Annex 3. TWIST Living Labs Action Plan

Annex to the E1.3.1 TWIST Common STrategy for mutual learning and capitalisation of RIS3 results

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List of acronyms and abbreviations

CENTA – Fundación Pública Andaluza Centro de las Nuevas Tecnologías del Agua (Spain)

ENoLL – European Network of Living Labs

ICT – Information and communication technologies

IFTS – Institut de la Filtration et des Techniques Séparatives (France)

ISA – Instituto Superior de Agronomia (University of Lisbon, Portugal)

IST - Instituto Superior Técnico (University of Lisbon, Portugal)

NGO -Non-governmental organization

OIEAU - Office International de l'Eau (France)

PhD – Doctor in Philosophy

R&D&I – Research, development and innovation

RIS3 - Research and Innovation Smart Specialization Strategies

SMEs – Small and medium enterprises

TWIST – Transnational Water Innovation Strategy

UNILIM – Université de Limoges (France)

WWTP – Wastewater treatment plant

1. Introduction

The Transnational Water Innovation Strategy (TWIST) has framed the project and its goals within the European strategic and policy context and has set a strategic framework to execute the defined objectives.

The defined vision for the TWIST strategy is:

"A territory that is resilient to market and climate changes, that stimulates economic growth and environmental protection by being anchored in innovation and stakeholder's engagement"

In order to accomplish the defined vision, a mission and four strategic objectives have been set as showed on figure 1.1.

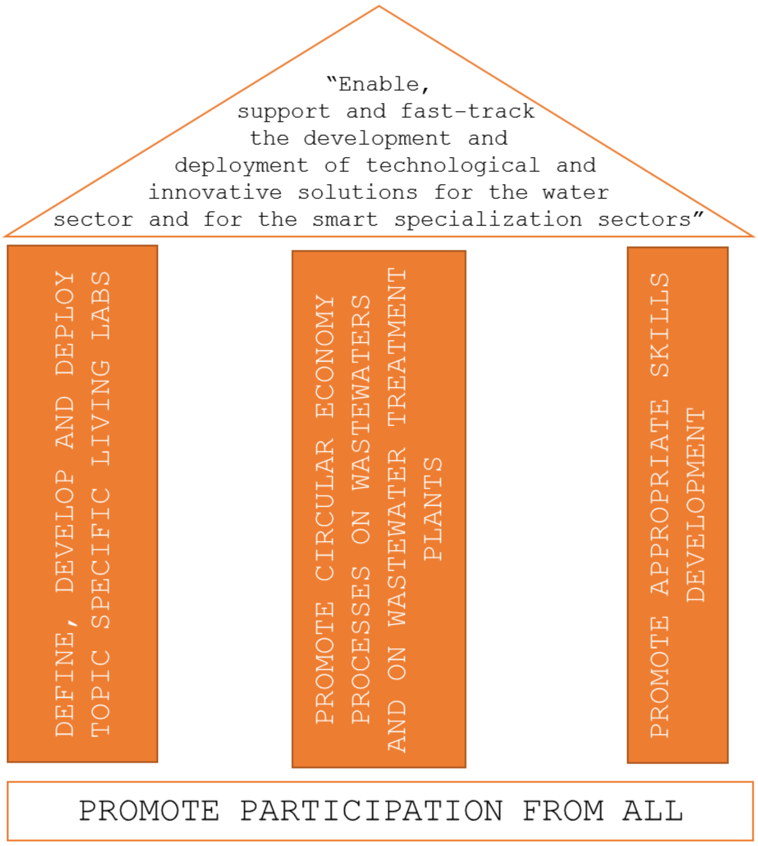

Figure 1.1 - TWIST Mission and Strategic Objectives

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It is therefore aimed for the strategy to become an engine for innovation of the water sector within the TWIST regions using as leverage the Research and Innovation Smart Specialization Strategies (RIS3).

This Action Plan will define the steps to carry out to define, develop and deploy the predicted three Living Labs.

In recent years, Living Labs have been gaining space and recognition as a privileged instrument for the integration of R&D&I with territorial development policy, placing citizens in the centre of innovation (bottom-up approach) and allowing a shift from linear research and innovation activities to 'open innovation'. Living labs are defined as "user-centred, open innovation ecosystems based on a systematic user co-creation approach in public-private-people partnerships, integrating research and innovation processes in real-life communities and settings" (Robles et al., 2015).

The topics on which the three living labs are focused are:

- Wastewater treatment and infrastructure management in France;
- Wastewater treatment and reuse in Spain;
- Wastewater reuse and resource recovery in Portugal.

The strategy defended that the living labs should be developed in one of two ways:

1. Related specifically to wastewater treatment and management, i.e. to be developed in wastewater treatment plants, being this way directly linked to the water sector and its functioning;
2. Related to the identified common smart specialization areas, i.e. to assist on the development of each smart specialization sector through improvements on industrial streams and/or processes that use water as a resource or through improvements directly related to aquatic environments (marine and/or freshwater).

Either way, the Living Labs will assist on the development of innovative technologies and/or processes that will have an overall positive impact on the water quality of rivers and seas and/or on the quantity of freshwater used or in need of treatment. They will also be a tool to a sustainable water management not only within the water sector, but also in other key sectors such as agro-food, health and energy.

Figure 1.2 shows the potential synergies that can be capitalised by the project considering a cross-sector nexus approach (point 2, above). This was defined considering the common smart specialization sectors among all participating regions. It considers the role that water has on specific sectors – energy, agri-food and health – and the potential to make them more sustainable regarding water and its use through their operation.

It also considers the role of cross-cutting smart specialization sectors, such as those technology intensive and that have been considered as enablers for growth and sustainable development.

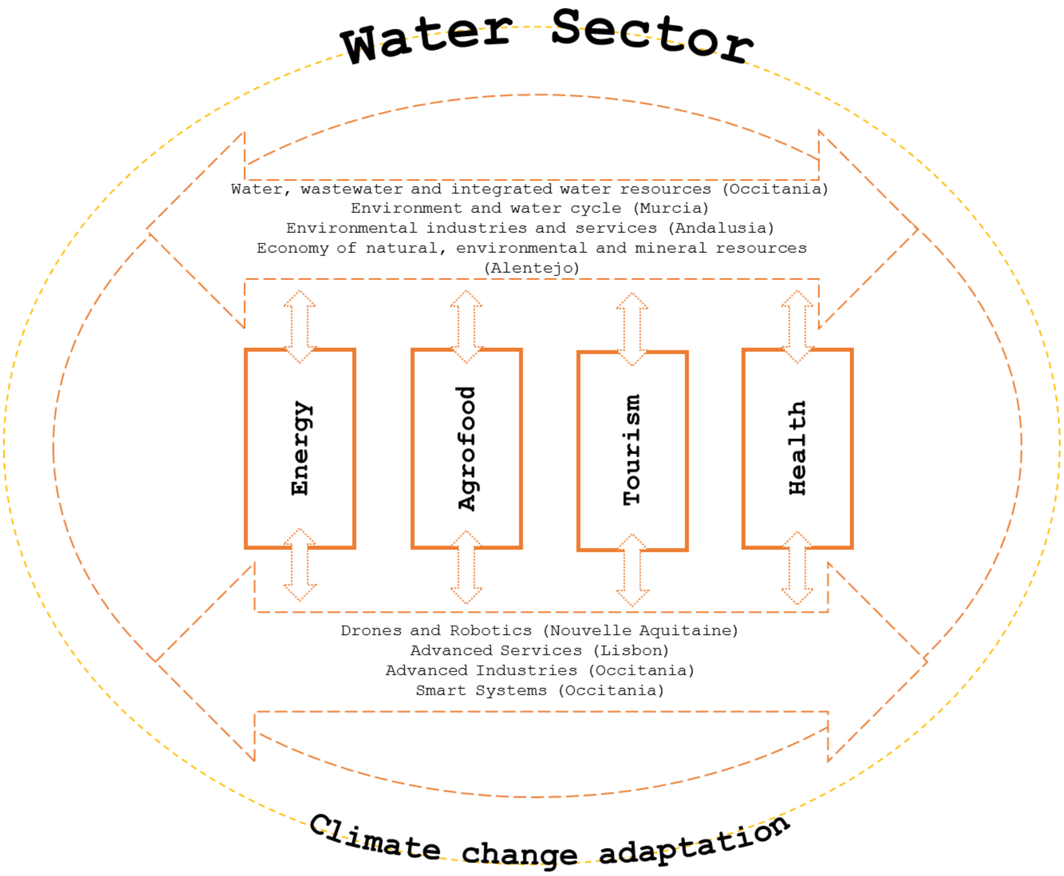

Figure 1.2 - Capitalisation of RIS3 in TWIST regions

2. Methodology

The present action plan was developed through a thorough desktop based research where both scientific articles, PhD dissertations and existing living lab handbooks have been analysed. These elements provided theoretical knowledge and insights on practical approaches to the living lab phenomena.

Due to the nature of living labs and the relatively early stage of development in Europe[1], there are no 'one fit for all' methodological guidelines that can be directly translated to the TWIST Living Labs Action Plan, hence the thorough literature review. Nonetheless, some common elements across Living Labs have been identified as well as similar organizational components and operational phases which anchored this document and assisted on its reliability and robustness.

Notwithstanding, the nature of many of the Living Labs presented, described and/or discussed in the topic related literature diverge from the Living Labs to be created within the TWIST projects. There is a wealth of work on ICT-related Living Labs focused mostly on users' actions and reactions to a certain technology and on Living Labs with a territorial approach and boundaries, such as smart cities. This fact, posed a challenge on defining this action plan and required adaptation of existing methodologies and guidelines to an industry-driven living lab where the users are not individuals *per se*.

This document is divided in 6 chapters. The first chapter links this document to the TWIST strategy and its relevant outcomes, broadly framing the TWIST Living Labs and identifying the ways which they can be developed, in order to support innovation in the water sector and to capitalise the RIS3 results.

The following chapter provides a theoretical background of the living labs phenomena, its positioning within the innovation process and key features. Chapters 4 and 5 present the understandings of a Living Lab as a milieu and as an approach, providing respectively a background on how to set up a Living Lab and on how to run it.

[1]The original concept was born in the US and has a different take on the living lab understanding.

Chapter 6 provides the list of actions that need to be carried out together with relevant information for each action to be completed, such asresponsibilities, timelines and timeframes. The previous chapter can also be used as an explanatory note on what is intended in the defined actions.

3. Understanding the Living Lab phenomena. Theoretical background.

3.1 Concept and positioning within the innovation process

In research and in practice, multiple attempts to define the Living Lab concept have been made with no consensus yet achieved. Living Labs have been described as a methodology, an organization, a system an arena, an environment and/or a systematic approach (Bergvall-Kåreborn, et al., 2009).

Bergvall-Kåreborn et al. (2009) proposed the following definition:

Living lab is a user-centric innovation milieu built on every-day practice and research, with an approach that facilitates user influence in open and distributed innovation processes engaging all relevant partners in real-life contexts, aiming to create sustainable values.

According to Leminen (2013):

Living labs are physical regions or virtual realities, or interaction spaces, in which stakeholders from public-private-people partnerships (4Ps) of companies, public agencies, universities, users, and other stakeholders, all collaborating for creation, prototyping, validating, and testing of new technologies, services, products and systems in real-life contexts.

Schuurman (2015) considers living labs as:

An organized approach (as opposed to an ad hoc approach) to active user involvement by means of different methods involving multiple stakeholders, as is implied in the Public-Private-People character of living labs.

ENoLL defines living labs as:

User-centred, open innovation ecosystems based on a systematic user co-creation approach, integrating research and innovation processes in real life communities and settings (Robles et al., 2015).

For Water Europe Living Labs are:

Water Oriented Living Labs are real-life, water oriented and demo-type and platform-type environments with a cross-sector nexus approach, which have the

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involvement and commitment of multi-stakeholders (including water authorities) and a certain continuity (good chance to continue to their existence), and provide a "field lab" to develop, test, and validate a combination of solutions as defined in the Water Europe SIRA, which include technologies, their integration as well as combination with new business models and innovative policies based on the value of water. (Water Europe, 2019).

Although different, these Living Lab definitions are not contradictory, but rather complementary perspectives that are intertwined (Bergvall-Kåreborn and Ståhlbröst, 2009b; Leminen S., 2015). The conceptual differences may be grounded on the multitude of Living Labs that have been created so far, focusing on different topics such as urban environment, ICT or health requiring therefore different approaches, methodologies and tools.

The TWIST project will not attempt to advance another Living Lab definition as it is outside its scope, but will embrace their main perspectives and apply them when found relevant throughout the set-up of the TWIST Living Labs; nonetheless special focus will be given to what the Water Europe Water Oriented Living Labs concept entails together with the ENoLL definition and requirements.

From a theoretical perspective of the **innovation process**, Living Labs are an emanation of both open innovation (firm-centric) and user innovation (user-centric). Schuurman (2015) claims that open innovation is about purposefully managing inbound and/or outbound knowledge transfers in order to stimulate and optimize the innovation process.

The open innovation concept rises as opposition to the closed innovation process traditionally used by the companies where most of the operations would run within its in-house R&D department and where knowledge and technologies would be kept away from external influences (Schuurman, 2015a). Open innovation is a nonlinear is process with more cooperation between internal R&D departments and the outside world, with everyone involved benefiting from the synergies associated with this collaboration.

This new way of formulating the innovation process puts the user in the centre of the innovation process advocating that *"the user is not simply a source of information or evaluator of the final product, but an active contributor of design ideas and a decision-maker in the process, often referred to as "co-creator" or "co-designer"* (Sanders & Stappers, 2008). Users become the focus of

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the innovation process instead of being merely passive receivers of the innovation. As a consequence, traditional innovation activities are shifting towards innovation networks, where traditional industries attempt to gain advantages from this user-driven approach.

By being open innovation ecosystems Living Labs allow to foster knowledge and technology transfers amongst the different actors that collaborate together and form the Living Lab network which is grounded on the premise that all involved actors collaborate to create value and will yield from it.

3.2 Key features and principles

Living Labs vary in type, size, topic, context and/or scale. Nonetheless there are some common and fundamental features that are displayed across many Living Labs and to which scholars and researchers have been looking at in an attempt to unveil a common framework.

3.2.1 Common elements of the Living Labs

Despite the many formulated definitions, some common elements of Living Labs have been identified. They are essential in a Living Lab concept, forming its backbone and separates them from other innovation processes (Figure 3.1).

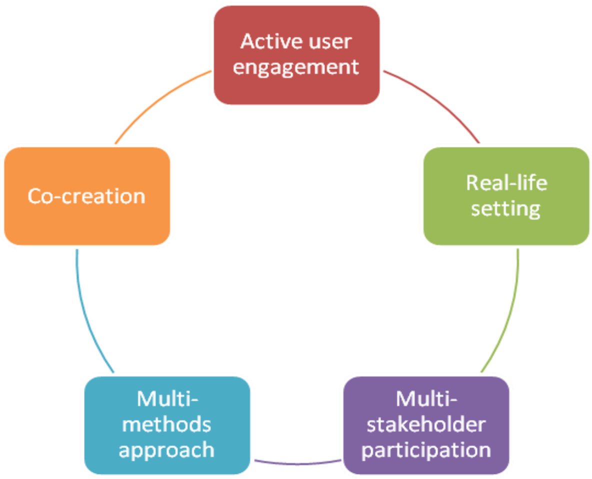

Figure 3.1 - Common elements of Living Labs

Active user engagement

User engagement is rooted in the origins of Living Labs and is key to its success. Within a Living Lab, users are engaged since the beginning of its activities, helping to develop and shape a product or service from incept to commercialization. To keep users motivated and engaged it is important to understand what motivates them to participate and contribute to Living Labs activities as its efficiency is strongly based on the creative power of user communities.

Real-life setting

This is a very specific characteristic of Living Labs where the activities take place in real-life settings as opposed to a laboratory setting. It implies the existence of a familiar context that reflects the users' environment, which allows to gain a thorough overview of the context. Understanding the context in which the Living Labs and its projects will take place is key to its success. Several dimension of context can be considered when designing a Living Lab and/or its projects[2]:

- The temporal context: duration of the living lab and of its projects and activities;
- The physical context: location and characteristics of the Living Lab and of this projects and activities;
- Technical/information context: information available and to be created and platforms for information dissemination;
- Social context: engaged actors, their characteristics and roles, values norms and attitudes (namely towards knowledge sharing);
- Task context: tasks and actions that will take place, potential interruptions *e.g.* by a technical problem.

Multi-stakeholder participation

Living Labs apply the quadruple helix model, facilitating the relationships between academia, industry, government and the public. Even if the main focus is on users, involving all relevant stakeholders is of crucial importance as they have the power to shape the outcomes by contributing with their specific know-

[2]Adopted from Coorevits and Jacobs (2016)

how and expertise. *"The participation not only of the potential customers but also of all other stakeholders along the value-chain can be seen as the foremost required element for the successful operation of a Living Lab"* (Feurstein et al., 2008).

Multi-methods approach

By having different phases and actors and by embracing a multitude of topics to which the living lab concept can be applied, there are different methods and tools that can be developed and applied throughout the innovation process. As defended by Evans, P. et al. (2017) *"there is no single Living Lab methodology, but all Living Labs combine and customize different user-centred, co-creation methodologies to best fit their purpose"*.

Co-creation

Co-creation is in the core of the living lab concept and is the central process for value creation in living labs. It links different sources of knowledge and perspectives producing mutual benefits for all stakeholders whilst making use of participatory methods[3].It is not a closed single process, but rather an interactive and iterative process occurring in all phases of a living lab construct, enabling and supporting innovation over the whole development process of a product/service lifecycle.

Several benefits emerge from a co-creative environment. It improves the architecture of products, enhancing its quality and lowering the production costs; it shortens the product life cycle due to the collaborative nature of Living Labs, allowing faster launch to market; it enables organizations to become more efficient and agile for rapid scaling (Westerlund et al., 2018). Additionally, it ensures a highly reliable evaluation of the market, resulting in a significant reduction of technology and business risks (Feurstein et al., 2008).

3.2.2 The three layered model of Living Lab analysis

Due to the multitude of existing Living Labs, the complexity of the activities developed and of the interactions that occuramong all involved actors, Schuurman (2015) proposed a three-layer level of analysis within the Living Lab

[3]The participatory methods will be further developed on a separate action plan as it is a cross-cutting issue and constitutes a TWIST strategic objective *per se*.

phenomena that facilitates its understanding, the macro, the meso and the micro level (see table 3.1).

The **macro** level is characterized by being a public-private-people partnership consisting of a set of stakeholders organized to facilitate and foster innovation and of the infrastructure in which it occurs. The macro level usually is organized to carry out research in a specific topic, often within a specific territory or with a specific focus. The author proposes the term Living Lab constellation to refer to this level of analysis. The **meso** level is characterized by the innovation projects that are carried out within the constellation. The **micro** level is composed by the specific research steps and activities within the Living Lab project, *i.e.* the methodological research steps.

Table 3.1 – The three levels model of Living Labs

Level of analysis	Description
Macro level	The living lab constellation consisting of a public-private-people partnership and/or its infrastructure
Meso level	The Living Lab innovation project(s)
Micro level	The individual research steps and activities carried out in a Living Lab

Source: adapted from Schuurman (2015)

3.2.3 Living Lab principles

There is a set of principles that have been identified that should be present across all Living Labs and the developed activities, they provide the foundation when defining all activities and assist on understanding the Living Lab added value (Ståhlbröst, A. and Holst, M., 2012). Furthermore, these principles, together with the key components (see chapter 4), provide the matrix under which ENoLL assesses what Living Labs are fitted to be accepted by the institution.

Although presented separately, the different principles, as well as the identified common elements of a living lab (see chapter 3) are intertwined, and in one way or another they establish relationships among them.

The main principles that should be present and permeate all living lab activities are:

1. Value,
2. Influence,
3. Sustainability,
4. Openness, and
5. Realism.

Value

Value creation is intrinsic to Living Labs being one of its overarching objectives to generate sustainable value for all stakeholders. Value creation expresses itself in two different ways: The value created in terms of business and the value of the developed innovation for users/customers.

Business value is related to issues such as employee value, customer value, supplier value, managerial value and societal value, whereas user or consumer value can be expressed as the user or societal value attached to the developed innovation.

Within a business perspective, success can be measured by the provision of superior value to customers and users, and for this aim it is considered essential to understand their need and motivations to use and/or purchase the innovation. In this perspective, living labs are an important platform of engagement supporting the focus on what the market wants andsimultaneously reduce costs and risks of theentire innovation process.

Value is also indexed to monetary value, *i.e.*, the monetary sacrifice that people are willing to make for acquiring the developed innovation and the relationship between that sacrifice and the benefits the innovation will bring to them.

Influence

The principle of influence is related to the decision-making power given to all stakeholders outside an organization, especially to users. One of the key elements of Living Labs is an active user involvement when shaping the innovation being this way influencers on the entire process. This goes beyond participation or engagement as in this perspective users are seen as equal partners' in innovation co-creation, having in fact the power to influence its concept and design.

Influence can also be understood as the power that a community/user group can have on accepting (buying) or declining (not buying) an innovation, influencing this way the success of it in the market.

Bergvall-Kåreborn, B. et al. (2009) highlight the importance and caution to define and explain the influence concept as it can have diverse and ambiguous definitions. It is suggested to manage this issue by looking at it in three dimensional ways: the *why*, the *who* and the *how*.

The w*hy* of influence the authors identify two motivations, the political and the technical. The first is based on the central principle that users have the right to influence technological decisions that will affect their private and professional life; the latter is grounded on the notion that the participation of skilled users can influence the quality and acceptance of the innovation product/service. The *who* of influence relates to the need of making reflective choices on who to engage in the process, and the how refers to the participation process itself and into what extent participation and influence are linked to different partners.

Sustainability

Bergvall-Kåreborn, B. et al. (2009) and Ståhlbröstand and Holst (2012) defend that sustainability within living labs refers both to the viability of a living lab and to its responsibilities to the wider community.

For viability the authors highlight aspects such as continuous learning and development over time as well as the partnerships and related networks that are created which have to be based on trust. *"In order to succeed with new innovations, it is important to inspire usage, meet personal desires, and fit and contribute to societal and social needs" (ibidem)*.

When referring to the responsibilities to the wider community, the authors take the Bruntland Report[4] definition of sustainable development, i.e. "Sustainable development seeks to meet the needs and aspirations of the present without compromising the ability to meet those of the future". Thus, living labs also need to take responsibility of its socio-economic and environmental effects as the engaged organization can play an active role on

[4]Report of the World Commission on Environment and Development: Our Common Future

contributing to sustainable growth while improving productivity, lowering costs and strengthening revenue.

Openness

Openness is essential within the innovation process of a living lab. Gathering perspectives, ideas and know-how from multi-disciplinary perspectives is likely to lead to faster and more successful development, new ideas and innovations. *"Living labs (…) strengthen the innovation capacity due to cross-fertilization and open collaboration between different actors"* (Bergvall-Kareborn et al., 2009).

Openness differs from the open innovation concept as the latteris firm-centric and aims the maximization of value for the company and customers. Openness relates to individual, team and companies mid-set with regard to accept new ideas and concepts and to knowledge transfer between different parties.

Bergvall-Kareborn et al. (2009) advises that for cooperation and knowledge sharing within a living lab which gathers multi-stakeholders' different levels of openness between stakeholders seem to be a requirement. This is likely to be related to the balance needed between sharing and protecting knowledge, the "information paradox" (West et al., 2006; Bogers, 2011, as cited in Schuurman, 2015).

Despite the many benefits that arise from openness downsides can also be considerable as openness can result in resources being made available for others to exploit, with intellectual property being difficult to protect and benefits from innovation difficult to appropriate (Dahlander & Gann, 2010, as cited in Schuurman, 2015). These downsides can lead to close ups as Bergvall-Kareborn et al. (2009) have witnessed.

Westerlund et al. (2018) suggest ways to deal with the "information paradox" and to manage intellectual property rights (IPR) helping living labs to ensure that all members respect one another and share their knowledge. Living Labs can set forth rules and regulations regarding the use, sharing, and licensing of IPR prior to the initiation of the innovation project within a consortium agreement that should be signed by all members. The agreement can also include how costs and gains will be distributed for each member considering their role and investment in the developments.

Realism

One of the premises of Living Labs is that all activities should take place in realistic, natural, real-life settings. In fact, focusing on real users in real-life situations is what distinguishes Living Labs from other kinds of co-creation environments. This however requires an effort at multiple levels and in correlation to issues such as context, users, use situation, technologies and partners (Bergvall-Kareborn et al., 2009).

"Orchestrating realistic use situation and understanding users' behaviour is one way to generate results that are valid for real markets" (Holst et al.,2010). In Living Labs, the approach has to be for real-world contexts, real users, and real situations.

Depending on the focus and context of a Living Lab, creating realistic use situations can be done in two approaches. One, where environments for testing and assessing products or services are created in ways that are similar to real world, the other, when products and services are tested and evaluated in the user real world environment.

Realism can also be related to the fact that different stakeholders experience different realities. This means that different stakeholders may give importance and be motivated by different issues. Researchers can be interested on the scientific results, whereas SMEs can be motivated by the synergies that are created in a Living Lab that can leverage their competitiveness which otherwise would be unlikely to be achieved. This is why involving different actors in real environments can lead to more robust innovation products or services.

As said earlier in the document, attention should also be given to the requirements for the Water Europe Living labs. Table 3.2 shows the principles present in the '*Atlas for the EU water-oriented Living Labs*' and their brief definition. As can be seen (in **bold**) most of the principles listed are similar to the ones required by ENoLL. As for the others, their concepts are imbedded in the 5 principles listed above.

Distribution is related to the concepts of openness, influence and values. Continuity is embedded on the perception of the sustainability concept. Lastly, empowerment of users and spontaneity are related to the openness, influence and realism principle.

Table 3.2 - Water Europe Living Labs principles

Principle	Definition
Openness	cross-fertilization, different levels of openness, and collaboration
Distributed	distributed knowledge base, transparent distribution of values
Influence	involvement of competent partners and domain experts
Continuity	trust building and context-unique knowledge over projects and innovation cases
Realism	testing and evaluation in users' real-world environments
Value	economic value of innovation outcomes and activities and 'value in-use' concept
Sustainability	viability of a living lab
Empowerment of users	motivation and creative ideation capabilities of user communities
Spontaneity	spontaneous interaction, reaction, and ideation

4. Living Lab as an environment: Key Components

When looking at a Living Lab as an innovation milieu or arena some key components have been identified. These components are essential to set up living labs as they form the structure in which the innovation process occurs and influence the success of Living Labs implementation.

Bergvall-Kareborn et al. (2009) identified five key components of a Living Lab environment that need to be defined when setting up a living lab. It is the combination of these components will result in innovation. The **key components** of a living lab environment are:

1. ICT and infrastructure;
2. Management;
3. Partners and users;
4. Research, and;
5. Approach.

Infrastructure

From the technological perspective, the product, service or installation being provided form the backbone for experimenting in the Living Lab. Without an infrastructure, which can be fixed or *ad-hoc*, technical testing and monitoring would not be possible. The technical infrastructure should be defined and taken into account when designing the research and the activities to be carried out.

The infrastructure influences in large scale the projects and outcomes in terms of measuring possibilities and feedback mechanisms. Fixed infrastructuresare likely to allow a clearer focus on the types of projects developed within a Living Lab, although limiting the possible stakeholders to be involved (Veeckman et al., 2013).

Defining the ICT infrastructure that will support the activities is also important as it will determine and support communication between all the involved actors. The identification of existing ICT infrastructure and the identification of likely needs are crucial for setting up a successful living lab.

More recently,Westerlund et al. (2018) found that in generalsetting up a Living Lab commonly require fivetypes of infrastructure: facilities, networks, hardware, software, andsensors.

Facilities can be dedicated or shared to host events, workshops and to develop the experimentations and to monitoring them. Networks are related the ICT infrastructure including servers to host web technologies and data that facilitate collaboration between all actors. The need of software, hardware and sensors vary from lab to lab and depending on its topic and focus.

Management

The management component represents the governance structure designed for each Living Lab. It is crucial to define the entities that form the governance group and that take on the administrative and managerial work of the Living Lab activities. It represents and defines the ownership and the organizational and policy aspects of a living lab.

The responsibilities of the governance group include, *inter alia*:

- Setting the lab's vision;
- define priorities and main issues related to the overarching Living Lab domain;
- making investment decisions;
- managing intellectual property rights;
- maintaining living lab infrastructures;
- planning the research;
- defining ways and moments stakeholders are involved;
- defining responsibilities and liabilities;
- Organising activities and ensure they meet the goals by monitoring the living lab performance.

The Governance body is also responsible for project level decisions. They select the projects to pursue and assign the appropriate members to oversee and run the activities and create user centric research methodologies.

Partners and users

Partners and users relate to the actors within the Living Lab network. Different users and stakeholders bring their own specific understanding, needs, knowledge and expertise to the network, setting the boundaries of the Living Lab's focus, of the knowledge transfer and likely outcomes.

Living Labs apply the quadruple helix model and are considered a concept that facilitates the relationships between academia, industry, government and the public. Thus, they deal with a set of different users and stakeholders from different backgrounds being from the collaboration between these different types of actors that the opportunity to unlock multidisciplinary knowledge, to create value and achieve the intended goals emerge. Researchers, students, citizens, user communities, external people, NGOs, SMEs, consultants, universities and facilities staff are an example of the multitude of actors that can be part of a Living Lab and of its innovation projects.

The different types of actors bring different contribution to the Living Lab ecosystem. It is therefore important to understand and define the type of each engaged stakeholder to better understand and define in which phase they are likely to be engaged, their likely contributionto knowledge creation whilst simultaneously boosting the creation of synergies.

Building upon the work of Leminen et al. (2012), Schuurman (2015) defines five different types of Living Lab actors (see figure 4.1). It is from the collaborative work of the different stakeholders that innovation is co-created in a fast-paced manner.

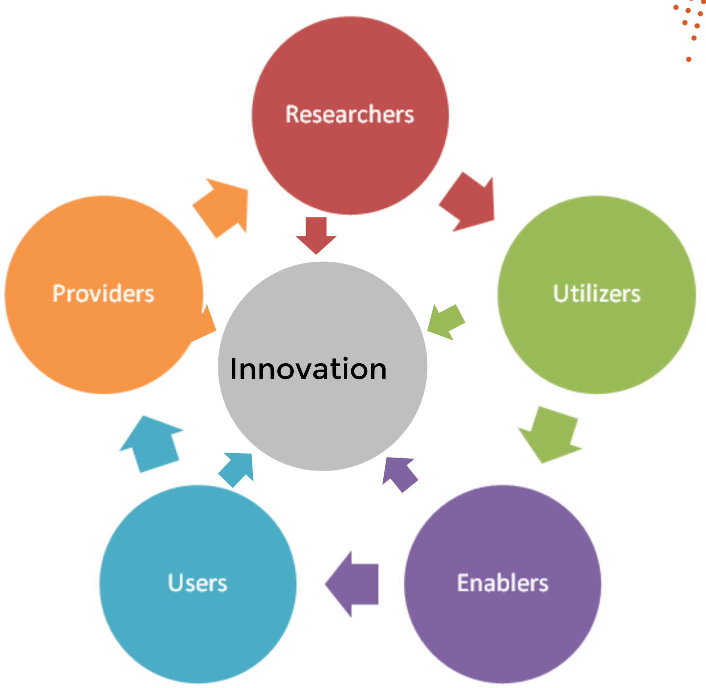

Figure 4.1 – Living Lab actors – agents of innovation

Schuurman defines Living Lab actors as follows:

Utilisers aim to develop their businesses within the living lab ecosystem, focusing is on developing and testing their new products and services. These utilisers use Living Labs as a strategic tool to collect data on test-users of their products or services and collaborate with all stakeholders in the Living Lab ecosystem, including the end-users. These actors drive short-term Living Lab projects and can be regarded as short-term, ad hoc 'users of the Living Lab'. Within the TWIST project utilisers are likely to be technology suppliers that will work with the Living Lab community towards the creation of innovation.

Enablers can be various public sector actors, non-governmental organisations or financiers, such as towns, municipalities, or development organisations. This actor provides (financial) resources or policy support in order to start-up and maintain the Living Lab operations.

Providers provide the other actors in the Living Lab with their product or service portfolio. They take care of the (material) infrastructure used for the Living Lab operations. They are mainly private companies that enter into Living

Labs to co-develop new products, services and solutions to their own business or industry needs and focus more on long-term results. They attain these goals through their involvement in general Living Lab operations and (possibly) in the Living Lab cases, driven by utilisers.

Researchers have an important mediating role between the utilisers and the users, as they make information regarding user needs easier to read and understand. They are expected to function as intermediaries between utilisers and users, as through their research they are able to abstract need and/or solution information from the users, which the utilisers are looking to explore. However, the Living Lab operations and activities also allow researchers to explore their own knowledge base (testing hypotheses, generating new theories/methodologies, etc.). They expect to generate research data that can be academically valorised. By doing so, researchers contribute to the knowledge retention of the Living Lab.

Users are the 'end-users' that are being involved in the Living Lab operations and in the (short-term) Living Lab cases. In some Living Labs, existing user groups or user communities are involved, while in others the Living Lab operations themselves facilitate the formation of a living lab user community. Due to the specificity of the Living Labs to be created within the TWIST project, in the large majority of occasions, end-users are going to be the facilities operators and managers, whether from a wastewater treatment plant (WWTP) or from industrial facilities. End-users can also be farmers that will use reclaimed water.

Research

The research component symbolises the collective learning that take place within a Living Lab environment resulting in contributions to theoretical and practical knowledge. Technological research partners can also provide direct access to research which can benefit the outcome of a technological innovation (Ståhlbröst, A. and Holst, M., 2012).

The type of research designed and the knowledge contributions when co-creating products and services, can lead whether to incremental innovation or to radical innovation. Living labs provide a prominent research setting to study technologies *in situ* and in use, and to investigate how technology and social behaviour influence each other (Veeckman et al., 2013).

Approach

The fifth key component of a Living Lab is the approach, which is related to methods, tools and techniques used within a living lab practice and that are needed for its operational success.

Different methods and tools are used throughout the living lab innovation processes having Veeckman et al. (2013) concluded that the innovation outcomes of a living lab depend on the type and mix of the used tools.

There is a wealth of methods and tools that can be applied in a living lab, that depend on several variables including among others, the governance structure and expertise, its domain or objective. ENoLL has been recognised as a major source of the various methods and tools in European Living Labs including collection and analysis of system logs, behavioural data, ethnographic research, questionnaires and/or focus groups. Thus, living labs provide tools to validate technologies and facilitate the development of innovative products, services or systems.

Each Living Lab will have its set of methods and tools that better adequate to the expertise and goals. Formal and informal methods such as survey, interviews, questionnaires, observation, focus groups or multi-criteria analysis have been used to collect and produce data.

In an attempt to categorize innovation tools in Living Labs, Leminen and Westerlund (2017) identified and distinguished a range of tools used to support innovation in living labs taking into account the characteristics of the innovation process used (if linear or non-linear) and the type of chosen tools, if standardized or customized.

Specific tools used for innovation include e.g. open communication and ideation tools for promoting, collecting, evaluating and disseminating contributions, monitoring tools for tracking activity, and individual contributions for possible legal reasons (*ibidem*).

The authors have built a two-dimensional framework helping to identify how methods and tools support understanding of living labs innovation activities and categorizes living labs in relation to innovation process (Figure 4.2).

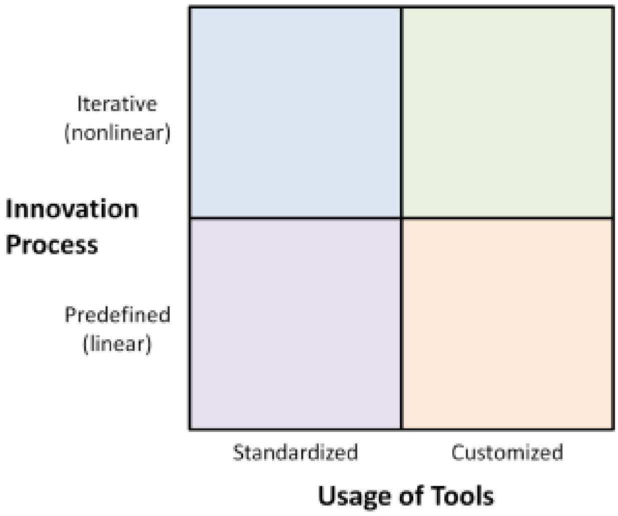

Figure 4.2 - Conceptual framework for categorizing living labs based on their innovation process and tools. Source: Leminen and Westerlund, 2017

The results of this research show that:

1. the use of standardized tools decrease the complexity of innovation activities, and decreasing complexity leads to predefined incremental innovation outcomes in living labs;

2. a predefined linear innovation process decreases the complexity of innovation activities, and decreasing complexity leads to predefined incremental innovation outcomes.

3. adopting an iterative, non-linear innovation process and customized tools for innovation activities increases the likelihood of an undefined and a novel innovation outcome (radical innovation).

To sum up, the authors highlight that understanding the tools used to support innovation and their differences helps stakeholders and the governance body to decide what they want to achieve, and then to design living labs of a particular type to achieve those objectives.

Some criteria can be considered when selecting or designing methods and tools to be used, namely the type of audience (are they experts or non-experts), how information is going to be collected, *i.e.,* if digitally, online or face-to-face.

The type of methods and tools can also be a criterion to consider, namely if they going to be customised, or ready-to- use toolkits.

Methods and tools are embedded in Living Labs and their activities and to each innovation project will needed to select and adapt tools that are appropriate to its particular activities and participants included taking into account the benefits and constraints that each category of tools will bring to the results.

5. Living Lab as an approach: Key Components

Ståhlbröst, A. and Holst, M. (2012) and Veeckman et.al (2013) argue that living labs are both an environment and an approach. The first relate to characteristics of living labs at a generic level (macro and meso level) and was described on the previous chapter. The key components of a living lab approach are considered on the project level (meso and microlevel) and define the methodological aspects of the Living Lab projects and activities.

If with the environmental perspective issues such as overall infrastructure and governance body are highlighted, on the approach perspective processes such as information transfers and methods for actors' involvement throughout the development of a new product or service come to the forefront. If the perspective of a living lab as an environment helps to set it up, the approach indicates how to run it.

Figure 5.1 – The Living Lab phases

Overall, Living Lab projects' operations are composed mainly by three phases, 1) the exploration phase, where the innovation concept is created; 2) the experimentation phase where the innovation prototype is tested; and 3) the evaluation phase where the results of the experimentation are assessed and fine-tuned and the product/service is prepared for market launch. Each of these

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phases has their own methods, steps and goals. Additionally, it is not a linearized process, being iteration a characteristic of the process, having some steps needed to be revisited to fine-tune the innovation.

1- **Exploration–innovation concept co-creation**, where needs and opportunities are identified, and the innovation concept design takes place. It is a highly participative phase where most of the identified actors are likely to be engaged in order to identify problems and opportunities and to find answers through a co-creative process.

Two main sub-phases. The first is generating needs for innovation and the second is designing the innovation concept.

In order to **identify needs** the following steps take place:

a) Scoping problems and opportunities – focus on the identification of particular problems or opportunities and their likely causes and effects.

b) Data collection – analysis and synthesis of the information gathered at the previous step to define the core problems and/or opportunities. Quantitative or qualitative data related to the functioning and characteristics of the issue(s) to be addressed should also be collected at this stage to setup a baseline. A clear problem/opportunity statement should be defined to guarantee the focus and understanding of all engaged parties.

c) Problem/opportunities evaluation (if applicable) – if more than one problem has been identified an evaluation process will take place to decide priorities and which ones will be worked on.

Once the needs have been generated, i.e. the problems/opportunities to work on are selected, the work focus shifts, and the identified needs need to be translated intoinnovation concepts.

In order to **co-design innovation concepts** the next steps are likely to be needed:

d) Co-design of responses and options – to find possible responses to the identified problems and opportunities. It is an iterative step that may need many cycles to transform an idea to a detailed concept until a final innovation concept's design is reached. It includes an ideation process where a wealth of visions and problem-solving ideas are likely to rise, and an iterative co-design process to assist on moving from an idea to a workable innovation concept. Ideally, needed resources to materialise each idea should also be identified.

e) Co-evaluation of the options (if applicable)–if more than one innovation concept is identified, it is needed to evaluate them in order to rank priorities, criteria such as costs/funding or feasibility can be used to select the preferred/best option.

Once a consensus has been reached among partners and engaged stakeholders on what concept will be taken forward for the experimentation and testing phase a new phase is started.

2- Experimentation – It´s the **Prototype design and test phase**, in this cycle the prototype/pilot is implemented and tested in a real-life environment. For the Twist Living Labs the distinction between prototypes and pilots are related to the fidelity level of the issue to be tested. Fidelity describes how realistic the prototype is, i.e. whether or not it is an accurate representation of the final product or if it is an early-stage model. The latter is considered to be a prototype, whereas the former (pilot) is a high-fidelity prototype.

Independently the fidelity level, both low and high fidelity prototypes need to be tested, although only pilots' tests results can inform whether or not the product or service is market ready.

The results of the tests should be monitored and measured, and any problem of its functioning should be registered as well as any measures adopted tosolve the situation. This phase should run through a pre-agreed period of time. Once the tests are concluded, information on the prototype results should be presented to all engaged actors and assessed. An agreement should be reached on whether or not to proceed to the subsequent phase.

Depending on the project some activities need to be carried out at this phase:

1. Definition of detailed/technical design and specifications;
2. Physical construction/prototype implementation;
3. Develop a monitoring plan – the monitoring plan should include the following information:

   - expected/desired impacts from the intervention;
   - indicators of these impacts;
   - equipment required, and;

   - actor(s) responsible for undertaking and registering the monitoring results.

4. Develop a research protocol;
5. Monitoring the tests and reporting final results.

If the prototype results are not the expected a new experimentation cycle might be needed to start, supported by changes in the experience/prototype design. In a worst case scenario, it can be decided to iterate the first phase.

If the results are broadly the ones expected and all engaged parties are satisfied with the achieved results the last phase can take place.

3- Evaluation – It's the **Fine tuning, final evaluation and deployment phase**, in this phase some fine tuning of the (high-fidelity) prototype might be needed until the final innovation is ready to be adopted and/or deployed. An evaluation of the results takes place through comparison between the baseline and the final results.

Once the engaged parties are satisfied with the achieved results, the innovation process is concluded and ready to be fully adopted and/or launched to the market.

This phase helps to refine the innovation and gain feedback before launching to market. The pre-commercialized product is tested, refined and presented iteratively until it reaches satisfactory level and gets ready.

In addition to these three corephases that arespecific toa Living Lab construct, a planning phase at the beginning of the process and a commercialization phase at the end need to be carried out. The planning phase entails the preparation of the innovation project as a whole, and organisational, strategical and management issues are considered. Among others, information about the project's underlying circumstances is gathered together with information on different perspectives and on the competencies among the project team. The project aim and scope are defined alongside with the potential knowledge span and boundaries agreed upon together with the project governance structure.

At the commercialization phase the objective is to present the innovation to potential buyers and introduce it in the market, and usually marks the beginning of a new process where go to market strategies and business models are defined.

6. Setting up the TWIST Living Labs

Living Labs are an approach to innovation that consist in three separated, but interrelated levels of analysis and consequently levels of actions.

At a macro level, Living Labs are Public-Private-People partnerships that are organised in ways to allow knowledge exchange and conduct innovation projects.These innovation projects are characterized by active user involvement, co-creation, multi-method and multi-stakeholder, which correspond to the meso level of analysis and action. In turn, these projects consist of different research steps that are aimed at generating user input and contribution to the innovation process, the micro level of analysis.

The TWIST Living Labs Action Plan will be structured using this approach and informed by the theoretical background supported by the key components of Living labs both as a milieu and an approach.

As mentioned above, the macro, meso and micro level of analysis are separated, but interrelated, thus action taken at the macro level are likely to be repeated both at the meso and micro level, although narrowing down of the focus and level of detail as is the case of problems and opportunities identification.

Due to the interrelation of the different levels of analysis and the required actions for setting up the lab and the ones needed at the operational stage, i.e. the actions required to run the lab, an unavoidable overlap between the macro level and meso level, and the meso level and micro level is likely to occur.

The actions listed in this Action Plan are not mandatory and, in some cases, might not even be needed, on another hand some actions not foreseen can be needed and added in a case-by-case approach. It is the responsibility of the Living Lab managing entity to select and/or adapt the actions to be undertaken as appropriate.

The actions (A) are listed and numbered from 1 to 'n' and have the prefixes (MA, ME, MI) to signal what level they relate to. Not all actions are sequential, and some can be developed simultaneously with others.

6.1 Macro Level

In this chapter are described the actions to undertake for setting up the TWIST Living Labs. As mentioned before, this first stage of the Action Plan aims to frame the creation of the TWIST Living Labs as environment at a Macro Level (see chapter 3 and table 3.1).

The macro level consists on the Living Lab constellation entailing the Living Lab infrastructure and public-private-people partnerships with different stakeholders that are organised to carry out Living Lab research and Living Lab projects.

At this stage the main **responsibilities** fall on the selected institutions to be responsible for the TWIST Living Labs:

1. In Spain:
   - Fundación Centro de las Nuevas Tecnologías del Agua (CENTA);
2. In France :
   - Office International de l'Eau (OIEAU);
   - Institut de la Filtration et des Techniques Séparatives (IFTS);
   - Université de Limoges (UNILIM).
3. In Portugal:
   - Instituto Superior Técnico (IST)
   - Instituto Superior de Agronomia (ISA).

As the below actions unfold new responsibilities will be identified, and new responsible persons are likely to be appointed. The responsibilities should not fall only on the TWIST partners.

The identified actions should be carried out as soon as possible and ideally before any other activity takes place. Nonetheless, some ongoing projects, trials or pilots can be added to the Living Lab after their start benefiting from the synergies created by the Living Lab.

Taking this into account, together with the key components of a Living Lab as an environment, the following actions should take place.

MACRO LEVEL (MA) ACTIONS – Setting up the Living Lab					
ACTIONS	OBSERVATIONS	WHO	WHEN	HOW - Suggestions	Output
MA-A1 – Define the Living Lab overarching theme and focus					
This action has already been partially undertaken at the beginning of the project. The selected overarching themes are: 1. Wastewater treatment and infrastructure management in France; 2. Wastewater treatment and reuse in Spain; 3. Wastewater reuse and resource recovery in Portugal. At this stage what is needed to decide is how to develop the Living Lab in ways to capitalise the RIS3 results as defined in the strategy, i.e. if the Living Lab going to be mainly related to:	An early contact to other industries (RIS3) can be made to present the project and ascertain their interest on being part of the Living Lab	Living Lab managing entity	Before any action is carried out	Consider issues like: • Feasibility; • Benefits; • Relevance; • Impacts; • Risk/pitfalls; • priorities	

1. wastewater treatment and management, i.e. to be developed in wastewater treatment plants, being this way directly linked to the water sector and its functioning; 2. to the identified common smart specialization areas, i.e. to assist on the development of each smart specialization sector through improvements on industrial streams and/or processes that use water as a resource or through improvements directly related to aquatic environments (marine and/or freshwater).					
MA-A2 – Identify and engage with stakeholders and users, and categorise them according their role					
Some of the relevant actors have already been identified at early stages of the TWIST project. The list is a starting point, and other actors are likely to be identified and engaged at this stage or later in	Highly participative action	Living Lab managing entity	Beginning of the project	Online search to identify topic related industries, NGOs; Contact	List of potential stakeholders, users and public to be engaged

the process. The stakeholders to be added are directly related to the decisions made on how to develop the Living Lab and its projects, namely on whether or not other actors of industries from the identified smart specialization areas should be engaged.				commerce/industrial chambers and/or associations to identify relevant companies; Contact Public Administration (Regional or local) to identify community groups and/or public with interest on or likely to be affected by the projects and to be informed on potential policy and/or land use management constraints; Contact universities and research groups to have information on	categorized by likely role

				the research projects being carried on and as certain their interest on taking part of the Living Lab constellation; List end-users.	
MA-A3 – Start arrangements to set-up the Governance Body for the Living Lab constellation					
The Governance body could include all country specific TWIST beneficiaries and a set of representative stakeholders.		Living Lab managing entity	Beginning of the project	Promote an engagement activity (e.g. conference call or meeting) with the identified actors Inception meeting	
MA-A3.1. Identify entities for the Governance Body and start the engagement process	The entities foreseen on the	Living Lab managing		As described above	

	TWIST proposal	entity			
MA-A3.2. Define stakeholders' roles and responsibilities within the Living Lab Constellation	Ideally it should be on a voluntary basis	Living Lab managing entity	Inception meeting	The nomination should be on a voluntary basis	List of confirmed stakeholders, users and public to be engaged categorized by likely role
MA-A3.3. Set the Living Lab constellation vision and define overall objectives and indicators		Living Lab managing entity	Inception meeting	Conference calls Meetings Workshops Focus groups See the "Common Methodology for the creation, implementation and management of three experimental Living	

				Labs”	
MA-A3.4. Define the overall scope of the research and identify expected learning outcomes		Living Lab managing entity	Inception meeting	Conference calls Meetings Workshops Focus groups	
MA-A3.5. Identify priorities and opportunities	MILESTONE	Living Lab managing entity	Inception meeting	Conference calls Meetings Workshops Focus groups Brainstorming Described in the common methodology	
This is a first stage of identifying a range of negative issues and potential opportunities. Later in the operational stage this issues are to be revisited in more detail and greater focus. The priorities and opportunities identified with this action have the potential to become projects of the living lab.					
MA-A3.6. Define and schedule engagement	Nominate a	Living Lab	Inception	Described in the	

activities and main ways to communicate	person/entity	managing entity	meeting for template and afterwards for plan developmen t	common methodology	
MA-A3.7. Elaborate a Management Plan for controlling the Living Lab infrastructure	Nominate a person/entity	Living Lab managing entity	Inception meeting for template and afterwards for plan developmen t	Description of contents of the plan included in the common methodology	Management Plan
MA-A4 – Identify and characterise the Living Lab infrastructure					
In this action information should be provided on the		Living Lab	Inception	Conference calls	

type of existing and needed infrastructure(s): Essential: Facilities – facilities where the experimentation will take place (if fixed or *Ad-Hoc)* and facilities to be used to hosts events such as workshops Networks – ICT-related infrastructure Potential (that will depend on each Living Lab, its projects and activities): Software Hardware Sensors		managing entity	meeting	Meetings Workshops Focus groups brainstorming List and characterise existing infrastructures and identify their main problems or possible constraints to the project	
MA-A5 – Define the Living Lab context					
Physical context - location of the Living Lab facilities and infrastructure Technical/information context - information available and to be created and platforms for information dissemination; Social context – engaged actors, their		Living Lab managing entity	Inception meeting	Conference calls Meetings Workshops Focus groups	

characteristics and roles, values norms and attitudes (*e.g.* position regarding knowledge exchange); Tasks context – tasks and actions that are likely take place and potential interruptions e.g. by a technical problem				brainstorming List and characterise existing networks and identify their main problems or possible constraints to the project	
MA-A6 – Disseminate to all actors the decision made in the inception meeting		Living Lab managing entity	After inception meeting		Inception meeting minute
MA-A7 – Analysis and assessment of the Living Lab constellation results and pitfalls		Living Lab main actors	End of Living Lab projects	Data collection and treatment Pre-defined assessment criteria	
MA-A8 – Dissemination of the Living Lab final results	MILESTONE Include all TWIST partners	Living Lab main actors	End of Living Lab projects	To all TWIST partners and engaged and non-engaged actors.	

				The results can be disseminated in events such as the “innovation pathways” organised by AdTA	

6.2 Meso Level – deciding on what projects are going to be developed within the Living Lab Constellation

The meso level is characterised by the innovation projects that are carried out within the Living Lab constellation.

The primary actions to be carried out at this level are similar to the ones carried out at the macro level of analysis, although with a narrower focus. The macro level looks at the overarching elements of a living lab set up, whereas the meso level narrows it down to a project level; hence the actions are more focused and detailed. This narrowing down permeates to the micro level where the methodological steps to inform the project are carried out. As Schuurman (2015) argues *"at this level [meso], we see the Living Lab constellation being put to use, with the innovation projects advancing along the different steps of the Living Lab methodology".*

In order to identify potential innovation projects to be part of the living lab constellation the following actions are suggested:

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MESO LEVEL (ME) ACTIONS – Selection of the innovation projects to take forward					
ACTIONS	OBSERVATIONS	WHO	WHEN	HOW - Suggestions	Output
ME-A1 – Screening priorities and opportunities identified at the MA-A3.4. action	Screening criteria must be previously defined for this action MILESTONE	Living Lab managing entity Some actors may also be engaged in this action	After the Living Lab constellation is setup	Issues of costs/funding, likelihood of success when addressing the issue (solve/minimise the problem or boost the opportunities) and technical and structural feasibility can be considered. Methodology described in the "Common methodology for the creation, implementation and management of three experimental Living Labs"	List of screened in potential priorities and opportunities
ME-A2 – Identify potential actors with interest on and/or that can play an active role on addressing the screened in priorities and opportunities	This action should be undertaken for all screened in issues	Living Lab managing entity	After the Living Lab constellation is setup	Contact commerce/industrial chambers/technology suppliers to identify potential stakeholders	Database

ME-A3 – Contact actors to ascertain their receptivity to be engaged in the Living Lab Project as well as ascertain their initial opinion on the likelihood of success and feasibility of the project.	The actors can be both the ones identified in the ME-A2 action or those whom contact the TWIST partners with a view to collaborate with them in specific partners. It is a two-way communication/engagement stream. This action should be undertaken for all screened in issues	Living Lab managing entity	After the Living Lab constellation is setup	E-mail Calls Meeting Formal letter/invitation Prepare a document/minute presenting the living lab constellation main characteristics, including its vision, objectives and MA stakeholders and the screening stage results resume	Database
ME-A4 Promote and hold a jointly meeting with the actors that have manifested interest on take part of the project and decide on whether or not proceed with the project At this stage issues like high-level requirements of the project and ballpark a solution and an estimate of time and costs can be useful for a decision.	This action should be undertaken for all screened in issues MILESTONE	Living Lab managing entity & Interested parties	After the Living Lab constellation is setup	Set and agree a date and location for the meeting to be held and prepare a meeting minute and main issues to be discussed. Suggest for the engaged parties to	Criteria for go/no go exercise Decision on whether or not to proceed with

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				think about potential criteria to be used on the Go/No Go exercise. A Go/No go approach can be used to assist on the decision-making	the project
ME-A5 – If the action above results on a 'Go to' decision schedule a project kick-off meeting	This action should be undertaken for all screened in issues	Interested parties	As soon as possible after the Go/No Go meeting	Set and agree a date and location for the meeting to be held. Prepare and disseminate a meeting minute.	
ME-A6 – Analysis and assessment of each project results and pitfalls		All parties			Report
ME-A7 – Dissemination of each project results	MILESTONE	All parties with the agreement of all		To all TWIST partners and engaged and non-engaged actors. The results can be disseminated in events such as the "innovation pathways" organised by AdTA	

6.3 Micro Level – Designing and running the Projects

On the micro level, project specific elements are defined, and the methodological research steps carried out. It is at this stage that the perspective of a Living Lab as an approach (see chapter 5) take shape.

The described actions at this level need to be carried out ineach individual projects, although some may be excluded and other actions included according to project specific issues.

The Research Protocol is considered an action but due to its specificity and know-how requirements is not developed in this action plan. Only actions that are specific to Living Labs as an innovation process are listed.

Another issue to be highlighted is the possibility of stakeholders contact the Living Lab managing entities with a view to test their concepts in the Living Lab facilities, having therefore already gone through phase one – the innovation concept phase, and through some steps of phase two. This means that they would be engaged in the Living Lab activities from the action MI-A10 - Experimentation kick-off and execution according Research Protocol. Likewise, it is possible that some phase 3 projects will not take place. Some projects can be abandoned – a no result is a result, others iterated and/or new concepts created.

Overall the following should be considered:

MICRO LEVEL (MI) – Running the Living Lab					
ACTIONS	OBSERVATIONS	WHO	WHEN	HOW	Output
MI-A1 - Set-up the project managing committee	On the managing committee all entities involved in the project should be represented	Living Lab managing entity	Before the project specific inception meeting	List actors and their role List the requirements for the Governance Body	Governance body protocol/contract
MI-A1.1 Define roles and responsibilities of each party	Nominate a Project Manager To be included in the Governance Body protocol/contract	All parties	Project specific inception meeting	Ideally the distribution should be made on a voluntary basis if not then it should be distributed homogeneously by the entities that form the Governance Body	
MI-A1.2 - Set the project's vision, define overall objectives and follow-up indicators	To be included in the governance body protocol/contract	All parties	Project specific inception meeting		
MI-A1.3.Identify expected learning outcomes and pitfalls	To be included in the governance body protocol/contract or in the definition of the project	All parties	Project specific inception meeting	Brainstorming Experiences sharing	
MI-A1.4.Identify other actors and users		All parties	Project	Brainstorming	

to be engaged that may benefit or be benefited by the project			specific inception meeting	Desktop based research Word of mouth	
MI-A1.5.Define a communication plan and schedule project follow-up meetings The communication plan should define what, how and when formal communication and information should occur. Attention should also be given to confidentiality issues, sensitive actions need to be identified and decisions should be made regarding information disclosure and access.		All parties (nominated entity/person) All parties	Project specific inception meeting	Agree on a template and contents	Communication plan
MI-A1.6.Define the communication platform		All parties (nominated entity/person)	Project specific inception meeting		Communication platform
MI-A1.7.Define how Intellectual Property Rights are going to be managed	To be included in the governance body protocol/contract	All parties	Project specific inception meeting		
MI-A1.8.Define costs distribution and look for possible funding opportunities	To be included in the governance body	All parties	Project specific inception		

	protocol/contract		meeting		
MI-A1.9 Define the project infrastructures Define the needed software, hardware, sensors and other equipment and instruments to conduct the experiments	To be included in the governance body protocol/contract	All parties	Project specific inception meeting		
MI-A1.10 Define/schedule follow-up/check moments to ascertain that everything is running as expected	Nominate an entity /person to be responsible of the follow-up	All parties (nominated entity/person)			
PHASE 1 Actions – Innovation Concept Co-creation These actions may not take place in the event of stakeholders contact the Living Lab managing entity with a view to test their already created innovation concepts.					
MI-A2 – Need finding and opportunities identification	MILESTONE			Methodology described in deliverable E3.3.2	Need finding synthesis report
MI-A2.1 Scoping problems and opportunities		All parties		Methodology described in deliverable E3.3.2	

Identify and broadly understand of the specific problem(s)/opportunities and their causes and effects.					
MI-A2.2 Data collection and analysis – Setting up a baseline Analysis and synthesis of the information collected at the previous action and quantitative and qualitative data collection related to the functioning and characteristics of the issue(s) to be addressed. The data collected will allow to follow-up the progress of the innovation project.		All parties (nominated entity/person)			
MI-A2.3 Problem/opportunities evaluation In the event of more than one problem/opportunity been identified an evaluation takes place to decide priorities and what issues will be worked on. A set of evaluation criteria should be defined in the beginning of this action	A problem/ opportunities statement should be drafted. It should be concise, clear and focused on the issues to be addressed.	All parties		Methodology described in deliverable E3.3.2	Problem/opportunities statement

MI-A3 – Co-design of the innovation concept	MILESTONE			Method included in the included in the "Common Methodology of Living Labs"	Co-design synthesis report
MI-A3.1 Co-design of answers and best possible solution finding This action must be highly participative and iterative. In addition to co-create answers, the objective of this action is to generate as many ideas as possible and identify innovative solutions to the problem statement created. It is likely to be an iterative co-design process to move from an idea to a workable innovation concept.		All parties			
MI-A3.2 Co-evaluation of the options and best possible solution selection In the event of more than one problem/opportunity been identified an evaluation takes place to rank priorities and select the best possible solution. A set of evaluation criteria should be defined in the beginning of this action.		All parties			

MI-A4 - Results assessment and consideration of iteration needs	MILESTONE	All parties		Method included in the included in the "Common Methodology of Living Labs"	
MI-A5 - Results communication		All parties (nominated entity/person)			
PHASE 2 Actions – Prototype co-design and test phase Some actions may not take place in the event of stakeholders contact the Living Lab managing entity with a view to test their already created innovation concepts. In this case, the first action to take place will be MI-A10.					
MI-A6 – Definition of detailed/technical design and specifications	Check if relevant to include other parties or experts	All parties (nominated entity/person)			Prototype technical report
MI-A7 – Research protocol definition	Check if relevant to include other parties or experts	Living Lab responsible entity & entity responsible for conducting			Research protocol

		the experiment			
MI-A8 – Define a monitoring plan and a logbook for the experimentation stage	This monitoring plan is to follow-up and keep on track the experiment	Living Lab responsible entity & entity responsible for conducting the experiment			Monitoring plan and logbook
MI-A9 – Physical prototype development/equipment acquisition and implementation	MILESTONE	Living Lab responsible entity & entity responsible for conducting the experiment (nominated entity/person)			Prototype
MI-A10 – Experimentation kick-off and execution according Research Protocol	MILESTONE	Entity responsible for conducting the			

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		experiment			
MI-A11 – Experimentation follow up and reporting according Research Protocol		Project Manager			
MI-A12 – Experimentation conclusion and results reporting		Entity responsible for conducting the experiment & Project Manager			Experimentation synthesis report
MI-A13 – Results assessment (usability evaluation) and consideration of iteration needs	MILESTONE	Entity responsible for conducting the experiment, users& Project Manager			usability evaluation report
MI-A14 - Results communication		Project Manager/ all parties on the project with the agreement of		As agreed on the communication plan	

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		all			
PHASE 3 Actions – Innovation design and deployment phase Some actions may not take place. Some projects can be abandoned or iterated.					
MI-A15 – Usability evaluation analysis and identification of fine-tuning needs		All parties			
MI-A16 – Prototype fine-tuning – From a high-fidelity prototype to an Innovation	MILESTONE	Entity responsible for conducting the experiment			The innovation
MI-A17 – Business Plan Draft		All parties (nominated person)			Business Plan Draft

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