



**PROJECT H2020**

**LIVERUR**

**Living Lab Research Concept in Rural Areas**

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**DELIVERABLE 4.2:**

**Report on the multi-modal approach for including circular approaches utilizing system dynamics**



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1 Douwe Jan Joustra, strategic advisor on transitional processes at ICE- Amsterdam: Circular Economy Academy (2013)

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<sup>4</sup> Anne P.M.Velenturf, Juliet S.Jopson: Making the business case for resource recovery.2018.

## EXECUTIVE SUMMARY

**LIVERUR project's main aim is towards a circular economy, to explore, interrogate and challenge a wide variety of rural innovation ideas relating to how we can make life on this planet more sustainable, circular and resilient.**

There has been a dramatic shift since the Internet determines each service and industrial sectors and in how the end-users (potential customers) consume, demand, and interact with products and services in urban/ peri-urban and rural areas. "The way we build products has fundamentally changed" said Ash Maurya, who developed a LEAN Canvas for RTD and Industrial players and gave a definition for the "Continuous innovation"<sup>1</sup>.

Living Lab is a perfect framework and instrument to offer a research and environment for each player in the Quadruple Helix Governance model to describe for Open and Continuous Innovation in the rural context. Following the definition of the Lean Canvas<sup>2</sup> and Circular Business Model Canvas (T3.4.) an adaptation scenario for each of the **LIVERUR** Rural Living Labs (active in linear and circular economy) is described in T4.2.

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1 [https://www.youtube.com/watch?time\\_continue=40&v=k6rWkOjc8Y0](https://www.youtube.com/watch?time_continue=40&v=k6rWkOjc8Y0)

2 Lean Canvas is adapted from The Business Model Canvas and is licensed under the Creative Commons Attribution-Share Alike 3.0 Un-ported License.

**Lean Canvas** describes the innovation process as linear model of economy by 4 main steps such as: **Requirements (Value) – Build (Process) – Release & customer feedback (People) – Market validation**.

**Circular Business Model Canvas** is defined as a more circular service model of 3 components: **Strategy** (mission, strategic positions & development paths, **design of value proposition**), **Resources** (core competencies & **assets**), and **Network** (business model networks and **partners**) in connection of feasibility, viability, and profitability in all actors of Quadruple Helix.

**The Living Lab methodology** contains four elements: **Co-creation – Exploration – Experimentation – Evaluation** (more in D3.2). **The intervention to build optimal Business Models through Living Labs can be implemented through a cyclic development approach**. The Rural Living Labs can contribute to the development of the rural innovation systems by: innovation infrastructure (ICT as well as governance), demand for innovative services, role of government policies (local and regional), innovation culture, skilled professionals and collaboration among all stakeholders (network strength).

The **LIVERUR** project offers a comprehensive knowledge on designing LEAN and Circular business models to stimulate and foster implementation of the circular economy. The multi-model approach offers two major approaches and types of business models for the circular rural economy within the Living Lab framework. D4.2. supports every kind of Circular Rural Living Labs in designing their own Circular Business Models in the closed-loop economy.

## INTRODUCTION

The T4.2. Development of a multi modal approach to compare living lab –circular economy approaches based on the main achievements of D3.4. Benchmarking of traditional value vs platform based living lab concept, also on D4.1. Suitable business models identified for each piloting area. “The RAIN (Regional circular living lab business model concept) is a new business model concept, designed specifically for the rural context and taking into account regional characteristics.”<sup>1</sup> (see more in D4.1.)

- **Activities:**
- **Mapping linear and circular business model canvas** (by Ash Maurya and Circulab Circular Economy -Business Model Canvas (CE-BMC) on a) material & product (object) and b) process (system) perspectives at c) micro-level and d) cross-border/regional level
- **Developing a regional circular economy platform based generic business model**, combining the product/service system by eco-innovation, socio-economic and environmental perspectives, with a focus to ‘value proposition

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<sup>1</sup> Grüneis et al. 2019, LIVERUR Deliverable 4.1. Suitable business models identified for each piloting area. Page 4.

- **Roadmap on how to implement circular strategies by Regional Circular Living Lab (RAIN) Business Models in the piloting areas and beyond.**
- **Method:** object oriented analysis and system dynamics by linear /platform BMC and CE-BMC.
- **Output:** Report on multi-modal approach for including circular approaches (roadmap) (TRA, M17)

### Design/methodology/approach

#### Actions:

- ✓ 1. Pre-conception /synergies with T3.4., T4.1.1, T4.3. and T4.4. (TRA & BAB) and FRCT in WP5. Deadline: 13th of September 2019
- ✓ 2. Draft of D4.2 Deadline: 20th of September.2019.
- ✓ 3. Review of D4.2 Deadline: 27th of September 2019
- ✓ 4. Final version of D4.2 Deadline: 29th of September 2019
- ✓ 5. Submission of D4.2 Report on the multi-model approach Deadline: 30th of September 2019.

**Findings** – After submitting D3.4. one-one completely filled and assessed LEAN Canvas and Circular Business Model Canvas by each partner, D4.2. goes further on the People-Product-Process Innovation at macro and micro level as well. The **LIVERUR Circular Economy Business Model Canvas template** follows the main components of RAIN platform of T4.1. (designed by BAB, Grüneis et al. 2019), the main SDGs goals and build a Roadmap on circular strategies in **LIVERUR** project.

**Originality/value** – The added value of D4.2 in bullet points are: Design and innovation in Rural context, Unlocking investment in the rural economy, Harnessing the role of business and consumers, Towards a recycling society – waste as a resource, Waste targets review, A resource efficiency target

**Keywords** *Open innovation, LEAN Business models, Circular Quadruple Helix model of stakeholders, Rural Living Labs*

# 1 MAPPING LINEAR AND CIRCULAR BUSINESS MODEL CANVAS (by Ash Maurya and Circulab (CE-BMC) on a)material & product and b)process (system) perspectives at c)micro-level and d)cross-border/regional level

## 1.1 Linear vs. Circular value chain in LIVERUR pilot areas

The main difference between the linear and circular economy is: the resources are lost in linear economy while the resources are kept circulating in the circular economy. As F. Bonciu defines, the linear way means that more production requires more resources obtained from the environment and more waste returned into the environment with disregard of the sustainability of the process but rather a component of the production process that is designed in a circular way (meaning that resources are initially obtained from the environment but afterwards waste becomes itself a resource and it is indefinitely re-cycled in the economic process)<sup>1</sup>.

There is no standardized definition of the Circular Economy and it means that the Circular Rural Economy or Sustainable Circularity in rural context is a new paradigm. The definitions include a set of new business models that can extract more value from resources while reducing their overall use. A circular economy is one in which products are recycled, repaired or reused rather than thrown away, and in which waste from one process becomes an input into other processes.

A circular model, based on the closed-loop economy elaborates the **upcycling opportunities**, such as “creative reuse”, “the process of transforming by-products”, “the waste materials”, “useless or unwanted products” into new materials or products of better quality or for better environmental – socio-economic value at the end of the life of the product. The circular rural models within **LIVERUR** piloting areas would give various scenarios how the rural products can be reused, repaired or recycled in peri-urban and rural areas by the support of the 13 new circular rural living labs.

**It challenges LIVERUR consortium partners to think about their own customer relationships, revenue streams, cost structures and high sustainable impacts in economic, social, environmental (ecological) and Living Lab aspects.**

**The difference between a linear and a circular economy (more in D3.5) is:**

	<b>Linear</b>	<b>Circular</b>
<b>Step by step plan</b>	Take-use-dispose	Reduce-reuse-recycle
<b>Focus area</b>	Eco-Efficiency	Eco-Efficiency
<b>Time schedule</b>	Short term, from purchase to sales	Long term, multiple life cycles
<b>Reuse</b>	Downcycling	Upcycling, cascading and high grade recycling

<sup>1</sup> F. Bonciu: The European Economy: From a Linear to a Circular Economy. Romanian Journal of European Affairs • December 2014.

The main elements of linear economy are illustrated by two figures, explaining the key nodes for transition from linear to circular economy at macro level.

### From linear economy

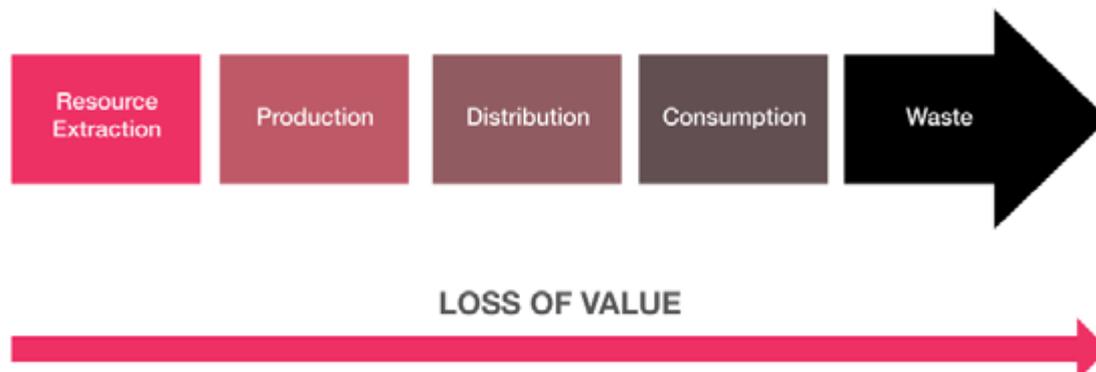


Figure 1. Key components to Linear economy. Source: Wadzi Motsi-Khatai & contributors, Ellen MacArthur Foundation - What is Circular Economy, 2019.

### A way forward through circular rural economy

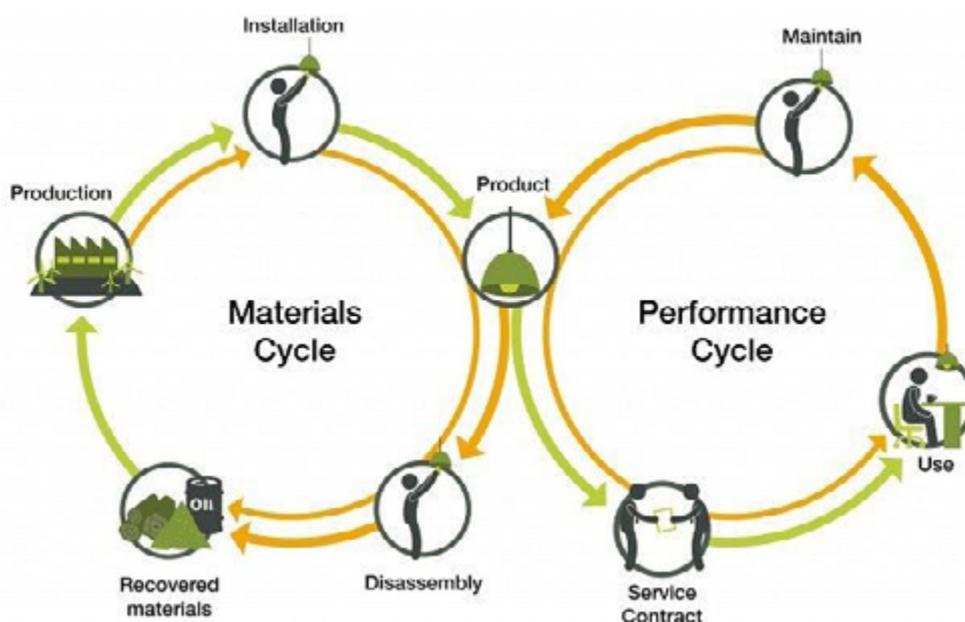


Figure 2. Key components to Circular economy comes from Materials cycle and Performance cycle. Source: Circular Economy Academy, 2013.<sup>2</sup>

These resource recovery steps address multiple sustainability challenges and require a better linear based “take-make-waste” practices. This needs to be assessed with environmental, social, technical and economic indicators from a whole-system perspective. The three key words which determines this challenges are: **Sustainable circularity**, where the practices going through **Wider transitions** sharing and self-producing economy via large scale **Collaboration**. Sustainability issues have many owners that need to be involved in collaborative solutions, from government strategy to infrastructure investment, business models and commercialisation to sharing of expertise and evidence regarding the costs and benefits of circular economy.

<sup>2</sup> Douwe Jan Joustra, strategic advisor on transitional processes at ICE-Amsterdam: Circular Economy Academy (2013).

Key points of the interventions cover the circular rural business cases are 1) Expanding the types of **values** and **costs** considered from primarily **economic** to also include **environmental, social and technical** aspects, and 2) **Governmental aspects** such as **regulatory change** and **policy integration**.

The added value in each stage of the intervention in a sustainable circular economy is generated by 4Ps: **Product - Process – People – Partners**.

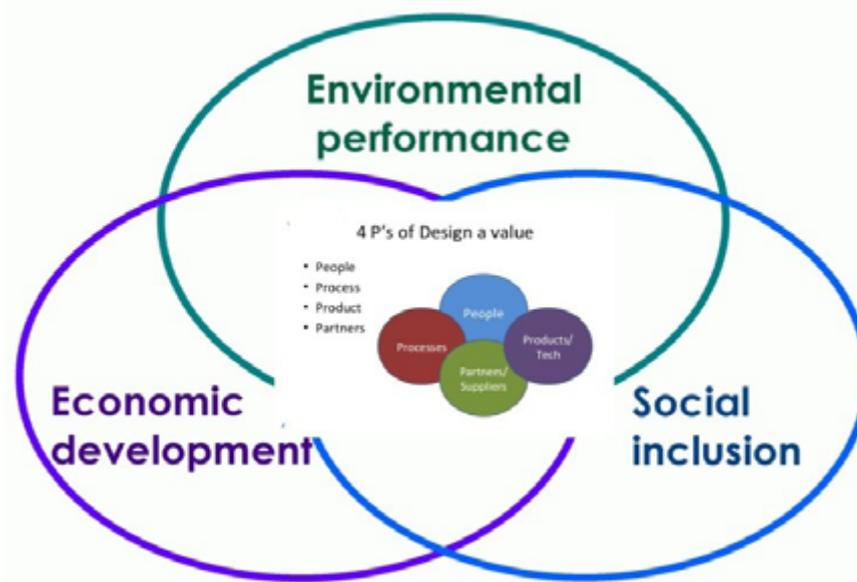


Figure 3. 4P's of Design a value. Source: Author.

## 1.2 Methodology for building the best Circular business models which are suitable for LIVERUR objectives

The approach of Circular Open Innovation (COI) requires innovations at all levels (e.g., process, product, people, organisational and partner network, business model) to enable systemic change, but it also requires changes from the Rural Living Lab's strategy, engagement with society, and the way in which a value is created (D3.5).

The RAIN criteria by BAB in T4.1. were developed by all relevant topics and results of WP2- and WP3 and feasibility check (feedback from pilot region partners) to build a set of qualitative indicators. Four main topics were identified (Living Lab approach, economic sustainability, social sustainability and ecological sustainability) and supplemented with 3-6 indicators each criteria and checked against covering (D4.1).

In T4.2. the preparatory models for the further optional business models in Circular Rural Living Labs and the RAIN criteria itself in T4.3 and T4.4. will be based on the comparison of Linear and Circular Rural business model canvas and the shift to the Sustainable Circularity via 13 new Circular Rural Living Labs. In WP5 through the pilots and WP6 the digital TOOLKIT will complete the evaluation process and methodology of **LIVERUR** towards sustainable circularity. (Fig. 4).

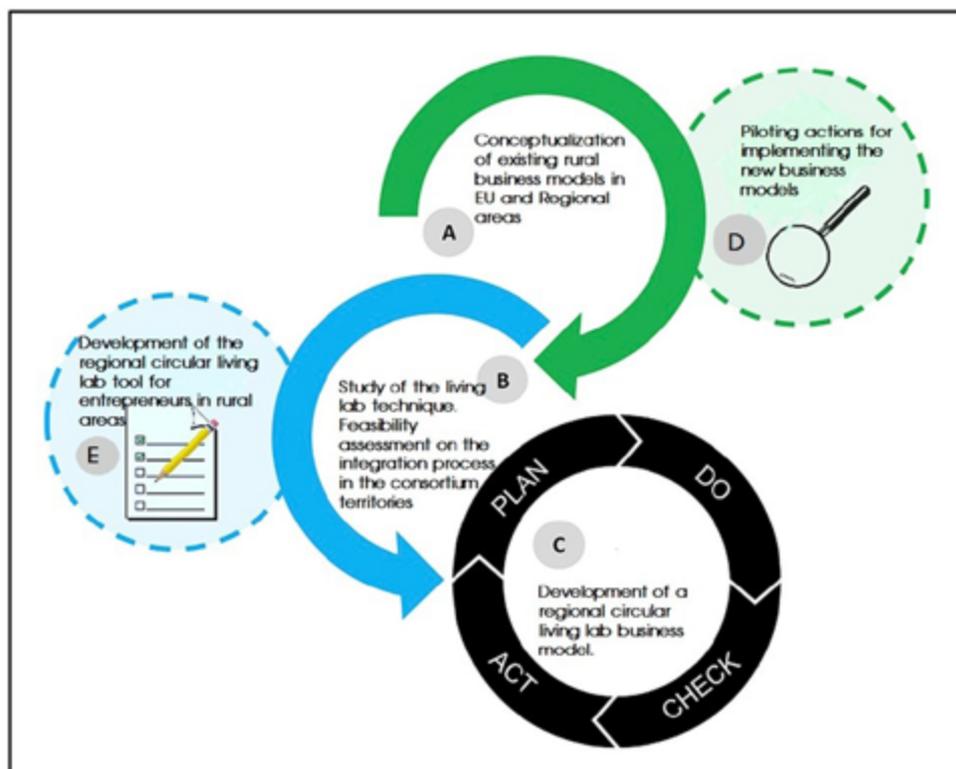


Figure 4. Evaluation process and methodology of LIVERUR towards sustainable circularity. Source: Author.

The usage of multi-model approaches, based on the two major Business Models (LEAN and Circular Rural) offer a real time comparison for all actors.

The LEAN Business Model Canvas representing the linear value chain by its “take – make – use - dispose- pollute”, while the Circular Rural Business Model Canvas by its “make – use –re-use – remake – recycle” supply chain.

The novelty of LIVERUR project is to bring multi-models to a single framework for interventions in the ‘circular economy’ (CE) in rural context for policymakers and small scale businesses (farmers and farmers associations, social entrepreneurs) to better manage their trades associated with resource efficiency practices.

The main target with LIVERUR pilot actions is the successful deployment, the reduction of waste, the estimation of resource needs and the development of additional value from natural resources. All could imply the development of a rural ecosystem in which rural innovations in sustainability support the economic activities in whole regions and rural areas in LIVERUR.

Practically the Circular Economy can be broken down into three types of activities (also see Figure 5), where all the three types can characterise the new 13 pilot actions.

The diagram below (Fig 5) is one of the best known models to illustrate the unified structure of Linear vs Circular supply chain and the necessity of the multi-model approach in LIVERUR at regional & rural level.

Following the Linear supply chain vs Circular Economy (CE) approaches, a unified model represents the liaison among the main elements and interactions:

“1. **Creating loops** – when a product reaches the end of its designed operational life, it is reused, repaired or recycled rather than thrown away.

- 2. **Slowing flows** – shifting to new ways of designing and making products ensures that they remain in use for as long as possible, thereby decreasing demand for new products.
- 3. **Narrowing flows** – this involves shifting to more efficient ways of using products, e.g. sharing products or adopting product-as-a-service models”.<sup>3</sup>

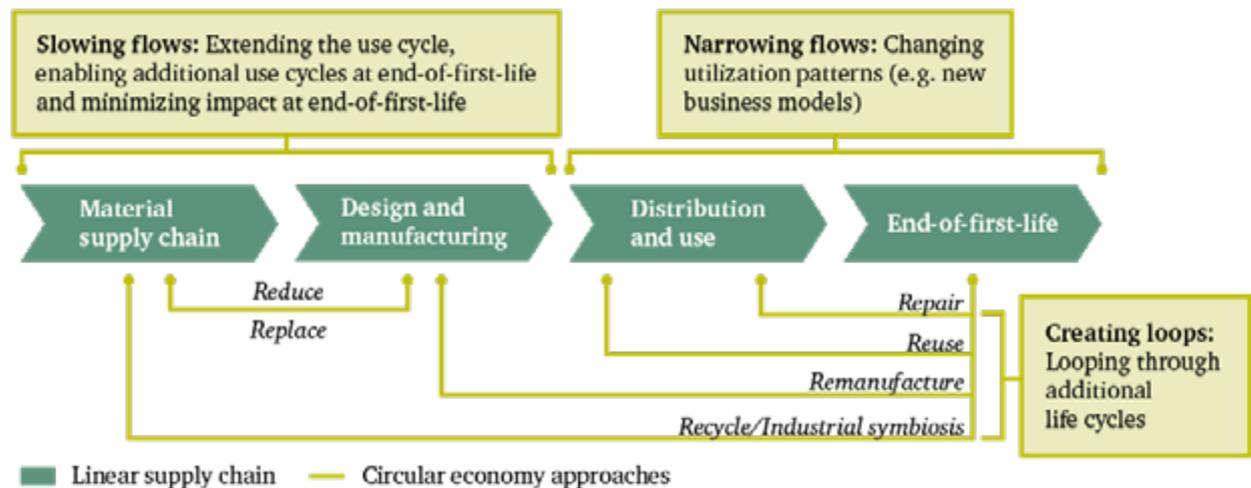


Figure 5. Unified model of Linear & Circular supply chain. Source: Johanna Lehne, Laura Wellesley, Felix Preston, adapted from a diagram by InnovateUK, 2019.

The **Lean Canvas** describes the innovation process as linear model of economy by 4 main steps such as: Materials supply chain – Design and Manufacturing – Distribution and use – End-of-first-life (More Fig 5.).

**Circular RURAL Business Model Canvas** is defined as a more circular service model such as five interactions among the four main components:

- Materials supply chain - End-of-first life : Recycle/Industrial symbiosis
- Materials supply chain - Design and Manufacturing: Reduce/Replace
- Design and Manufacturing - End-of-first-life: Remanufacture
- Distribution and use – End-of-first-life: Repair & Reuse

In the **LIVERUR** project optimally both approaches can be used, linear vs circular as well. In order to be build a successful business model the biggest challenge is to redirect the end-of-life-products to a second lifecycle, which are characterised by closed-loop and upcycling channels.

In the current system of a linear economy by extracting and processing the resources (materials and products) and then trading them for further manufacturing, they are losing their functionality after being used, ending up as waste often burned or landfilled. This economic system causes an increasingly geographically separation of production and consumption resulting in a highly complex, material and energy intensive, and environmental harming workflow in the supply chains.

What happens if we close the loop by redesigning the whole processes? These loops can be redesigned to be run through not only once by materials and products, but to be repetitive as often as possible. The new lifecycle of the material is processed along the supply chain, for reusing the materials. Therefore the tighter the circle, the faster materials return to consumption and less resources are required in each terms. A closed circle of sharing or reusing products among consumers does not need new materials and finally it requires less energy than the bigger loop of recycling those

3 J. Lehne, L. Wellesley, F. Preston: An Inclusive Circular Economy, Priorities for developing countries, 22.May.2019. <https://reader.chathamhouse.org/inclusive-circular-economy-priorities-developing-countries#introduction>

products. The circular economy pursues a harmonious intergrowth and sustainable development of both the economic and the social system without harming the natural ecosystem.

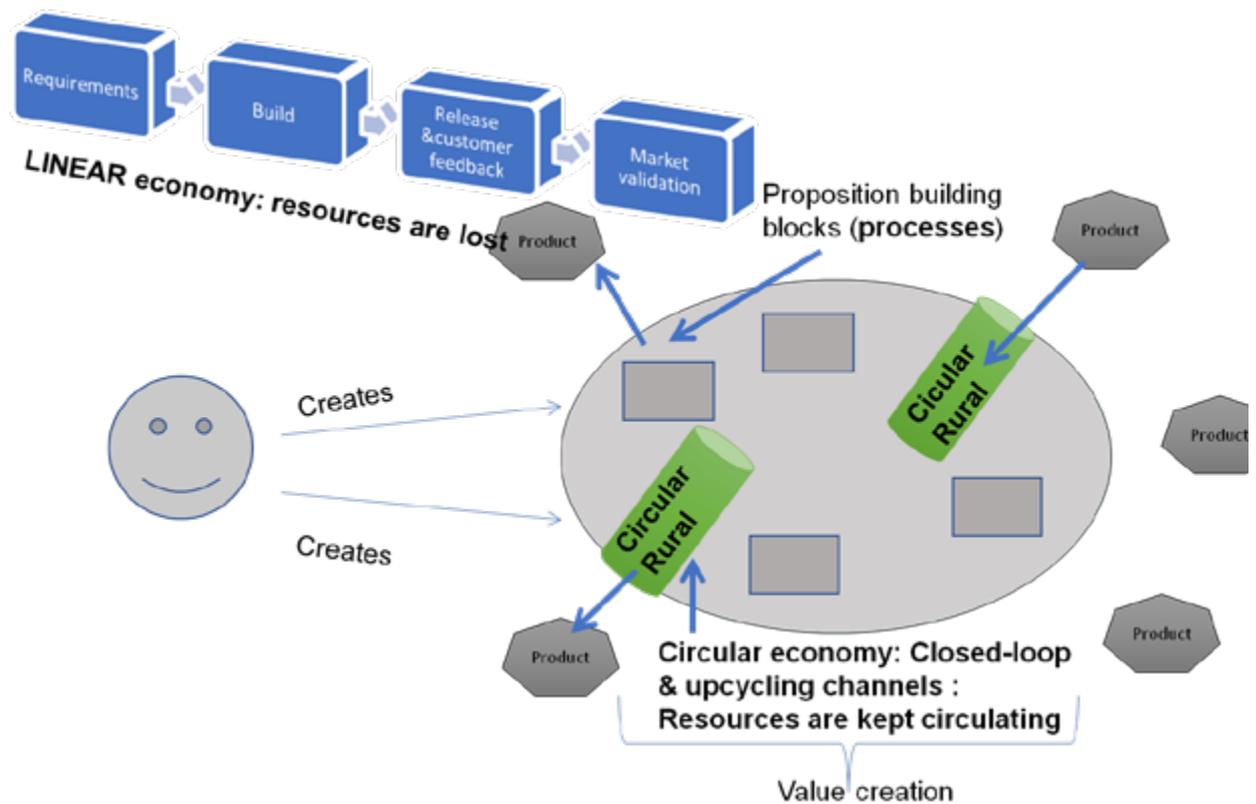


Figure 6. Platform of linear further to circular economy: designing the Canvas. Source: Author & Simone Cicero (Italy) by Meedabyte.<sup>4</sup>

The LEAN canvas template is adapted by Ash Maurya based on the Business Model Canvas of Alex Osterwalder. The template optimizes a Lean Startup methodology as well with a big emphasis on taking the customer and its problems solving into the middle of actions.

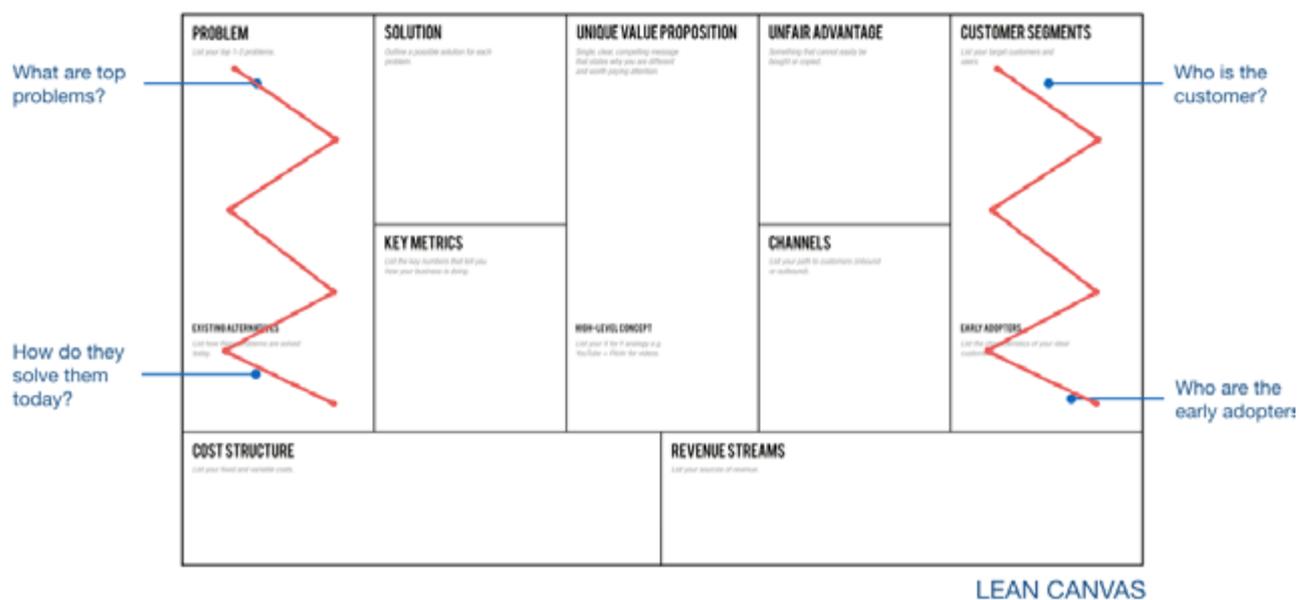


Figure 7. LEAN Canvas by Ash Maurya.<sup>5</sup>

<sup>4</sup> The work is licenced under Creative Commons Attribution-Noncommercial 3.0 Unported License.

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Ash Maurya has changed the main building blocks of the Osterwalder’s Business Model Canvas and added more elements:

- ✓ **Problem**- a problem box was included because several businesses do fail applying a lot of effort, financial resources and time to build the wrong product. It is therefore vital to understand the problem first.
- ✓ **Solution**- once a problem has been recognised the next thing is to find an amicable solution to it. As such, a solution box with the Minimum Viable Product “MVP” concept was included.
- ✓ **Key Metrics**- a startup business can better focus on one metric and build on it. These key metrics tell you how your business is tracking.
- ✓ **Unfair Advantage**- this is essentially the competitive advantage. A startup should recognise whether or not it has an unfair advantage over others and is not easily copied.

The Lean Canvas prioritizes getting the customer-problem-solution foundation in order first -**making it ideal for early stage research and innovation projects. The EC also propose to use this Lean Canvas in the H2020 RIA projects.** As is it easy to see how **if a user/customer and problem assumptions aren’t in order**, everything else on the canvas falls apart.

Without filling up the solution box, the canvas becomes unusable for all actors in the R&I activity fields.

The basic board of Circular Business Model Canvas has been designed by CIRCULAB, France, (see Fig 7.) and it was added and completed by some additional elements (see Fig 8.).



Figure 8. The Board of Circular Business Model Canvas. Source: Circulab, Wiithaa, 2015.

### 1.3 New Buildings blocks in LIVERUR LEAN Canvas

LIVERUR LEAN Canvas could help for the stakeholders in the Rural Living Labs in four aspects

1. To add a new building block to RLL approach which is **Concept design/problem analysis/ user needs**
2. To support the linear use of materials by the highest performances until the end-of-life-product
3. Evaluate materials, products, performance, market, loss of waste and resources, potentials to be recyclable for the sustainable circularity
4. Awareness of the principles of Open Innovation to foster the innovation capacities and TRL in the whole supply chain

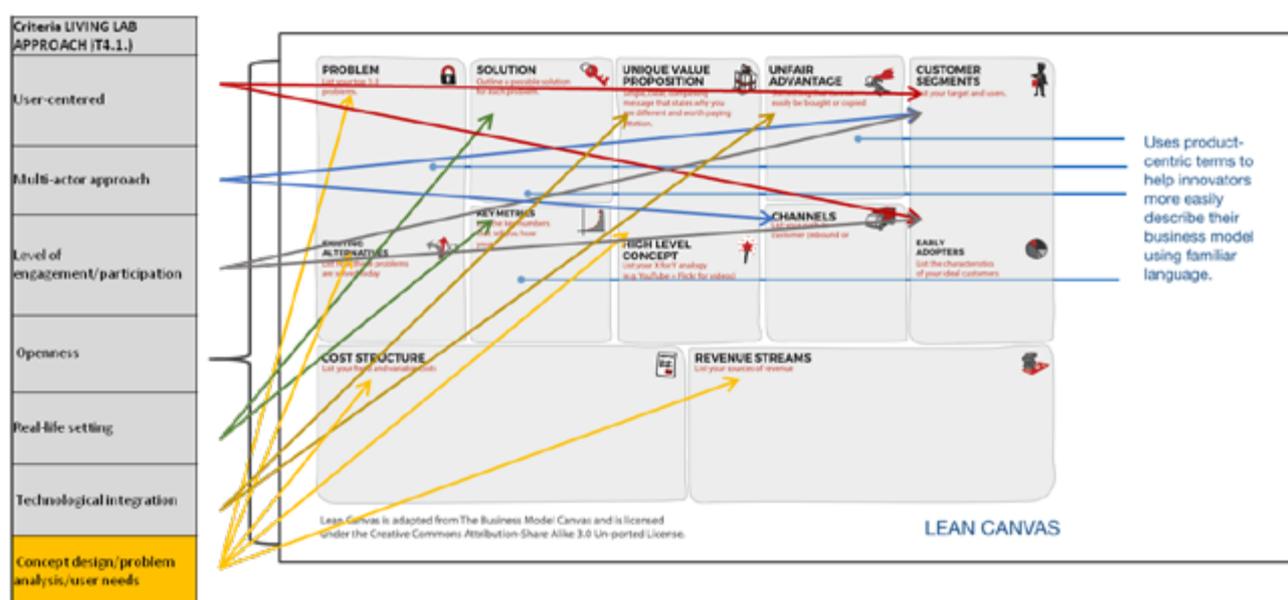


Figure 9. LEAN Canvas by LIVERUR RLL approach. Source: Author, Grüneis et al 2019, Lean Canvas by Ash Maruya.

### 1.4 New Buildings blocks in LIVERUR Circular Business Model Canvas

These new building blocks emphasize that a **transition requires both producers and consumers in combination with technological innovation (TRL)**, in order to overcome the linear use of materials and products and loop them back into the economic system.

In T3.5. and T4.2. the original Circular Business Model Canvas of Circulab has been adapted to **LIVERUR** project and redesigned , in order to support the Circular Rural Living Lab Business Models` development in T4.3. and T3.4. and 13 Pilots in WP5 along the **LIVERUR Circular Rural Business Model Canvas**.

**Key aspects** of CR-BMC: Partners, Key activities, Key Resources, Value Proposition, Customers and contexts, Distribution and Upcycling.

**Key additional criteria:** Multiactor involvement, Sustainable differential advantage, Range of applications, Commercial Viability, Serving customer needs, Scalability, Transferability to other regions and/or sectors with similar preconditions, TRL level improvement.

The Six Additional Building blocks to the basic board (by WP3 - WP4 - WP5) are:

1. Sustainable Development Goals (SGD)
2. SWOT Analysis:
  - RAIN Principles* (defined by BAB LIVERUR working paper as draft of Deliverable 4.3):
3. TRL level (6, 7, 8, 9)
4. User centric/ICT enabled experimentation environment
  - Exogenous elements* (defined by BAB LIVERUR working paper as draft of Deliverable 4.3.):
5. Rural Living Labs Governance Model (PPPP).
6. RLL Mission Statement

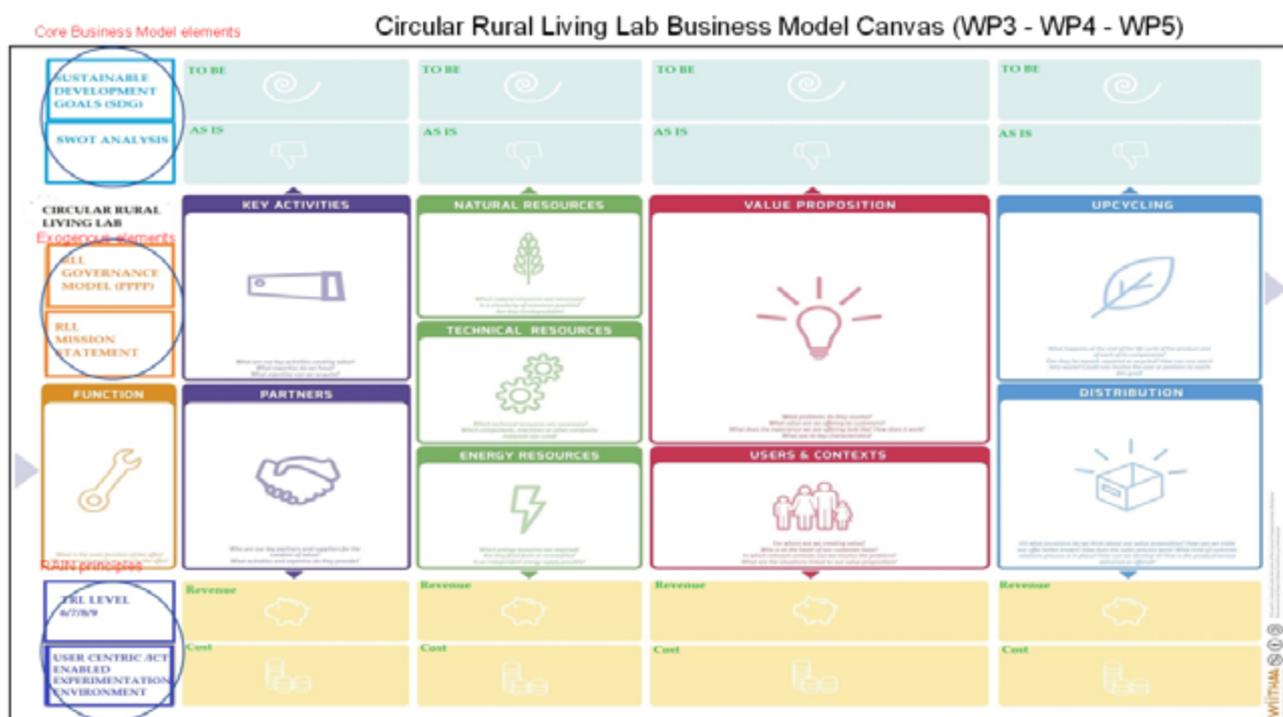


Figure 10. The six additional building blocks to Circular Rural Living Lab Business Model Canvas.

## 2 DEVELOPING A REGIONAL CIRCULAR ECONOMY PLATFORM BASED GENERIC BUSINESS MODEL, COMBINING THE PRODUCT/SERVICE SYSTEM BY ECO-INNOVATION, SOCIO-ECONOMIC AND ENVIRONMENTAL PERSPECTIVES, WITH A FOCUS ON TO “VALUE PROPOSITION”

The general concept underlying the **circular economy** has been developed by various researchers and think tanks, which are complementary to each other and showing the main principles of this new approach to economy [1, 2, 3, 4].

This variety of concepts supports the approach of Scott to the relation **between sustainability and circular economy**.<sup>6</sup> Scott provided a useful conceptualization of circular economy in relation to sustainability. He argues for understanding the circular economy as “a concept used to describe a zero-waste industrial economy that profits from two types of material inputs: (1) biological materials are those that can be reintroduced back into the biosphere in a restorative manner without harm or waste (i.e. they breakdown naturally); and, (2) technical materials, which can be continuously re-used without harm or waste”.

He defines sustainability as the capacity to continue into the long term and, at the same time, as a mechanism that enables the circular economy to work. (Fig 2.)

Briefly, the 7-Ps are as follows (an overview of this model is shown in Fig 2):

**Preparation** – accepting the breadth and depth of sustainability (e.g. particularly the financial implications) and understanding that sustainability is not solely about the environment or being independent. Equally as important is a full recognition of what the reformer is up against when trying to implement profitable, long-term practices (e.g. apathy, ignorance, short-term thinking).

**Preservation** – encompasses two areas: internal (collecting and displaying real-time measurement) and external (keeping ahead of laws, pending legislation, trends and developments).

**Processes** – sustainable belief systems, philosophies, business models, and thought patterns that help match a business with customer demands, core capabilities and best practices.

**People** – accepting the importance of training and education and working diligently to avoid the wasting of people, specifically: employees (who seek security and motivation), stakeholders (who want a return on their investment), customers (who want safe, value-laden products), and the world community – including the two-thirds of humanity who are currently left out of the global economic loop (who desire jobs and inclusion) and who represent an economic force all their own.

**Place** – the buildings and places where work is performed and/or products are sold. Product – goods and services that are free from unnecessary waste (‘nonproduct’) and toxins – and designed so that the materials, energy and manpower that comprise them (and their packaging) are treated as investments and continuously reused.

<sup>6</sup> Scott, J.T. The Sustainable Business a Practitioner’s Guide to Achieving Long-Term Profitability and Competitiveness, 2nd ed.; Greenleaf Publishing: Sheffield, UK, 2015. [[Google Scholar](#)]

**Production** – the physical, mechanical, biological, and chemical processes used to transform raw materials into products or services – as well as the transportation of raw materials and finished goods. To be sure, there is so much overlap amongst the different fields and categories that comprise sustainability that it can often be quite difficult to determine where one category or field begins and another ends (p.3-4).

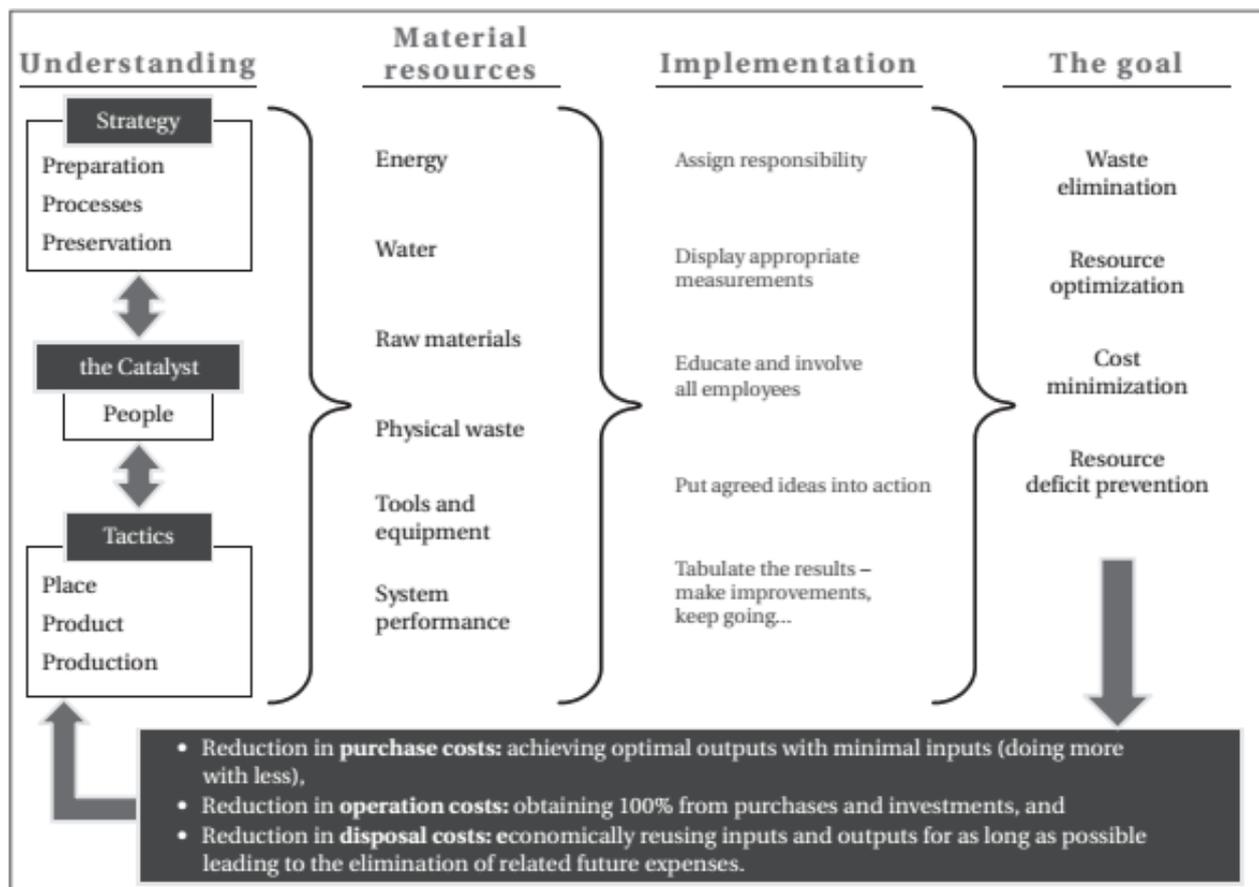


Figure 11. The 7-P Application Model (toward sustainability). Source: Jonathan T. Scott, 2008.

## 2.1 Designing Sustainable Rural Circularity by the Living Lab approach

**LIVERUR** focussing on the horizontal (macro) and vertical (micro) levels of Open Innovation and the Circular Economy needs in rural and peri-urban areas, to adding important socio-economic, ecological/environmental, tech/ICT etc. impacts as new dimensions, which imply access to a wide range of actors as well as into the circular rural businesses.

This tasks (T4.2.) and other tasks in WP2, WP3 (mainly T3.5), WP4, WP5 and WP6 recognize the relevance of sharing knowledge and capabilities in line with the Open Innovation agenda. We hence wish to debate the interaction between Open Innovation and CE, highlighting the various fields of innovation and new dimension of CE, like Agriculture 4.0.

In the World Government Summit in Dubai/UAE in 2018 a report was launched called *Agriculture 4.0 – The Future Of Farming Technology*. It presented all the challenges which will require collective efforts from all the actors (national, regional and local governments, investors), and main players in the innovative agricultural technologies.

The targeted goal-oriented efforts, from top-down and macro-economic level must design “Agriculture 4.0” which will no longer depend on applying water, fertilizers, and pesticides uniformly across entire

fields. If the top-down approach can cross the bottom-up approaches, the small scale family business and farmers will use minimum quantities required and target very specific areas (from water to organic fertilizers and bio-pesticides).

The report also states that, the farms and the local agricultural operations will have to be run very differently, primarily due to advancements in information technology such as sensors, devices, connected machines, IoT , Big Data, robotics, blockchain technologies, VR/AR and Artificial Intelligence.

This gives a realistic future and forecasts for all new 13 circular rural living labs as well.

## 2.2 Drafting the regional Circular Rural Business Model Canvas at macro-level

The implementation of the circular rural economy involves a paradigm shift by all actors because it includes all aspects of the social and economic activities.<sup>7</sup>

Despite the growing interest in the link between **sustainability, resource efficiency and competitiveness** by governments and companies in the rural economy, the awareness of the concept of circular economy in rural context is still relatively low. Developing a common understanding of circular rural economy and its key components would help understanding, designing and drafting the site works for wider take-up of the concept and encourage the cooperation among the involved stakeholders.

In order to implementing the regional circular economy strategies in peri-urban and rural areas, the new 13 Circular Rural Living Labs would play key roles in all targeted regions building **Sustainable Circularity** and execution in the **value chain**.

The framework include the new way of thinking in terms of **sustainability and circularity** evaluation of the business model. These aspects are to optimize the processes and to understand the dynamics of the processes needed. For example, change in one link in the supply chain may dramatically influence the whole model.

The **sustainability** part can be conducted by using the natural-technical and energy resources. The **circularity** aspect focuses on visualization of the business model canvas (see Fig. 4.-5-6) in order to understand the needed actors (team/partners/users), their relationships (network, governance model), cycle stages, and flows of material and information.

## 2.3 Drafting the regional Circular Rural Business Model Canvas at micro-level

Implanting sustainability into innovation processes and assessing an innovation's sustainability impact are great challenges because of their complexity (e.g., Bonn & Fisher, 2011; Lozano, 2015) and ambiguity (Engert et al., 2016). For example, the concept of sustainability depends on a number of (conflicting) interests (e.g., social, ecological, and economical) and parameters that vary across industries, countries, and time (Salzmann et al., 2005). Presumed sustainable solutions can thus cause *rebound effects* due to unforeseen consequences indirectly in other areas (Buhl et al., 2017). Hence, there is a need to deal with complexity in sustainable innovation development and

<sup>7</sup> Felix Preston, A Global Redesign? Shaping the Circular Economy, Chatham House Briefing Paper, March 2012. [https://www.biblioteca.fundacionicbc.edu.ar/images/d/d7/Bp0312\\_preston.pdf](https://www.biblioteca.fundacionicbc.edu.ar/images/d/d7/Bp0312_preston.pdf)

in early innovation stages. In order to exploit the sustainability potentials in innovation processes and to enable interim innovation assessments based on a systematic and strategic approach, it is necessary to define appropriate requirements and to build a common sustainability vision that can guide the innovation process and thus minimize or eliminate risks as well as detect opportunities for sustainable development (e.g., Broman & Robert, 2017; Robert et al., 2013). Especially with an increasing radicalness of an innovation, the embeddedness of an innovation in individual, social, or cultural contexts of use is not ensured (Clausen et al., 2011). The SDGs could be the basis

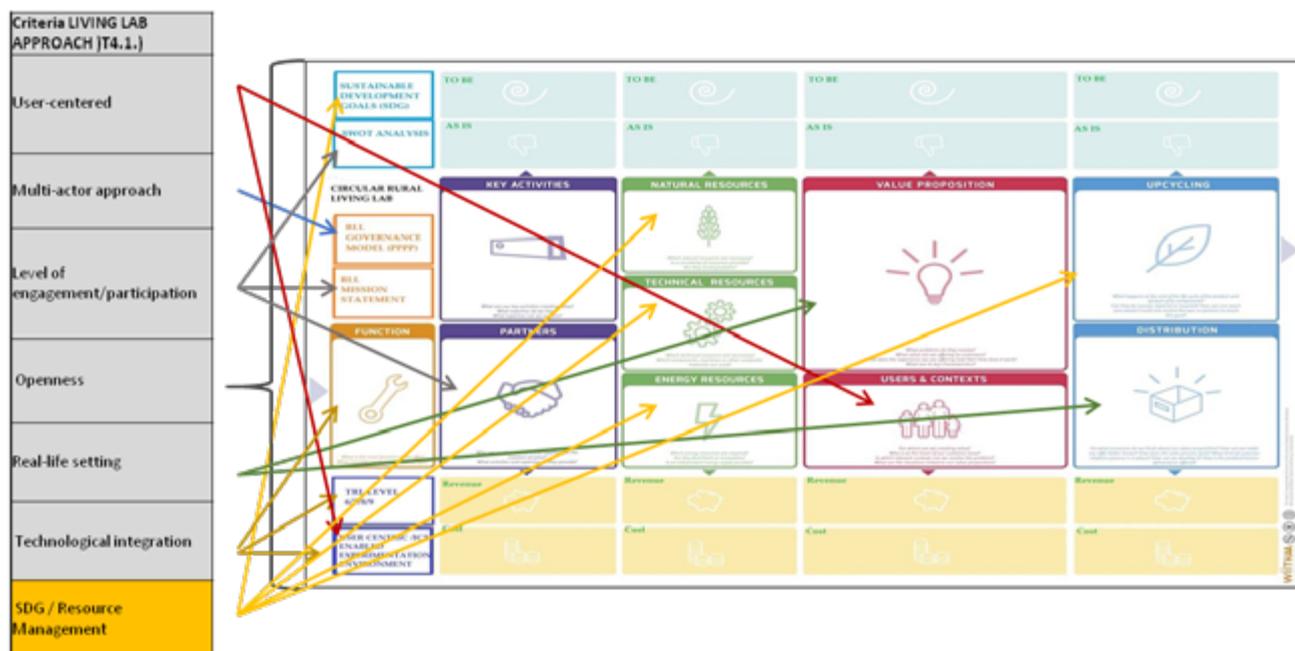


Figure 12. New component to Living Lab approach: SDG & Resource Management. Source: Author, Grüneis et al. 2019.

for the requirements that sustainable innovations face in order to achieve these ambitious goals. Furthermore, the approach of open innovation can significantly reduce the risk of innovations failing on the market, especially radical innovations in a difficult market or those facing technological uncertainties (Clausen et al., 2011).

To enable more systemic innovation, it is important to identify and integrate relevant sustainability aspects as early as possible, given that product and service design at this stage are still adaptable and early-stage modifications are relatively low-cost compared to later modifications (see Figure 15). At the beginning of the process, the degree of freedom and influence on the project outcome is high, whereas little information is available and the cost of change is low. At later stages in the process, the availability of information is higher, but then the cost of change has increased (Verworn 2009). The challenge in the front end is created by the low amount and quality of information and certainty.

# 3 ROADMAP ON HOW TO IMPLEMENT CIRCULAR STRATEGIES BY A REGIONAL CIRCULAR LIVING LAB (RAIN) BUSINESS MODEL IN THE PILOTING AREAS AND BEYOND

## 3.1 The 2030 Agenda for Sustainable Development and the SDGs

The “Transforming our World: the 2030 Agenda for Sustainable Development” including 17 Sustainable Development Goals (SDGs) and 169 targets was adopted on 25 September 2015 by Heads of State and Government at a special UN summit. The Agenda is a commitment to eradicate poverty and achieve sustainable development by 2030 world-wide, ensuring that no one is left behind. The adoption of the 2030 Agenda was a landmark achievement, providing for a shared global vision towards sustainable development for all.

### Developing the 2030 Agenda in Europe

In Europe ~46% of edible mass of fruit and vegetables is lost or wasted (FAO, Global food losses and food waste, 2011). The journey started in June 2012, with the “**Rio+20**” **Conference on Sustainable Development**, where Governments decided to develop global Sustainable Development Goals, building on the Millennium Development Goals but also including issues such as natural resources management, sustainable consumption and production, effective institutions, good governance, the rule of law and peaceful societies. The reports of the Open Working Group on Sustainable Development Goals and the Intergovernmental Committee of Experts on Sustainable Development Financing formed the basis of the final Agenda package, through a series of intergovernmental negotiations in partnership with major groups and stakeholders, ensuring the broadest possible ownership of this new Agenda.

Analysing the 17 SDGS, few SDGs were selected for the **LIVERUR** objectives:

SDG2 (promoting water reuse and organic fertilisers, facilitating food donation), 3 (addressing microplastics), 8 and 9 (boosting innovation, jobs and added value), 12 (supporting waste prevention and responsible management of waste and chemicals, addressing food waste and supporting Green Public Procurement), 13 (potential of material efficiency to reduce CO2 emissions) 14 (decisive actions to fight marine litter). (More: 10518/16 Closing the loop - An EU action plan for the Circular Economy; 15159/17 Eco-innovation: enabling the transition towards a circular economy; 10447/18 - Delivering on the EU Circular Economy Action Plan.)

<https://www.un.org/sustainabledevelopment/development-agenda>

[https://ec.europa.eu/environment/sustainable-development/SDGs/index\\_en.htm](https://ec.europa.eu/environment/sustainable-development/SDGs/index_en.htm)

## 3.2 The Roadmap on Circular Strategies in LIVERUR

The main mission of the **LIVERUR** Circular Living Labs is to support the implementation of the main important building blocks of smart rural development by horizontal and vertical level in macro and micro environments. T3.5. developed an integration technique for all the actors in existing territorial rural business areas to a transition into the circular economy.

In the middle of the business are the **Consumers** and all the aspects of the **Sustainability in the Circular Economy**: 1. Circular Supplies 2. Resource Recovery, 3. Product Life Extension 4. Sharing Platforms 5. Product as a Service 6.

The **LIVERUR Roadmap on Circular strategies** define a set of valuable step towards enhancing circular economy, digital transformation, local self-sufficiency, resource management, legal/policy initiatives and other elements of sustainable living and integration technique in each piloting regions. **The sustainable living lab facilities will provide a rural innovation environment for businesses would be based on a common research and innovation framework and on a collection of resources constituting the living lab environment.**

**Living Lab development in LIVERUR goes through three distinct phases:**

- *Need finding and concept creation (WP2-WP3-WP4-WP7 in Year 1- Year 2),*
- *Preparation for ensuring sustainability of stakeholder involvement and the living lab business models (WP 2- WP3- WP4- WP5 – WP6 in Year 1 and Year 2).*
- *Application development and experimentation ( WP3 - WP4- WP5- WP6- WP7) Year 2 and Year 3)*

**Table 1 lists the fundamental elements (based on WP2 and T4.1. results) which contribute to the rural innovation system as main building blocks to the LIVERUR ROADMAP on Circular strategies 1.0 specifically by the new Rural Living Labs:** the innovation infrastructure (ICT as well as governance (PPPP)), the demand for innovative services, the role of government policies (local and regional), innovation culture, collaboration among all local/regional stakeholders (network strength) and sufficient knowledge on performances in sustainable circularity.

ICT Innovation infrastructure	
Initial Year 1-2 WP2-WP3-WP4	Closed Year 2-3 WP3-WP5-WP6-WP7
Governance Infrastructure	
Initial Year 1-2 WP2-WP3-WP4-WP5-WP7	Closed Year 2-3 WP3-WP5-WP6-WP7
Demand for Innovative Services	
Initial Year 2 WP2-WP3-WP4-WP5-WP6	Closed Year 2-3 WP3-WP5-WP6-WP7
Government role	
Initial Year 1-2 WP2-WP3-WP4-WP5-WP6	Closed Year 2-3 WP3-WP4-WP5-WP5-WP7
Innovation culture (creative problem solving, user needs)	
Initial Year 1-2 WP2-WP3-WP4-WP5-WP6	Closed Year 2-3 WP3-WP4-WP5-WP6-WP7
Stakeholder networking	
Initial Year 1-2 WP2-WP3-WP4-WP5-WP6	Closed Year 2- 3 WP3-WP4-WP5-WP6-WP7
Knowledge/Indicators on performances in sustainable circularity	
Initial Year 1-2 WP2-WP3-WP4	Closed Year 2-3 WP3-WP4-WP5
SDG /TRL/Living Labs Assessments	
Initial Year 1-2 WP2-WP3-WP4-WP6-WP7	Closed Year 2-3 WP3-WP4-WP5-WP6-WP7

*Table 1. Fundamnetal elements to LIVERUR Roadmap in Circular Strategies 1.0*

In accordance to the main time schedule and main building blocks of the **LIVERUR Roadmap on Circular strategies**, a set of horizontal actions is proposed to be adapted in each rural living lab **at macro-level** (in the targeted regions).

- 1.Designing the innovation in rural context
- 2.Unlocking investment in the rural economy

- 3. Harnessing the role of rural business and consumers
- 4. Towards a recycling society – waste as a resource
- 5. Waste targets review
- 6. Resource efficiency target (More Fig 17.).

Designing the innovation in rural context	Unlocking investment in the rural economy	Harnessing the role of rural business and consumers	Towards a recycling society – waste as a resource	Waste targets review	Resource efficiency target
<b>Small scale innovation pilots</b>	Environmental taxation	Building on rural environmental footprint pilots	Awareness in villages / farms about recycling techniques	Phasing out land filling of recyclable waste	Resource Management
<b>Skills development</b>	Innovative financial instruments	Broad stakeholder cooperation	Smart Farms, Smart Village	Work with project members on implementation	SDG targets
<b>Market applications (digital, ICT)</b>	Rural Innovation Accelerators	Actions for green employment with local SMEs and social enterprises	Food of future from waste	Extended producer responsibility	Resource efficiency indicators
<b>Partnership (PPPP) via Rural Living Labs</b>	Investment through Quadruple Helix partnership in practice	Boosting the rural Entrepreneurship	Involvement of waste suppliers	Marine litter, waste of food & construction	Evaluation of the targeted indicators
<b>Coherent agri-product policy</b>	Compensation schemes in green agriculture	Customers online, feedbacks	Sustainable circularity local actions in rural areas	Forecast & review about trends	Figures/ Facts on rural communities
<b>Eco-design / labelling</b>	Regional calls for best Eco-design contests	Eco-design/ labelling by Ecodesign Directive (EC, 2015). <sup>1</sup>	Ecodesign local business network	Designing / labelling the principles of new products in reuse of waste	Guideline for implementing the principles
<b>Cascading use of waste</b>	Motivating RLLs for cascading use of waste	Best practices towards replication	Public involvement to build local roadmaps	“Step by Step” local roadmaps	Indicators of local energy maps

Table 2. Main elements of LIVERUR Roadmap on Circular Strategies. Source: Author.

<sup>1</sup> The European Commission presented in December 2015 an Action Plan for the circular economy about the EU Ecodesign Directive (from 2016 onwards). <http://www.europarl.europa.eu/legislative-train/theme-new-boost-for-jobs-growth-and-investment/file-ecodesign-for-circular-economy>

**Six vertical business actions are scheduled to implement the principles of the circular economy, which represent the major circular business opportunities in each LIVERUR Rural Living Labs at micro– level (adapted by the ReSOLVE framework)<sup>8</sup>.**

**List of Actions: Action 1: Regenerate Action 2: Share Action 3: Optimise Action 4: Loop 5. Virtualise 6. Exchange.**

What are meaning the 6 actions?

- **Action 1:** Regenerate and restore natural capital as a shift to **renewable energy and materials**, to returning recovered biological/ecological resources to the nature. Thus helps to reclaim, retain, and regenerate the whole ecosystems.
- **Action 2:** Share actions maximizing the **utilization of products by sharing them among users**, in form of “peer-to-peer”, sharing of private and public products through a pool of products. “Sharing” means also **reusing products if they are still technically acceptable to use, and/or prolonging their life through re-designed durability, maintenance and/or repair.**
- **Action 3:** Optimise actions are focused on **increased measures on the performance and efficiency of a product/service, removing the waste (entirely or partially) in the production process and in the overall supply chain.** They may also be related to the ICT based optimisation, such as big data, automation, remote sensing. Important note: the optimization doesn’t require changing the flow in the product or the technology.
- **Action 4:** Loop actions aiming to keep the **components and materials in closed loops in circularity.** The inner loops getting higher priority.
- **Action 5:** **Virtualize actions means virtualise value chains to deliver the product or service or process virtually instead of materially.**
- **Action 6:** Exchange actions are focused on the selection of resource inputs, to **replacing old materials with advanced materials. If it’s needed to applying new technologies** (e.g., 3D printing) or choosing new products and services by the collective decision.

1.REGENERATE	2.SHARE	3.OPTIMISE	4.LOOP	5.VIRTUALISE	6.EXCHANGE
Regenerate and restore natural capital	Keep product loop speed low and maximise product utilisation	Optimise system performance	Keep components and materials in closed loops and prioritise inner loops	Deliver utility virtually	Select resource input wisely
<i>Example: Retain and restore natural capital</i>	<i>Example: Share</i>	<i>Example: Reuse Increase efficiency/ remove waste</i>	<i>Example: Remanufacture</i>	<i>Example: Virtualise value chains, e.g. online shopping</i>	<i>Example: Substitute resources directly</i>

Table 3. Business actions to implement circular rural economy. Source: Ellen MacArthur Foundation.

<sup>8</sup> Ellen MacArthur Foundation. Growth Within: A Circular Economy Vision for a Competitive Europe; Ellen MacArthur Foundation: Cowes, UK, 2015. [https://www.sun-institute.org/wc/files/growth\\_within\\_for\\_print1.pdf](https://www.sun-institute.org/wc/files/growth_within_for_print1.pdf)

Analysing the common elements in the LEAN Canvas and Circular Rural Business Models, as “pro and cons”, similarities and “shift the transition”, **the different business models focuses on problems and solutions, key metrics, competitive advantages in linear economy.**

**The circular process focuses on performance rather than products in circular economy, the various type of purchases (access- , usage-, performance- and result- based purchases) define various circular business models by the multi-actors (users, customers) and networks.**

Business Models types and characteristics	LIVERUR LEAN CANVAS	LIVERUR CIRCULAR BMC
An increased utilisation rate of products	X	X
Making continuous improvements in a business operation	X	X
Focused on problems and solutions, key metrics, competitive advantages	X	X
The maintenance focuses on performance rather than products		X
Retaining the ownership of products to the service provider.		X
Redistribution/resell and buy-back business activities		X
Remanufacturing focuses on refurbishment and maintenance of used parts and components in order to be sold again.		X
On the consumer side there are new purchasing models	X	X
The access- or usage-based purchasing models; goods and products are purchased for a certain usage or access period		X
The performance-based models a defined performance or service is purchased, which is not bound to a particular product or good.		X
The result-based models focus on a defined service result.		

Table 4. Differences and similarities in Lean and Circular Business Models. Source: Source.

# 4 DESIGNING AND ADAPTING CLUSTERS WITHIN LIVERUR TO THE SPECIFICITIES OF PILOT REGIONS TO FOSTER THE BUSINESS DEVELOPMENT AND INNOVATION

Based on the specificities of the pilot regions (More: T4.1.), T4.2 is proposed to designing and adapting clusters within **LIVERUR** to foster the business developments and innovation in all targeted regions.

- 1. Food and agricultural systems and supply chains cluster  
The physical and economic access to adequate food and drink remains a worldwide problem. Yet food insecurity, with even the richest countries seeing a rise in the use of food banks. At the same time, the food and agriculture industry is responsible for enormous environmental impacts including use of land, water, energy and raw materials, toxic emissions, with often vast waste implications. The cluster can focus to the healthy & functional food innovation, basing on common competences, cross-border complementarities, market needs and new trends.
- 2. Social farming cluster  
The concept of the social farming connects social entrepreneurs, cooperatives with policymakers, businesses and NGOs. More and more attention is articulating for Social farming in the perception of farming and rural resources, where the social, health and mental wellbeing of all involved. The social farming concept represents an opportunity for farmers, but also other entities operating in rural areas, to introduce and develop new alternative services (connection the religious organisations or cooperatives), expand and diversify their activities and their roles in the rural society.
- 3. New regional/local investment alternatives in rural areas cluster  
Environmental taxation, Innovative financial instruments, Rural Innovation Accelerators
- 4. Creativity and sustainability in Rural Entrepreneurship cluster  
This research cluster explores the sustainability aspects of Creativity & Heritage in Craft, with further impacts in the rural context, including remote, rural and mountain tourism, innovative business models, systems change and SME development in Rural Entrepreneurship.
- 5. Decentralised alternative energy cluster  
Solar, biomass, micro-grid, passive houses.
- 6. Digital technologies cluster  
Smart farming, Emerging technologies (AR, AI, VR, Big Data, robotics, Blockchain, sensors, cloud computing etc.), AgriTech, FinTech start-ups, AgriFood, Smart villages

## 4.1 Optional clusters of 20 selected LIVERUR pilot projects

	Partner (country), region	Project name	Clusters (optional)
1	RMB (AT), South Burgenland	Living Lab Südburgenland	Food and agricultural systems and supply chains cluster (in their 3 pilot projects)
2	ADRI (ES), Vega del Segura	Circular rural business model for biowaste	Decentralised Alternative energy cluster
3	UHLA (CZ) Posumavi	Šumavaprodukt s.r.o.	Creativity and sustainability in Rural Entrepreneurship cluster
4	UHLA (CZ) Posumavi	Turistická oblast Pošumaví	Food and agricultural systems and supply chains cluster
5	TRA (MT), Birkirkara	Circular Rural Living Lab Malta	Food and agricultural systems and supply chains cluster, Digital Technologies cluster, Social farming cluster
6	FRCT (PT) Terceira Island	Happy Cows Project	Food and agricultural systems and supply chains cluster
7	UL (SI), Slovenia	SRS Padna – Historian houses	Creativity and sustainability in Rural Entrepreneurship cluster, Food and agricultural systems and supply chains cluster
8	UL (SI), Slovenia	SRS Solčava – Logarska dolina	Social farming cluster, Food and agricultural systems and supply chains cluster
9	UL (SI), Slovenia	SRS Kungota – House of all generations	Creativity and sustainability in Rural Entrepreneurship cluster, Food and agricultural systems and supply chains cluster
10	CRAPL (FR), West of France	Energetic transition for farms in West FR	Decentralised Alternative energy cluster
11	CRAPL (FR), West of France	Agricult. biomethane product unit to energy transition	Decentralised Alternative energy cluster
12	ZSA (LV), Latvia	Smart Collaboration for Agriculture	Food and agricultural systems and supply chains cluster
13	ZEKA (TR), Manisa	Olive Excellence Center	Food and agricultural systems and supply chains cluster, New regional/local investment alternatives in rural areas cluster
14	UCT (IT), Trasimeno	Efficiency of processes in rural tourism	Food and agricultural systems and supply chains cluster, Creativity and sustainability in Rural Entrepreneurship cluster

15	E 35 (IT), Reggio Emilia	Cooperativa di Comunità 'Valle dei Cavalieri'	Social farming cluster, Food and agricultural systems and supply chains cluster, Creativity and sustainability in Rural Entrepreneurship cluster
16	E 35 (IT), Reggio Emilia	Parco commestibile Edible Park for citizens	Food and agricultural systems and supply chains cluster
17	DAR (TN), Quedhref	Kolna Kesra	Food and agricultural systems and supply chains cluster, Creativity and sustainability in Rural Entrepreneurship cluster
18	CRAB (FR), Brittany	Metha BDC	Decentralised Alternative energy cluster
19	CRAB (FR), Brittany	Air and Energy Territorial Plan	Decentralised Alternative energy cluster
20	CRAB (FR), Brittany	Dairy Territorial Value	Food and agricultural systems and supply chains cluster

*Table 5. Clustering the new Circular Rural Living Labs. Source: Author and Grüneis et al 2019.*

## CONCLUSIONS

The World Economic Forum and Ellen MacArthur Foundation were the pioneers to boost to shift from the current linear model of economy (Lean Business Model Canvas) to a Circular Business Model Canvas and attracted the attention and cooperation of the major global companies, NGOs, Governments, and policymakers. The reasons for this fundamental change is forecasted and expected by its huge financial, social and environmental benefits. Additionally, the global shift from LEAN model of economy to CIRCULAR also concerns smaller companies, consortiums, core groups, clusters, social enterprises and cooperatives on a micro-level in smaller regions.

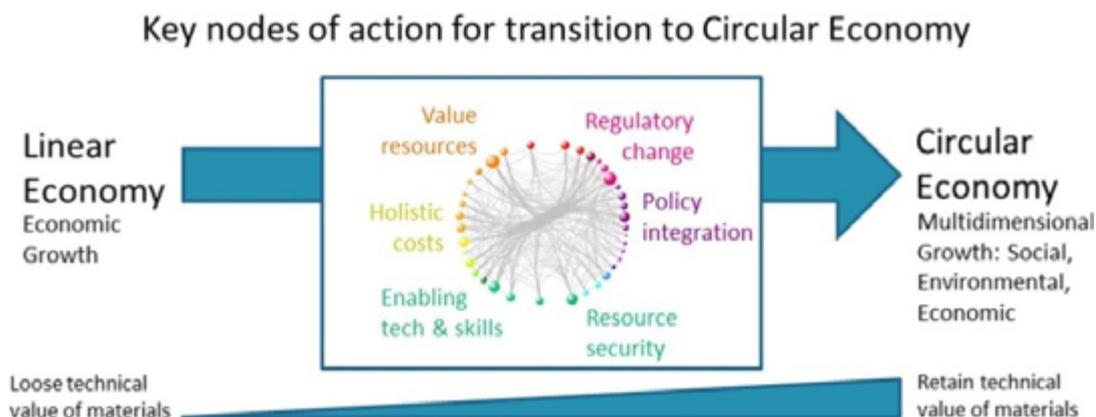


Figure 13. Key components to CE: Multidimensional Growth: Social, Environmental, Economic and Retain technical value of materials. Source: Anne P.M. Velenturf, Juliet S. Jopson.<sup>9</sup>

Therefore the key points in the regional innovation systems within *LIVERUR* should include all the components to design sustainable Circular Business Models and be incorporated in *LIVERUR Roadmap On Circular Strategies 1.0*:

- Designing and adapting business development and innovation concepts, such as clusters, to the specificities of rural regions; and
- Making the most of digital possibilities, including digital services for new modes of education and communication to build innovation capacity, and through the delivery digital services in all domains to facilitate daily life.
- Design and innovation in Rural context
- Unlocking investment in the rural economy
- Harnessing the role of business and consumers
- Towards a recycling society – waste as a resource
- Waste targets review
- A resource efficiency target
- Clustering actors, application fields, products and processes

The proposed horizontal and vertical actions at macro and micro level are in accordance with the SDG goals.

The *LIVERUR Roadmap On Circular Strategies 1.0* could be discussed, defined and evaluated on the regional stakeholders meetings, inviting the decision makers in connection of various tasks in WP4 (T4.3. and T4.4.) , WP5 and WP6. (T6.1).

<sup>9</sup> Anne P.M.Velenturf, Juliet S.Jopson: Making the business case for resource recovery.2018. <https://doi.org/10.1016/j.scitotenv.2018.08.224>

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