

# Evaluating the Performance of the Regional Living Lab Concept on Integrated Sustainable Energy Planning

Giannouli Ioanna<sup>1</sup> Tourkoulas Christos<sup>2</sup> Georgiou Paraskevas<sup>3</sup> Cantero Celada Sergio<sup>4</sup> Fernández Maroto Miguel<sup>5</sup>

<sup>1</sup> Business and Project Management S.A., Athens

<sup>2</sup> Laboratory of Industrial and Energy Economics, National Technical University of Athens, Zografou

<sup>3</sup> Hellenic Parliament, Athens, Greece

<sup>4</sup> PLANZ Planeamiento Urbanístico S.L.P., Valladolid, Spain

<sup>5</sup> University of Valladolid - Instituto Universitario de Urbanística, Valladolid, Spain

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## Abstract

Substantial research effort has been devoted on the importance of integrating energy into spatial planning and even more to embed their synergy in the regional value and production/consumption chains, in order to develop less vulnerable to failure and to societal resistance energy projects. Inspired by these findings, a methodological approach for holistic energy planning on a regional/local level was developed under the INTENSSS-PA project (HORIZON2020 Programme). The core of this methodology lies on the Regional Living Lab (RLL) approach, including multiple aspects such as the development of spatial concepts, new co-creating strategies, business cases, societal alliances, and institutional changes and formats. The objective of this paper is to develop and operationalize a methodological framework for evaluating: (i) the overall performance of the proposed Integrated Sustainable Energy Planning methodology, (ii) the performance of the energy plan, and (iii) the performance of the INTENSSS-PA RLL as an environment for integrated sustainable energy planning and the performance of the INTENSSS-PA RLLs in relation to the LL's essentials. The evaluation methodology is applied on the case study of the RLL established by the Junta de Castilla y Leon in Spain, showing the related performance results.

**Keywords:** *Integrated Sustainable Energy Planning, Participatory Decision Making, Regional Living Labs, Evaluation Methodological Framework, Impact Assessment, Multicriteria Analysis*

# 1 Introduction

The desired and ongoing shift towards the path of sustainable development paved with more renewable energy and increased efficiency in energy systems has already vast consequences for both physical and socioeconomic landscapes.

Integrated Sustainable Energy Planning (ISEP) considers that linking alternative land use functions and associated interests, has benefits for exploiting the potential of different renewable energy sources (RES). ISEP provides a means of identifying and understanding area-based conditions that may enable or accommodate energy initiatives, and how these initiatives can be supported by the local society and get connected to the local economy. Nevertheless, ISEP is not merely a matter of spatial design but also of institutional design as it involves several stakeholders with diverse and sometimes conflicting objectives that must come to a consensus.

There is a debate for over two decades, if a strong central governance model with a top-down hierarchy of policies and regulatory requirements for energy and spatial planning, is better, or alternatively, a bottom-up driven, decentralized and innovation-friendly approach favoring energy projects and low-carbon build environment, and vice-versa (Crawford & French, 2008; De Boer & Zuidema, 2015; Owens, 1990). The so far experience has shown that, to be rather a restrictive dilemma when, alternatively, top-down and bottom-up developments can interact in a very productive way (Sørensen & Torfing, 2007).

As far the innovations occurring at the local and regional level, it is the ecosystem itself that facilitates local citizens, municipalities and businesses to begin and embrace sustainable energy initiatives, creating spatial and institutional challenges (Walker et al., 2010).

Therefore, the development of an innovative and acceptable institutional decision making process involving societal and business partners and cross-departmental agendas is not only desirable but also of crucial importance.

Figure 1 illustrates the different phases, procedures, actors, and interactions appearing within a typical ISEP as described above. The main inherent assumption is that the governing of changes in energy systems involves a multi-level and multi-actor process of shared governance (Giannouli et al., 2018; Loorbach, 2010). As proven, there is a key necessity to include various stakeholders with multidisciplinary skills for developing feasible, viable and bankable energy projects.

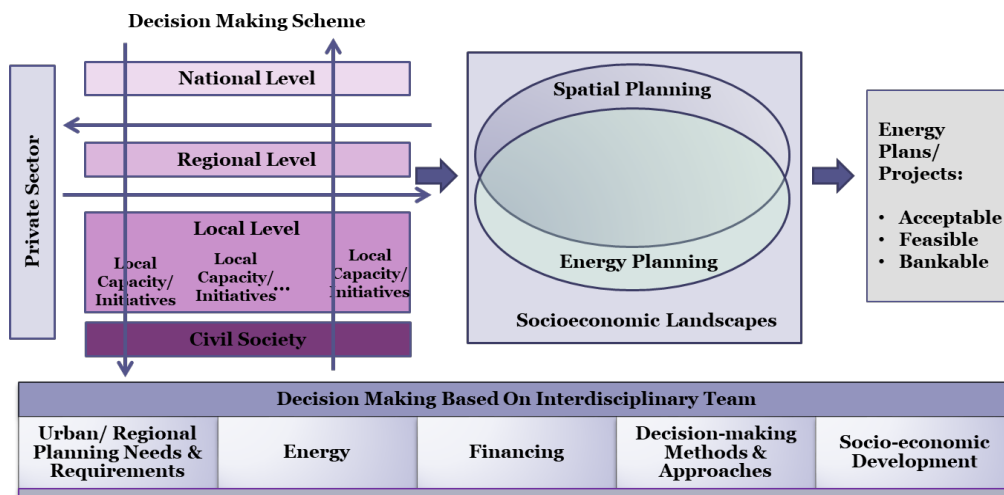


Figure 1. Conceptual Model of Integrated Sustainable Energy Planning

The development and implementation of a holistic approach for ISEP considering these characteristics, could support substantially the efficient and effective realization of renewable and energy efficiency projects increasing their feasibility and acceptability.

The cornerstone of the proposed decision-making process which favors interdisciplinarity and participation, is the Living Lab (LL) concept (Ballon & Schuurman, 2015; Ståhlbröst & Holst, 2012). LL is a term given in 2003 by William Mitchell, defined as “a user-centric research methodology for sensing, prototyping, validating and refining complex solutions in multiple and evolving real life contexts”. Partners and stakeholders within an LL bring their own know-how and expertise to the collective, helping to achieve knowledge transfer and spanning (Bergvall-Kareborn & Stahlbrost, 2009).

The current study presents a detailed methodological concept for evaluating the performance of the energy planning approach adopted in the INTENSSS-PA project. The purpose is to assess the extent that the developed ISEP process and energy plan meet the needs of RLL’s participants. Furthermore, the evaluation concept is extended by also assessing the perception of the participants on the appropriateness of the RLL environment as an energy planning environment, as well as the performance of the seven RLLs established within INTENSSS-PA compared to LL concept’s interoperability elements. Considering that INTENSSS-PA RLLs focus on social innovation rather than technological innovation, their evaluation acquires interest from a research perspective. The remaining of this paper is organized as follows: Section 2 summarizes the framework of INTENSSS-PA and introduces the basic characteristics of the ISEP approach developed. Section 3 describes the methodological concept, the fundamentals (methods & tools) and the successive steps for the evaluation procedure. Section 4 presents the application of the proposed framework for the case of the RLL of Junta Castilla y Leon in Spain, and Section 5 gives some of the first available evaluation results. The last section provides the directions of the future work to be

done.

## 2 The INTENSSS-PA Project and the related ISEP approach

INTENSSS-PA (stands for INspiring Training ENergy-Spatial Socioeconomic Sustainability to Public Authorities) project is funded under the 2015 call of HORIZON2020 Programme. Its objective is to develop and implement a human and institutional capacity building process addressed to public authorities and societal stakeholders for ISEP and energy projects realization. A multidisciplinary team of 17 partners from public and private sectors and academia, coming from seven EU Member States is involved in the project.

Considering that LL concept is both an environment and an approach, where innovation process is supported for all involved stakeholders in real-world contexts, seems as a very promising approach to realize INTENSSS-PA's scope. Therefore, one RLL has been established in each participating EU's Regional Area (see Table 1), compiling a network of seven RLLs.

Table 5: INTENSSS-PA RLLs Network

RLL	Coordinating Partner
Calabria (Italy)	Calabria Regione (CaR)
Pomurje (Slovenia)	Association of Slovenia Municipalities (SOS)
Groningen (The Netherlands)	Groningen Municipality
Karditsa (Greece)	Development Agency of the Regional Area of Karditsa (ANKA)
Middelfart (Denmark)	Middelfart Municipality
Zemgale (Latvia)	Zemgale Planning Region (ZPR)
Castilla y León (Spain)	Junta Castilla y Leon (JCYL)

The INTENSSS-PA LLs (i.e. Regional Living Labs–RLL) are defined as emerging People Public Private Partnerships (PPPP) in which all the stakeholders work together to create, experiment and evaluate new innovative approaches and institutional innovation related to ISEP. The challenge-goal is to develop the conditions for a transnational thematic network of RLLs, as well as to investigate the possibility of the RLL concept to be incorporated in the institutional framework of energy planning of different Member States/Regions (INTENSSS-PA, 2017). RLLs are expected to add value to energy planning by developing strategies and procedures approaching to a more open and collaborative way of governance and by making the involved actors more effective and the decisions more legitimate.

The overall ISEP methodological approach based on RLL concept under INTENSSS-PA project constitutes of four iterative steps that are presented in figure 2 (INTENSSS-PA, 2017; Ståhlbröst & Holst, 2012).

- The first step provides a structured path for the creation of an RLL in each region. It involves the analysis of the contextual factors of the spatial and energy planning

process, the identification of the related stakeholders and their role, the socio-economic settings, the institutional structures and the spatial and energy capacity of the region.

- The second step is focused on the co-decision of the planning focus of each RLL, meaning to define the vision and the scope of the energy plan throughout stakeholders' participation and interaction.
- The third step is the actual process of planning, based on the stakeholder involvement, by following the notions of co-design and co-creation. The outcome is the energy plan accompanied with the benefit of actual experiential learning activities taken place (Bergvall-Kareborn, Hoist, & Stahlbrost, 2009; Evans & Karvonen, 2011; Leminen, 2015).
- The fourth step is focused on the assessment of the integrated sustainable energy plan developed, and the monitoring and control of its implementation.

Within each of these four methodological steps, tasks are organized and implemented with a focus to ensure the application of the five key principles of the LL approach, i.e.: value, influence, sustainability, openness and realism.

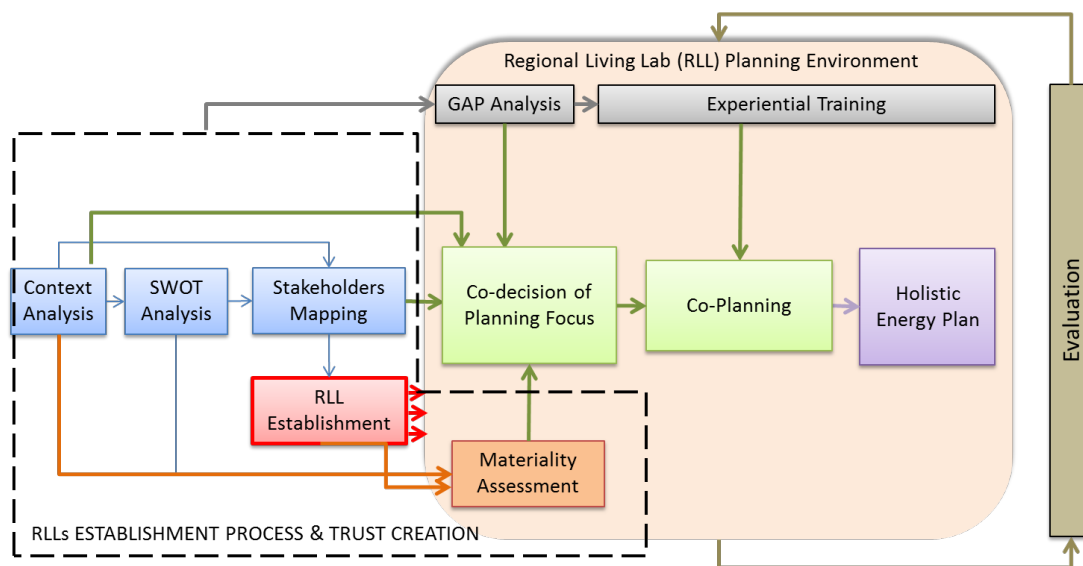


Figure 2. INTENSSS-PA Implementation Methodological Approach

The final stage of evaluating the performance and effectiveness of the above overall concept, which supports the planning for energy transition, is a very important and rather complex task. The evaluation results are expected to provide insights on the needs of stakeholders in relation to energy/regional planning and their perception on the energy transition requirements.

### 3 Evaluation Framework

RLL participants are invited to evaluate the planning approach developed and implemented within INTENSSS-PA project as compared to their needs on ISEP. Following the experimentation phase where participants have applied the co-planning concept, the evaluation is further combined with the aim to generate new and unexplored needs or to modify their identified needs.

In addition, two more evaluation aspects are included a) the assessment of the performance of the RLL as an ISEP environment, and b) the comparative assessment of the INTENSSS-PA RLL against the interoperability elements characterizing the intended functions of an LL. Therefore, the evaluation’s objective is fourfold (figure 3), to assess:

- i) the overall performance of the ISEP approach,
- ii) the overall performance of the seven integrated sustainable energy plans,
- iii) the performance of the seven RLLs as planning environments,
- iv) the degree that the seven INTENSSS-PA RLLs meet the LL’s essential elements.

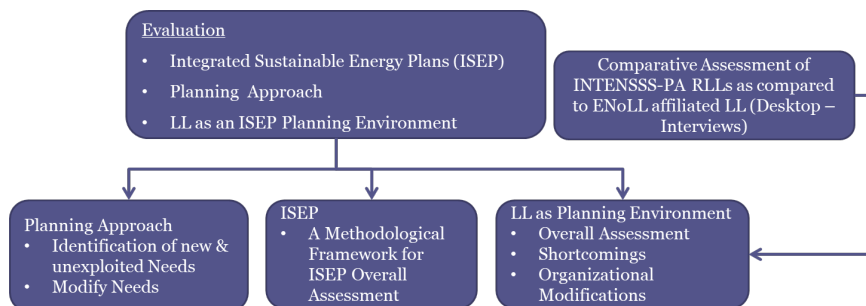


Figure 3. INTENSSS-PA Assessment Objectives

More specifically, the methodology used for addressing the evaluation problem at hand should:

- Consider multiple criteria expressing the evaluation objectives of all stakeholders involved in and/or affected by energy planning and the performance of the energy system.
- Quantify the evaluation criteria expressing both tangible and intangible impacts of the planning approach.
- Assess the relative importance of the various evaluation criteria, sub-criteria.
- Synthesize different opinions to identify the most preferable “compromise” solution.
- Cope with the inherent uncertainty associated with the estimation of benefits and costs, by performing sensitivity analysis.

The comprehensive methodological framework (Vermote et al., 2014; Zografos & Giannouli, 2001a) proposed for the overall evaluation of the INTENSSS-PA planning concept and energy

plans, is presented schematically in figure 4.

As illustrated, a key issue involved in the selection of the appropriate evaluation methods and tools is the identification of the evaluation objectives of ISEP for the different regional areas.

The assessment objectives are defined by the:

- stakeholders’ needs and expectations,
- policy requirements,
- actual characteristics and development needs of each regional area along with technological and legal/institutional requirements,
- specific objectives of each ISE Plan.

The evaluation objectives are expressed through a set of criteria, which in turn are quantified by a set of measures of effectiveness (i.e. indicators).

As being apparent from figure 4, the cornerstone of the proposed evaluation framework, as for overall INTENSSS-PA project, is the determination of stakeholders and their role.

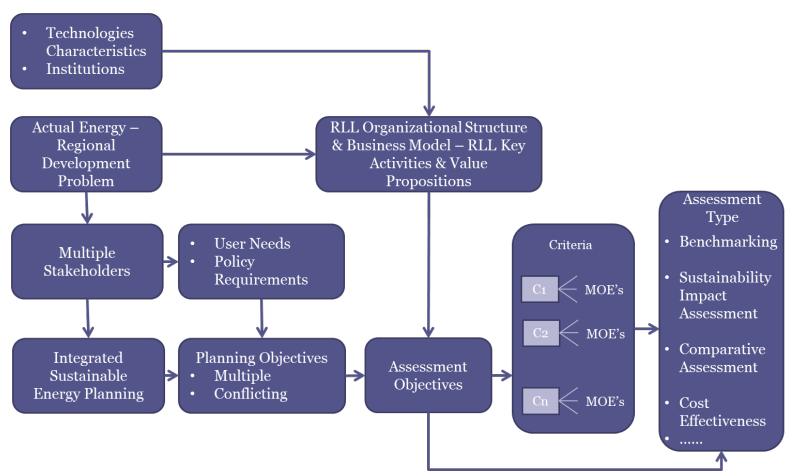


Figure 4. Overall Evaluation Framework of the INTENSSS-PA planning approach and Integrated Sustainable Energy Plans

### RLLs Benchmarking Perspective - Interoperability Cube

As part of the Corelabs project, a framework was designed to assess the performance of LLs according to their relevant dimensions and characteristics. Seven categories for analysis and evaluation of LLs were identified for the case of INTENSSS-PA concept and approach. The six categories are derived from the “interoperability cube” developed within the Corelabs project (<http://www.ami-communities.eu/wiki/CORELABS>), while the seventh category addresses the capacity building functionality of the INTENSSS-PA RLLs as ecosystems of

experiential learning.

The harmonization cube identifies the exchange possibilities on six prominent aspects/views (Mulder et al., 2007) that communicate an LL’s essentials: User involvement, Service creation, Infrastructure, Governance, Innovation outcomes, and Methods & tools (in order to harmonize methods and tools on these aspects), and explicitly defines interoperability elements from organizational, contextual and technological perspective under different standards. The cube for harmonizing LL is a 6x3x3 model that enables the definition of a shared reference of methods and tools used in ENoLL. Each topic (side of the cube) facilitates interoperability between both development phases of an LL. Hereto, three development phases, i.e., setup, sustainability, and scalability have been distinguished.

Figure 5. displays the Living Lab Harmonization Cube along with the different elements of each aspect as modified to address INTENSSS-PA RLL’s focus/theme.

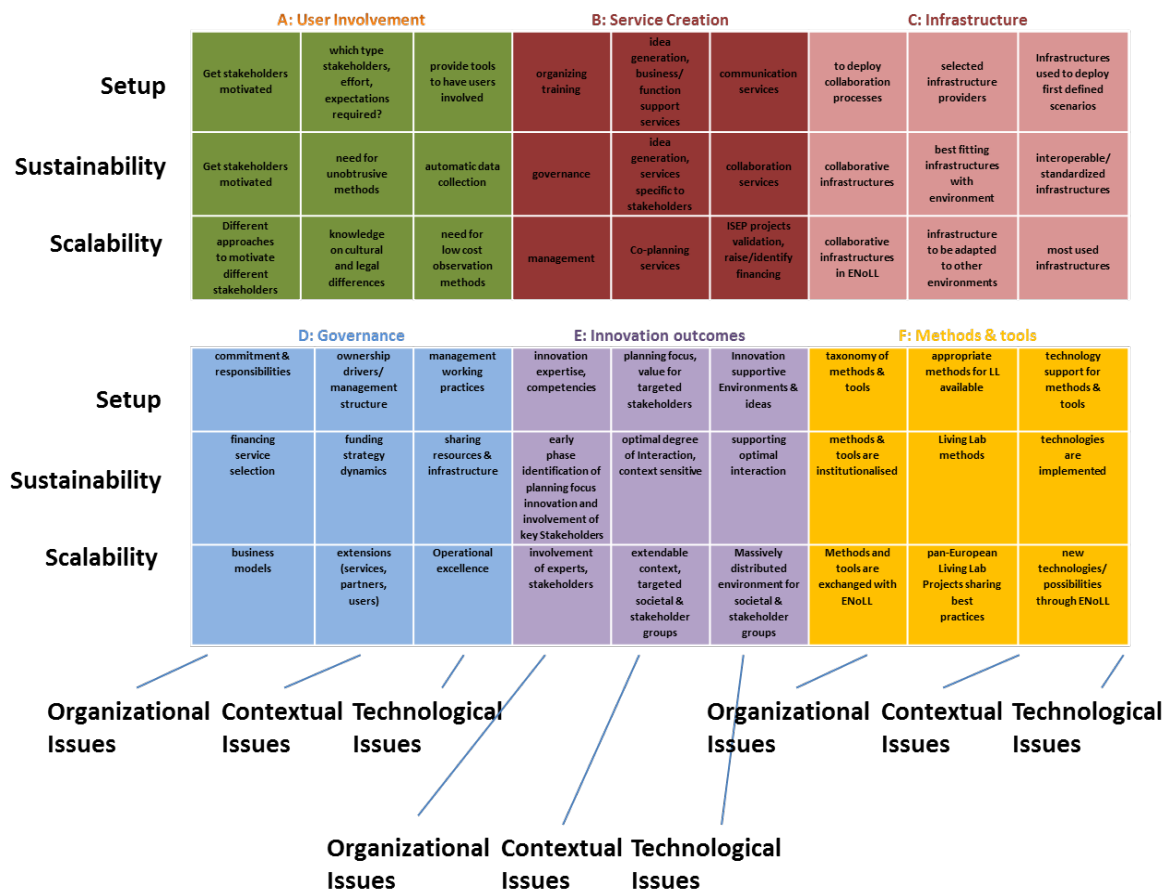


Figure 5. Harmonization Cube Structure & Interoperability Elements (Molinari & Schumacher, 2011; Mulder et al., 2007)

Each stakeholder group will assess RLL’s elements (i.e. aspects of the essentials) based on its perspectives and goals. The assessment will take place based on predefined scales and open (descriptive) answers based on the achievements (quantitative data) of the RLL related to each attribute of the 6x3x3 cube model (i.e. number of participants, number of events,



information systems implemented, etc.). The data collected and analyzed for each RLL assessment aspect will be translated based on a scale ranging from 0 – 100 for every category (aspect). The value 0 means that an RLL has nothing specific installed or deployed in this category; whereas a value of 50 means that some specific measures have been taken. The value 100 reflects that all requirements are fulfilled and implemented. Under this rationale, the RLLs can assess themselves accordingly from 0 up to 100. For INTENSSS-PA (RLLs theme focus), specific definitions have been identified for the scale measuring each of the six RLL perspectives (INTENSSS-PA, 2018).

### **Assessment of the ISEP Methodological Approach, the Energy Plans and RLLs in terms of their Performance**

The approach considered considers the fact that there are several stakeholder groups with different and sometimes conflicting objectives, and that the seven energy plans and the contextual attributes within which these are developed, vary substantially between the seven European regions. The steps to implement the assessment are the following:

**Step 1:** Development of the enhanced Business Model Canvas for each RLL to support RLLs to reflect on themselves in relation to their value creation, community involvement and sustainability.

**Step 2.** Definition of evaluation criteria based on the Canvas parameters and INTENSSS-PA project objectives, i.e. RLL overall focus.

**Step 3.** Selection of scale and units to measure each criterion to determine the parameter values for each RLL in relation to the criteria defined in the previous step.

**Step 4.** Selection of the most appropriate approach to perform the data analysis and evaluation based on the characteristics of the evaluation problem and of the identified criteria and indicators.

**Step 5.** Assess the individual energy plans and co-planning process performance by applying the parameters and methods identified above.

**Step 5.** Overall performance assessment of the seven RLLs followed by a comparative analysis.

### **RLLs Business Model Canvas**

To assess the performance of the ISEP methodological approach and energy plan, as well as of the RLLs as energy planning environments is necessary to define the framework of operation of each RLL in relation to the co-planning concept implemented. Despite the fact

that the seven RLLs focused on the same theme using the same methodological approach, they have substantial organizational and operational differences.

The modified Business Model Canvas within the scope of the INTENSSS-PA RLLs is presented in Table 2.

Table 6: RLL on Integrated Sustainable Energy Planning (ISEP) Business Model Canvas

INTENSSS-PA RLLs Extended Business Model Canvas				
Key Partners	Key Activities	Value Proposition	Societal Stakeholders Relationships	Society Segments
PPPP (Private Public People Partnership)actors: economic sectors, municipalities, public authorities, research centers, universities and representatives of the society	Operating activities for the implementation of integrated sustainable energy planning according to INTENSSS-PA planning approach (task 3.2 foreseen activities)	<ul style="list-style-type: none"> <li>• Need and priority finding on energy sector within the socio-economic and physical landscapes</li> <li>• Identification and experimentation of innovative ideas and services for social and business schemes/models for energy projects deployment.</li> <li>• Vision creating on holistic regional/ local development</li> <li>• RLL as a physical and virtual meeting place between the different actors of open innovation and multilevel governance</li> <li>• High added value consultation and interdisciplinary technical assistance between RLL participants on ISEP activities implementation.</li> </ul>	Forms of institutional collaboration and cooperation with end user groups (for example: free specialized training, piloting or equipment use in favor of the end users (local community) for testing and acceptability purposes)	Different groups of stakeholders and local community, depending on the nature of the ISEP and of the considered energy projects, their properties, the physical environment and the purposes of potential pilot.
	<b>Key Resources</b>		<b>Delivery Channels</b>	
	Human and financial resources required for the implementation of the Regional Living Lab on ISEP		Communication and awareness, raising-towards local community to gain participation and acceptability	
<b>Cost Structure</b>		<b>Revenues Streams</b>		
<ul style="list-style-type: none"> <li>• RLL establishment cost</li> <li>• RLL administrative cost (costs related to run the RLL but also to identify funding for the plan, appropriate advisory, expert knowledge for training, etc.)</li> <li>• Planning process technical cost</li> <li>• Planning process communication/ awareness raising cost</li> </ul>		RLL resources i.e. Public funding, other sources of funding, self-funding through advisory fees, contribution in kind by public & private stakeholder groups involved in energy and spatial planning.		
<b>Living Lab Approach</b>		<b>Capacity Building</b>		
<p>How is it designed and implemented?</p> <p>Where does it make any difference for:</p> <ul style="list-style-type: none"> <li>• Building Capacity to Public Authorities and Stakeholder Groups on ISEP?</li> <li>• Integrating the energy theme into spatial planning and socioeconomic landscape?</li> <li>• Establishing an actual 4P model for ISEP within the local community?</li> <li>• Co-designing acceptable and feasible energy projects?</li> <li>• Introduce multilevel governance in ISEP development?</li> </ul>		<p>How is it designed and implemented?</p> <p>Where does it make any difference for:</p> <ul style="list-style-type: none"> <li>• Increasing the understanding of public authorities and stakeholder groups for the need of ISEP?</li> <li>• Increasing know-how of public authorities on how to develop ISEP?</li> <li>• Increasing the understanding of the need for participatory and interdisciplinary decision making?</li> <li>• Increasing the understanding on the need for institutional reorganization and multilevel governance schemes for successful ISEP?</li> <li>• Increasing the understanding of the public authorities on the necessity of a bottom-up, institutionalized and well-structured approach and environment in order to implement the energy transition?</li> </ul>		
<b>Advance over State of Practice on ISEP</b>		<b>Sustainability (i.e. strength of relationships and continuation) &amp; Impact</b>		
<p>What are the elements of originality in relation to the:</p> <ul style="list-style-type: none"> <li>• Nature of the Energy Planning innovation implied by INTENSSS-PA and notably your RLL?</li> <li>• Characteristics of the Energy Planning Focus selected?</li> <li>• Nature of the energy projects proposed for implementation (i.e. impacts, added value, integration level, sustainability, business models introduced)?</li> </ul>		<p>Where is impact situated? (e.g. at societal/ business /policy level, etc.)</p> <p>How do you intend to:</p> <ul style="list-style-type: none"> <li>• Make the RLL successful in terms of post-project implications?</li> <li>• Evolve from INTENSSS-PA project RLLs to a permanent Regional Living Lab?</li> <li>• Preserve the interdisciplinary aspect and ISEP proposed approach in the future?</li> <li>• Preserve multilevel governance or cross-community cooperation in ISEP in the future?</li> <li>• Preserve joint capacity building of different public authorities and societal actors?</li> </ul>		

## Evaluation Criteria and Measures of Effectiveness

The evaluation criteria have been identified based on the Business Model Canvas' attributes and the dimensions and characteristics expressing the LL's essentials (i.e. interoperability cube elements). Figure 6 presents the evaluation criteria, which are grouped according to the evaluation objectives they are expressing.

Objective A. Assessment of the Integrated Sustainable Energy Plan	Objective B. Assessment of the Integrated Sustainable Energy Planning Approach	Objective C. Assessment of the RLL as an Integrated Sustainable Energy Planning Environment
<ul style="list-style-type: none"> <li>• Planning Outputs</li> </ul>	<ul style="list-style-type: none"> <li>• Criteria Objective A</li> <li>• Community building and proper functioning</li> <li>• Society driven, Open Innovation methodology implementation</li> <li>• Administrative &amp; R&amp;D Productivity</li> </ul>	<ul style="list-style-type: none"> <li>• Criteria of Objective A + B</li> <li>• Capacity Building Outputs (outcomes)</li> <li>• Sustainability Potential</li> </ul>

Figure 6. Correspondence of Evaluation Objectives and Evaluation Criteria

The majority of the above-identified criteria can be measured objectively, while some of them subjectively. The indicators quantifying these criteria are available in the respective deliverable of INTENSSS-PA project (INTENSSS-PA, 2018). For each evaluation criterion and attribute of the interoperability cube, a set of indicators has been identified. They derived through desktop research on LLs evaluation and on integrated – strategic energy planning performance concepts, approaches and projects (Alcoitra, 2013; Lund et al., 2013; Molinari & Marsh, 2014; Steidle et al., 2000). There are several cases where these indicators, require one more level of hierarchical decomposition in order to get measured. All parameters of the indicators are measured on scale from 0 (lower performance) to 100 (higher performance). In figure 7 the major sub-criteria (i.e. group of indicators) expressing the evaluation criteria are listed.

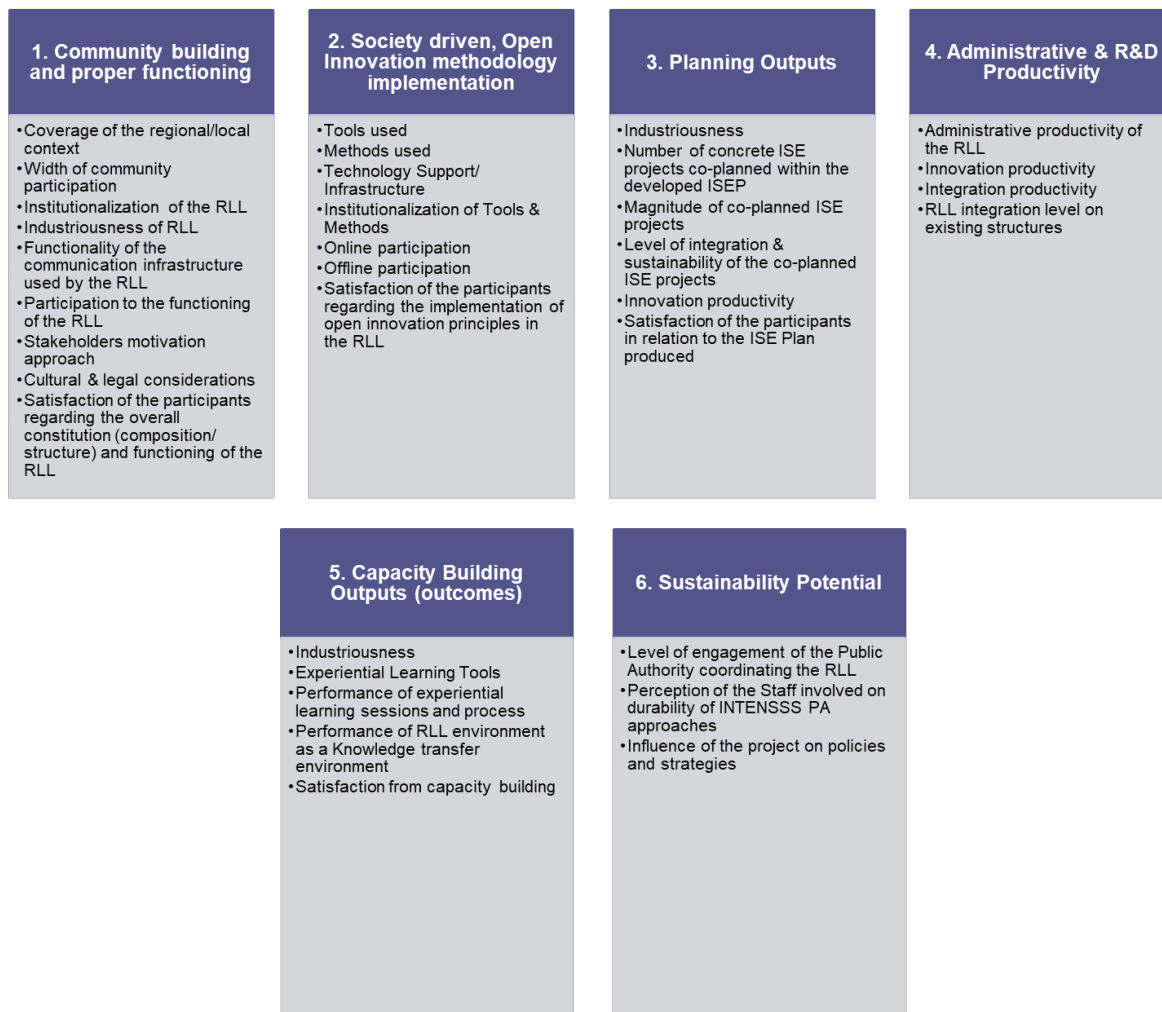


Figure 7. Sub-criteria Expressing the Evaluation Criteria

## Assessment Methods & Tools for Data Analysis

The general framework to conduct the evaluation of the performance of the seven RLLs developed and operated within INTENSSS-PA is presented in figure 8.

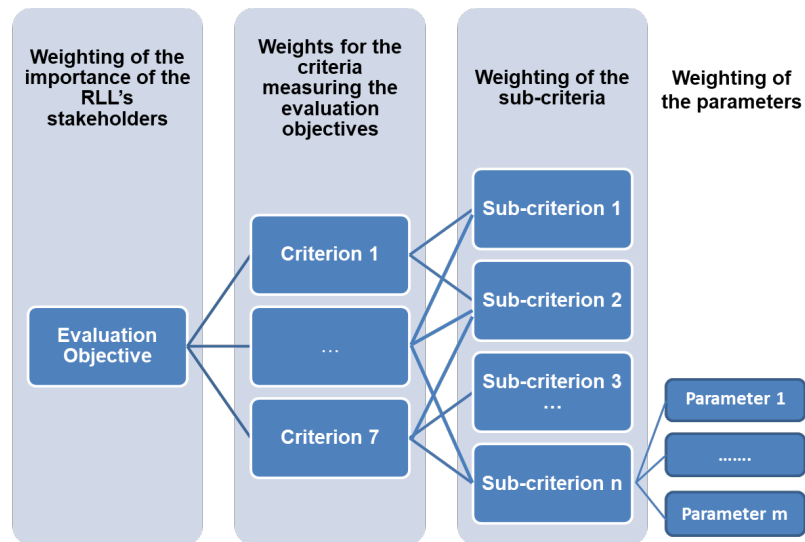


Figure 8: General evaluation framework of INTENSSS-PA RLL performance.

The performance of each RLL will be evaluated by taking into consideration its performances on those evaluation criteria and their measures of effectiveness that are related to the evaluation objective each time.

Different levels of weighting are foreseen at each hierarchical level of the evaluation problem i.e. evaluation criteria, sub-criteria (i.e. indicators), parameters. To make the final evaluation the weighting of the stakeholder groups is also considered in relation to their importance to impact or being impacted by the ISE Plan.

The calculation of the overall RLL performance considering the different levels of weighted attributes is made by using the following equation:

$$Total\ RLL\ performace = \sum_1^n w_{stakeholder} * (\sum_1^m w_{criterion} * \sum_1^k w_{sub-criterion} * p_{sub-criterion}) \quad (Eq.1)$$

where,

$w_{stakeholder}$ , the weight of each involved category of stakeholders (n).

$w_{criterion}$ , the weight of each criterion (m).

$w_{sub-criterion}$ , the weight of each sub-criterion (k).

$p_{sub-criterion}$ , the performance of each sub-criterion as resulted by the respective indicators.

The methodological approach for eliciting the weights of the sub-criteria considered by the different stakeholder groups (Level 3) consists of the following steps:

- ✓ Step 1: Ranking of the sub-criteria according to their importance.
- ✓ Step 2: Sorting the sub-criteria according to their importance.
- ✓ Step 3: Evaluation of the sub-criteria specifying the value of 100 to the most important

sub-criterion and lower values up to 1 to the remaining sub-criteria so as to depict appropriately their differences.

- ✓ Step 4: Calculation of the different weights for each sub-criterion (an electronic questionnaire has been developed).

### **Evaluation Implementation Approach**

The questionnaire developed for the evaluation of the performance of INTENSSS-PA RLLs is an excel-based tool. More specifically it consists of: (i) two introductory sheets, (i.e. one with instructions as to how to complete the questionnaire and one describing the evaluation methodological steps), (ii) seven sheets, one for each evaluation criterion, and (iii) one sheet for the weighing of the sub-criteria (i.e. the indicators). For each indicator being assessed, its quantitative performance is provided followed by questions on the perception of the interviewee on the performance of the indicator.

The questionnaires have to be completed by all the involved stakeholder groups and in particular by the Key Stakeholders, as they have been identified during the RLL establishment.

Generally, it is recommended the completion of the questionnaires through in-person interviews, of course without excluding alternative means.

It should be mentioned that one aggregated questionnaire has to be completed by each stakeholder (i.e. one from each municipality, region, energy agency, etc) for the case of stakeholder with more representatives in the RLL activities.

In order to facilitate the process of the overall evaluation of the seven INTENSSS-PA RLLs, a few simplifications on the evaluation approach were made. In particular:

- The weighting of the importance of the sub-criteria has been performed by the RLL coordinator and RLL facilitator, providing an aggregated weighting for the sub-criteria.
- When a sub-criterion is expressed by more than one parameter, its performance is calculated by the average performance of the foreseen parameters.
- The seven evaluation criteria have been considered of equal importance for evaluating performance of the RLLs (i.e. Level 2 weights).
- The weights of the involved stakeholder groups (i.e. Level 1) are calculated by taking into consideration the results of the stakeholder analysis, which was carried out during RLL establishment process.

## **4 Evaluation Results of the RLL of Junta Castilla y Leon**

The evaluation phase within INTENSSS-PA project has just initiated and is expected to be completed by end of July 2018. A frontrunner RLL is the one established and coordinated by

the Junta de Castilla y León (JCyL), Directorate de Vivienda, Arquitectura y Urbanismo and supported by the Institute of Urban Planning (IUU) of the University of Valladolid. The Integrated Sustainable Energy Plan of Castilla y León is developed with the essential objective to create a useful tool that will guide the holistic planning processes, combining energy, spatial social and economic aspects into urban actions. It is a result of collaborative work considering the following axis: a) more efficient models of energy consumption; b) integration of spatial and energy planning, and c) the better use of the region's natural resources. The Integrated Sustainable Energy Plan includes a total of 21 specific actions for the sustainable development and integrated management of urban district heating in Castilla y León. The implementation of these actions corresponds to investments of newly installed RES for district heating (i.e. biomass) of 150 MW by 2030.

The RLL constellation consists of 12 different stakeholder groups, while the total number of organizations participated in the RLL activities raised up to 28. Seven of these organizations that have been involved through the whole working process, have participated in the evaluation process up to now, including the Regional Government, the University of Valladolid, the Public Company for Infrastructure and Environment, the Municipality of León, the technological research center CARTIF, the spatial planning private company PLANZ and the professional chamber of architects of León.

The questionnaires have been completed through in-person interviews. The analysis of data collected so far for JCyL RLL is concisely described below.

### **JCyL RLL Benchmarking**

The performance of the JCyL RLL in relation to the six elements characterizing the performance of an LL according to the interoperability cube model is presented in the spider-web diagram of figure 9.

Although the evaluation process is not completed yet, JCyL RLL reveals a performance below average (i.e. 50) in the elements of infrastructure, and methods and tools. Such a behaviour was expected since few measures have been taken towards implementing these elements and especially infrastructure either for data collection or for exchanging and awareness rising. Besides the intensity of work required within INTENSSS-PA project, the time span available was very short to develop infrastructures if not already existing. In relation to the element "methods and tools", the RLL performs practically on a score of 50; however, the methods and tools implemented are related to the technical aspects of co-planning rather than the RLL operation.

In relation to the innovation outcomes, it is considered that the value of the RLL for stakeholder groups has become visible and an innovation-supporting environment has started to be created. The involvement of users has been also evaluated as meaningful. In a 1.5 year



period, the RLL performed 11 working meetings, as well as other bilateral discussions and larger awareness/training events with an average participation of 25 persons. The frequency of participation of the key stakeholder groups is very high, while there is a high degree of participants' commitment.

Despite the early maturity stage of the RLL, participants deem that services of added value have been already provided, while society and intra-network services have started to deploy. All evaluation stakeholders gave a very high score on the provided added value, considering that the approach offers them “A whole new way of addressing specific concerns”. This conclusion/evaluation result is also supported by the scoring on the capacity building element (i.e. the seventh side of the cube –not represented on the spider-web) where interest, completeness and quality of the provided services have been evaluated near 75.

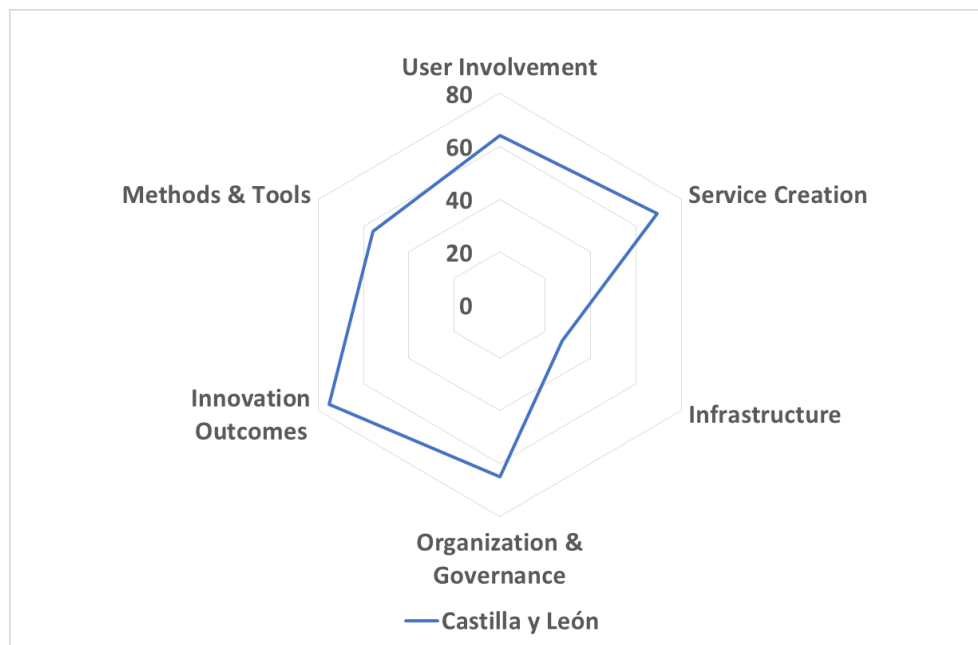


Figure 9. JCyL RLL's Interoperability Cube Model Analysis

In conclusion, the so far evaluation results make obvious that JCyL RLL has a very good level of acceptance by the stakeholders. They perceive the benefits it can bring to their functions and objectives, as well as the new meaningful way of working it introduces. However, more time and effort is needed to identify a business model that will enhance RLL's position on the planning era of the Region, in order to provide the necessary resources to build infrastructures and gain real sustainability.

### JCyL ISEP Performance Evaluation

Table 3 presents the aggregated results on the four evaluation objectives. As seen from the scores, the stakeholders involved so far in evaluating the work performed within JCyL RLL consider that both the process as well as the resulted plan perform well.

In particular, the impression in relation to the level of feasibility and acceptability of the co-planned energy project corresponds to a score of 75, resulting from two reasons: a) a very high score in relation to the feasibility and technical soundness of the proposed guidelines (i.e. 90), and b) the concern that to gain acceptability, more activities are required to enhance the awareness and perception of the impacted societal groups on the actual energy projects' impacts. Considering the achievement of cooperation between stakeholders for the implementation of the Integrated Sustainable Energy Plan, the score shows that the difficulties of the administrative procedures continue to exist; however, RLL acts towards the reduction of frictions in co-planning and supports the convergence of views.

Table 3: Evaluation Results

<b>Evaluation Objective</b>	<b>Evaluation Score</b>
Overall Performance of the Integrated Sustainable Energy Plan	84
Overall Performance of the ISEP Process	81
Overall Performance of the INTENSSS-PA RLL Concept for ISEP	76

It should be noted that the evaluation of the overall performance of RLL on ISEP takes place right after its establishment and the first co-planning effort that is a labor-intensive process-innovative for several participants- which requires experience and capacity on behalf of the coordinator to achieve sustainability of relationships (i.e. trust creation). This fact affects the evaluation result, especially in relation to the performance of the overall concept.

## 5 Concluding Remarks & Directions for Future Actions

A comprehensive methodological framework for assessing the INTENSSS-PA RLL concept for ISEP has been presented. The proposed methodology recognizes all the challenges and the difficulties associated with the evaluation of the impacts generated by the introduction of a new interdisciplinary and participatory way of energy planning through an integrated and sustainable approach to regional development. The results from evaluating the performance of the INTENSSS-PA RLL in JCyL are rather appealing and encouraging on the efficiency and effectiveness of the designed ISEP concept and the developed energy plan.

Studying the evaluation results of JCyL RLL and the preliminary results of the other six INTENSSS-PA RLLs it can be concluded that the performance of all RLLs on two of the aspects expressing the LL's essentials, i.e. "service creation" and "innovation outcomes" is substantial higher than the one corresponding to the maturity level (i.e. just after set-up stage). The reason is that INTENSSS-PA RLLs are focused on social innovation and not on technological innovation and as a result the impact of the RLLs outcomes and services are directly related to the RLL's stakeholders' objectives, while the network of relationships between them is stronger. Considering, the "infrastructure" aspect and the technological

development related to “User Involvement” and “Tools”, there INTENSSS-PA RLLs are lacking behind even from the set-up stage for two main reasons, (a) because they cover partly their needs by using the stakeholder's infrastructure and (b) because they are no institutional entities hindering the development and acquisition of the infrastructure. “Governance” aspects can also be closer to sustainability development stage of a LL depending on the profile, motivation and power of the RLL’s coordinator on the energy and spatial planning process. Last but not least, about the limited participation of the society, i.e. of people, in all INTENSSS-PA RLLs, the major argument is that the people involvement on an LL focused on technological innovation requires individual willingness, while the participation of society on a LL focused on energy planning (i.e. social innovation) requires collective consciousness.

Work under development includes: (i) the evaluation of the performance of INTENSSS-PA RLLs in order to draw meaningful conclusions on the proposed ISEP concept, meaning its functioning and applicability to different planning contexts, as well as (ii) the validation of the proposed methodological framework for evaluating RLLs on ISEP.

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