Water Europe

Technology & Innovation

WATER-ORIENTED LIVING LABS

WOLL Water Oriented Living Lab

HOW TO ASSESS AND EVOLVE WATER-ORIENTED LIVING LABS A MANUAL WITH A VISION

NOTEBOOK SERIES#2

Water Europe

Technology & Innovation

WOLL Water Oriented Living Lab

TABLE OF CONTENTS

INTRODUCTION

This Water-Oriented Living Labs Notebook Series #2 document provides practical and provisional guidelines for the identification, assessment, and evolution of Water-Oriented Living Labs (WOLLs). Its purpose is to serve as a manual for those parties who want to drive their research and development process towards a Water-Smart Society, as defined in Water Europe's Vision, and embed their water-smart innovations in society, using the Living Labs concept. It follows the Water-Oriented Living Labs Notebook Series #1 document, titled "WOLLs – Definitions, Practices and Assessment Methods", which details the history and the state-of-the-art of the Living Lab concept, and identifies the tailored version of the Harmonization Cube as the best instrument for assessing Water-Oriented Living Labs. The present document is a follow-up in which next steps are proposed to tailor the Harmonization Method and develop a practical supporting tool for the assessment and evolution of WOLLs.

The assessment methodology and tool have not yet been fully developed in detail for the water sector but sets the base for further development in a next step, together with stakeholders from the water sector and practitioners from Living Labs. The creation of this more advanced method and supporting tool as well as promoting the realisation of Living Labs focused specifically on realising Water Europe's Vision – that is, a network of Water Europe Living Labs (WELLs) – is in fact the subject of the next Water-Oriented Living Labs Notebook series #3 document, titled 'How to Develop a WELL. Advanced Guideline for a Water-Smart Living Lab Approach', which will be known as 'The BlueBook'.

WOLLS AND A WATER-SMART SOCIETY

Water-Oriented Living Labs are relevant innovation ecosystems that promote the co-creation, testing, and evaluation of innovations in representative real-life environments, with the ultimate aim of realising a 'Water-Smart Society'.

The creation of a Water-Smart Society represents a formidable challenge. It encompasses the need for major societal changes in response to climate change and demographic trends, including realising a robust and reliable water sector with flood risk management and water security as important goals. The pursuit of a circular economy and the energy transition are also part of the challenge. All these elements are components of important international policies, including the European Green Deal .

The Living Lab concept is highly relevant to the innovation process leading towards a Water-Smart Society. It takes research and development out of laboratories and sets it in real-life contexts. This allows for a better understanding of what triggers innovations and of those innovations that prove to be successful in different environmental, social, and cultural contexts. A Living Lab is not only a network of infrastructures and services, but also a collaborative ecosystem that is established to sustain community-driven innovations in a multi-stakeholder context. It offers an effective research methodology for sensing, prototyping, validating, and refining complex solutions in multiple and evolving real-life contexts, which go beyond the researcher's perspective.

To further leverage the Living Lab concept to stimulate water innovation in a European context, collaborative networks of interoperable Water-Oriented Living Labs (WOLLs) are seen as a promising instrument for advancing the water sector's future strategic agenda. Such a network of collaborative and complementary Living Labs would require a harmonized approach in their set-up and practices, so that research results, innovations and good practices can be generated, compared and shared in a coordinated and concerted manner. Such a harmonized approach is expected to contribute to accelerating the innovation process aimed at tackling key societal challenges such as water scarcity, pollution and climate change impact, and ultimately at realising Water Europe's Vision of a Water-Smart Society.

To this end, this manual proposes the fundamental components of a standardised process and practical support tool to map, assess and evolve European Living Labs, and set the stage for the harmonised development of an interoperable network of WOLLs.

From an overall perspective, we believe that a Water-Smart Society represents the realisation of our Vision, while the WOLL approach, resulting ultimately in WELLs, is an important instrument we use to achieve this. In essence, one could therefore say that the formula VISION x WOLL= WELL reflects our aspiration.

1) The European Green Deal, approved 2020, is a set of policy initiatives by the European Commission with the overarching aim of making the European Union (EU) climate neutral in 2050

A VISION FOR WATER-ORIENTED LIVING LABS IN EUROPE

The current playing field in Europe is characterized by a large number of initiatives in which water-related innovations find their way into real-life applications. Living Labs can be of great social value in this regard because they can help enhance the speed and scale with which these introductions take place. Living Labs can be characterized by properties along two important dimensions:

1. **Scale**. This refers to the Living Lab's spatial coverage and the related governance. Here, we can distinguish Living Labs of three different scales: regional (e.g., river basins, public domain), urban (public-private domain e.g. cities) and local (e.g., specific industrial areas or domestic living quarters, private domain).

2. **Maturity**. This second dimension refers to the level of development of the Living Labs' conceptual and operational development. Based on the recommended Living Lab Analysis Model (LLAM) or the so-called Harmonization Cube (see Water-Oriented Living Labs Notebook Series #1), we distinguish three levels: start-ups, sustainables and scalables. The last category is considered the top category, consisting of sustainable Living Lab organisations that have achieved a high level of maturity.

Water Europe wishes to further develop and deploy the Living Lab instrument, in the shape of Water-Oriented Living Labs, in close collaboration with Water4All in the drive towards a water-smart Europe. We observe, however, that there are wide variations in the level of maturity of the existing Living Lab initiatives and relevant gaps or inefficiencies in the European landscape of (collaborative) Living Labs with respect to the innovation challenges that need to be tackled to meet our Vision of a Water-Smart Society. This means all innovative aspects of a Water-Smart Society need to be taken on by a network of (Water-Oriented) Living Labs, e.g. multiple-waters, circular water, digital water, resilient water and inclusive water.

There is consequently a strong need for a more systemic approach, which would allow Living Labs to contribute more effectively to the realisation of water-smart goals. This will of course need to be in harmony with the objectives of important European legislation such as WFD , RED and CAP as well as with the Green Deal. With this in mind, Water Europe will be joining forces with European water stakeholders to further evolve the concept of Water-Oriented Living Labs. The ultimate goal is to promote the evolution of the European network of Living Labs from low to medium maturity level, through to the highest degree of organisation/maturity that Water-Oriented Living Labs can achieve in Europe, namely, that of a Living Lab accredited by Water Europe: a Water Europe Living Lab, or WELL.

The current WOLLs, as they are described in all their diversity in Water Europe's Atlas of the EU Water-Oriented Living Labs, provide our starting point. This list of WOLLs can be further expanded, and they can be assessed to establish their maturity levels, as well as their potential to evolve into WELLs.

As recommended in the Water-Oriented Living Labs Notebook Series #1 the LLAM (Living Lab Assessment Model) or Harmonization Cube is recommended as the best available assessment method to be used for assessing and evolving Living Labs.

To pursue Water Europe's WELL strategy, this method needs to be tailored for the water sector in general, and more particularly with the future goal of a network of collaborative Water-Oriented Living Labs in mind. The immediate challenge is, in close partnership with the Water4All programme, to stimulate and guide the growth and development of WOLLs along concrete steps towards role in tackling all the challenges towards the vision of a Water-Smart Society and towards a well-functioning WOLL with the highest level of maturity (i.e. WELL).

The ultimate objective is to develop a collaborative network of WELLs – or 'WELLNet' – which will make an indispensable contribution to realising Water Europe's Vision of a Water-Smart Society.

This vision and strategy for migration from the current situation and maturity levels of Water-Oriented Living Labs, towards an established network of mature and collaborative WELLs, can be visualised in Table 1. It distinguishes existing WOLLs variants as i-WOLLs (i for initial) and e-WOLLs (e for established) and s-WOLLs (s for scalable) based on the maturity levels in the Harmonization Cube. The migration goals are to evolve the lower maturity WOLLs towards higher levels. Indicative timing by Water Europe is to realise the future vision of a network of WELLs (WELLNet) by 2027, using the intermediate period to invest in the migration path to realise a critical mass of and complementary, collaborative and "interoperable" WELLs; "interoperable" meaning that results in the Living Labs are standardised to an extend that they can be exchanged with other Living Labs as well, providing meaningful experimental results on which next level research and innovation can be built, as such accelerating the innovation path towards a Water-Smart Society.

Maturity levels	A. Actual	B. Migration (WE & Water4All)		C. Future (WE)
1. Start-up	i-WOLL	i-WOLL → e-WOLL		
2. Sustainable	e-WOLL	e-WOLL → s-WOLL		
3. Scalable	s-WOLL	s-WOLL → WELL		WELLNet
Strategic Guidance	WE Vision	WE Vision	Water4All SRIA	WE Vision

Table 1: Development stages in the context of Water Europe's existing (Actual) and upcoming (new) activities and longer term (future) goal; and those in context of the Water4All programme (Green: present situation. Red: Synergetic actions of Water4All and WE. Orange: Mission of WE).

Driving the impact of WOLLs

In the pursuit of these objectives, Water Europe, drawing on its Vision, will stimulate the evolution of the concept of Water-Oriented Living Labs as an instrument taking into consideration three key functions in modern innovation, multi-disciplinary R&D, digitalisation, and communication & inclusiveness:

1. **Multi-disciplinary R&D**. The integration of water targeted R&D into Living Labs is one of the main historical motivations underlying the development of the WOLL concept. Today, however, a WOLL is much more than simply a means of introducing new water technology, it has become pre-eminently an attractive, integrated setting for the parallel amalgamation of various innovations – such as those relating to a circular economy, a Nexus approach, or the coupling of water and energy. After all, a Water-Smart Society amounts to much more than the introduction of disruptive or incremental water technology innovations. Water Europe therefore sees a productive Water-Oriented Living Lab environment as a multifunctional organisational form that pursues a Water-Smart Society with a view to the general social interest.

2. **Digital Twins**. Digital twins have a key role to play in WOLL development. A digital twin integrates artificial intelligence (e.g., machine learning) and domain models with real-time data, creating living digital replicas of a physical infrastructure which evolve and change along with their real-life counterparts. They provide an integrated digital knowledge management system, with which up-to-date system information is shared unambiguously and traceably with supervisors, water managers and citizens (online). This makes it possible, for instance, to study the consequences of potential measures by means of scenario planning. Digital twins are increasingly being employed in the planning, realisation and maintenance of water systems and their infrastructure. For all stakeholders, including citizens, access to reliable, current information is essential if we are to meaningfully involve them in decision-making. That is why Water Europe sees a digital twin configuration with citizen oriented IoT tools as a fundamental part of its WOLL approach.

3. **Communication & inclusiveness**. WOLLs provide an excellent environment for effective communication, thanks to the way they bring together different stakeholders to collaborate on achieving common goals. After all, WOLLs deal with real-life situations in which meeting the social challenges surrounding water is considered a task to be shared by citizens, governments, and the private sector. In this context, Water Europe sees an important role for both the network of WOLLs (or WELLs) and itself in communication to the different stakeholders, and in promoting communication among them. Modern communication tools (e.g. social media) embedded with the network of collaborative WOLLs can play a crucial role in promoting inclusive research and innovation, considered to be one of the key components in successful modern innovation processes.

4) The 5 innovation areas defined for the updated Water Europe vision for a Water Smart Society
5) WFD: Water Framework Directive, RED: Renewable Energy Directive, CAP: Common Agricultural Policy

THE LIVING LAB ASSESSMENT MODEL (LLAM): HARMONIZATION CUBE

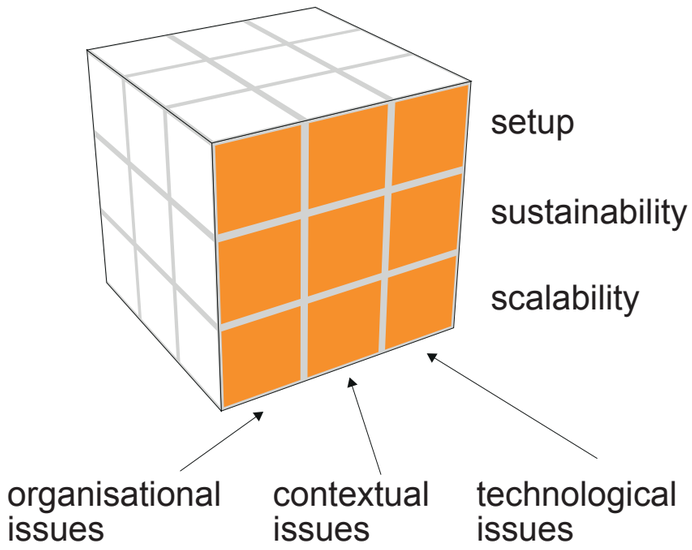
An effective and accurate WOLL assessment process and tool are indispensable in the effort to promote the development and evolution of a network of collaborative WOLLs. We have found that the most appropriate tool for the task is a tailored version of the Harmonisation Cube, an assessment method developed in an EU-funded CoreLabs project (IST035065). The Harmonization Cube (LLAM) model combines academic learnings and definitions i.e. the six aspects (e.g. foundational elements) that represent the essential characterization of a Living Lab (Mulder et al. 2008), as well as many of the common principles for fostering well-functioning Living Lab ecosystems as defined by our Water-Oriented Living Labs Notebook Series #1, 'WOLLs – Definitions, Practices and Assessment Methods'. It furthermore standardises ("harmonises") them for a comprehensive assessment of Living Labs on all its aspects. Using such a harmonising approach allows for comparative and concerted mapping, assessing and evolution: i.e. development of action plans and roadmaps towards the network of collaborative Living Labs.

Having been adopted by ENoLL as its key taxonomy for classifying Living Labs from all sectors, it also promises potential for benchmarking and comparison with other Living Labs throughout Europe (even from other sectors), allowing for sharing best practices and learning from each other in the development of Living Labs towards higher levels of maturity.

The 3-step assessment methodology presented below applies a version of the Harmonisation Cube tailored to WOLLs. It can be used as a guide for the co-ordinated assessment, analysis, synergic development, harmonisation, and networking of regional WOLL initiatives. It will foster the building of bridges between existing WOLLs, enabling them to learn from each other, benchmark successful approaches and exchange best practices. It also facilitates alignment and knowledge sharing with Living Lab initiatives in other sectors, thanks to a common Living Lab concept and a harmonised language.

As will be shown, the Harmonisation Cube can currently be used to:

- **Assess and analyse the six foundational elements** inherent to any Living Lab's functioning and development, as represented on the Harmonisation Cube's six faces, namely: 1) governance, 2) service creation, 3) infrastructure, 4) methods & tools, 5) user involvement and 6) innovation outcomes (Figure 1). The analysis of these foundational elements in greater detail, will allow to determine the WOLLs' maturity level (i- , e-and -s WOLLs) in their natural development cycle, from start-up, to sustainability and scalability.
- **Identify development opportunities** and enable i-, e- and -s WOLLs to follow the same general guidelines and standardized reference methodology towards improving their functioning, interoperability and, ultimately, their added value in promoting innovations in the water sector through the European network of interoperable WELLs. The overall aim will be to support the further development and innovation process of existing WOLLs in setting up and configuring new ones from scratch.
- **Enhance a participative approach** with key stakeholders in the water sector.



In its current form however, the Harmonisation Cube is not suited for:

- Focussing the assessment and analysis on evaluation criteria to determine the contribution of a WOLL to the aims of a specific mission statement, such as the Water Europe Vision.
- Assessing WOLLs in terms of specific water-sector requirements, with a view to qualifying them as WELLs, or creating a roadmap for them to become WELLs.

A next generation Harmonization Cube method and practical tool-suit will be needed to meet Water Europe's vision. In this Water-Oriented Living Labs Notebook Series #2 we investigate how the Harmonization Cube could be tailored to the water sector and a first prototype of a practical tool-suite will be proposed, together with a 3-step assessment methodology in which the tailored method and tool can be applied. In a next step, to fully meet Water Europe's Vision, the Water-Oriented Living Labs Notebook Series #3, titled 'How to Develop a WELL. Advanced Guideline for a Water-Smart Living Lab Approach', will be produced and made available in the autumn of 2022. To be known as 'The BlueBook', it will provide more detailed guidelines for tailoring the tool towards specific requirements and strategic goals in the water sector. It will be produced in close consultation with Water Europe's Vision Leadership Teams (VLTs), as well as partners in European projects, in which Water Europe participates and experience is gained with Living Labs. Water Europe's Vision will govern this process.

For the time being, the provisional assessment of existing Water-Oriented Living Labs will be conducted using the 3-step methodology which is described in the next section. The assessment's final outcome will be a core group of i-, e- and s- WOLLs which, together, will provide a testbed for the new WOLL approach (see Table 1). A selection from this core group of WOLLs will be fed into the WOLLs x Vision = WELLs equation in a subsequent phase, in a process supported by the advanced BlueBook guidelines.

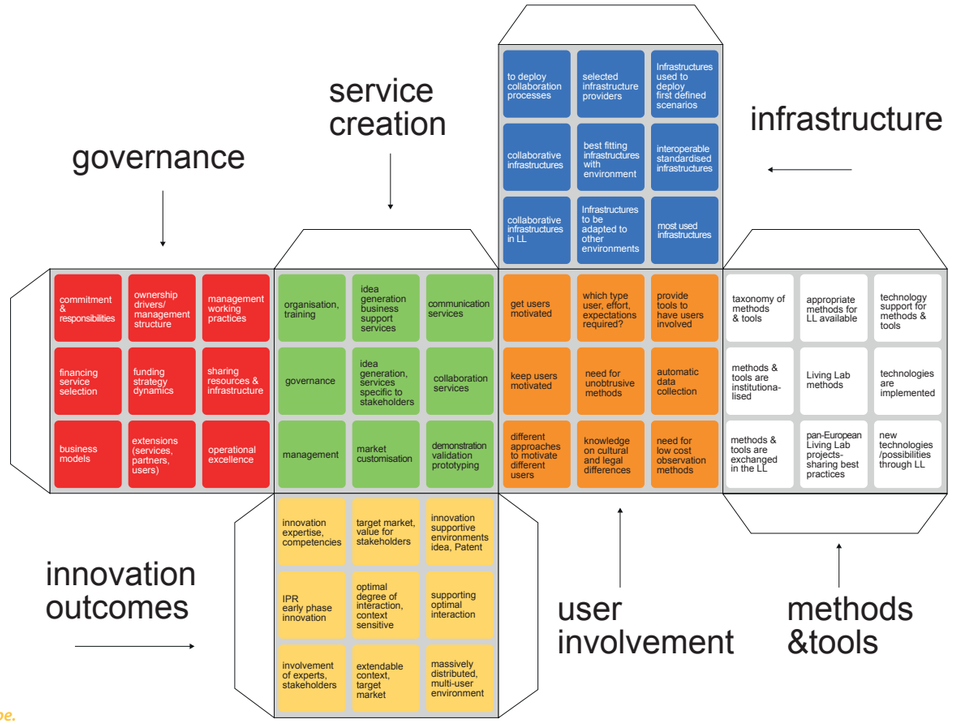
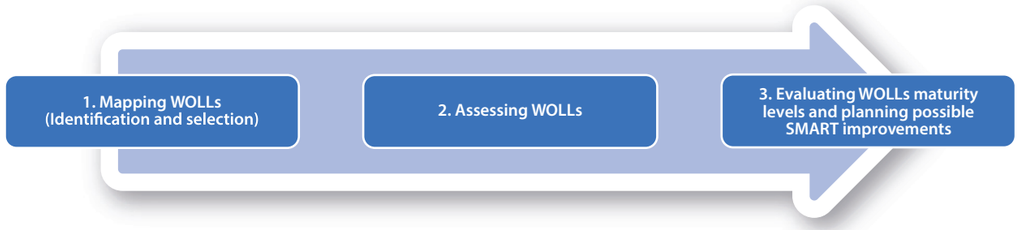


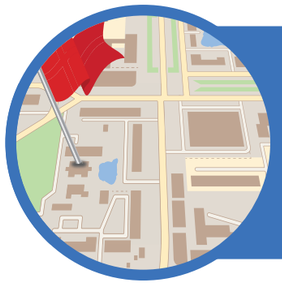
Figure 1: Visualisation of the Harmonisation Cube.

6) See Water-Oriented Living Lab Notebook series #1, 'WOLLS – Definitions, Practices and Assessment Methods'

The 3-STEP WOLL ASSESSMENT METHODOLOGY

The 3 steps in the proposed WOLL assessment methodology are: 1) Mapping WOLLs, 2) Assessing WOLLs and 3) Evaluating WOLLs maturity levels and planning possible SMART improvements.





STEP 1: MAPPING WOLLs

The activities will start with the identification and characterization of a group of EU candidate WOLLs, and their selection based on pre-identified criteria expressed in the shared definition of Water-Oriented Living Labs. This will generate a map/long list of demo- and platform-type environments for the development, testing and validation of water-related innovations, which may qualify as WOLLs.

Step 1: Mapping WOLLs

Applying the methodology to map candidate WOLLs

The activities will start with the identification of demo- and platform-type environments for the development, testing, and validation of water-related innovations. These environments will be selected as candidate WOLLs based on pre-identified criteria expressed in a shared definition of Water-Oriented Living Labs. This will result in a map of the existing Living Lab organisations dedicated to implementation of research, development, and innovation relating to the water sector.

Shared definition of Water-Oriented Living Lab:

Water-Oriented, real-life demonstration and implementation instrument that brings together public and private institutions, government, civil society, and academia to jointly build structured grounds to develop, validate, and scale-up innovations that embrace new technologies, governance, business models, and advancing innovative policies to achieve a Water-Smart Society.

Step 1 hence involves the conduct of a desk-top study and stakeholder mapping to identify and map water-oriented demo- and platform-type environments that provide a 'field lab' to develop, test, validate and implement water-oriented innovations. The basic characterizations of these candidate WOLLs will be collected and documented, to produce in a provisional classification by scale (local, municipal, regional or national) and initial ranking by maturity (start-ups, sustainables or scalables), as shown below.

Candidate WOLL name	
Location	
Scale (Local, Municipal, Regional,National)	
Estimated Maturity	

Further analysis of each candidate will then be carried out to establish to what extent they meet the basic criteria to qualify for a WOLL. An initial list of selection criteria (to be further finetuned in Water-Oriented Living Lab Notebook series #3) is shown below.

Initial Selection Criteria	
MISSION STATEMENT	
Mission statement related to Water Europe's Vision?	(Yes/No)
Mission statement related to the WATER4ALL SRIA?	(Yes/No)
Mission statement related to EU WFD, RED, CAP or Green Deal?	(Yes/No)
Mission statement related to UN SDG approach?	(Yes/No)
Mission Statement related to specific National Member State Issues?	(Yes/No)
FOCUS	
Reference to Water Infrastructure Asset Management Issues?	(Yes/No)
Reference to Water Security and/or Water Safety Issues?	(Yes/No)
Reference to Total Cost of Ownership Issues?	(Yes/No)
Reference to Integrated Spatial Planning Issues?	(Yes/No)
Reference to Water-Food Sustainability Issues?	(Yes/No)
ORGANISATION	
A permanent set-up of the Living Lab?	(Yes/No)
Designated real-life test environment?	(Yes/No)
An open-test environment?	(Yes/No)
Involvement and commitment of multiple stakeholders from the water sector (including water authorities)?	(Yes/No)
Involvement of cross-linking Nexus partners from different sectors (Water-Food-Energy)?	(Yes/No)
A continuity plan for the Living Lab (e.g., planned revenue streams for multi-annual economic sustainability)?	(Yes/No)

STEP 2: ASSESSING WOLLs

This involves using a tailored Harmonisation Cube for the qualitative and quantitative assessment of the candidate WOLLs.

STEP 2: ASSESSING WOLLs

Once the list of candidate WOLLs has been drawn up, the application of the tailored Harmonisation Cube assessment can be prepared and carried out. As mentioned earlier, the Harmonisation Cube is currently considered the best available assessment methodology. It harmonises methods and tools for the analysis of Living Lab, providing detailed assessment criteria for the six foundational elements of any Living Lab, namely: 1) governance, 2) service creation, 3) infrastructure, 4) methods & tools, 5) user involvement and 6) innovation outcomes. Each of these elements occupies one face of the Cube (see figure 2).

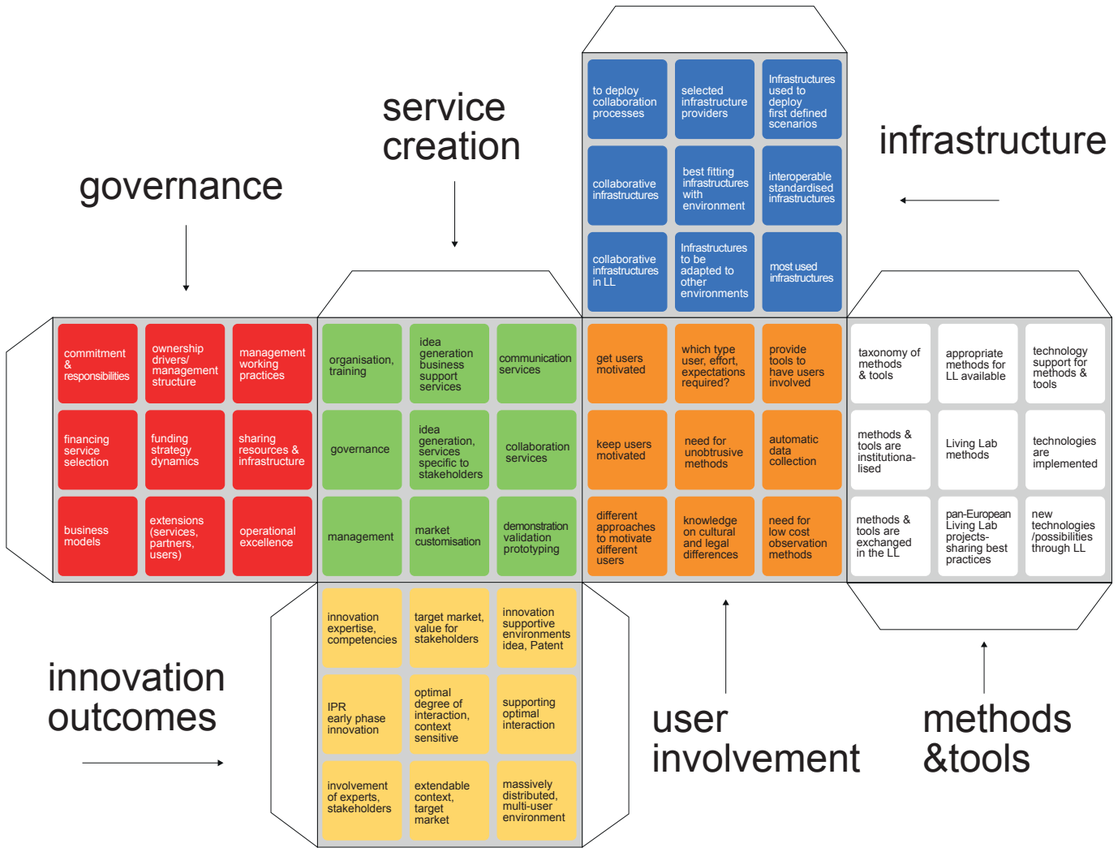


Figure 2: The 6 foundational elements of the Harmonization Cube.

As shown in Figure 3, each face of the Cube includes a 3x3 evaluation matrix, with organisational, contextual, and technological perspectives on the horizontal axis; and the three phases of a Living Lab's development: setup, sustainability and scalability, on the vertical axis.

The 3x3 evaluation matrix is used to assess each foundational element of the Living Lab. This determines the development phase and the opportunities for strengthening its impact on the implementation of innovations, which is achieved by improving its organisational set-up, its interaction with its environment (contextual), and the way it leverages technologies to optimise support to the research, development, and innovation process. The general evaluation criteria (so not yet made specific for the water sector) per foundational element are shown in Figure 3.

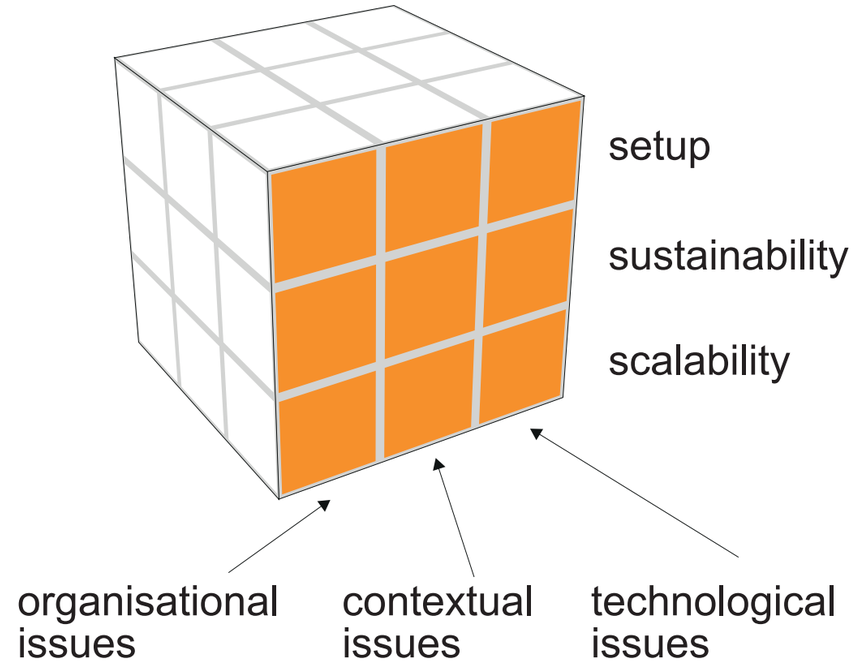


Figure 3: The 9 evaluation perspectives of the Harmonization Cube.

user involvement

get users motivated	what type of users, efforts, expectations are required?	provide tools to have users involved
keep users motivated	need for unobtrusive methods	automatic data collection
different approaches to motivate different users	knowledge on cultural and legal differences	need for low cost observation methods

service creation

organisation, training	idea generation business support services	communication services
governance	idea generation, services specific to stakeholders	collaboration services
management	market customisation	demonstration validation prototyping

infrastructure

to deploy collaboration processes	selected infrastructure providers	Infrastructures used to deploy first defined scenarios
collaborative infrastructures	best fitting infrastructures with environment	interoperable standardised infrastructures
collaborative infrastructures in LL	Infrastructures to be adapted to other environments	most used infrastructures

governance

commitment & responsibilities	ownership drivers/ management structure	management working practices
financing service selection	funding strategy dynamics	sharing resources & infrastructure
business models	extensions (services, partners, users)	operational excellence

innovation outcomes

innovation expertise, competencies	target market, value for stakeholders	innovation supportive environments idea, Patent
IPR early phase innovation	optimal degree of interaction, context sensitive	supporting optimal interaction
involvement of experts, stakeholders	extendable context, target market	massively distributed, multi-user environment

methods & tools

taxonomy of methods & tools	appropriate methods for LL available	technology support for methods & tools
methods & tools are institutiona-lised	Living Lab methods	technologies are implemented
methods & tools are exchanged in the LL	pan-European Living Lab projects-sharing best practices	new technologies /possibilities through LL

Figure 4: General evaluation criteria per foundational element.

APPLYING THE HARMONISATION CUBE TO CURRENT WOLLS

In order to evaluate Water-Oriented Living Labs, a first tailored version of the Harmonisation Cube and a practical tool have been developed. The tool tailors both the 6 foundational elements and the 3x3=9 evaluation criteria for each foundational element to the basic Research, Development and Innovation requirements in the water sector. These are the WOLL metrics, which in the present report are still provisional. These metrics serve to explore the playing field to define the outlines of a more detailed approach targeting the water sector.

The WOLL metric scores will allow us to provisionally assess the extent to which a Living Lab currently meets the fundamental WOLL objectives. The fundamental elements and associated objectives are presented below, followed in Figure 4 by their layout in the Harmonisation Cube scoring tool:

USER INVOLVEMENT
Objective: Involve water users (e.g., cities/citizens, industry and/or agriculture) as well as the users of innovations that will enable a Water-Smart Society (e.g., water users, utilities, and related service providers like wastewater management companies), giving them the opportunity to have an influence on solutions that will affect their future.

SERVICE CREATION
Objective: Facilitate and support the development of new ideas, services and solutions that contribute to a sustainable and Water-Smart Society and offering representative (semi) real-life environments of water production, distribution and (re)use, for co-design and validation.

INFRASTRUCTURE
Objective: Provide the physical or virtual environment to integrate, test, validate and measure the performance of water innovations. This may involve an experimental set-up (e.g., in labs, or demo sites) or, real-life test environments for water production, distribution and (re)use (e.g., at utilities, river basin settings, urban areas, [agro] industrial sites).

GOVERNANCE
Objective: Engage the quadruple helix from the water sector in an innovation-eco-system, for instance, by involving public (water management) authorities (including utilities), water users, water research organizations and technology developers, with a view to having them work jointly on the management and continuity of the WOLL.

INNOVATION OUTCOME
Objective: Facilitate innovations that contribute to a sustainable and Water-Smart Society ('mission focus'). These outcomes can consist of knowledge, new products and services and/or IPR. Outcomes can take the form of finished end-user applications, but also of prototypes or simply of knowledge about usage patterns.

METHODS AND TOOLS
Objective: Provide and continuously update specific (interoperable) methods and tools to acquire relevant large-scale user data related to the targeted innovation outcomes within the water sector.

THE WOLL HARMONISATION SCORING TOOL

Objectives of the 6 foundational elements

WOLL Harmonisation Cube scoring Tool	User Involvement	Service Creation	Infrastructure	Governance	Innovation outcome	Methods and Tools
	Objetive: Involve **waters users** (e.g., cities/citizens, industry and/or agriculture) as well as the **users of innovations that will enable a Water-Smart Society** (e.g., water users, utilities, and related service providers like wastewater management companies), giving them the opportunity to have an influence on solutions that will affect their future.	**Objetive:** Facilitate and support the development of **new ideas, services and solutions** that contribute to a sustainable and Water-Smart Society, and offering **representative (semi) real-life environments of water production, distribution and (re)use**, for co-design and validation.	**Objetive:** Providing the **physical or virtual enviroment**, to integrate, test, validate and measure the **performance of water innovations.** This may include an experimental set-up (e.g. in labs, or demo-sites) or (preferably) or real-life test enviroments for water production, distribution and (re)use (e.g. at utilities, river basin settings, urban areas, [agro] industrial sites]	**Objetive:** Engage the **quadruple helix from the water sector in an innovation ecosystem** e.g. by involving public (water managing) authorities (including utilities), water users (e.g. cities/citizens, industries and/or agriculture), water research organizations and technology developers, with a view to having them work jointly on the management and continuity of the WOLL.	**Objetive:** Facilitate **innovations that contribute to a sustainable and Water Smart Society ("mission focus").** These outcomes can consist of knowledge, new products and services and/or IPR. Outcomes can take the form of finished end-user applications, but also of prototypes or simply of knowledge about usage patterns.	**Objetive:** Provide and continuously update specific (interoperable) methods and tools to **acquire relevant large scale user data** related to the targeted innovation outcomes within the water sector.

	UO Metrics		UC Metrics		UT Metrics		SO Metrics		SC Metrics		ST Metrics		IO Metrics		IC Metrics		IT Metrics		Gov0 Metrics		GC Metrics		GT Metrics		INNO Metrics		INNOC Metrics		INNOT Metrics		M&TO Metrics		M&TC Metrics		M&TT Metrics	
Set up	UO 1	Y	UC 1	Y	UT 1	Y	SO 1	Y	SC 1	Y	ST 1	Y	Infra0 1	Y	InfraC 1	Y	InfraT 1	Y	Gov0 1	Y	GovC 1	Y	GovT 1	Y	INNO 1	Y	InnoC 1	Y	InnoT 1	Y	M&TO1	Y	M&TC1	Y	M&TT1	N
Sustainability	UO 2	Y	UC 2	Y	UT 2	N	SO 2	Y	SC 2	N	ST 2	Y	Infra0 2	N	InfraC 2	Y	InfraT 2	Y	Gov0 2	N	GovC 2	Y	GovT 2	Y	INNO 2	N	InnoC 2	N	InnoT 2	Y	M&TO2	N	M&TC2	N	M&TT2	N
Scalability	UO 3	Y	UC 3	N	UT 3	N	SO 3	N	SC 3	N	ST 3	N	Infra0 3	N	InfraC 3	N	InfraT 3	N	Gov0 3	N	GovC 3	N	GovT 3	N	INNO 3	N	InnoC 3	N	InnoT 3	N	M&TO3	N	M&TC3	N	M&TT3	N
	100%		**67%**		**33%**		**67%**		**33%**		**67%**		**33%**		**67%**		**67%**		**33%**		**67%**		**67%**		**33%**		**33%**		**67%**		**33%**		**33%**		**0%**	

	User Organizational Metrics (UO-Metrics)		User Contextual Metrics (UC-Metrics)		User Technological Metrics (UT-Metrics)		Service Organizational Metrics (SO-Metrics)		Service Contextual Metrics (SC-Metrics)		Service Technological Metrics (ST-Metrics)		Infra Organizational Metrics (Infra0-Metrics)		Infra Contextual Metrics (InfraC-Metrics)		Infra Technological Metrics (InfraT-Metrics)		GOV Organizational Metrics (Gov0-Metrics)		G tual Metrics Metrics)		GO ogical Metrics Metrics)		INN ational Metrics Metrics)		IN tual Metrics Metrics)		INN ogical Metrics Metrics)		Methods and anizational Metrics trics)		Methods a ontextual Metrics etrics)		Methods and Tools Technological Metrics (M&TT-Metrics)		**50%**
METRICS SCORE	**67%**						**56%**						**56%**						**56%**						**44%**						**22%**						**TOTAL SCORE**

Total score of the Harmonisation Cube (in this fictitious example 48%)

WOLL Maturity Radars: WOLL Overall score | WOLL User involvement | WOLL Service Creation | WOLL Infrastructures | WOLL Governance | WOLL Innovation outcomes | WOLL Methods & Tools

Figure 5: Tool for assessing attributes of the Harmonisation Cube adapted to the WOLLs (example of the overall scoring tabs).

WOLL QUANTITATIVE ANALYSIS

The WOLL Harmonisation scoring tool was developed to facilitate and guide an assessor in evaluating each and all of the foundational elements of the Harmonisation Cube through the use of the WOLL quantitative metrics. The assessor scores each foundational element on the basis of simple 'yes' or 'no' answers to a series of metric questions, as exemplified below.

USER METRICS
- User Organisational Metrics (UO-Metrics)
- User Contextual Metrics (UC-Metrics)
- User Technological Metrics (UT-Metrics)

SERVICE METRICS
- Service Organisational Metrics (SO-Metrics)
- Service Contextual Metrics (SC-Metrics)
- Service Technological Metrics (ST-Metrics)

INFRA METRICS
- Infra-Organisational Metrics (InfraO-metrics)
- Infra Contextual Metrics (InfraC Metrics)
- Infra Technological Metrics (InfraT-Metrics)

GOV METRICS
- GOV Organisational Metrics (GovO-Metrics)
- GOV Contextual Metrics (GovC-Metrics)
- GOV Technological Metrics (GovT-Metrics)

INNO METRICS
- INNO Organisational Metrics (Inno-Metrics)
- INNO Contextual Metrics (InnoC-Metrics)
- INNO Technological Metrics (InnoT-Metrics)

METHODS & TOOLS METRICS
- Methods and Tools Organisational Metrics (M&TO-Metrics)
- Methods and Tools Contextual Metrics (M&TC-Metrics)
- Methods & Tools Technological Metrics (M&TT-Metrics)

Scoring the WOLL metrics in the tool produces a score for each metric type (3 per foundational element, so a total of 18 (3x6); for each foundational element (6 in total); as well as a total score for the WOLL in question, indicating the areas where its further development might be considered. Figure 6 shows an example of the scoring tool applied to the User Metrics.

WOLL Harmonisation Cube scoring Tool	User Involvement					
	Objetive: Involve **waters users** (e.g., cities/citizens, industry and/or agriculture) as well as the **users of innovations that will enable a WaterSmart Society** (e.g., water users, utilities, and related service providers like wastewater management companies), giving them the opportunity to have an influence on solutions that will affect their future.					
	UO		**UC**		**UT**	
	UO Metrics		**UC Metrics**		**UT Metrics**	
Set up	UO 1	**Y**	UC 1	**Y**	UT 1	**Y**
Sustainability	UO 2	**Y**	UC 2	**Y**	UT 2	**N**
Scalability	UO 3	**Y**	UC 3	**N**	UT 3	**N**
	100%		**67%**		**33%**	
	User Organizational Metrics (UO-Metrics)		User Contextual Metrics (UC-Metrics)		User Technological Metrics (UT-Metrics)	
METRICS SCORE	**67%**					

Figure 6: WOLL metric types.

A screenshot of one of the 6 tabs in the scoring tool is shown below, taking the example of the User Involvement foundational element. It shows how the assessor will be able to score each of the 9 WOLL metrics with a simple 'yes' or 'no' in response to specific water-oriented questions.

WOLL Harmonisation Cube scoring Tool	User (U) Involvement Score									
	Objetive: Involve water users (e.g., cities/citizens, industry and/or agriculture) as well as the users of innovations that will enable a Water-Smart Society (e.g., water users, utilities, and related service providers like waste water management companies), giving them the opportunity to have an influence on solutions that will affect their future.									
	UO-Metrics			**UC-Metrics**			**UT-Metrics**			
Set up	**UO 1**	Do you focus the LL on at motivating at least one of the key water user groups to be involved in measurements and the design process of water innovations (urban/citices, industry and/or agriculture)?	**Y**	**UC 1**	Did you characterise the type of water or water related technology users you want to engage in the innovation process (type of water user, water related technology user), to **take into consideration their differences?**	**Y**	**UT 1**	Did you set-up methods and tools to engage with the defined user groups (e.g. online tools for social networking, apps, cameras, video etc. design workshops and consultation meeting, brain storming etc held in the local places as schools, libraries, cafes)?	**Y**	**100%**
Sustainability	**UO 2**	Did you agree on longer term arrangements with user proups of water or related technologies?	**Y**	**UC 2**	Did you design a engagement strategy for water users or technology users, as part of the co-creation process? E.g. to keep users motivated	**N**	**UT 2**	Did you set-up methods and tools for continuous feedback from users e.g. permanent industry sounding board, citizens communities?	**N**	**67%**
Scalability	**UO 3**	Did you consider to expand user engagement and research, e.g. towards other type of water users, or (collaborate with) other geographical areas (including confrontation with other LLs)?	**Y**	**UC 3**	Did you adapt engagement strategy e.g. towards other type of water users, or other geographical areas taking into account knowledge on cultural and legal differences?	**N**	**T 3**	Did you set-up low cost continous user observation technologies and standards e.g. atomated data collection of water use in the LL environment etc), that allow for sharing research results with other LLs or?	**N**	**33%**
SMART opportunities for WOLL maturity development	**UO Score**	**100%**		**UC Score**	**67%**		**UT Score**	**33%**		
S=Specific: Define a specific challenges and action to improving your LL maturity level	UO Improvements									
M=Measurable: Define deliverables or concrete progress on targeted challenge										
A=Actionable: Verify if you as a Living Lab organisation can actual DO something to realise these improvements										
R=Reasonable: within the scope of your available resources: define how much resources would be required to realise the improvements										
T=Timely: realisable within acceptable timing: define a reasonable timeline to realise the improvements										
METRICS SCORE	**67%**									**TOTAL SCORE**

Possibility to score each of the 9 metrics with a simple "yes" or "no" each leading to a quantified score per metric (in this example 100%, 67% and 33%), and overall score for the foundational element (in this example 67%)

WOLL Maturity Radars: WOLL Overall score | WOLL User involvement | WOLL Service Creation | WOLL Infrastructures | WOLL Governance | WOLL Innovation outcomes | WOLL Methods & Tools

Figure 7: Scoring of the WOLL metrics in the User involvement Tab.

STEP 3. EVALUATING WOLLs MATURITY LEVEL AND PLANNING POSSIBLE SMART IMPROVEMENTS

Step 3: Evaluating WOLLs maturity levels

Following the quantitative analyses in Step 2, a qualitative analysis can be performed in those cases in which improvement opportunities have been identified. To this end, the WOLL scoring tool offers an assessor the possibility to focus on specific improvement points and developing an improvement plan based on a SMART approach.

WOLL MATURITY ASSESSMENT AND VISUALISATION

The tool provides visualisations (WOLL maturity Radars) of the maturity levels in a dedicated tab, to enable a quick and easy overview of where further developments and improvements in the WOLL are possible.

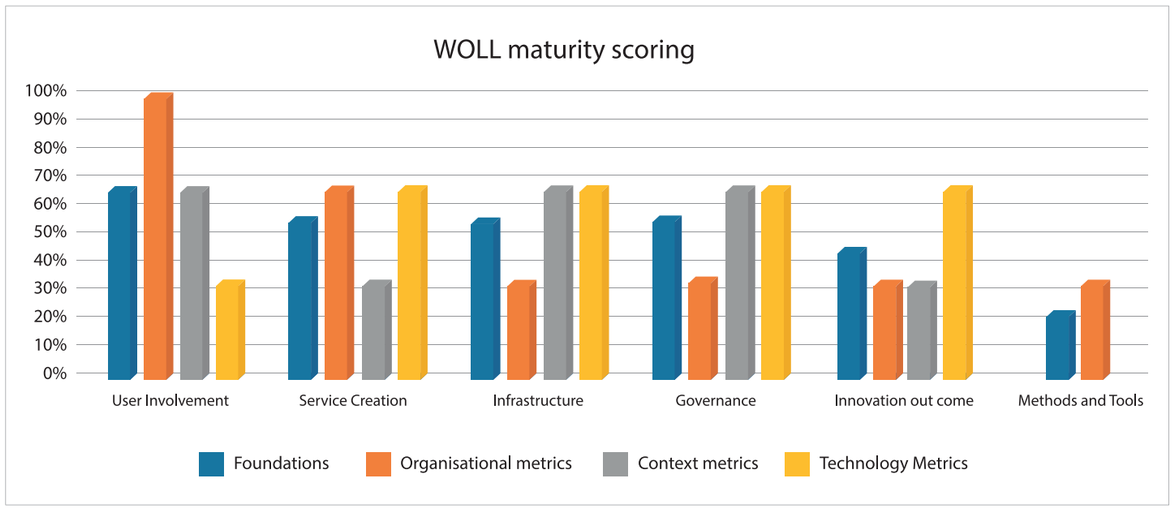
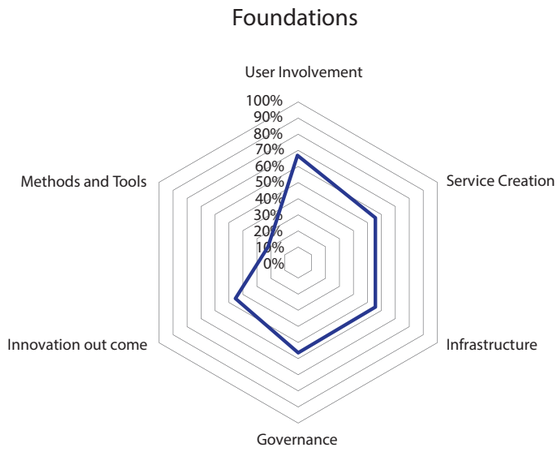


Figure 8: Example overview of WOLL maturity scoring.



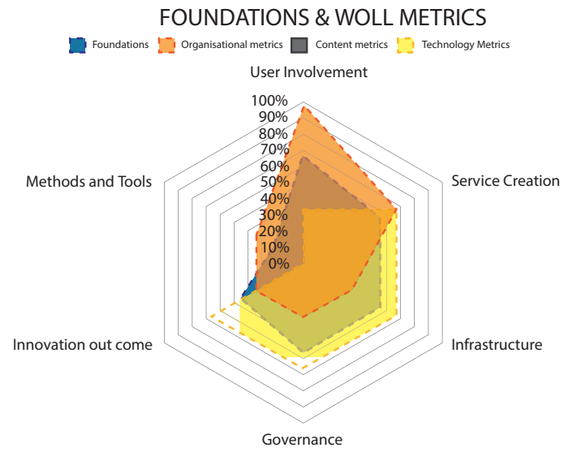


Figure 9 Example of Radar visualisation of WOLL maturity scores considering Organisational, Context and Technology Metrics.

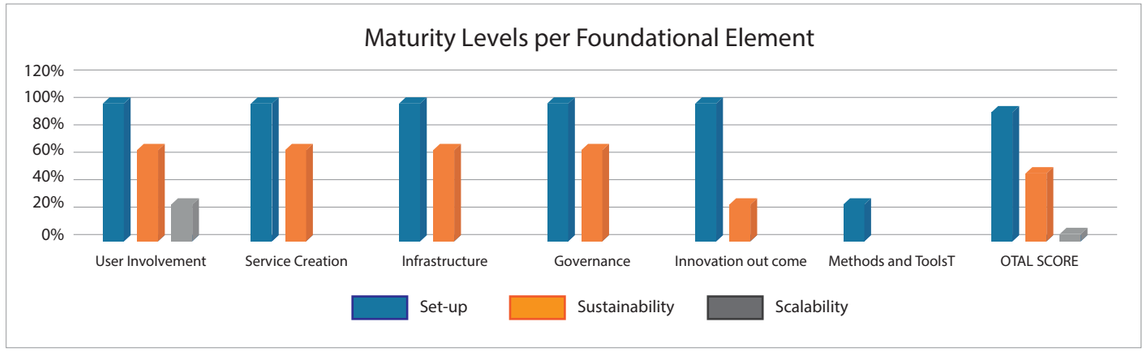


Figure 10: Example overview of WOLL maturity scoring per WOLL foundational element.

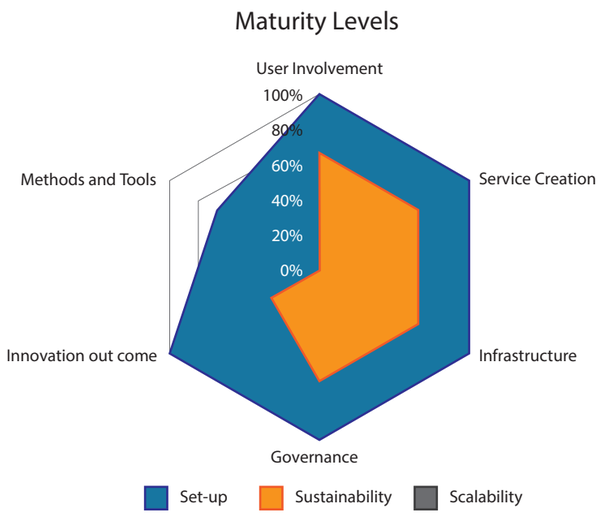


Figure 11: Example of Radar visualisation of WOLL maturity scores per foundational element.

DEVELOPING A WOLL – SMART IMPROVEMENT PLAN

Where low scores have been received, the WOLL or its (external) assessor will be able to use the tool to define an improvement plan using the SMART approach . The SMART in SMART goals in our WOLL assessment tool stand for Specific, Measurable, Achievable, Reasonable, and Timely. Defining these parameters as they pertain to specific goal-setting helps ensure that objectives are focused, concrete, realistic, assessable and attainable within a certain time frame. With the WOLL tool the SMART approach can be applied in each foundational element. For each foundational element in the Harmonization Cube priority Actions and Key Performance Indicators (KPIs) can be defined related to the WOLL metric types (organisational, context or technical), to improve the maturity levels of the Living Lab, as follows:

- **S = Specific:** Define specific challenges and actions to improve the Living Lab maturity level.
- **M = Measurable:** Define deliverables or concrete progress for targeted challenge.
- **A = Actionable:** Verify whether the Living Lab organisation can actual do something to realise these improvements (and indicate who is in a position to implement the improvement action).
- **R = Reasonable:** Ensure that the improvement actions are within the scope of available resources; define how many resources (FTE, budget) would be required to realise the improvements.
- **T = Timely:** Ensure actions are realisable within acceptable time-frame; define a reasonable timeline to realise the improvements.

SMART opportunities for WOLL maturity development	UO Score	100%	UC Score	67%	UT Score	33%
S=Specific: Define a specific challenges and action to improving your LL maturity level	UO Improvements		UC Improvements		UT Improvements	
M=Measurable: Define deliverables or concrete progress on targeted challenge						
A=Actionable: Verify if you as a Living Lab organisation can actual DO something to realise these improvements						
R=Reasonable: within the scope of your available resources: define how much resources would be required to realise the						
R=Reasonable: within the scope of your available resources: define how much resources would be required to realise the						

CONCLUSIONS

The Water-Oriented Living Labs Notebook Series #2 document provides a first step towards developing practical and provisional guidelines for the identification, assessment and evolution of Water-Oriented Living Labs (WOLLs), in the light of Water Europe's Vision on the role of WOLLs. The document highlights how a future network of mature Water-Oriented Living Labs can play a enabling role in tackling the key challenges towards realising a Water-Smart Society. To develop such a network of collaborative and complementary Water-European Living Labs (i.e. abbreviated as WELLNet), a harmonised methodology will be required to assess the current status of Water-Oriented Living Labs, and trace the path towards developing their maturity levels and towards a complementary and collaborative WELLNet. The report shows how the existing Harmonization Cube (LLAM) method can be tailored specifically for the water sector. A first prototype tool based on this tailoring is proposed, as a basis for a next step in which this tool will be further developed together with Water Europe's Vision Leadership Teams and other relevant stakeholders from the water sector. This next step will be the subject of the Water-Oriented Living Labs Notebook Series #3, titled 'How to Develop a WELL. Advanced Guideline for a Water-Smart Living Lab Approach', which will be known as 'The BlueBook'.

7) The SMART criteria are commonly attributed to Peter Drucker's Management by Objectives concept

APPENDIX:

SCORING TABS OF THE WOLLS ASSESSMENT TOOL

What follows are the details of the different scoring tabs within the WOLL assessment tool. Every WOLL is to be scored on the basis of a simple 'yes' or 'no' answer to each question. The results will be translated into a quantitative score per metric type – i.e., O (organisation), C (context) and T (technology) – and an overall score for the specific foundational element concerned. In the following stage, Step 3, the assessor will be able to qualitatively analyse the scores, with the aim of identifying means of improving the WOLL's performance on the specific foundational element, and thus increase its maturity level per metric type, and advance its interoperability within the European network of WOLLs, and ultimately WELLs.

Detailed WOLL Metrics per Foundational Element

1. User Involvement (U) Score

USER (U) INVOLVEMENT SCORE								
Objetive: Involve water users (e.g., cities/citizens, industry and/or agriculture) as well as the users of innovations that will enable a Water-Smart Society (e.g., water users, utilities, and related service providers like waste water management companies), giving them the opportunity to have an influence on solutions that will affect their future.								
UO-Metrics			**UC-Metrics**			**UT-Metrics**		
UO 1	Do you focus the LL on at motivating at least one of the key water user groups to be involved in measurements and the design process of water innovations (urban/citices, industry and/or agriculture)?	**Y**	**UC 1**	Did you characterise the type of water or water related technology users you want to engage in the innovation process (type of water user, water related technology user), to take into consideration their differences?	**Y**	**UT 1**	Dis you set-up methods and tools to engage with the defined user groups (e.g. online tools for social networking, apps, cameras, video etc. design workshops and consultation meeting, brain storming etc held in the local places as schools, libraries, cafes)?	**Y**
UO 2	Did you agree on longer term arrangements with user proups of water or related technologies?	**Y**	**UC 2**	Did you design a engagement strategy for water users or technology users, as part of the co-creation process? E.g. to keep users motivate?	**N**	**UT 2**	Did you set-up methods and tools for continuous feedback from users e.g. permanent industry sounding board, citizens communities?	**N**
UO 3	Did you consider to expand user engagement and research, e.g. towards other type of water users, or (collaborate with) other geographical areas (including confrontation with other LLs)?	**Y**	**UC 3**	Did you adapt engagement strategy e.g. towards other type of water users, or other geographical areas taking into account knowledge on cultural and legal differences?	**N**	**UT 3**	Did you set-up low cost continous user observation technologies and standards e.g. atomated data collection of water use in the LL environment etc), that allow for sharing research results with other LLs?	**N**

2. Service Creation (SC) Score

SERVICE CREATION (SC) SCORE								
Objetive: Facilitating and supporting the develpment of new ideas, services and solutions that contribute to a sustainable and water smart society, and offering a representative (semi) real-life environments of water production, distribution and (re)use, for co-design and validation.								
SCO-Metrics			**SCC-Metrics**			**SCT-Metrics**		
SCO 1	Did you set up and train the stakeholders for a collaborative and co-creation process within the WOll targeted at tackling challenges in the water sector, covering at least technical services (e.g. demo and prototyping)?	**Y**	**SCC 1**	Did you identify and set-up new idea generation approaches through identifying critical or important aspects to the water smart society and do you have a business support (market strategies) services in place?	**Y**	**SCT 1**	Did you set-up a clear communication plan and services to engage users in the co-creation process; and do you consider sharing valuable lessons of communication from successful and unsuccessful water related projects and teams?	**Y**
SCO 2	Do you have a stable governance structure, that reflects all relevant stakeholders of water value chain for the co-creation process within the focus area of your WOLL?	**Y**	**SCC 2**	Did you set-up a sustainable mechanism for user involvement in idea generation, services to specific stakeholders, considering open innovation and interoperatibility aspects as well as and customer services (e.g. market customisation etc)?	**N**	**SCT 2**	Did you set-up durable collaboration services using technologies or other similar tools to support and enable cooperation between all parties involved?	**Y**
SCO 3	Do you manage the service creation process taking into consideration intra-network services (collaborations and learning with external parties, beyond your core-partners and other Living Labs)?	**N**	**SCC 3**	Do you facilitate the design of user engaged market uptake strategy for the resulting products and services for the water sector, including IPR and business models?	**N**	**SCT 3**	Did you have supporting technologies to enable cooperation between all parties involved to make demonstration, validation and prototyping?	**N**

3. Infrastructure (Infra) Score

INFRASTRUCTURE (Infra) SCORE								
Objetive: Providing the physical or virtual environment, to integrate, try-out, validate and measure the performance or water innovations. This may include an experimental set-up (e.g. in labs, or demo-sites) or (preferably) reallife test environments including (external) infrastructures for water production, distribution and (re)use (e.g. at utilities, urban areas, (agro) industrial sites)								
InfraO-Metrics			**InfraC-Metrics**			**InfraT-Metrics**		
InfraO 1	Did you set-up a collaboration process to deploy and operate networks, sensors, data collection mechanism that provide meaningful insights in the performance of water related innovations (as targeted in your water mission)?	**Y**	**InfraC 1**	Did you select (external) infrastructure providers (such as water utilities, urban authorities, industries etc), to set up the necessary infrastructure needed for your project (local or regional level)?	**Y**	**InfraT 1**	Have you already deployed the necessary infrastructures to run your first test scenarios using appropriate water related (external) infrastructures hardware, Software, servers, etc?	**Y**
InfraO 2	Do you have collaborative infrastructure in place to operate networks, sensors, data collection processes, analysis etc to external infrastructures surrounding the LL to be able to acquire real life user data of sufficient quality and over time?	**N**	**InfraC 2**	Based on previous results, did you already identify the best fitting (external) water related infrastructures on wich to deploy the data-collection mechanism and tools, securing longer term collaboration e.g. through legal arrangements?	**Y**	**InfraT 2**	Did you set-up the technologies, tools and standard, such that collaborative data-collection can also be done together with others (e.g. other external water infrastructures in the region (country) or other WOLLs)?	**Y**
InfraO 3	Did you set-up the collaborative data-collection process, to enable easy exchange and collaborative research with other WOLLs?	**N**	**InfraC 3**	Do you have the possibility to adapt and expand the infrastructure for data-collection to other environments (e.g. to integrate other urban water users, or to integrate industry and/or agriculture)?	**N**	**InfraT 3**	Have you identified the most used (external) infrastructure (that secure relevant user feedback on water innovations, also for collaborations with other WOLLs and that enable scalability)?	**N**

4. Governance (Gov) Score

GOVERNANCE (Gov) SCORE								
Objetive: Engage the quadruple helix from the water sector in a (inter) regional context e.g. involving public (water managing) authorities (including utilities), water users (e.g. cities/citizens, industries and/or agriculture), water research organizations and technology developers, wich jointly agree on managing and maintaining the WOLL								
GovO-Metrics			**GovC-Metrics**			**GovT-Metrics**		
GovO 1	Did you set-up responsibility, authority structure and contractual arrangements to involve the key stakeholders for the quadruple helix in the water sector (see above)?	**Y**	**GovC 1**	Did you set-up overall ownership, management structure, IPR rules and priorities of the WOLL in line with the goals of the involved organizations (such us research driven, innovation driven or business driven)?	**Y**	**GovT-1**	Do you have business management working practices (working methods and innovations that managers use to improve the effectiveness of work system)?	**Y**
GovO 2	Did you agree on longer term financial arrangements for the joint infrastructures as well as mutual arrangement in respect to using each other´s technologies and services?	**N**	**GovC 2**	Do you have funding and financing strategy/service in place to continuously “fuel” the WOLL with relevant projects?	**Y**	**GovT-2**	Do you have technologies, management, tools (e.g. management software) and practices in place to allow for monitoring and sharing the use os resources & infrastructure?	**Y**
GovO 3	Did you define business models to scale up your WOLL to increase its activities over time?	**N**	**GovC 3**	Did you organise the WOLL in a way that it is open to external parties, including other LL´s, to carry out users tests?	**N**	**GovT-3**	Do you apply management approaches to aim for operational excellence problem-solving, consistency in external collaboration?	**N**

5. Innovation Outcomes (Inno) Score

INNOVATION OUTCOME (Inno) SCORE								
Objetive: Facilitate predominantly innovations that contribute to a sustainable and water smart society (“mission focus”). These outcomes can be knowledge, new products and services and/or IPR. Outcomes can be in the form of finished end-user applications but also in the form of prototypes or mere knownledge about usage patterns.								
InnoO-Metrics			**InnoC-Metrics**			**InnoT-Metrics**		
InnoO 1	Did you arrange for the relevant innovation expertise and competencies within the WOLL to support the targeted water innovations	**Y**	**InnoC 1**	Did you define and detail your mission, to aim for water oriented innovations that result in relevant impact to create societal and market value for the stakeholders (e.g. a SRIA)	**Y**	**InnoT 1**	Did you set-up innovation supportive environments (services) to foster Ideas, technology and Patents for the stakeholders, in line with your water oriented mission.	**Y**
InnoO 2	Do you have processes in place to solve possible IPR issues and identified processes and phases to secure continued stakeholder engagements in water oriented R&D&I	**N**	**InnoC 2**	Do you have optimal degree of Interaction with the involved parties to work together, share innovation outcomes and regularly update your mission in order to take into account new developments and adaptations to different/new contexts	**N**	**InnoT 2**	Do you have a supporting technology or tools to steer the interaction between the involved parties towards the targeted outcomes	**Y**
InnoO 3	Have you identified a wider pool of (external) experts (including through other WOLLs) and the possibility to engage them if required for expanding developing water related innovations and solutions	**N**	**InnoC 3**	Is your Living Lab ready to expand its focus or collaborate with other WOLLs to tackle challenges in adjacent markets, application or geographic areas	**N**	**InnoT 3**	Do you have technological support to engage -if required- very large multi-user engagement towards targeted innovation outcomes	**N**

6. Methods & Tools (M&T) Score

METHODS & TOOL (M&T) SCORE								
Objetive: Provide and continuously update specific (interoperable) state of the art methods and tools to acquire relevant large scale user data related to the targeted innovation outcomes within the water sector.								
M&TO-Metrics			**M&TC-Metrics**			**M&TT-Metrics**		
M&TO 1	Did you define taxonomy of methods (categorization or classification) & tools to enable meaningful results from user experiments?	**Y**	**M&TC 1**	Are your selected methods and tools for large scale (in-situ) user monitoring and measurement available for use?	**Y**	**M&TT 1**	Do you deploy a tech-watch process to support continuous validation of state of the art methods and tools for user monitoring and measurements in the water sector?	**N**
M&TO 2	Are your selected methods and tools validated and endorsed by the relevant stakeholders connected to the WOLL?	**N**	**M&TC 2**	Are your methods and tools geared for continued and longer term Living Lab experiments with users, within a sustainable WOLL?	**N**	**M&TT 2**	Did you set-up technology support (develop, testing and acceptance) to update methods and tools to the state of the art where necessary (e.g. new IoT devices)?	**N**
M&TO 3	Did you standardize your methods & tools (e.g. open source) and search best practices, so that to enable data exchange with other WOLLs?	**N**	**M&TC 3**	Did you set-up best practices sharing methods, tools and mechanisms at panEuropean Water Oriented Living Lab projects?	**N**	**M&TT 3**	Did you design your methods and tools in a way (open source) to accept and interface new technologies/possibilities that comes through external networks (e.g. WOLLs)?	**N**

The tables below show the tool's functionality to define SMART opportunities for WOLL maturity development for different foundational elements.

WOLL USER INVOLVEMENT SCORING TAB

WOLL Harmonisation Cube scoring Tool	User (U) Involvement Score									
	Objetive: Involve water users (e.g., cities/citizens, industry and/or agriculture) as well as the users of innovations that will enable a Water-Smart Society (e.g., water users, utilities, and related service providers like waste water management companies), giving them the opportunity to have an influence on solutions that will affect their future.									
	UO-Metrics			**UC-Metrics**			**UT-Metrics**			
Set up	**UO 1**	Do you focus the LL on at motivating **at least one of the key water user groups** to be involved in measurements and the design process of water innovations (urban/citices, industry and/or agriculture)?	**Y**	**UC 1**	Did you characterise the type of water or water related technology users you want to engage in the innovation process (type of water user, water related	**Y**	**UT 1**	Dis you set-up **methods and tools to engage with the defined user groups** (e.g. online tools for social networking, apps, cameras, video etc. design workshops and consul-	**Y**	**67%**
Sustainability	**UO 2**	Did you agree on longer term arrangements with user proups of water or related technologies?	**Y**	**UC 2**					**N**	
Scalability	**UO 3**	Did you consider to **expand user engagement and research**, e.g. towards other type of water users, or (collaborate with) other geographical areas (including confrontation with other LLs)?	**Y**	**UC 3**	Did you adapt engagement strategy e.g. towards other type of water users, or other geographical areas taking into account **knowledge on cultural and legal differences?**	**N**	**T 3**	Did you set-up low cost continous user **observation technologies and standards** e.g. atomated data collection of water use in the LL environment etc), that allow for sharing research results with other LLs?	**N**	
SMART opportunities for WOLL maturity development	**UO Score**	**100%**		**UC Score**	**67%**		**UT Score**	**33%**		
S=Specific: Define a specific challenges and action to improving your LL maturity level	UO Improvements			UC Improvements			UT Improvements			
M=Measurable: Define deliverables or concrete progress on targeted challenge										
A=Actionable: Verify if you as a Living Lab organisation can actual DO something to realise these improvements										
R=Reasonable: within the scope of your available resources: define how much resources would be required to realise the improvements										
T=Timely: realisable within acceptable timing: define a reasonable timeline to realise the improvements										
METRICS SCORE	**67%**									**TOTAL SCORE**

Qualitative assessment area to develop SMART opportunities for maturity development

WOLL Maturity Radars: WOLL Overall score | WOLL User involvement | WOLL Service Creation | WOLL Infrastructures | WOLL Governance | WOLL Innovation outcomes | WOLL Methods & Tools

WOLL SERVICE CREATION SCORING TAB

WOLL Harmonisation Cube scoring Tool	SERVICE CREATION (SC) Score									
	Objetive: Facilitating and supporting the development of new ideas, services and solutions that contribute to a sustainable and water smart society, and offering a representative (semi) real-life environments of water production, distribution and (re)use, for co-design and validation									
	SCO-Metrics			**SCC-Metrics**			**SCT-Metrics**			
Set up	**SCO 1**	Did you set up and train the stakeholders for a collaborative and co-creation process within the WOLL targeted at tackling challenges in the water secftor, covering at least technical services (e.g. demo and prototyping)	**Y**	**SCC 1**	Did you identify and set-up new idea generation approaches through identifying critical or important aspects to the water smart society and do you have a business support (market strategies) services in place.	**Y**	**SCT 1**	Did you set-up a clear communication plan and services to engage users in the co-creation process; and do you consider sharing valuable lessons of communication from sucessful and unsuccessful water related projects and teams.	**Y**	
Sustainability	**SCO 2**	Do you have a stable governance structure, that reflects all relevant stakeholders of water value chain for the co-creation process within the focus area of your WOLL	**Y**	**SCC 2**	Did you set-up a sustainable mechanism for user involment in idea generation, services to specific stakeholders, considering open innovation and interoperability aspects as well as and customer services (e.g. market customisation etc)	**N**	**SCT 2**	Did you set-up durable collaboration services using technologies or other similar tools to support and enable cooperation between all parties involved.	**Y**	
Scalability	**SCO 3**	Do you manage the service creation process taking into consideration intra-network services (collaboratIons and learning with external parties, beyond your core-partners and other Living Labs)	**N**	**SCC 3**	Do you facilitate the design of user engaged market uptake strategy for the resulting products and services for the water sector, including IPR and business models.	**N**	**SCT 3**	Did you have supporting technologies to enable cooperation between all parties involved to make demonstration, validation and prototyping.	**N**	**56%**
SMART opportunities for WOLL maturity development	**SCO Score**	**67%**		**SCC Score**	**33%**		**SCT Score**	**67%**		
S=Specific: Define a specific challenges and action to improving your LL maturity level	SCO Improvements			SCC Improvements			SCT Improvements			
M=Measurable: Define deliverables or concrete progress on targeted challenge										
A=Actionable: Verify if you as a Living Lab organisation can actual DO something to realise these improvements										
R=Reasonable: within the scope of your available resources: define how much resources would be required to realise the improvements										
T=Timely: realisable within acceptable timing: define a reasonable timeline to realise the improvements										
METRICS SCORE	**56%**									**TOTAL SCORE**

WOLL Maturity Radars | WOLL Overall score | WOLL User involvement | WOLL Service Creation | WOLL Infrastructures | WOLL Governance | WOLL Innovation outcomes | WOLL Methods & Tools

WOLL Harmonisation Cube scoring Tool	INFRASTRUCTURE (Infra) SCORE									
	Objetive: Providing the **physical or virtual environment**, to integrate, try-out, validate and **measure the performance of water innovations.** This may include an experimental set-up (e.g. in labs, or demo-sites) or (preferably) reallife test environments including (external) infrastructures for water production, distribution and (re) use (e.g. at utilities, urban areas, (agro) industrial sites)									
	InfraO-Metrics			**InfraC-Metrics**			**InfraT-Metrics**			
Set up	**InfraO 1**	Did you set-up a collaboration process to deploy and operate networks, sensors, data collection mechanisms that provide meaningful insights in the performance of water related innovations (as targeted in your water mission)?	**Y**	**InfraC 1**	Did you select (external) infrastructure providers (such as water utilities, urban authorities, industries etc), to set up the necessary infrastructure needed for your project (local or regional level)?	**Y**	**InfraT 1**	Have you already deployed the necessary infrastructures to run your first test scenarios using appropiate water related (external) infrastructures hardware, Software, servers, etc?	**Y**	
Sustainability	**InfraO 2**	Do you have collaborative infrastructure in place to operate networks, sensors, data collection processes, analysis etc to external infrastructures surrounding the LL to be able to acquire real life user data of sufficient quality and over time?	**N**	**InfraC 2**	Based on previous results, did you already identify the best fitting (external) water related infrastructures on which to deploy the data-collection mechanisms and tools, securing longer term collaboration e.g. through legal arrangements?	**Y**	**InfraT 2**	Did you set-up the technologies, tools and standard, such that collaborative data-collection can also be done together with others (e.g. other external water infrastructures in hte region (country) or other WOLLs)?	**Y**	
Scalability	**InfraO 3**	Did you set-up the collaborative data-collection process, to enable easy exchange and collaborative research with other WOLLs?	**N**	**InfraC 3**	Do you have the possibility to adapt and expand the infrastructure for data-collection to other environments (e.g. to integrate other urban water users, or to integrate industry and/or agriculture)?	**N**	**InfraT 3**	Have you identified the mosto used (external) infrastructure (that secure relevant user feedback on water innovations, also for collaborations with other WOLLs and that enable scalability)?	**N**	**56%**
SMART opportunities for WOLL maturity development	**InfraO Score**	**33%**		**InfraC Score**	**67%**		**InfraT Score**	**67%**		
S=Specific: Define a specific challenges and action to improving your LL maturity level	UO Improvements			UC Improvements			UT Improvements			
M=Measurable: Define deliverables or concrete progress on targeted challenge										
A=Actionable: Verify if you as a Living Lab organisation can actual DO something to realise these improvements										
R=Reasonable: within the scope of your available resources: define how much resources would be required to realise the improvements										
T=Timely: realisable within acceptable timing: define a reasonable timeline to realise the improvements										
METRICS SCORE	**56%**									**TOTAL SCORE**

WOLL Maturity Radars | WOLL Overall score | WOLL User involvement | WOLL Service Creation | WOLL Infrastructures | WOLL Governance | WOLL Innovation outcomes | WOLL Methods & Tools

WOLL GOVERNANCE SCORING TAB

WOLL Harmonisation Cube scoring Tool	GOVERNANCE (Gov) SCORE									
	Objetive: Engage the quadruple helix from the water sector in a (inter) regional context e.g. involving public (water managing) authorities (including utilities), water users (e.g. cities/citizens, industries and(or agriculture), water research organizations and technology developers, wich jointly agree on managing and maintaining the WOLL									
	GovO-Metrics			**GovC-Metrics**			**GovT-Metrics**			
Set up	**GovO 1**	Did you set up **responsability, authority structure and contractural arrangements** to involve the key stakeholders for the quadruple helix in the water sector (see above)?	**Y**	**GovC 1**	Did you set-up overall ownership, management structure, IPR rules and priorities of the WOLL in line with the goals of the involved organizations (such us research driven, innovation driven or business driven)?	**Y**	**GovT 1**	Did you set-up a clear communication plan and services to engage users in the co-creation process; and do you consider sharing valuable lessons of communication from sucessful and unsuccessful water related projects and teams?	**Y**	
Sustainability	**GovO 2**	Did you agree on longer term financial arrangements for the joint infrastructures as well as mutual arrangement in respect to using each other´s technologies and services?	**N**	**GovC 2**	Do you have funding and financing strategy/service in place to continuously "fuel" the WOLL with relevant projects?	**Y**	**GovT 2**	Did you set-up durable collaboration services using technologies or other similar tools to support and enable cooperation between all parties involved?	**Y**	
Scalability	**GovO 3**	Did you define business models to scale up your WOLL to increase its activities over time?	**N**	**GovC 3**	Did you organise the WOLL in a way that it is open to external parties, including other LL´s, to carry out user tests?	**N**	**GovT 3**	Did you have supporting technologies to enable cooperation between all parties involved to make demonstration, validation and prototyping?	**N**	**56%**
SMART opportunities for WOLL maturity development	**GovO Score**	**33%**		**GovC Score**	**67%**		**GovT Score**	**67%**		
S=Specific: Define a specific challenges and action to improving your LL maturity level	GovO Improvements			GovC Improvements			GovT Improvements			
M=Measurable: Define deliverables or concrete progress on targeted challenge										
A=Actionable: Verify if you as a Living Lab organisation can actual DO something to realise these improvements										
R=Reasonable: within the scope of your available resources: define how much resources would be required to realise the improvements										
T=Timely: realisable within acceptable timing: define a reasonable timeline to realise the improvements										
METRICS SCORE	**56%**									**TOTAL SCORE**

WOLL Maturity Radars: WOLL Overall score | WOLL User involvement | WOLL Service Creation | WOLL Infrastructures | WOLL Governance | WOLL Innovation outcomes | WOLL Methods & Tools

WOLL INNOVATION OUTCOME SCORING TAB

WOLL Harmonisation Cube scoring Tool	INNOVATION OUTCOME (Inno) SCORE									
	Objetive: Facilitate predominantly innovations that contribute to a sustainable and water smart society (“mission focus”). These outcomes can be knowledge, new products and services and/or IPR. Outcomes can be in the form of finished end-user applications but also in the form of prototypes or more knowledge about usage patterns.									
	InnoO-Metrics			**Inno C-Metrics**			**Inno T-Metrics**			
Set up	**InnoO 1**	Did you arrange for the relevant innovation expertise and competencies within the WOLL to support the targeted water innovations (SRIA related)?	**Y**	**InnoC 1**	Did you define and detail your mission, to aim for water oriented innovations that result in relevant impact to create societal and market value for the stakeholders (e.g. a SRIA)?	**Y**	**InnoT 1**	Did you set-up innovation supportive environments (services) to foster ideas, technology and Patents for the stakeholders, in line with your water oriented mission?	**Y**	
Sustainability	**InnoO 2**	Do you have processes in place to solve possible IPR issues and identified processes and phases to secure continued stakeholder engagements in water oriented R&D&I?	**Y**	**InnoC 2**	Do you have optimal degree of interaction with the involved parties to work together, share innovation outcomes and regularly update your mission in order to take into account new developments and adaptations to different/new contexts?	**N**	**InnoT 2**	Do you have a supporting technology or tools to steer the interaction between the involved parties towards the targeted outcomes?	**Y**	
Scalability	**InnoO 3**	Have you identified a wider pool of (external) experts (including through other WOLLs) and the possibility to engage them if required for expanding developing water related innovations and solutions?	**Y**	**InnoC 3**	Is your Living Lab ready to expand its focus or collaborate with other WOLLs to tackle challenges in adjacent markets, application or geographic areas?	**N**	**InnoT 3**	Did you have supporting technologies to enable cooperation between all parties involved to make demonstration, validation and prototyping?	**N**	**44%**
SMART opportunities for WOLL maturity development	**InnoO Score**	**33%**		**InnoC Score**	**33%**		**InnoT Score**	**67%**		
S=Specific: Define a specific challenges and action to improving your LL maturity level	InnoO Improvements			InnoC Improvements			InnoT Improvements			
M=Measurable: Define deliverables or concrete progress on targeted challenge										
A=Actionable: Verify if you as a Living Lab organisation can actual DO something to realise these improvements										
R=Reasonable: within the scope of your available resources: define how much resources would be required to realise the improvements										
T=Timely: realisable within acceptable timing: define a reasonable timeline to realise the improvements										
METRICS SCORE	**44%**									**TOTAL SCORE**

WOLL Maturity Radars | WOLL Overall score | WOLL User involvement | WOLL Service Creation | WOLL Infrastructures | WOLL Governance | WOLL Innovation outcomes | WOLL Methods & Tools

WOLL Harmonisation Cube scoring Tool	METHODS & TOOL (M&T) SCORE									
	Objetive: Provide and continuously update specific (interoperable) state of the art methods and tools to acquire relevant large scale user data related to the targeted innovation outcomes within the water sector.									
	M&TO-Metrics			**M&TC-Metrics**			**M&TT-Metrics**			
Set up	**M&TO 1**	Did you define taxonomy of methods (categorization or classification) & tools to enable meaningful results from user experiments	**Y**	**M&TC 1**	Are your selected methods and tools for large scale (in-situ) user monitoring and measurement available for use	**Y**	**M&TT 1**	Do you deploy a tech-watch process to support continuous validation os state of the art methods and tools for user monitoring and measurements in the water sector	**N**	
Sustainability	**M&TO 2**	Did you select methods and tools validated and endorsed by the relevant stakeholders connected to the WOLL	**N**	**M&TC 2**	Are your methods and tools geared for continued and longer term Living Lab experiments with users, within a sustainable WOLL	**N**	**M&TT 2**	Did you set-up technology support (develop, testing and acceptance) to update methods and tools to the state of the art where necessary (e.g. new IoT devices)	**N**	
Scalability	**M&TO 3**	Did you standardize your methods & tools (e.g. open source) and search best practices, so that to enable data exchange with other WOLLs	**N**	**M&TC 3**	Did you set-up best practices sharing methods, tools and mechanisms at panEuropean Water Oriented Living Lab projects	**N**	**M&TT 3**	Did you design your methods and tools in a way (open source) to accept and interface new technologies/ possibilities that comes through external networks (e.g. WOLLs)	**N**	**44%**
SMART opportunities for WOLL maturity development	**M&TO Score**	**33%**		**M&TC Score**	**33%**		**M&TT Score**	**67%**		
S=Specific: Define a specific challenges and action to improving your LL maturity level	M&TO Improvements			M&TC Improvements			M&TT Improvements			
M=Measurable: Define deliverables or concrete progress on targeted challenge										
A=Actionable: Verify if you as a Living Lab organisation can actual DO something to realise these improvements										
R=Reasonable: within the scope of your available resources: define how much resources would be required to realise the improvements										
T=Timely: realisable within acceptable timing: define a reasonable timeline to realise the improvements										
METRICS SCORE	**44%**									**TOTAL SCORE**

WOLL Maturity Radars | WOLL Overall score | WOLL User involvement | WOLL Service Creation | WOLL Infrastructures | WOLL Governance | WOLL Innovation outcomes | WOLL Methods & Tools

COLOPHON

- **Original title:** Water-Oriented Living Labs. How to assess and evolve Water-Oriented Living Labs. A manual with a vision. Notebook Series#2
- **Editors:** Andrea Rubini (Water Europe), Durk Krol (Water Europe), Emily Kemp (Water Europe), Isabella Gervasio (Water Europe), Wim van Vierssen, Ron Weerdmeester (PNO), Samson Tsegay (PNO)
- **Layout and design:** Ana de León (Water Europe), Marín Asociados

- **Citation:** Water-Oriented Living Labs: Water-Oriented Living Lab Notebook Series #2. How to assess and evolve towards a network of Water-Oriented Living Labs
- **ISBN:** 9789464003109

NOTES

Water Europe
Technology & Innovation

Water Europe

Technology & Innovation

WOLL Water Oriented Living Lab

Water Europe

Technology & Innovation

WATER-ORIENTED LIVING LABS

WOLL Water Oriented Living Lab

HOW TO ASSESS AND EVOLVE WATER-ORIENTED LIVING LABS A MANUAL WITH A VISION

NOTEBOOK SERIES#2

WATER EUROPE – THE EUROPEAN TECHNOLOGY PLATFORM FOR WATER – B. AUGUST REYERS 80.1030
BRUSSELS, BELGIUM • WWW.WATEREUROPE.EU • INFO@WATEREUROPE.EU • +32 (02) 7068291