFORMER project lies on regions, as they can be regarded as a crucial focus point where different socio-technical regimes effectively intersect in real-life configurations. Therefore, we aim to find leverage points to simultaneously push two or more socio-technical regimes towards climate neutrality and aim to generate innovation on this regional scale level.

Due to the scale, scope and complexity of such an approach, implementing a TSL will face some fundamental challenges, that have to be addressed in the TRANSFORMER project:

- Ensuring a **balanced representation** of different societal groups and enabling all stakeholders to (efficiently and effectively) participate in a large-scale Living Lab.[27]
- Ensuring that stakeholders are **motivated to participate** over the long time of a systemic transformation, lasting several years or even decades.
- **Integrating existing economic and political networks** in a TSL without creating an imbalance of (political and economic) forces, thus preventing an inclusive transformation process.
- Dealing with **individual interests** and **conflicting ideas** among the stakeholders, especially with regard to "veto players".[28]
- Creating a **common vision** for a transformation on a regional scale among the variety of different stakeholders.
- Implementing **suitable governance arrangements** for a TSL, operating on different levels of government (local, regional, national) but not (necessarily) within the boundaries of a specific political and administrative unit.[29]

[25] cf. Schönwälder 2021, 488

[26] For an explanation *of socio-technical regimes* see: Geels 2002; Fuenfschilling & Truffer 2014

[27] With a special focus on empowering marginalised groups and stakeholders with limited resources to participate (cf. Kamruzzaman 2020).

[28] Like large companies and business groups in the fossil fuel industry that still have significant political influence and can fundamentally hinder (energy) transformations (Balthasar et al. 2019; cf. Bayulgen & Ladewig 2016). To this regard, it is important to emphasize that the "potential for policy change decreases with the number of veto players, the lack of congruence (dissimilarity of policy positions among veto players) and the cohesion (similarity of policy positions among the constituent units of each veto player) of these players" (Tsebelis 1995, 289). Therefore, the upscaling of Living Labs to a regional level and with a focus on a comprehensive systemic transformation might impose a serious challenge as this will very likely increase the number of "veto players" that lack political congruence and cohesion.

[29] With regard to the discussions about *governance* and sustainability transformations see: Ehnert et al. 2018; Kronsell & Mukhtar-Landgren 2018; Patterson et al. 2017; Rabadjieva & Terstriep 2021.

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- Identifying, implementing and managing necessary **steps** and **iterative loops** in the TSL process.[30]
- Assessing and measuring the **effects** and **effectiveness** of multiple connected experiments on complex socio-technical regimes.[31]

With regard to these challenges, we need to learn from the predecessors of TSLs: even though they might operate on a smaller scale or focus "only" on one socio-technical regime, their experiences—especially with regard to the methodological approach and conceptual framework—will contribute to the conceptualization of TSLs. Therefore, these expected challenges guide the selection and evaluation of TSL predecessors.

3 Methodology

The previous chapter showed, that TSLs can be described as a *Large-scale Living Lab for systemic transformation*. Therefore, the search words for identifying TSL predecessors were chosen accordingly.[32] The projects and structures identified in the research were collected in a database and briefly described based on publicly available information. Accordingly, over 70 projects were collected in the database (see Table 4, p. 37) which possess certain characteristics of a TSL (Table 1) or are of interest to the TRANSFORMER project with regard to their methodological approach or their thematic focus. This database provided the basis to identify projects that were most suitable for further investigation and analysis. In that respect, the focus lies on projects that provide insights with regard to the development of a conceptual framework and a feasible methodological approach for the TSL concept, thus addressing some of the above-depicted challenges (see Chapter 2). In addition, these projects can provide valuable insights with regard to the conceptual grounding of evaluation and impact assessment within the TRANSFORMER project. Seven projects were selected and evaluated (Chapter 5) in order to answer the second research question: *What is the conceptual framework and methodological approach of the TSL predecessors to accelerate the transition towards climate neutrality?*

Even though many of the identified and selected projects and structures are just being implemented—and have only limited results so far—they are an excellent opportunity to learn about their experiences in order to find possible solutions for the above depicted challenges of implementing a TSL.

[30] With regard to the whole TSL process: Identification and participation of stakeholders (coalition building), defining the problem and analysing how it is connected to the current system, developing a vision and feasible scenarios for the transformation process as well as implementing, monitoring and adjusting measures ("experiments") to achieve the desired transformation goals.

[31] Especially with regard to "help decision-makers prioritise adaptation interventions […] from a cost-effective and social perspective" (Etxebarria et al. 2021, 36; cf. Krlev & Terstriep 2022).

[32] Key words were "Transition Super Lab", "Large-scale Living Lab", "Regional Living Lab", "Urban Living Lab" and a combination of "Living Lab" and a project relevant thematical focus (mobility & transport, hydrogen infrastructure, circular economy, CO_2 emission reduction & capture technologies for green and fair agri-food supply chains). For this desk research, different sources were used: Academic catalogues (e. g. the Library of the Ruhr University), Web of Science, SCOPUS, Google Scholar and—especially for more detailed and current project information—the search engine "Google".

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In addition, the identification of TSL predecessors also provides a necessary step, to get connected and establish a platform for "active and simultaneous learning" about common experiences and solutions for pathways to climate neutrality and sustainability.[33]

4 Description of the Database

The database of TSL-predecessors is the basis for the *Summary of data collection on TSL predecessors* (see Table 4, p. 37).[34] To this end, the database is kept as simple as possible: it encompasses the name of the project or structure and a short description (including a source for further information about the project). The database also includes projects, which do not necessarily qualify as a TSL predecessor but are of methodological or thematical relevance to the TRANSFORMER project (see Chapter 3). At the time of the submission of this Deliverable, 73 projects were collected in the database.
In order to keep track of the results of identified TSL predecessors and to identify more structures that can be regarded as TSL predecessors, the database is designed as a "living database" which will be supplemented in future. Based upon this database, seven TSL predecessors were selected. They will be briefly described and evaluated in the next chapter.

5 Evaluation and comparison of selected projects

As mentioned above, the aim of this Deliverable is to provide insights with regard to the development of a conceptual framework and a feasible methodological approach for the TSL concept. Therefore, the seven selected projects and structures are not portrayed in detail but only briefly described and evaluated with regard to a specific aspect that addresses one of the above-depicted challenges for implementing a TSL (see Chapter 2). Their real-life experiences will contribute to the further development and conceptualization of the TSL approach.

The first case "**A Deep Demonstration of a Circular, Regenerative and Low-Carbon Economy in Slovenia"** focuses on a circular economy approach to foster a fundamental systemic transformation of the whole country. This case is used to provide a general methodological approach based on an iterative process developed by EIT Climate-KIC in the Deep Demonstration program[35] (systems innovation model), that can be adapted and applied to the TSL concept.

The second case "**REWAISE – Resilient Water Innovation for Smart Economy**" is structured in nine Living Labs which focus on the creation of smart water ecosystems. In this project, a canvas for "Defining Models of Governance" was applied in order to find suitable governance arrangements and business models. This

[33] For the according "Communication and Dissemination Strategy", see also Deliverable 6.1 and 6.2 of the TRANSFORMER project.

[34] The database was compiled with MS Excel and is included in the attachment of this Deliverable.

[35] *Deep Demonstrations* are designed as large-scale projects which "are intended to be inspirational examples of what's possible (EIT Climate-KIC 2019a, 2)". In this demand-led approach, EIT Climate-KIC works together with "city authorities, regional bodies, governments or industry leaders who are committed to fundamental transformation to a net-zero emissions, resilient future (ibid.)". In their *systems innovation approach* (see case of Slovenia below), a portfolio approach of experiments is applied and multiple leverage points for systemic change are used simultaneously in order to learn "what creates the fastest pathways to change (ibid.)".

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canvas provides an easily implementable blueprint, to assess the interests, capabilities and roles of the different stakeholder groups and thus addresses the challenge of finding and implementing suitable governance arrangements and appropriate legal forms for TSLs and their related projects and activities.

The third case "**Rybnik 360 project"** faces the challenge to develop a transition strategy for a coal mining region. This case will be used to illustrate a novel approach ("Deep Listening") with regard to the participation and involvement of stakeholders in the vision building process and in developing ideas and possible solutions for the transformation. This approach is particularly interesting, as it addresses multiple of the above depicted challenges with regard to the involvement of stakeholders simultaneously.

The fourth case "**Deep Demonstration Vienna"** uses a portfolio approach to become climate neutral until 2040. This case will provide an example of a useful methodological approach to identify and bring together stakeholders and a programme that provides an opportunity for citizens to get actively involved in the development of climate protection measures and the financial decision-making process.

The fifth case "**Future City_Lab: Reallabor für nachhaltige Mobilitätskultur**" aims at developing solutions to transform the mobility system in the city of Stuttgart, focusing on the "cultural dimension of mobility". The Living Lab gives a promising example on how learning possibilities can be designed in order to be conducive for the transition process. This will address the challenge of enabling stakeholders to participate in a large-scale Living Lab, ensure that stakeholders are motivated to participate over the long time of a systemic transformation, and to create a common vision for a transformation on a regional scale among the variety of different stakeholders.

The sixth case "**Score - The Coastal City Living Lab**" applies Living Lab methodologies in a network of 10 coastal cities to develop and implement integrated solutions to adapt to climate change and enhance their climate resilience. This case is used to provide a methodological framework for the challenge of assessing and measuring the effects an effectiveness of multiple connected experiments on complex socio-technical regimes. This is a prerequisite for decision-makers to prioritise adaptation interventions from a socio-economic.

The seventh case "**Climate Ready Clyde - Building a more resilient, prosperous and fairer Glasgow City Region"** developed a portfolio of connected solutions in order to fundamentally transform the socio-economic system to become a climate resilient region. It provides the insight, that having an "economic case" is a strong leverage point to overcome obstacles and generate widespread acceptance for the transformation process. This case will also be used to exemplify, that changing whole socio-economic systems is a complex undertaking that can (or has to) be addressed in many ways: for example, by the "use of culture to help achieve transformational adaptation"[36].

[36] Twist et al. 2020, 2

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Table 2: Description of TSL predecessors and projects with valuable insights for the TSL concept. Source: own compilation.

A Deep Demonstration of a Circular, Regenerative and Low-Carbon Economy in Slovenia
A study by the consulting company Material Economics has calculated, that the implementation of a circular economy has the potential to cut 56% of the emissions from heavy industry by 2050.[37] Therefore, the Slovenian government identified the circular economy as a strategic development priority for meeting the country's climate targets. In order to achieve their ambitious goal to become a zero-carbon country by 2030, the Slovenian government implemented in 2018 a *Roadmap for Circular Economy*[38] and adopted in 2019 a proposal by the EIT Climate-KIC called: *A Deep Demonstration of a Circular, Regenerative and Low-Carbon Economy in Slovenia.* The applied "**Systems Innovation Methodology**" will be described in more detail, as it provides a useful approach that can be adapted to the TSL process. In the first step (see Figure 2), relationships with local stakeholders were established in order to develop a common understanding of the transformation process and to create a commitment to work together.[39] To this regard, the participation of stakeholders from all societal groups—including citizens and civil society organisations—is of central importance in order to fully understand the local and sectoral challenges and "for improving the legitimacy of public policymaking"[40].

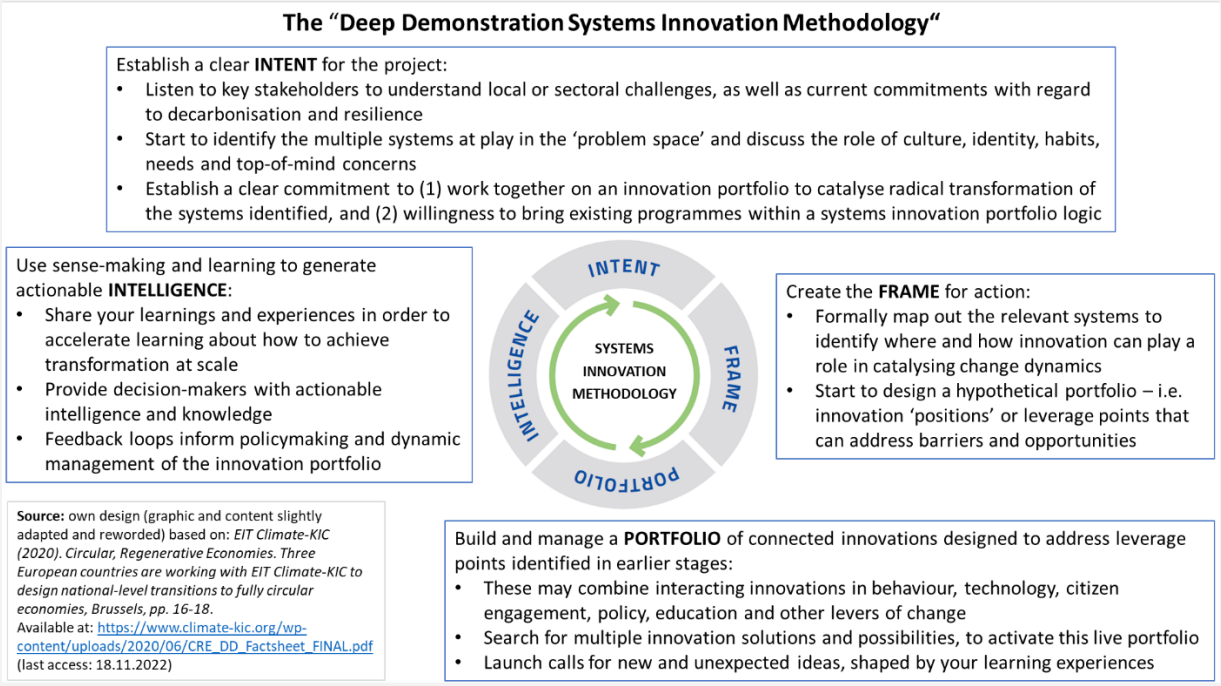

Figure 2: The Deep Demonstration Systems Innovation Methodology as a blueprint for a TSL process. Source: own design (graphic and content slightly adapted and reworded) based on: EIT Climate-KIC 2020a, 16-18.

[37] Material Economics Sverige AB 2018, 5

[38] Košir et al. 2018

[39] EIT Climate-KIC 2020a. For a detailed explanation of the methodology see: EIT Climate-KIC 2021b

[40] Schönwälder 2021, 489

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In the second step, the Slovenian government and a variety of stakeholders mapped relevant factors and activities in the climate context, in order to explore and identify possible transformation scenarios.[41] The goal was to "move away from incremental solutions and to create and implement a portfolio of strategic, coordinated innovative interventions" to "achieve real transformative change across the whole system"[42].

The developed innovation solutions (third step) focus on three pillars: Smart and circular communities, Circular green development and Circular policy design and science. Under the umbrella of the *Slovenian Center for Smart and Circular Transition,* the activities will be structured across 17 linked programs which target "the three major stakeholder groups of local communities, business, and policy-makers"[43].

The transition focuses on five key supply chains that will simultaneously be transformed: forestry, built environment, manufacturing, food and mobility. Specific implemented projects are for example the establishment of waste collection systems and recycling centres.[44]

The implementation of (and experimentation on) corresponding projects is designed to have positive social, environmental and financial impacts (avoided greenhouse gas emissions, launched services and products on the market, revenue etc.). In addition, the projects also aim at promoting "shifts in behaviours, mindsets and practices, thus creating the framework and conditions needed for systemic change."[45]. To this regard, learning from the experiences (step four) is a key element in this iterative process, in order to generate actionable intelligence for decision-makers and to learn how to "achieve transformation at scale"[46].

Lessons learned for the TRANSFORMER project:

The case of **Slovenia** fulfils all of the above depicted criteria for a TSL: applying Living Lab methodologies with a strong emphasis on citizens´ participation and using a large-scale portfolio approach that aims at a fundamental systemic change for a whole country. Moreover, the case of Slovenia provides real-world experiences on how a systemic transformation can be implemented and managed in a large-scale Living Lab. To this regard, the applied *Systems Innovation Methodology* gave evidence-based knowledge about necessary steps and iterative loops that are useful in the management of the TSL process. Therefore, the case of Slovenia addresses on of the main basic challenges of a TSL on how to identify, implement and manage a transformation process in a TSL (see Chapter 2).

In addition, circular economy is of thematical relevance for the TRANSFORMER project (especially for the TSL in Western Macedonia). The example of Slovenia can therefore provide additional thematical learning opportunities for the TRANSFORMER project.

[41] This consists of a "comprehensive resource flow map encompassing the flows of raw and intermediate materials, finished products, waste, energy, human resources, economic value as well as imports and exports, [that] […] will form the backbone of any further activities". (EIT Climate-KIC 2020d)

[42] EIT Climate-KIC 2022

[43] Ibid.; EIT Climate-KIC 2021a

[44] Lavtizar et al. 2021, 426; cf. EIT Climate-KIC 2022

[45] EIT Climate-KIC 2022

[46] EIT Climate-KIC 2020a, 18

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REWAISE – Resilient Water Innovation for Smart Economy

REWAISE – Resilient Water Innovation for Smart Economy is a European project for the creation of smart water ecosystems. It started in 2020 and will run until 2025. The project is structured in nine Living Labs which are grouped into three European hubs (Atlantic, Continental, Mediterranean).[47] As large-scale real-life demonstrators, the REWAISE Living Labs aim at contributing to a carbon neutral and sustainable hydrological cycle, consistent with the concept of a resilient circular economy. The project focusses on establishing a "framework of digital innovations to support alternative water management"[48], especially with regard to reducing freshwater and energy use as well as recovering nutrients and materials. The project also aims at creating new market niches for products and services in water-smart activities, and to "redefine the governance models and provide recommendations that can remove unnecessary legal barriers to innovation in Europe"[49].

This brief summary about the REWAISE project focuses on the aspect of "redefining the governance models" as it addresses the above depicted challenge of identifying and implementing suitable governance arrangements for TSLs (Chapter 2). To this regard, it is important to emphasize, that due to the complexity and the diversity of large-scale Living Labs there is no "one-size-fits-all" governance model.[50] However, in general the governance and management structure of a Living Lab (or a TSL) should be designed according to the way it is managed and organised on a strategic or operational level. To this regard, "the Living Lab vision and scope, risk management, operations, knowledge sharing as well as dissemination activities should be taken into account"[51].

With regard to the specific Living Lab activities, the support by "the local governments, decision makers and the private companies" is of major importance.[52] However, studies about sustainability transition and (large-scale) "Urban Living Labs" show, that *collaborative governance* approaches—which focus on the inclusion and cooperation of different stakeholder groups—are also regarded as a key success factor.[53] Therefore, the **canvas for "Defining Models of Governance"** (see Figure 3) which was applied in the REWAISE project, is based upon the idea that the governance arrangements of a Living Lab "should provide decision-making opportunities to all stakeholders".[54] Therefore, representatives from all stakeholder groups need to be involved from the beginning and the chosen governance model "should mirror a circle of mediators where there are no dominating voices".

[47] http://rewaise.eu/living-labs/ (last access 19.11.2022)

[48] Bódi et al. 2022, 14

[49] ibid.

[50] Zingraff-Hamed et al. 2021

[51] Bódi et al. 2022, 14

[52] ibid.

[53] Ehnert et al. 2018; Kronsell & Mukhtar-Landgren 2018; Patterson et al. 2017; Martin et al. 2019; Medina et al. 2022; Rabadjieva & Terstriep 2021; Voytenko et al. 2016; Zingraff-Hamed et al. 2021. Other studies highlight the importance of "*bottom-up participatory governance*" approaches for generating trust and solving problems (Medina et al. 2022) and "*polycentric governance*" approaches (Zingraff-Hamed et al. 2019).

[54] Bódi et al. 2022, 14

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The central questions addressed by the canvas to define the most fitting governance model for a Living Lab are:

"Who are the participants?

- Public administration, Research institutions and Universities, Companies, SMEs, Society

Who is paying/contributing with what? Including:

- Project manager and other personnel, Budget, In-kind

How are decisions taken in the different levels?

- Project strategy, Project implementation, Day-by-day decisions

Which is the communication strategy?

- Internal communication, External communication

Figure 3: Canvas for identifying suitable "Models of Governance". Source: Bódi et al. 2022, 14.

What does each participant get?

- Money, Social impact, Prototypes, products or services, Intellectual property"[55]

This canvas provided a basis for the REWAISE project, to analyse and implement suitable governance models and find appropriate legal forms for the different projects in the respective Living Labs.[56]

Lessons learned for the TRANSFORMER project:

As the concept of TSLs is still evolving, no practical experiences with regard to the governance and operational level exist so far. However, it is obvious that TSLs—as large-scale Living Labs—will operate on different levels of government (local, regional, national) and across the boundaries of political and administrative units. Due their focus on a systemic transformation by applying a portfolio approach, TSLs also may have a large scope of activities. In addition, as the framework may change significantly during a long-term systemic transformation (e. g., due to amended or new regulations or changes of socio-economic influencing factors), governance arrangements will not be static. Implementing suitable governance arrangements for a TSL is therefore especially diverse and challenging. To this regard, the canvas for identifying suitable "Models of Governance"—that was successfully applied in the large-scale Living Lab REWAISE—provides an easily implementable blueprint to assess the interests, capabilities and roles of the different stakeholder groups. This provides the basis to identify, establish and if necessary adapt governance arrangements and appropriate legal form for the TSLs and its different projects.[57]

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Rybnik 360 project

The City of Rybnik is situated in the Silesian province, which is the largest coal-producing area of the EU.[58] The Rybnik metropolitan area has 2.3 million residents and is home to "240,000 businesses generating approximately eight per cent of Poland's GDP."[59] Coal mining is still a dominant industry, with "over 10% of the population work[ing] in entities connected to the mining industry"[60]. Despite the economic importance, there are several reasons for a complete phase-out of coal mining and fossil power generation: their severe negative effect on air pollution levels[61], the lack of competitiveness for Silesian coal[62] and regulations regarding the emission of greenhouse gases.[63]

Rybnik faced the challenge, how to involve the various stakeholders in the region and dealing with their "different and often contradictory interests and expectations"[64] in the development of the transformation process. In cooperation with the EIT Climate-KIC, Rybnik authorities addressed this challenge by implementing a novel approach in order to involve all stakeholders: ***Deep listening***.

The idea was, that the city government shouldn´t impose a particular perspective on the citizens, "but listening to the citizens and other stakeholders in the city to identify the pathways of this transformation"[65]. In order to do this, over 200 in-depth interviews and 900 surveys were conducted between April and October of 2020.[66] This resulted in the creation of 93 innovation ideas that evolve around four identified key areas for improvement: air quality, quality of life, future of mining and future of work.[67] This resulted in the "creation of a portfolio of strategic solutions that are interconnected to amplify the impact on Rybnik's entire urban ecosystem"[68]. They address "the most relevant urban challenges, such as how to support entrepreneurs and encourage the creation of new business activities, or how to catalyse the replacement of coal-based heating systems in residents' homes"[69]. However, Rybnik360 does not have "predefined and pre-planned activities. It is a continuous process of verifying initiatives

[55] Bódi et al. 2022, 33-34

[56] For a detailed description of the established governance arrangements and business models in the nine Living Labs of the REWAISE project see: Bódi et al. 2022, 47-54. For a stakeholder mapping and comprehensive study about the societal contexts in the Living Labs see: Medina et al. 2022, 34-97

[57] Bódi et al. 2022, 33-34

[58] Barbiroglio 2021

[59] EIT Climate-KIC 2020b

[60] Dunlop et al. 2021, 9

[61] EIT Climate-KIC 2020b

[62] Sadura et al. 2021

[63] EIT Climate-KIC 2020b

[64] Sadura et al. 2021

[65] EIT Climate-KIC 2021d

[66] Dunlop et al. 2021, 9. For a detailed description of the methodology see: Sadura et al. 2021

[67] d'Antonio et al. 2021

[68] EIT-Climate-KIC 2021c

[69] d'Antonio et al. 2021

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and adapting them in order to optimise their effectiveness[70]. This means, "that after the initial implementations, there is constant learning evolution of the portfolio"[71].

Lessons learned for the TRANSFORMER project:

The case of "Rybnik 360 project" is a particular interesting example of a TSL predecessor, as citizens played—through a methodological approach called "Deep Listening"—a key role in developing the vision for the transformation as well as possible development scenarios. This methodological approach addresses several of the above depicted challenges with regard to the involvement and balanced representation of stakeholders in a TSL (see Chapter 2). It also can be a promising tool for the development of a commonly agreeable vision for a transformation and a motivational incentive to participate over the long time of such a transformation process. In addition, Rybnik faces similar challenges as two of the TRANSFORMER regions (Lower Silesia and to a lesser extent also the Ruhr Valley) and can therefore be of thematical interest.

Deep Demonstration Vienna

The city of Vienna already implemented in 1999 a Climate Protection Programme and put sustainability and climate protection as central guidelines in the Vienna city development plan of 2014 (STEP 2025).[72] Based on their Smart City Vienna Framework Strategy and the Vienna Climate Guide, Vienna committed to becoming climate neutral by 2040.[73]

In order to foster a rapid systemic transformation towards a decarbonised city, Vienna identified key levers that focus on different policy groups: "urban renewal and energy supply, urban planning and green infrastructure, mobility, the climate action budget as a steering mechanism, innovation and the local economy, and public participation and social justice".[74] Out of this portfolio of connected solutions that will be tested in the next years[75], two of the instruments are particularly interesting for the implementation of a TSL: A "Map of climate protection pioneers"[76] and the "Participatory budget for climate action".

The lack of networking between research institutions, companies, administrative institutions and civil society actors is regarded as a significant barrier to the implementation of innovations in the area of climate change and resilience. In order to increase the visibility of single stakeholders and to improve

[70] Sadura et al. 2021

[71] EIT-Climate-KIC 2021c

[72] Vienna City Administration, Municipal Department 18 (MA 18) – Urban Development and Planning 2014

[73] Vienna City Administration, Municipal Department 20 of the City of Vienna – Energy Planning 2022

[74] City of Vienna 2020; For a detailed description of key levers for transformation change see: Vienna City Administration, Municipal Department 20 of the City of Vienna – Energy Planning 2022

[75] Such as a platform for integrated mobility solutions for "[c]arbon-free city logistics and mobility to bridge the urban-rural divide, including innovative approaches to last-mile logistics" (EIT Climate-KIC 2020c, 19), "Power Plant roofs" (a combination of PV canopies and the flowering of rooftops for improving the microclimate) or a platform to support the foundation of renewable energy communities ("one-stop-shop"): https://brutkasten.com/klimaschutz-stadt-wien-mit-landkarte-und-deep-demo-auf-dem-weg-zur-dekarbonisierung/ (last access: 19.11.2022) [in German only]

[76] "Landkarte der Klimaschutz VorreiterInnen"

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the cross-disciplinary exchange and cooperation of these stakeholder groups, the City of Vienna developed in cooperation with Climate-KIC and the network Ashoka a **Map of climate protection pioneers.**[77] The map is built on a standardised questionnaire and telephone interviews conducted between November 2019 and January 2020. 30 pre-identified persons were asked to name (up to) three people, who took a pioneering role in making a positive contribution to the development, implementation and dissemination of solutions in the field of climate protection. The respondents were also asked, to assess the type and intensity of the relationships (e. g. close working relationships) with the named persons.[78] These nominated people were also contacted, interviewed and asked to name three "climate protection pioneers" and their respective relationships to them. At the end of this process, 305 persons were identified. However, the goal of this mapping is not to identify all relevant stakeholders or to create a ranking about their importance with regard to climate protection. The objective is to identify relevant (but sometimes not prominent and therefore "invisible") persons and organisations in order to invite them to an open participation process.[79] This methodology will be adapted and applied in the TRANSFORMER project.[80]

Participatory budgets are a governance tool that aim at "increasing transparency and civil control in governing"[81]. The first idea for a **Participatory budget for climate action** in the City of Vienna was developed in 2020. Facing political obstacles in the beginning, a Participatory Budget for Climate Action of 6 million Euros was implemented in 2021.[82] It is now widely regarded as a possible "lever for achieving climate change mitigation and adaptation goals by broadly involving citizens in idea-generation and decision-making processes"[83]. It might be especially useful to generate completely new ("out-of-the-box") ideas for initiating local climate protection projects in Vienna.[84] If implemented correctly, it can also be a useful tool for promoting a democratic and socially just transition, by "actively reaching out to […] traditionally underrepresented groups.[85]

The City of Vienna started the first round of the participation process in three districts in the beginning of 2022: More than 1100 ideas for climate protection and adaptation were proposed by the Viennesse citizens and together with experts further developed into 102 concrete project outlines. A representative jury will now decide, which of the projects will be implemented in the next two years.[86]

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[77] Kesselring 2020 [in German only]. For a beta version see: https://embed.kumu.io/2a03775a3cbf09bf351988affdab4080#ashoka-climate-innovators-map/hauptrolle/249 (last access: 19.11.2022). For a detailed description of the methodology see: Matti et al. 2020.

[78] Analogous translation from German to English. For original (German) wording see: Kesselring 2020, 8

[79] ibid.: 9.

[80] For future updates see: https://kumu.io/transformer-designing-long-term-systemic-transformation-frameworks-for-regions/

[81] Madej 2019, 258

[82] For the development of the concept and the process of implementation see: https://www.demsoc.org/projects/vienna-climate-team-wiener-klimateam-vienna-participatory-budget-on-climate-action (last access: 19.11.2022)

[83] Amann & Hohoff 2022; Aili et al. 2022, 78

[84] Schott & Naimer-Stach 2021, 12

[85] Amann & Hohoff 2022

[86] Stadt Wien n.d.

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Lessons learned for the TRANSFORMER project:

The case of Vienna provides an interesting methodological approach to identifying and connecting stakeholders (Map of climate protection pioneers). As this is a prerequisite for enabling all stakeholders to (efficiently and effectively) participate in a large-scale Living Lab, this method addresses one of the above depicted challenges for implementing a TSL (see Chapter 2). This method might also prove to be useful, with regard to identifying stakeholders that are "not so visible" and ensuring the involvement, balanced representation and collaboration of different societal groups (quadruple helix). The second "experiment" that is part of the portfolio—the Participatory budget for climate action—could be a particular useful social innovation for a TSL: as TSLs are designed to operate on a large-scale (in the case of TRANSFORMER a whole region) they face—more than smaller Living Labs that are restricted to local communities or municipalities—the challenge of creating legitimacy for political decisions. The inclusion of citizens in financial decision-making processes (e.g., via a participatory budget for transformational action), could be a useful governance tool that encourages citizens to participate in the transformation process and thus create a sense of ownership and personal responsibility.[87]

Future City_Lab: Reallabor für nachhaltige Mobilitätskultur

[Real-world laboratory for a sustainable mobility culture]

Being one of the most important automotive clusters in Europe, the city of Stuttgart and its infrastructure is strongly oriented towards car traffic ("car friendly city"). Facing severe negative impacts of car traffic (such as increased particulate matter, CO_2 emissions, space consumption, traffic jams and noise), the Future City_Lab: Reallabor für nachhaltige Mobilitätskultur aimed at developing solutions to transform the mobility system in the city, focusing on the "cultural dimension of mobility"[88].

In this Living Lab, citizens, academia, companies and the city administration closely cooperated in order to develop ideas about mobility solutions that conserve resources, support health and physical activities and create a new "quality of life" in the city and region.[89] To this regard, the Living Lab did not focus on technological innovations or strategies for traffic optimization. In an iterative process, citizens and students of the University of Stuttgart developed ideas for experiments that were designed to generate accessible knowledge about transformational needs, to create spaces for open discussions and to raise awareness for a "culture" of sustainable mobility. In a competition, different projects were selected and implemented beginning in 2016.[90]

[87] Madej 2019, 258

[88] Lindner et al. 2021 [in German only]

[89] ibid., 12

[90] Such as the temporary conversion of parking space for establishing "creative spaces" by citizens ("Parklets"), a "citizen rickshaw" to bring together younger and older people, or the implementation of a station for a hypothetical balloon-based local transport system (based on Jules Verne) to serve as a place of discussion for citizens about a transformation towards new forms of sustainable mobility. For an overview of the different projects see: http://www.r-n-m.net/projekte/# [in German only] (last access: 19.11.2022)

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Part of the Living Lab was the creation of "possibilities for learning about sustainable transformation": For this, new and innovative forms of academic teaching and learning within the field of "sustainable mobility culture" were developed, applied and tested.[91] The "action oriented, explorative, cooperative, and participatory" approach "provided knowledge on systems, goals, and transformations and allowed participants to gain expertise as well as methods and communications skills". [92] The teaching concept included inter-disciplinary seminars, workshops and field research assignments.
The evaluation of the teaching and learning project showed the great need "for inter- and transdisciplinary teaching formats that address societally relevant issues and respond to the challenges of sustainability".[93] In addition, the project showed that Living Labs "can be a nucleus and driver for systematically implementing inter- and transdisciplinary, research-oriented teaching that promotes education for sustainability" [94].

Lessons learned for the TRANSFORMER project:
Learning plays a central role in the discussions about sustainability transitions, as it is a necessity for gaining a deeper understanding and awareness of the problems and possible solutions for transformational needs. It is therefore regarded as a prerequisite for participation and the creation of a sense of ownership for the transformation.[95]
The *Reallabor für nachhaltige Mobilitätskultur* is a promising example that shows, how learning possibilities can be designed in order to be conducive for the transition process. Therefore, TSLs should integrate such teaching and learning concepts. However, as TSLs focus on systemic transformations that take several years or even decades, such learning possibilities should not be limited to the universities but should include elementary and high school students as well. To this regard, the learning process should be mutual: teaching students the complexity and need for transformational change and integrating their perspectives and ideas about a sustainable future vice versa. This will contribute to address the challenge of: 1) ensuring a balanced representation of different societal groups and enabling all stakeholders to (efficiently and effectively) participate in a large-scale Living Lab, 2) ensuring that stakeholders are motivated to participate over the long time of a systemic transformation, lasting several years or even decades, and 3) creating a common vision for a transformation on a regional scale among the variety of different stakeholders (see Chapter 2).

[91] Pfau & Uhl E. 2021
[92] ibid., 1
[93] ibdi., 4
[94] ibdi., 4
[95] Hicks 2014; Van Mierlo et al. 2020

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Score - The Coastal City Living Lab[96]

Climate change will lead to more frequent extreme weather events, sea-level rise and coastal erosion.[97] Therefore, coastal cities have to adapt and develop strategies to rapidly, equitably and sustainably enhance their climate resilience. The Score project addresses these challenges by using Living Lab methodologies to develop and implement integrated solutions in a network of ten coastal cities. Starting in 2021, the project will focus in the four years of its duration on "Smart Technologies and Digital Platforms" (such as a "GIS early warning support platform" or "Low-cost sensing technologies and citizen science kits") and "Ecosystem Based Approaches" (such as Floodplain management", "Reforestration" or "Sustainable Agriculture"). Citizens will be involved in the design and—via methods of citizen science—assessment of the different measures.[98]
One of the challenges of this large-scale Living Lab is to develop a "methodological framework for the socio-economic assessment of adaptation measures to climate change"[99] in order to "help decision-makers prioritise adaptation interventions […] from a cost-effective and social perspective"[100]. Therefore, this project addresses on of the above depicted challenges with regard to implementing a TSL: to assess and measure the effects an effectiveness of multiple connected experiments on complex socio-technical regimes.

In this project, two different methods will be applied: the "Multiple criteria analysis" (MCA) and the "Cost-benefit analysis" (CBA). They will not be described in detail, as they are well known and often applied (see Table 3 for a brief description).[101] However, these methodologies face some limitations[102] and need to be adapted to the specificities of the ten different coastal cities "in terms of the location and scale of the study area, the main hazards and sectoral impacts that need to be addressed".[103]

[96] Smart control of the climate resilience in European coastal cities

[97] Etxebarria et al. 2021, 6

[98] Etxebarria et al. 2021. For an overview of the measures and programms see: https://score-eu-project.eu/ (last access: 19.11.2022)

[99] Etxebarria et al. 2021, 6

[100] Etxebarria et al. 2021, 36

[101] For the different steps of the two methodologies see: Etxebarria et al. 2021, 22-49.

[102] With regard to the MCA for example the "boundaries of participation, including the choice of stakeholders" and that the "process may be technically [too] complex for some stakeholders, particularly in the assessment of options and weighting of criteria" (Etxebarria et al. 2021, 26) and with regard to the CBA for example the „lack of capacity when trying to economically assess all benefits" or the "intangible aspect of environmental aspects" (ibid., 38).

[103] Etxebarria et al. 2021, 49

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Table 3: Summary of main differences between MCA and CBA. Source: Etxebarria et al. 2021, 10-11 (table complemented and slightly adapted).

	Multiple criteria analysis (MCA)	Cost-benefit analysis (CBA)
Description	The Multiple criteria analysis allows to integrate stakeholders and is therefore regarded "as an appropriate method for the participatory-based assessment […] MCA is a useful participatory-based tool to solve complex decision problems, allowing individuals to compare different options, according to pre-defined criteria and to come up with an overall score for each option, thus being able to prioritize them."	The "CBA is a socio-economic assessment tool that decision-makers often rely on to value and compare different adaptation measures and to make public choices [...]. Adaptation measures are prioritized in terms of an economic efficiency criteria, i.e., the maximization of the difference between benefits and costs expressed in monetary terms. In comparison with classic CBA, which only includes market-related costs and benefits, the social CBA also considers non-market costs and benefits."
Level of complexity[104]	Low	High
Type of assessment	Participatory	Expert-based
Stakeholder involvement	Yes	No

Lessons learned for the TRANSFORMER project:

The Score project is large-scale Living Lab, that is designed to have specifics impacts on complex ecological and socio-economic systems. Therefore, this project faces one of the challenges, that future TSLs will also have to address: to assess the effects and effectiveness of multiple connected experiments on complex socio-technical regimes in order to provide a basis for decision making. Therefore, the evaluation of the combined application of a Multiple criteria analysis and a Cost-benefit analysis will provide valuable insight for TSLs about possibilities and limitations to measure and assess multiple connected experiments. As the next case shows, having such an assessment is not only a prerequisite for decision-making but it may also help to overcome resistance and generates support for transformational change.

Climate Ready Clyde - Building a more resilient, prosperous and fairer Glasgow City Region

A report about the impact of climate change on the Glasgow City Region showed, that the risk of bad weather events like frequent floods, storms and extreme heat will increase significantly due to climate change.[105] The resulting damages to the infrastructure and to the built and natural environment is estimated to have an annual economic cost for the Glasgow City Region of "£400 million each year by the 2050s […]. In many cases these impacts will fall on disadvantaged and vulnerable groups."[106]

The report generated an awareness for the urgent need to act and it clearly showed, that "[a]dapting to climate change will alleviate future costs to public services, and reduce overall pressures".[107] In order

[104] (Knowledge, technical skills, time, and cost requirements)

[105] England et al. 2018; cf. IPCC 2022

[106] Climate Ready Clyde 2018, 3

[107] Climate Ready Clyde 2018, 4

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to develop a strategy for the adaptation to climate change, the "Clyde Rebuilt" project was initiated by Climate Ready Clyde and EIT Climate-KIC in 2020. The project had the objective to bring all relevant stakeholders together (quadruple helix) and supporting their collaboration for identifying and developing possible solutions for the transformation. The idea was to move away "from stand-alone projects like concrete flood walls to more systemic solutions that might couple river restoration with wetland creation, flood forecasting and warning systems, and new insurance mechanisms"[108].

The development of a "Vision and Theory of Change for a Climate Ready Glasgow City Region"[109] and the specification of the conceptual approach for transformational adaptation stood at the beginning of the project.[110] Build upon that, Clyde Rebuilt conducted together with the stakeholders of the region a mapping of the political, economic and cultural systems in order to identify "new levers in Glasgow City Region's systems which have the potential to stimulate more transformational change, before piloting, evaluating, adjusting and scaling-up. These levers have then been used to identify large-scale innovation actions which will significantly accelerate adaptation progress."[111] Part of the Clyde Rebuilt project was to assess the economic costs of climate change and—with regard to the identified possible solutions—the costs of adaptation in the Glasgow City Region.[112] This "economic case" was a crucial lever, that helped to overcome opposition (e. g. with regard to the expected costs for transformation and the apprehension of short-term losses for the economy[113]) and to generate acceptance for the transformation towards a climate resilient Glasgow City Region.

The work of Clyde Rebuilt supported the development of the "Glasgow City Region Climate Adaptation Strategy"[114] which identified 11 strategic "interventions that introduce a broader systemic perspective to move from incremental to transformative change to be achieved by 2030"[115]. They are addressed by *Flagship actions*, which are an early initial package of bundled and interconnected large-scale measures which are required to be addressed simultaneously in order to support the systems level approach of the Adaptation Strategy over the next five years.[116] They are designed to help implement "multiple interventions in the Strategy and invite a wide cohort of actors—public, private, third sector and communities—to coalesce behind them."[117]

[108] Climate Ready Clyde 2020a

[109] Climate Ready Clyde 2021a, 10-12; For a detailed description see: Climate Ready Clyde 2020b

[110] Watkiss et al. 2020

[111] Ibid., 25

[112] Climate Ready Clyde 2021c

[113] Climate Ready Clyde 2021c

[114] Climate Ready Clyde 2021a, 28

[115] EIT Climate-KIC 2021c; These interventions focus on diverse areas in the realm of adaptation (from supporting the ability of organisations, businesses and communities to adapt to climate change or to enable and equip individuals and communities to participate in adaptation, focusing on the most vulnerable). For example, one of the interventions is to establish the Glasgow City Region as a Living Lab for climate adaptation, to fill evidence gaps with regard to "a robust understanding of potential risk, adaptation options and how they can be implemented" (Climate Ready Clyde 2021a, 57). For a detailed overview of the interventions and connected measures see: Climate Ready Clyde 2021a, 26-59.

[116] Climate Ready Clyde 2021a, 65.

[117] Climate Ready Clyde 2021a, 67-68

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One of these Flagship Actions is highlighted in this summary, as it reflects the complexity of systemic change and the need to address all elements of societal systems for a fundamental systemic transformation: "The use of culture to help achieve transformational adaptation"[118].
The role of creative and cultural approaches for supporting transformations to sustainability as well as for adaptation to the effects of climate change is increasingly recognised among scholars and practitioners.[119] Therefore, in the "Climate Adaptation Strategy" a new approach is developed and tested that focuses on "the use of cultural and creative practices"[120] in order to engage citizens, reach different constituencies and to "build a groundswell of much needed diversity, new voices and different ways of responding to the challenge".[121] To this regard, cultural and creative practices can create spaces for "transformative imagination" in order to explore and imagine possible alternative futures and visions which contribute to promoting a necessary shift in mindsets for the transformative process.[122] Cultural practices can also support the development of "informed perspectives on adaptation and resilience"[123]. This will contribute "to build greater connection and ownership, so that individuals and communities are enabled and empowered to participate in adaptation processes" [124]. Some of the already implemented projects promoting the use of cultural practices for transformational adaptation are the *Glasgow Women's Library, Lateral North* and *Rig Arts* which focus on empowering communities of interest.[125]

Lessons learned for the TRANSFORMER project:
The case of Glasgow City Region was not only chosen because it fulfils most criteria of a TSL predecessor.[126] First of all, it exemplifies that with regard to climate change mitigation and adaptation has to be thought together. Even more interesting is the insight, that an "Economic Case"[127] significantly helps to overcome opposition with regard to the expected costs for transformation and the apprehension of short-term losses for the economy and it can generate acceptance for the transformation towards a climate resilient region. An "Economic Case" can, therefore, address the challenge of how to overcome

[118] Twist et al. 2020

[119] Watkiss et al. 2020, 24

[120] Climate Ready Clyde 2021a, 71; (As part of „Flagship Action 3: Increasing community agency in adaptation processes through culture and creative practice")

[121] Climate Ready Clyde 2021a, 71

[122] Twist et al. 2020, 11

[123] Climate Ready Clyde 2021a, 71

[124] Climate Ready Clyde 2021a, 71

[125] Climate Ready Clyde 2022

[126] However, the case of Climate Ready Clyde implicates, that TSLs may not (necessarily) be understood as a single large-scale project with a concise and clear process. A TSL can also be a "structure" that consists of different projects adding and building upon on each other and evolving during the process. To this regard, it is also important to understand, that the multiple solutions (experiments) require different methodological approaches. Therefore, for example Living Lab methods may only be applied in certain projects and measures of the TSL process.

[127] That "[a]dapting to climate change will alleviate future costs to public services, and reduce overall pressures" (Climate Ready Clyde 2018, 4)

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resistance of influential stakeholders like large companies that are still dependent on fossil resources in industrialised regions, such as the Ruhr Valley or Lower Silesia (see Chapter 2).
In addition, the case also exemplifies, that changing whole socio-economic systems is a complex undertaking that can (or has to) be addressed in many ways. To this regard, the use of cultural practices and processes can be an essential element, to create a common vision, to engage citizens and reach different constituencies and to empower marginalised groups and communities in the transformation processes. All of which are key challenges which have to be addressed in the process of implementing and managing a TSL.

The cases described in this chapter all possess key characteristics of a TSL predecessor and show the diversity of different methodological approaches and possible solutions to foster a fundamental transformation towards climate neutrality. They also provide valuable insights with regard to the challenges of implementing a TSL (see Chapter 2). The following chapter will reflect these findings with regard to the two research questions and provide an indication for the need for further research and conceptualization of the TSL approach.

6 Summary and conclusion

The TSL concept is based on the realization, that the urgency and complexity of climate change requires an approach, which allows to simultaneously develop and test a portfolio of large-scale systemic solutions for climate neutrality. However, the TSL concept is a new and still evolving concept which is only vaguely outlined yet. Therefore, this Deliverable had to elaborate a working definition and identify common characteristics of TSLs. This provided the basis to identify TSL predecessors in order to evaluate, assess, and compare their conceptual framework and methodological approach for accelerating the transition towards climate neutrality. This will contribute to the development of the methodological framework of the TSL concept and provides the conceptual grounding of evaluation and impact assessment within the TRANSFORMER project. To this regard, two questions were guiding this Deliverable: *How can TSLs be characterized and what kind of projects and structures can be regarded as their predecessors?* And build upon that: *What is the conceptual framework and methodological approach of the TSL predecessors to accelerate the transition towards climate neutrality*?

With regard to the first research question, TSLs were defined in this Deliverable as *Large-scale Living Labs for systemic transformation*, which can be characterized by three core features:

1. Adaptation and application of Living Lab methodologies
2. Aiming at large-scale systemic solutions for a rapid sustainable transformation
3. Applying a portfolio approach of measures (experiments) and using multiple leverage points for systemic change simultaneously

This first outline of the TSL concept is still up for (academic) debate and currently lacks an answer to the questions of what “large-scale” means in practice (city, regional or national scale) and which “scope” the systemic transformation has to encompass to qualify as a TSL (partial/incremental or complete/radical transformation). However, based on the identified characteristics, key challenges for implementing a

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TSL—especially with regard to stakeholder management and suitable governance structures—could be identified. These expected challenges guided the selection and evaluation of TSL predecessors. To this regard, over 70 projects that have certain characteristics of a TSL or are of interest to the TRANSFORMER project with regard to their methodological approach were collected in a database. Seven of these TSL predecessors were selected and evaluated.

The cases were selected because they all chose a portfolio approach that aims at large-scale systemic solutions for a sustainable transformation and they all applied—at least some of the—methodologies that characterise a TSL. They vary in their geographic scale (city, region and whole country) and their thematic focus, but they all provide valuable insights with regard to some of the above depicted methodological challenges of implementing a TSL (see Figure 4).

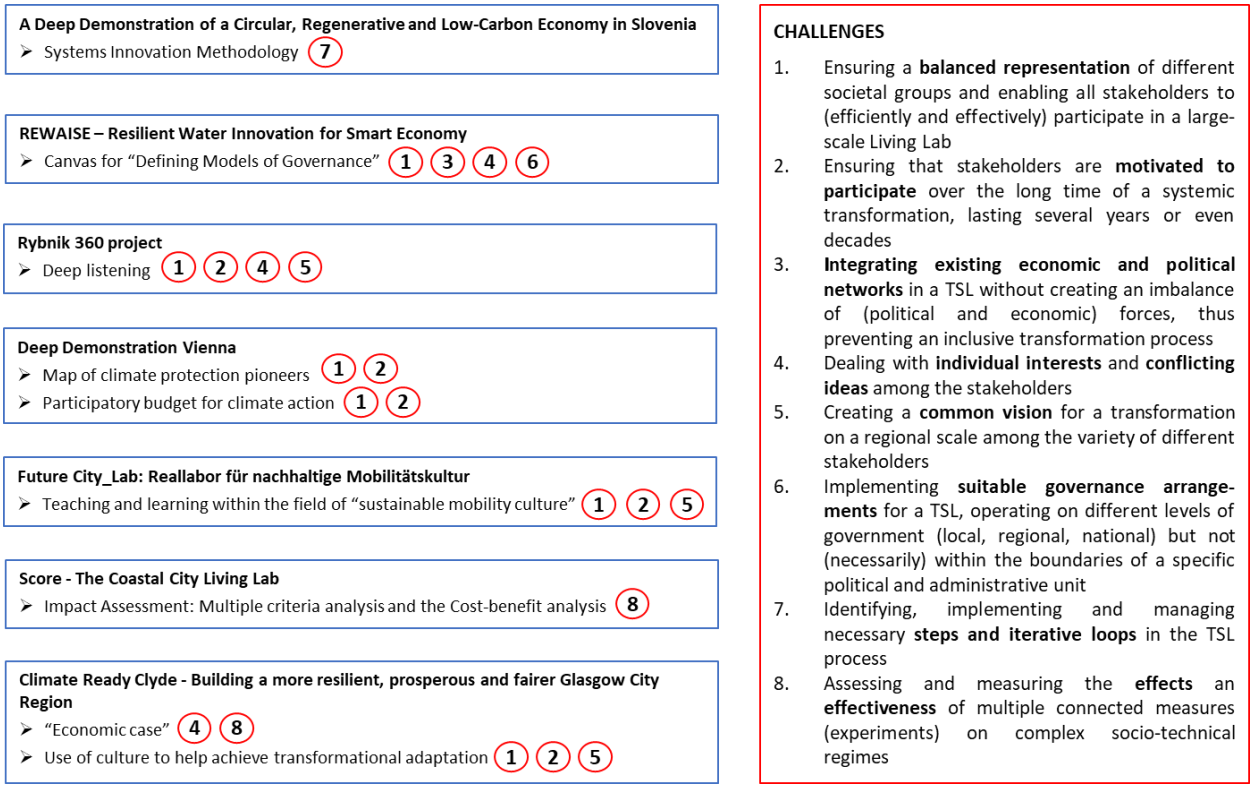

Figure 4: Overview of the cases that address identified challenges for implementing TSLs. Source: own design.

The gained knowledge about the experiences of the selected cases will contribute to the conceptualization of the TSL approach and the development of a suitable methodological framework for the TRANSFORMER project: the "Deep Demonstration in Slovenia" (Systems Innovation Methodology) will, for example, provide valuable insights for developing a "Transition Super-Lab roadmap blueprint process" (Task 4.1, WP4) and the impact assessment applied in "Score" (MCA & CBA) can be beneficial for the development of an "Assessment framework for Transition Super-Labs" (Task 5.1, WP5) and for the ''Impact Evaluation of TSLs pilots in regions'' (Task 5.2, WP5).

Generally, the various and diverse methods and tools applied in the identified TSL predecessors (see Figure 4 and the attached Table 4, p. 37) will be selectively evaluated and added to the TRANSFORMER "Toolkit & Knowledge Hub" (Task 4.2 & 4.3, WP4). To that regard, some of the above depicted concepts,

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methods and tools will be applied in the next two years in the TRANSFORMER project, for example with regard to the identification and collaboration of stakeholders (Map of climate protection pioneers) and for finding suitable governance arrangements in the TSLs (Canvas for "Defining Governance Models"). This will particularly contribute to the envisaged task of "Enabling coalitions and develop vision for Super-Labs" (Task 3.1, WP3) and for "Setting-up Super-Lab uses cases" (Task 3.2, WP3).

However, in order to adapt and apply these methods and tools in this project, we first need to gain a deeper understanding about the different (political, economic and social) contexts in the four TRANSFORMER regions: Emilia Romagna (Italy), Lower Silesia (Poland), Ruhr Area (Germany) and Western Macedonia (Greece). To this regard, case studies will be conducted in order to provide a solid evidence-base for decision-making regarding their potential for transformation and to gain a deeper understanding about the specific challenges in these regions for the implementation of the TSLs (Task 2.2 of WP2).

As described above, the TSL concept is designed to be transferred to other regions in which particularly difficult transition efforts will be required. Therefore, a quantitative mapping based on statistical data will be conducted to identify regions in Europe that would benefit the most from the TRANSFORMER Super-Lab approach (Task 2.1, WP2).

The gained knowledge of the cases studies, the quantitative mapping and the real-world experiences of implementing TSLs in the TRANSFORMER regions will be analysed and fed into the development and further conceptualization of the TSL approach (Task 2.3, WP2). This will contribute to find solutions for achieving the goal of climate neutrality.

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Attachments

Table 4: Database of TSL predecessors and projects of methodological or thematic interest. Source: own compilation. [128]

ID#	Name	Description	Thematical	Methodological	Region	Country	Scale
1	**Adelaide Living Laboratory Hub**	Research to build a stronger evidence base to support government policy and planning and industry delivery aimed at low carbon living (https://www.unisa.edu.au/research/research-node-for-low-carbon-living/research-projects/adelaide-living-laboratory/)	Low carbon housing	Green Star Communities rating tool [+Living Lab method.]	Adelaide: three key development sites (Tonsley, Bowden and Lochiel Park)	Australia	local
2	**Agro Living Lab**	Cooperation of over 200 farmers and local agrotechnology companies to work together on developing and testing agrotechnology machinery to improve user-centered design (https://www.interregeurope.eu/good-practices/agro-living-lab-eliving-lab-projects)	Agriculture	[Living Lab method.]	Länsi-Suomi	Finland	regional
3	**Andalusian Living Lab**	Cooperation of public administrations, local civil protection agencies, fire fighters and technological enterprises to develop, test and apply digitilisation systems, technologies and techniques reducing the risk of forest fires (https://desira2020.eu/andalucia-spain/)	Wildfire management [Forestry/Agriculture]	[Living Lab method.]	Andalucia	Spain	regional
4	**Andorra Living Lab**	Space for startups to test and apply products, technologies and services and to network on a national level (https://andorralivinglab.ad/)	Entrepreneurship	Quadruple Helix model [Living Lab method.]	Andorra	Andorra	national
5	**Apollon**	Advanced pilot composed of four thematically focussed Living Lab experiments to demonstrate the positive impacts of collaborative cross-border Living Lab networking (https://cordis.europa.eu/project/id/250516)	International business networking	[Living Lab method.]	Portugal, Sweden, Finland, Amsterdam	Portugal, Sweden, Finland, Netherlands	international
6	**Blue City Lab**	Platform and labspace to support the transition towards a biocircular economy and to connect pioneers within the biocircular community (https://www.bluecitylab.nl/)	Entrepreneurship	-	Rotterdam	Netherlands	laboratory
7	**Bornholm renewable energy based smart community [PowerLabDK]**	Testing, demonstration and development of renewable energy sources as well as educational training and research of the environmental and socioeconomic sustainability and impact of the renewable energy sources (https://research-and-innovation.ec.europa.eu/system/files/2020-04/ec_rtd_responsible-island-bornholm.pdf)	Renewable energies	[Living Lab method.] - does not explicitly mention it	Island of Bornholm	Denmark	Local

[128] The database was edited by Matthew Federico Becker (undergraduate assistant of the working group „Urban and regional economics“ at the Ruhr University Bochum).

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ID#	Name	Description	Thematical	Methodological	Region	Country	Scale
8	**Catalonia Living Lab**	Public-private framework for the development and testing of connected and automated vehicle technologies for the international automotive and research industry through virtual simulation, laboratories, proving grounds and public roads (https://space.uitp.org/initiatives/catalonia-living-lab-barcelona-av-spain)	Mobility	[Living Lab method.]	Catalonia	Spain	Local
9	**Central Ostrobothnia Living Lab**	Involving stakeholders of the Kokkola Industrial Park, the Living Lab will study the impact of digitalisation in the bioeconomy sector while focussing on the sustainable transition from an agricultural-based rural society to a smarter-based rural environment through digitilisation and the use of the social capital of the area (https://desira2020.eu/central-ostrobothnia-finland/)	Digitalisation	[Living Lab method.]	Central Ostrobothnia	Finland	regional
10	**City of Leuven**	City administration put together a portfolio of strategic experiments to achieve systemic, holistic change and deep decarbonisation in the neighbourhood Kessel-Lo while involving the citizens from the very start (https://www.climate-kic.org/news/citizens-inspire-a-car-free-leuven/)	Mobility	[Living Lab method.] - does not explicitly mention it	Kessel-Lo in Leuven	Belgium	local
11	**CITYLAB**	Set of living laboratories on innovation and implementation processes for sustainable urban logistics that will exchange, experience and develop methodologies for implementation transfer between cities and between companies. Objective is to develop knowledge and solutions for emission-free city logistics in urban centres. (https://ec.europa.eu/inea/en/horizon-2020/projects/h2020-transport/urban-mobility/city-lab)	Low carbon logistics	[Living Lab method.]	Amsterdam, Brussels, London, Oslo, Paris, Rome, Southampton	Netherlands, Belgium, United Kingdom, Norway, France, Italy	local
12	**Climate Ready Clyde - Building a more resilient, prosperous and fairer Glasgow City Region**	Cross-sector initiative to develop a Strategy and Action Plan against the impacts of climate change (http://climatereadyclyde.org.uk/)	Resilience	-	Glasgow	United Kingdom	regional

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ID#	Name	Description	Thematical	Methodological	Region	Country	Scale
13	**Decarbonisation Community for Logistics**	Cooperation of freight, transport and trade associations, logistics companies, local municipalities and the community that uses freight village services to help reduce the logistics sector's carbon footprint both locally and system-wide by testing solutions in real-life freight villages (EIT-Climate-KIC-Innovation-Projects-Portfolio-2020.pdf)	Low carbon logistics	Creation of a "climate action ecosystem"	Bologna	Italy	regional
14	**Deep Demonstration of a circular, regenerative economy: Decarbonizing Slovenia**	Collaboration between the Joint Research Centre, EIT Climate-KIC, EIT RawMaterials and the Slovenian government to implement a circular, regenerative and low-carbon economy (https://s3platform.jrc.ec.europa.eu/en/w/the-jrc-supports-the-project-aiming-at-decarbonising-slovenia-a-deep-demonstration-of-a-circular-regenerative-and-low-carbon-economy-)	Low carbon economy	Deep Demonstration (https://www.climate-kic.org/wp-content/uploads/2021/10/Deep-Demonstrations-Methodology.pdf)	Slovenia	Slovenia	national
15	**Deep Demonstration Vienna**	Three lead experiments based on the goals and objectives of the Smart City Wien Framework Strategy by the city administration: The path to equitable distribution of blue and green infrastructure; Urban public spaces of the future; The path to carbon-neutral neighbourhoods (https://smartcity.wien.gv.at/deep-demonstration-als-ideenwerkstatt/)	Ecologically and socially sustainable urban development	Deep Demonstration (https://www.climate-kic.org/wp-content/uploads/2021/10/Deep-Demonstrations-Methodology.pdf)	Vienna	Austria	local
16	**Deep demonstrations of net-zero emissions, resilient maritime hubs: Cyprus**	Collaboration between the port of Piraeus, the port of Valencia and the Cyprus Deputy Ministry of Shipping to develop an experimental portfolio for prioritised areas to test impactful solutions, support mutual learning and communicate to a wider audience to create a circular, inclusive, net-zero-emissions maritime sector (http://www.unsdsn.gr/deep-demonstrations-for-zero-net-emissions-in-the-)	Low carbon logistics	Deep Demonstration (https://www.climate-kic.org/wp-content/uploads/2021/10/Deep-Demonstrations-Methodology.pdf)	Piraeus, Valencia, Cyprus	Greece, Spain, Cyprus	national
17	**Deep demonstrations of net-zero emissions, resilient maritime hubs: Piraeus**	Collaboration between the port of Piraeus, the port of Valencia and the Cyprus Deputy Ministry of Shipping to develop an experimental portfolio for prioritised areas to test impactful solutions, support mutual learning and communicate to a wider audience to create a circular, inclusive, net-zero-emissions maritime sector (http://www.unsdsn.gr/deep-demonstrations-for-zero-net-emissions-in-the-)	Low carbon logistics	Deep Demonstration (https://www.climate-kic.org/wp-content/uploads/2021/10/Deep-Demonstrations-Methodology.pdf)	Piraeus, Valencia, Cyprus	Greece, Spain, Cyprus	local

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ID#	Name	Description	Thematical	Methodological	Region	Country	Scale
18	**Deep demonstrations of net-zero emissions, resilient maritime hubs: Valencia**	Collaboration between the port of Piraeus, the port of Valencia and the Cyprus Deputy Ministry of Shipping to develop an experimental portfolio for prioritised areas to test impactful solutions, support mutual learning and communicate to a wider audience to create a circular, inclusive, net-zero-emissions maritime sector (http://www.unsdsn.gr/deep-demonstrations-for-zero-net-emissions-in-the-)	Low carbon logistics	Deep Demonstration (https://www.climate-kic.org/wp-content/uploads/2021/10/Deep-Demonstrations-Methodology.pdf)	Piraeus, Valencia, Cyprus	Greece, Spain, Cyprus	local
19	**Deep Demonstrator Milano**	Partnership of the Municipality of Milano, the municipal Agency for Mobility and Environment, Poliedra, the Pilitecnico di Milano - Energy Department, Dark Matter Labs and Bankers Without Boundaries to contribute to the reduction of the carbon footprint of the city of Milan and to the achievement of the "Carbon Neutral City" target by 2050 (https://www.poliedra.polimi.it/en/project/deep-demonstrator-milano-2/)	Decarbonisation of urban development	Deep Demonstration (https://www.climate-kic.org/wp-content/uploads/2021/10/Deep-Demonstrations-Methodology.pdf)	Milan	Italy	local
20	**DELTA: Living Lab for the Energy Transition in Darmstadt**	Implementation of new concepts and technologies to optimize energy consumption on multiple scales in the city of Darmstadt, coordinated by the Technical University of Darmstadt (https://www.energiewendebauen.de/en/project/delta-darmstadt_energy_laboratory_for_technologies_in_application)	Renewable energies	[Living Lab method.]	Darmstadt	Germany	local
21	**Eindhoven City Lab**	Cooperation of the municipality of Eindhoven and the Stichting MAD to improve the urban environment by involving experts and citizens and digital innovations (https://www.stadslabeindhoven.nl/over-ons/)	Socially sustainable urban development	Quadruple Helix model	Eindhoven	Netherlands	local
22	**Energise Living Labs**	ENERGISE is an innovative pan-European research initiative to achieve a greater scientific understanding of the social and cultural influences on energy consumption. ENERGISE develops, tests and assesses options aimed at transforming the quality and quantity of energy use among households and communities across Europe. (http://www.energise-project.eu/about-ENERGISE)	Renewable energies	[Living Lab method.]	Denmark, Finland, Germany, Hungary, Ireland, Netherlands, Switzerland, United Kingdom	Denmark, Finland, Germany, Hungary, Ireland, Netherlands, Switzerland, United Kingdom	local

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ID#	Name	Description	Thematical	Methodological	Region	Country	Scale
23	**Energy Capital**	Smart energy partnership for the West Midlands (UK) consisting of energy infrastructure providers, local authorities, academia, diverse businesses and energy entrepreneurs to make the West Midlands attractive to develop and deliver innovative clean energy systems and associated businesses in the world and secure the necessary investments and powers (https://energy-capital-tfwm.hub.arcgis.com/)	Entrepreneurship and renewable energies	-	West Midlands	United Kingdom	regional
24	**Energy Lab Nordhavn**	Cooperation of DTU, City of Copenhagen, CPH City & Port Development, HOFOR, Radius, ABB, Danfoss, COWI, Nerve Smart Systems, Glen Dimplex, METRO THERM and the PowerLabDK facilities to develop and and demonstrate future energy solutions by using Copenhagen's Nordhavn as a full-scale smart city energy lab and demonstrating how electricity and heating, energy-efficient buildings and electric transport can be integrated into an intelligent, flexible and optimized energy system (http://www.energylabnordhavn.com/)	Renewable energies	Smart city energy lab	Nordhavn in Copenhagen	Denmark	local
25	**Energy Living Lab**	Private association researching, replicating, distributing and communicating living lab-concepts in the energy sector (https://energylivinglab.com/de/)	Renewable energies	[Living Lab method.]	-	-	-
26	**EnergyBlock Copenhagen**	Test site of Copenhagen Solutions Labs for Decentralised Energy and Blockchain solutions exploring the potential of utilising renewable energy sources in an existing urban environment and connecting them to an open blockchain for energy as well as showcasing and demonstrating to citizens, investors and decision makers a proof of concept for scaling in other parts of Copenhagen and in other cities (https://cphsolutionslab.dk/en/news/energyblock)	Renewable energies	[Living Lab method.]	Copenhagen	Denmark	local
27	**Forging Resilience in Dolomites**	Partnership of the Fondazione Edmund Mach, Hub Innovazione Trentino and Università di Trento DICAM to create resilient communities in the Dolomites (https://www.climate-kic.org/news/dolomites-forging-climate-resilience/)	Resilience	Deep Demonstration (https://www.climate-kic.org/wp-content/uploads/2021/10/Deep-Demonstrations-Methodology.pdf)	Italian Dolomites	Italy	regional

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ID#	Name	Description	Thematical	Methodological	Region	Country	Scale
28	**Future City_Lab: Reallabor für nachhaltige Mobilitätskultur**	Living Lab coordinated by the University of Stuttgart to explore and develop concepts for sustainable mobility by involving science, administration, companies and citizens (https://elib.uni-stuttgart.de/bitstream/11682/11088/1/Reallabor-RNM-Zines-Intro-2020.pdf)	Mobility	[Living Lab method.]	Stuttgart	Germany	local
29	**Gipuzkoa**	Collaboration of the the Basque Government, the Provincial Council of Gipuzkoa, the OECD, a wide range of local agents and EIT Climate-KIC to transform Gipuzkoa through inclusive, participatory decision making, new business ecosystems and co-ownership of solutions to become more economically, socially and environmentally sustainable (https://www.climate-kic.org/news/gipuzkoa-quest-for-sustainability/)	Economically, socially and environmentally sustainable regional development	Deep Demonstration (https://www.climate-kic.org/wp-content/uploads/2021/10/Deep-Demonstrations-Methodology.pdf)	Gipuzkoa	Spain	regional
30	**GreenHydroChem**	Collaboration of multiple energy companies and research institutions for a living lab to produce, transport, store and use ecologically sustainable hydrogen in central Germany (https://www.imws.fraunhofer.de/de/presse/pressemitteilungen/green-hydrochem-reallabor-wasserstoff.html)	Renewable energies	[Living Lab method.]	central Germany	Germany	regional
31	**Helsinki Living Lab**	Cooperation between Helsinki City and the Helsinki-Uusimaa Region and Tallinn aimed at gaining a deeper understanding of social developments in rural and peri-urban areas around the two cities as well as issues that pertain to digital services and other novel solutions that enable multiple locations for life and work, rural and urban (https://rural-urban.eu/living-lab/helsinki)	Digitalisation	[Living Lab method.]	Helsinki-Uusimaa, Tallinn	Finland, Estonia	regional
32	**Hubs for Circularity**	Public-private collaboration to achieve a leap forward towards circularity and carbon neutrality in the use of resources (feedstock, energy and water) in a profitable way within local contexts connecting various regional stakeholders (industry, SMEs, local authorities, educational institutions and civil society) (https://www.aspire2050.eu/p4planet/hubs4circularity)	Decarbonisation of regional development	[Living Lab method.]	TBD	TBD	regional

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ID#	Name	Description	Thematical	Methodological	Region	Country	Scale
33	**INTERREG Central Baltic (ERDF) / Baltic Urban Lab: Integrated Planning and Partnership Model for Brownfield Regeneration**	New integrated planning and partnership models for brownfield regeneration are created and tested in practice in Norrköping, Tallinn, Turku and Riga and made available to all cities in the region to help them in revitalization of urban space and support the development of smart, sustainable city districts with high-quality living and working environments. (https://www.balticurbanlab.eu/)	Economically, socially and ecologically sustainable urban development	[Living Lab method.]	Norrköpping, Tallinn, Turku, Riga	Sweden, Estonia, Latvia	local
34	**Irish Agri-Food Deep Demonstration**	Partnership of the Ministry of Agriculture, Food and the Marine of Ireland and EIT Climate-KIC to support national climate action in the agriculture and food sector (https://www.climate-kic.org/press-releases/eit-climate-kic-joins-forces-with-the-government-of-ireland-to-stimulate-climate-innovation-in-the-agri-food-sector/)	Agriculture	Deep Demonstration (https://www.climate-kic.org/wp-content/uploads/2021/10/Deep-Demonstrations-Methodology.pdf)	Ireland	Ireland	national
35	**Karlsruhe Mobility Lab**	Collaboration of scientific institutions, the public sector and transportation companies to develop and test innovations for local public transportation and urban and regional mobility (https://www.ittrans.org/en/about/news/insights-into-the-mobility-of-tomorrow-region-is-a-pioneer-in-terms-of-sustainable-mobility-development.html)	Mobility	[Living Lab method.]	Karlsruhe	Germany	regional
36	**Landscape Metropolis**	Strategy developed by local stakeholders in Ferrara to develop a sustainable mobility network in the Po river delta to improve connectivity between the City of Ferrara and surrounding municipalities, with the broader goal of regenerating the delta landscape and reversing trends of population loss affecting rural communities by designing and executing experiments for citizens to experience new and clean ways of travel via water and land (EIT-Climate-KIC-Innovation-Projects-Portfolio-2020.pdf)	Mobility	[Living Lab method.]	Ferrara	Italy	regional

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ID#	Name	Description	Thematical	Methodological	Region	Country	Scale
37	**LIVING LAB URBAN AREA – MANCHESTER**	Cooperation of the Greater Manchester Combined Authority and the University of Manchester to fight energy poverty in Greater Manchester whilst engaging with and building upon the Local Energy Advice Programme that provides free advice and support to energy poor and vulnerable households (https://www.step-in-project.eu/urban-living-lab/)	Renewable energies	[Living Lab method.]	Greater Manchester	United Kingdom	regional
38	**LivingLab Hasselt**	Collaboration of Wageningen University & Research and the Amsterdam Institute of Advanced Metropolitan Solutions to monitor and study the spatiotemporal character of indoor and outdoor atmospheric parameters that influence citizen's health and to find climate adaptation interventions (https://ichange-project.eu/living-lab-hasselt/)	Resilience	[Living Lab method.]	Amsterdam	Netherlands	local
39	**Madrid Deep Demonstration**	Cooperation of the City Council of Madrid, Universidad Politécnica de Madrid, Ferrovial, Matadero Madrid, Distrito Castellana Norte, Iberdrola and other organisations and citizens' movements, to implement actions related to mobility, urban renaturalization or the recovery and improvement of neighbourhoods and housing, among others in a participatory co-creation process that meets the common interest of the citizens of Madrid (https://spain.climate-kic.org/en/news/madrid-officially-signs-up-to-eit-climate-kics-deep-demonstration-of-clean-healthy-cities/)	Ecologically and socially sustainable urban development	Deep Demonstration (https://www.climate-kic.org/wp-content/uploads/2021/10/Deep-Demonstrations-Methodology.pdf)	Madrid	Spain	local
40	**Malmö**	Viable Cities: Partnership of City of Malmö, VA SYD, Sysav, E.ON, Trivector AB, Ericsson, Lund University and RISE to develop an action plan on how to achieve climate neutrality by 2030 (https://en.viablecities.se/foi-projekt/klimat-neutrala-malmo-2030?rq=malm%C3%B6); Deep Demonstration: Partnership of City of Malmö and EIT Climate-KIC to pave the way for continued urban transition for sustainable development (https://www.climate-kic.org/news/malmo-first-swedish-city-join-climate-kic/)	Viable Cities: Decarbonisation of urban development; Deep Demonstration: ecologically and socially sustainable urban development	Viable Cities: -; Deep Demonstration: Deep Demonstration (https://www.climate-kic.org/wp-content/uploads/2021/10/Deep-Demonstrations-Methodology.pdf)	Malmö	Sweden	local
41	**MASA**	Partnership between the Municipality of Modena and the University of Modena and Reggio Emilia to test, evaluate and implement connected and autonomous vehicles (https://trid.trb.org/view/1736816)	Mobility	[Living Lab method.]	Modena	Italy	local

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ID#	Name	Description	Thematical	Methodological	Region	Country	Scale
42	**Merezzate+ (Milano)**	Living Lab coordinated by Politecnico di Milano to integrate clean energy, energy efficiency, sustainable mobility and circular economy in a sprawling urban development project by engaging residents, local public actors, and stakeholders such as housing associations and utilities (EIT-Climate-KIC-Innovation-Projects-Portfolio-2020.pdf)	Ecologically and socially sustainable urban development	[Living Lab method.]	Milan	Italy	local
43	**Moabit West (Berlin)**	Partnership of TU Berlin, Unternehmensnetzwerk Moabit e.V., Quartiersmanagement Moabit West, CHORA conscious city, Imperial College London, Nextbike GmbH, Berliner Agentur für Elektromobilität eMO, autoBus and local authorities in order to combine different aspects of a future sustainable city while focussing on three main topics: energy efficiency, low carbon mobility and sustainable water management (https://www.tu-berlin.de/ztg/menue/projekte_und_kompetenzen/projekte_abgeschlossen/ssd0/parameter/maxhilfe/mobil/)	Ecologically sustainable urban development	Smart Sustainable Districts (SSD) (https://www.climate-kic.org/wp-content/uploads/2016/04/SSD-Extract-V2.pdf)	Moabit West in Berlin	Germany	local
44	**MOVE21**	Innovation project in Oslo, Gothenburg and Hamburg (and later on Munich, Bologna and Rome) coordinated by the City of Oslo to transform European cities and their surroundings into smart zero emissions nodes for mobility and logistics (https://move21.eu/what/)	Low carbon logistics, mobility	[Living Lab method.]	Oslo, Gothenburg, Hamburg, Munich, Bologna, Rome	Norway, Sweden, Germany, Italy	local
45	**Norddeutsches Reallabor**	Collaboration of scientific, economic or political partners aiming at testing alternative energy sources, especially hydrogen, in industrial production processes in Northern Germany (https://norddeutsches-reallabor.de/)	Renewable energies	[Living Lab method.]	Northern Germany	Germany	regional
46	**North Great Plain region**	Living Lab coordinated by the University of Debrecen to improve the performance of SMEs in rural areas by involving farmers, advisors and researchers to develop solutions together and encourage the use of digital opportunities (https://desira2020.eu/north-great-plain-region-hungary/)	Digitalisation	[Living Lab method.]	North Great Plain Region	Hungary	regional
47	**Northern Greece**	Living Lab coordinated by the American Farm School/ATHENA to catalyse rural digitalisation by offering advanced digital services by exploiting the existing agricultural digital infrastructure (https://desira2020.eu/northern-greece-greece/)	Digitalisation	[Living Lab method.]	Northern Greece	Greece	regional

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ID#	Name	Description	Thematical	Methodological	Region	Country	Scale
48	**oPEN Lab**	Living Labs in Tartu, Pamplona and Genk coordinated by VITO to revitalise urban spaces and support the transition to Positive Energy Neighbourhoods by identifying and demonstrating replicable, commercially viable solution packages (https://openlab-project.eu/about/)	Ecologically and socially sustainable urban development	[Living Lab method.]	Tartu, Pamplona, Genk	Estonia, Spain, Belgium	local
49	**Practice-based Learning in Cities for Climate Action (PELICAN)**	Project coordinated by the Greater Manchester Combined Authority to design and deliver a roadmap to reach carbon neutrality by 2038 and to help reduce fuel poverty and health risks posed by bad air quality (EIT-Climate-KIC-Innovation-Projects-Portfolio-2020.pdf)	Ecologically sustainable regional development	Roadmap	Greater Manchester	United Kingdom	regional
50	**Queen Elizabeth Olympic Park (London)**	Urban district development in London coordinated by the London Legacy Development Corporation to establish the former venue of the 2012 London Olympic Games as a multifunctional digitalised and sustainable district (Smart Sustainable Districts_Deep Demonstrations.pdf)	Economically, socially and ecologically sustainable urban development	Smart Sustainable Districts (SSD) (https://www.climate-kic.org/wp-content/uploads/2016/04/SSD-Extract-V2.pdf)	Queen Elizabeth Olympic Park in London	United Kingdom	local
51	**Reallabor Braunschweig-Wolfsburg**	Living Labs in Wolfsburg, Brunswick and the surrounding area to implement, demonstrate and evaluate the use of 5G-network systems for the development of smart regions and cities (https://verkehrsforschung.dlr.de/de/projekte/5g-reallabor)	Digitalisation	[Living Lab method.]	Braunschweig-Wolfsburg	Germany	regional
52	**REPAiR Living Labs: REsources Management in Peri-urban AReas: Going Beyond Urban Metabolism**	European project for the development of place-based solutions and strategies for a better management of material resources and waste in peri-urban areas in Hamburg, Amsterdam, Ghent, Lodz, Pecs and Naples (http://h2020repair.eu/case-studies-map/)	Ecologically sustainable urban development	Geodesign framework (http://h2020repair.eu/about-repair/project-methodology/)	Hamburg, Amsterdam, Ghent, Lodz, Pecs, Naples	Germany, Netherlands, Belgium, Poland, Hungary, Italy	local

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ID#	Name	Description	Thematical	Methodological	Region	Country	Scale
53	**REWAISE**	European project for the creation of smart water ecosystems by integrating a digital framework for decentralised water services and decision-making and by demonstrating them in three European hubs according to hydrological resources, needs, geography and climate (http://rewaise.eu/living-labs/ and http://rewaise.eu/the-project/)	Ecologically sustainable regional development	[Living Lab method.]	Levante, Salamanca, Extremadura, Galicia, Midlands, Northern Cantabria/Asturias-region, Poznan, Ostrava, Skaane	Spain, United Kingdom, Poland, Czechia, Sweden	regional
54	**RIPEET Transition Lab**	European project to support Responsible Research and Innovation policy experimentations for energy transition in Extremadura, Highlands and Islands of Scotland and Ostrobothnia (https://ripeet.eu/index.php/about)	Renewable energies	"Transition Labs" [Living Lab method.]	Extremadura, Highlands and Islands of Scotland, Ostrobothnia	Spain, United Kingdom, Ostrobothnia	regional
55	**Rybnik 360 project (City of Rybnik)**	Collaboration of the administration of Rybnik and EIT Climate-KIC to create a sustainable future for a coal-mining city (https://www.climate-kic.org/in-detail/citizens-just-transformation-rybnik/)	Socially and economically sustainable regional development	Deep Demonstration (https://www.climate-kic.org/wp-content/uploads/2021/10/Deep-Demonstrations-Methodology.pdf)	Rybnik	Poland	regional
56	**Score - The Coastal City Living Lab**	Project by a network of ten European coastal cities to develop a strategy to rapidly, equitably and sustainably enhance coastal city climate resilience (https://cordis.europa.eu/project/id/101003534)	Resilience	[Living Lab method.]	Sligo, Dublin, Oeiras, Barcelona Province/Vilanova|La Geltrù, Benidorm, Basque Country, Gdansk, Piran, Samsun, Massa	Ireland, Portugal, Spain, Poland, Slovenia, Turkey, Italy	local, regional
57	**SHAREPLACE**	Development and testing of concepts to improve the connectivity of local, regional and transnational mobility systems in five pilot regions: Bergamo, Crema, Osijek, Ulm, Zalaegerszeg (https://www.interreg-central.eu/Content.Node/SHAREPLACE.html)	Mobility	[Living Lab method.]	Osijek, Zalaegerszek, Ulm, Bergamo, Crema	Croatia, Hungary, Germany, Italy	regional
58	**SMART DELTA RESOURCES CASE**	Collaboration of large energy and resource-intensive companies in the Flemish-Dutch Schelde-Deltaregion to create a competitive and climate neutral industry by 2050 (https://www.smartdeltaresources.com/en)	Decarbonisation of industry	-	Schelde-Deltaregion	Belgium, Netherlands	regional

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ID#	Name	Description	Thematical	Methodological	Region	Country	Scale
59	**Smart Village Living Lab: India**	Network of a group of academicians, students, representatives from industry, businesses and members of village communities to improve the quality of drinking water, the access to clean energy, affordable housing and education as well as improve the environmental surrounding (https://ruralliv-inglab.wixsite.com/smartvillgeliv-inglab/about)	Ecologically and socially sustainable urban development	[Living Lab method.]	Nischintakoili Block of Cuttack District in Odisha	India	local
60	**SmartMobilityLondon**	Living Lab set up by TRL to test, simulate and innovate transport technologies to improve safety and ecological and social sustainability of London's transport system (https://smart-mobility.london/)	Mobility	[Living Lab method.]	London	United Kingdom	local
61	**TALIA -Territorial Appropriation of Leading-edge Innovation Actions,**	Project to increase transnational activity of innovative clusters and networks of key sectors of the MED area (https://keep.eu/projects/21321/Territorial-Appropriation-o-EN/)	International business networking	-	-	-	regional
62	**Test site Stockholm**	Place provided by the KTH Royal Institute of Technology to develop, test and evaluate new ideas and technologies concerning sustainable mobility in Stockholm (https://www.itrl.kth.se/research/ongoingprojects/test-site-stockholm/test-site-stockholm-1.765033)	Mobility	-	Stockholm	Sweden	local
63	**The Atlantic Innovation Region (AIRe)**	Integration of research and new technologies in sectors such as Life Sciences, AI, Big Data & Analytics with local communities etc. by establishing the West of Ireland as a testbed for these sectors and start-ups (https://western-development.ie/2022/02/24/west-of-ireland-is-appointed-region-of-innovation-as-regional-living-lab-launches-across-the-atlantic-economic-corridor/ and https://enoll.org/network/living-labs/?livinglab=atlantic-innovation-region)	Entrepreneurship	[Living Lab method.]	West of Ireland	Ireland	regional
64	**The Green Light District**	Consortium of challenge owners, citizens, municipal authorities and sustainability experts to support the local community to co-create numerous small-scale projects concerning ecological sustainability, e.g. recycling hubs, waste-free shops etc. (EIT-Climate-KIC-Innovation-Projects-Portfolio-2020.pdf)	Ecologically and socially sustainable urban development	-	Postcode area 1012 in Amsterdam	Netherlands	local

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65	**The Isar-Plan River Restoration**	Collaboration of the State Office of Water Management and the Munich city government for a socio-ecological urban river restoration to improve resilience against environmental risks and sustainable urbanization (https://interlace-hub.com/case-study/23365)	Ecologically sustainable urban development, resilience	-	Munich	Germany	local
66	**The Keele University Smart Energy Network Demonstrator (SEND)**	Platform for energy generation, distribution, storage, forecasting and balancing to be intelligently carried out across different energy sources on the Keel University campus (SEND_smart-energy-network-demonstrator-4pp-nov19.pdf)	Renewable energies	[Living Lab method.]	Keele University campus	United Kingdom	local
67	**The Ray**	18-mile test stretch in southwest Georgia to test connected and automated vehicles (https://theray.org/2019/08/11/a-living-lab-for-connected-vehicles/)	Mobility	[Living Lab method.]	Georgia	USA	local
68	**The TIES Living Lab**	Collaboration of 25 partners with the UK-Government, i3P and the Construction Innovation Hub to make the infrastructure sector more efficient (https://tieslivinglab.co.uk/)	Economically, socially and ecologically sustainable urban and regional development	[Living Lab method.]	United Kingdom	United Kingdom	national
69	**Thessaloniki Smart mobility Living Lab**	Thessaloniki as a platform for testing technological and innovative solutions for mobility, cooperative and autonomous vehicles and freight transport solutions (https://openlivinglabdays.com/2019/07/29/local-visit-thessaloniki-smart-mobility-living-lab/)	Mobility	[Living Lab method.]	Thessaloniki	Greece	local
70	**Torino City Lab**	Torino as a platform for the testing of innovative solutions, providing a system of physical, technological infrastructures, relations and know-how concerning digitalisation at the service of quality of life, environmental and social sustainability (https://www.torinocitylab.it/en/)	Digitalisation	[Living Lab method.]	Torino	Italy	local
71	**Trentino as a lab**	Initiative by the Autonomous Province of Trento whereby the creation of new ICT services, products and social infrastructures is enhanced by user-driven, open innovation principles and practices and cooperation of ICT companies and research centres with local end users (https://dl.acm.org/doi/abs/10.1145/2072069.2072130)	Digitalisation	[Living Lab method.]	Trento	Italy	regional

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72	**Utrecht The New Centre**	Cooperation of Municipality of Utrecht, Jaarbeurs and SSD-paertners to co-develop, pilot and test new integrated solutions for a multifunctional and sustainable city centre (https://wiki.tum.de/display/sddi/Utrecht%2C+The+New+Centre)	Economically, socially and ecologically sustainable urba development	-	Utrecht	Netherlands	local
73	**Wallonia European Creative District Project**	Enhancement of the potential of creative and cultural industries to revitalize the industrial transition of the Walloon economy (http://twist-cluster.be/projets/wallonia-european-creative-district.htm?lng=en)	Socially and economically sustainable urban development	-	Wallonia	Belgium	regional
74	**WindNode**	Partnership of multiple technology companies and research institutions to identify, develop, create and test renewable energy sources and sustainable grids in Germany (https://tu-dresden.de/bu/wirtschaft/bwl/ee2/ressourcen/dateien/enerday-2021/2021-04-08_WindNODE-for-Enerday_graebigkey-note.pdf?lang=de)	Renewable energies	[Living Lab method.]	Germany	Germany	national

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