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## Framework for a circular economy strategic planning

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## Summary

The aim of this report is to present the framework for a circular economy strategic planning that has been designed ad hoc for the CICERONE project. After a brief reminder of the fundamentals of circular economy to clearly set the scope of analysis, two methodologies will be presented. The first methodology (A) will be used for T1.4 and T2.2 and the main criteria for the assessment of current and future programs have been highlighted. The second methodology (B) has been developed and structured in order to make the future SRIA based on a collection, assessment and prioritization of objectives, innovation fields toward roadmaps per themes and per challenges. At the end, it will allow to propose key integrated pilots that rely on the highest priorities in Innovation Fields to be funded by the future CICERONE platform. Specific and user-friendly tools have been designed to perform the assessment of Innovation Fields (see annex excel files).

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## Approval

Date	By
2020-03-17 10:08:09	Dr. Jean-francois RENAULT (FZJ)

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## KEYWORDS

*Sustainable innovation, Circular economy, Environment, resources and sustainability, Public sector innovation, sustainability, SRIA, programme owners, framework, objectives, innovation field, criteria, prioritization, assessment, planning, methodology, roadmap*

## 1 INTRODUCTION

The aim of this report is to present the methods for a circular economy strategic planning that have been designed *ad hoc* for the CICERONE project, although deeply relying on the current state of art in terms of frameworks for guiding multi-dimensional analysis in the purpose of a circular economy strategic planning. The first section will explain the objectives of the methodologies and how they are intended to be implemented in different tasks of the project, their specificities, and how it was co-created with the respective other tasks participants in order to ensure a proper and efficient use in their own analysis. It will summarize the process that has been developed from M1 to M6 in order to build the content and results that are presented in this report. A brief reminder of the fundamentals of circular economy will also be proposed to clearly set the scope of analysis that we defined for the purpose of this task. The second section will describe the methodologies in describing i) the

assessment of performances in R&I programs on one hand, (ii) the prioritization of R&I activities for the future SRIA on the other hand. The synergies between these two methodologies will be highlighted and guidelines will be clearly presented so that these tools can be autonomously used by other tasks' participant in CICERONE, and even beyond, by the future joint platform when it will be created, and possibly amongst the stakeholder networks. The third section will more specifically detail the operational use of the files that have been created for the purpose of the project. Finally, the last section will conclude on the expected outcomes of the implementation of the methodologies by presenting a few scenarios on the possible results that may be achieved based on the methodologies, as well as a SWOT analysis related to the successful practical use of the theoretical canvas here exposed.

## **2 OBJECTIVES, CO-CREATION PROCESS AND SCOPE OF ANALYSIS**

### **2.1 Objectives**

The objective of this task is to develop a framework for guiding multi-dimensional analysis in the purpose of a circular economy strategic planning. It will be implemented directly within CICERONE in tasks T1.4, T2.1 and T2.2 to prioritization and performance activities but also potentially beyond CICERONE when the joint platform will be set-up. The methodologies proposed in this report have to be considered as canvas / guidelines / protocols to be followed in the upcoming analysis but the actual content will be provided in each respective tasks, not in T1.3. The main advantage is to decouple the theoretical framework design approach with the practical use, even though the whole work presented here was commonly built with all participants involved in the implementation of these methodologies. By doing so, T1.3 ensure a proper harmonized logics between T1.4, T2.1 and T2.2.

### **2.2 Co-creation process**

T1.3 was led by CEA, in charge of coordinating the methodologies built-up, and involved primarily VITO (T1.3 leader), IVL (T2.1 leader), TNO (T2.2 leader), as well as PNO and GKZ. In addition, ENEA, as WP2 leader has been included in all discussions and meetings to ensure a good consistency between WP1 and WP2. Having VITO, IVL and TNO fully committed in the construction of methodologies has been a key success factor for the future implementation of these in their respective tasks. Indeed, the risk of designing a theoretical framework without users would have been to produce elements that are not sufficiently aligned with their corresponding objectives, or simply not enough easy to understand for a person that didn't participate to build it up. Through different means, it has been possible one hand to source relevant information from the literature and the expertise from the different participant, from other inputs within CICERONE (such as WS1 outcomes, or the PO survey from WP4), and on the other hand by collective intelligence brainstorming face to face and by phone. Finally, PNO and GKZ prepared a memo on the adoption drivers for CE business models from the perspective of SMEs, and industries in the primary and secondary raw materials sector such as metallurgy. The aim of this contribution is to ensure a sound consideration of problematics faced by economic stakeholders which may balance with very practical insight a more theoretical approach as designed in T1.3. Figure 1 shows the summary of the co-creation process that was followed from M1 to M6.

## T1.3 Co-creation process overview



**Figure 1: Overview of actions led between M1 and M6 to feed T1.3 analysis**

To ensure efficient usability of the methodology developed in this task, a revision plan has been developed with partners involved in its application (VITO, IVL, TNO), to ensure improvements are made when necessary. Special efforts were made to clearly detail the methodology build-up step-by-step, so that it is as self-explanatory as possible. In addition, a user friendly excel tool has been created, to be directly used for criteria prioritization assessment (see Section 4 of this document).

Foreseen improvements / adaptations include:

**Methodology A** (See Section 3 of the document): evaluation of indicators in T1.4 can help to check whether the input in T2.2 is relevant. However, T1.4 participants found out that it was particularly challenging to get quantitative data and information on the relevant KPIs proposed in D1.4 to measure the effectiveness of CE programmes. An example that illustrates the challenge of good input indicators for T2.2 concerns sustainable production metrics but such information is not systematically available. Consequently, the methodology can be adapted to use different quantitative goals, and thus align with updated Circular Economy strategies and Actions Plan. Moreover, future feedback on the SRIA will provide recommendations to fine-tune methodology A. In the short-term implementation Plan (Task 3.4) a process of updating the Methodology A will also be suggested, e.g. for the selection of new joint programmes and their impact assessment. **More information on these revisions can be found in the related deliverables under Task 2.2 and Task 3.4.**

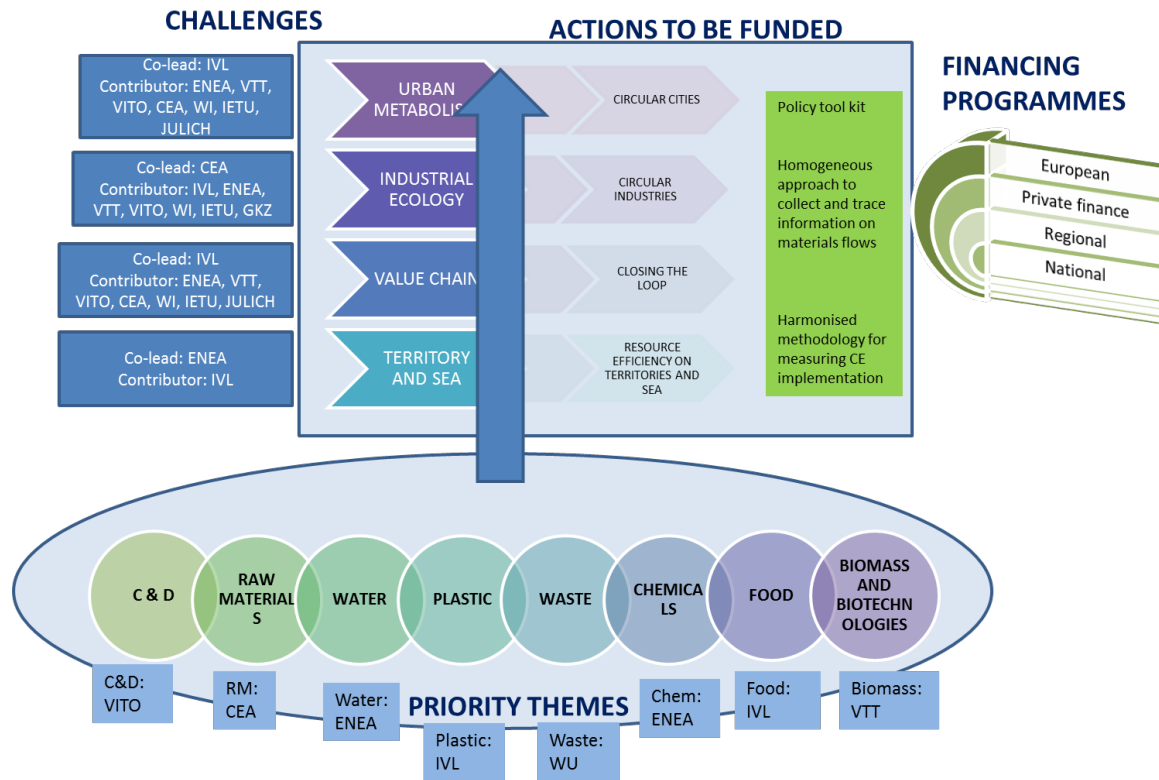
**Methodology B** (See Section 3 of the document): The calculation method was improved in the prioritization process to determine the prioritization cut-off in T2.1 – instead of using a standard cut off (e.g. average score), T2.1 participants adapted the cut-off based on all the data collected for each theme/challenge by calculating an equal product curve across the data. This provides much more granularity in determining which innovation fields can be prioritized for each theme/challenge. T2.1 participants also decided to remove the roadmapping step from the whole prioritization / characterization process given that the input and definition of the platform (members, service, model, etc.) was required for determining both the timeline and location of the IFs. In the S short-term implementation Plan (Task 3.4) a process of updating the Methodology B will also be suggested, for identifying new innovation fields and joint programmes. **More information on these revisions can be found in the related deliverables under Task 2.1 and Task 3.4.**

### **2.3 Reminders, terms and definitions on Circular Economy**

Circular Economy is gathering a huge amount of literature, in particular trying to give definitions (as available in D1.1 and also reminder in Annex A), scopes, approaches and the aim of CICERONE is not to lead research on that purpose. T1.3 in particular will start from the state-of-art and most commonly shared expressions to give the minimum of concepts, vocabulary and boundaries where the methodologies are relevant to be applied. The Description of Work already proposed a segmentation of the main priority themes that may be related to existing resources flows where CE can be implemented such as plastics, water, raw materials etc... They also represent a possible market segmentation at a very high level but that may be refined later in the project as analysis is progressing. However, it is very important to underline that value chains may be very different from a theme to another, and even with a theme, depending on the type of material / product, the supply, demand, technology barriers, regulations may be completely different. In that sense, it is not really relevant for the purpose of CICERONE to make a full representation of the market, since CE is not a market itself with different segments, but rather a constellation of market involving various industries and stakeholders. As a summary, for T1.3, the only important definition are the ones from the priority themes, as well as the cross-cutting challenges.

As it is currently discussed within T2.1, in principle, the themes are understood to represent material flows (both raw and manufactured, primary and secondary materials) and in relation to relevant key sectors. On the other hand, the challenges refer to the various geographical and societal levels on which CE is applied. Urban areas can include urban and peri-urban areas, territory and sea can include coastal areas, and industrial systems can be seen from the individual plant level to the level of multiple plants (e.g. industrial park). In this regard, value chains can refer to a macro level, such as the trade and movement of products, materials and commodities globally and between countries, etc.

According to the WS1 outcomes, for all challenge groups (Urban areas, Industrial systems, Value chain and Territory and Sea), it is essential to take all priority themes into consideration because these are composed of complex and interlinked systems and sub-systems. Although some challenges will have more straightforward priorities related to some themes, it is difficult a priori to assign specific themes to a corresponding challenge without possibly forgetting very important issues. In methodology B presentation in section 3.2, we will introduce how this correspondence will be ensured following a precise prioritization route.



**Figure 2 : Reminder of CICERONE concept with themes and challenges** (*intermediate version, under construction in T2.1*)

Besides, it was proposed in the previous EU-funded project, FUTURING, to define six Building Blocks that enable to represent all dimensions that must be taken into account to address CE<sup>1</sup> :

- **Science & Technology**, such as eco-design, recycling processes, ecotoxicology or humanities...
- **Business & Innovation**, such as circular business models, eco-systemic cooperation...
- **Human Being & Society**, such as behavioural change or consumption patterns...
- **Policy & Finance**, such as public procurement, regulations, incentives, standardisation...
- **Environmental responsibility**, such as corporate social responsibility...
- **Education & Training**, such as long-life learning or public awareness...

T1.3 will start from this result on build the methodologies including as much as possible in a harmonized way these different dimensions.

Finally, another type of classification is target groups, which corresponds to the spatiality of where CE will be applied: at a micro (for example, a building level), at meso (for example, a district or an eco-industrial park), or at a macro level (for example a city, or a region). Indeed, the specificities of a CE implementation challenges may be quite different depending on the scale which may have impact on the relative weight of the different Building Blocks presented here above. As an example, policy & finance may have a stronger influence at macro level CE implementation, or the business models could be successful at a meso level, such as in industrial symbiosis, whereas this may not be relevant at a higher scale or simply not economically viable at a lower one.

<sup>1</sup> <http://www.futuring-project.eu/static/deliverables/FUTURING-D1.3.pdf>

According to the current progress of T2.1 at M5, it has been initially discussed to align the challenges with such geographical scaling micro/meso/macro.

As a conclusion, this analysis will rely on commonly agreed concepts defining CE based on the literature, not trying to reinvent an ad hoc one, will build from simple segmentations in terms of resources flow, called priority themes that may be linked to a series of actual industries and value chains, and will use terms and definitions that simply enable to describe the multi-dimensional, systematic and holistic specificities of CE for the purpose of the task T1.3.

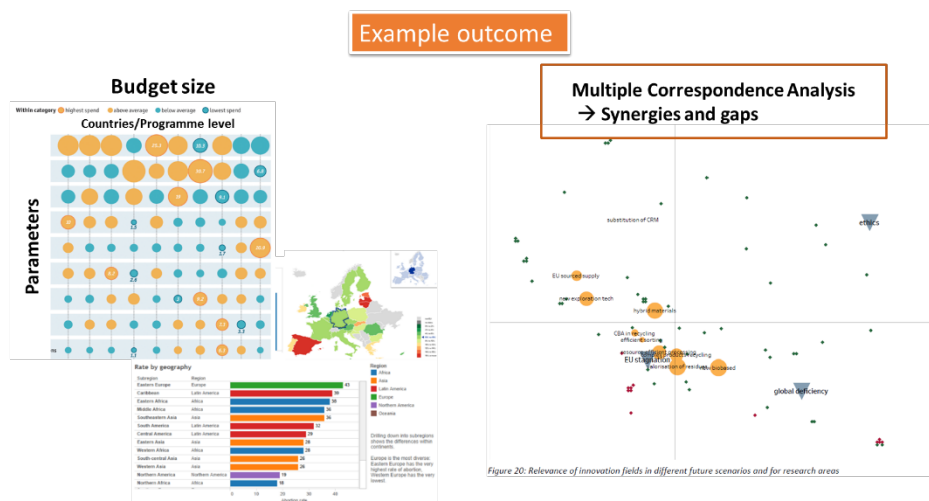
### 3 DESCRIPTION OF METHODOLOGIES FOR STRATEGIC PLANNING

This section will detail the construction of the methodologies for strategic planning. Two methodologies will be presented that address different tasks and different objectives.

First, methodology “A” or “Assessing Circular Economy R&I programmes” aims:

- To identify needs and gaps of current R&I programmes by providing a baseline of aspects and key performances indicators that may be used typically by Program Owner in order to monitor their own activities, such as the circularity impacts in terms of environment, economy, and society. A gap analysis approach will be proposed in T1.4 to evaluate individual programs by comparing their achieved impact with desired indicators as proposed in T1.3 methodology A. It will lead to more in-depth case studies to understand the success and failure factors that will feed the reflexion on T2.1. Figure 3 shows a possible representation of T1.4 results (which may significantly evolve since 6 more months will occur between delivery date of this task and T1.4 end) ;

## Coverage analysis – Compilation and analysis



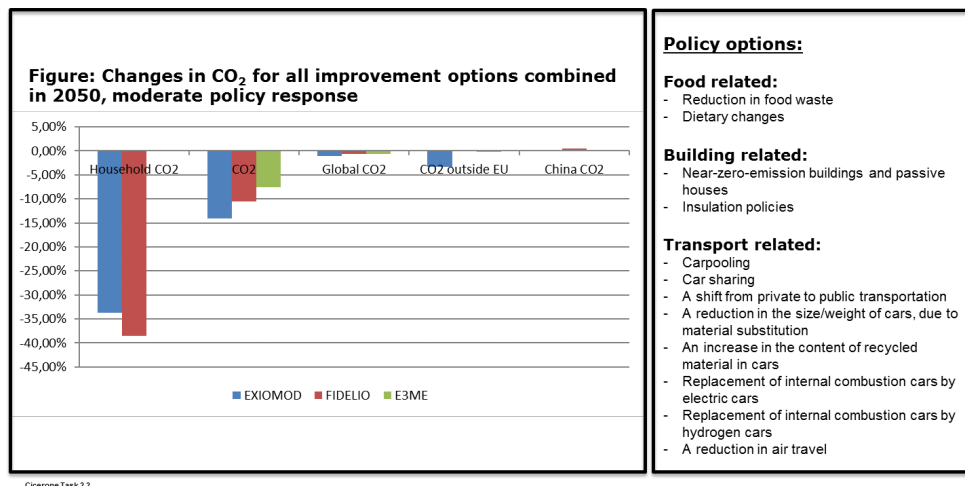
**Figure 3 : Example of T1.4 outcome** (Source: VITO)

- To use as much as possible the very same framework to perform an *ex-ante* impact assessment of the future SRIA that should take lessons learnt from the first diagnosis to operate a well performing program. The *ex-ante* impact assessment will enable to understand potential future impacts of the SRIA on environment, society and the economy. As an example, how the reduction of primary material use may reduce CO<sub>2</sub> emissions or enhance inclusive growth in the EU? The first part of methodology A implementation is



related to CICERONE Task 1.4 whereas the second part is related to Task T2.2. Figure 4 shows a possible representation of T2.2 results (which may significantly evolve since 18 more months will occur between delivery date of this task and T1.4 end).

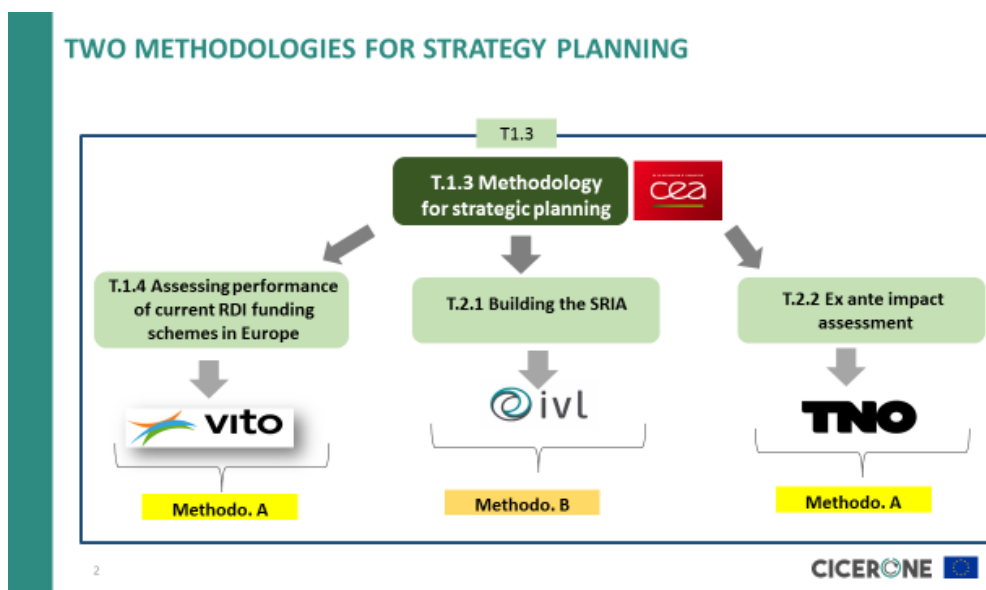
## EXAMPLE OF A PREVIOUS PROJECT



**Figure 4 : Example of T2.2 outcome** (Source: Carboncap project, TNO)

Then, methodology “B” or “Prioritizing and planning the SRIA” aims to build the overall architecture of the SRIA which goal is to set priorities in all research and innovation activities that will be categorized, mapped and ranked. The final objective is indeed to propose joint funding programmes to allow best efficiency in investments, avoid duplication of initiatives and strengthen R&I funding across EU. Thus, T1.3 intends to design the outline of the SRIA whereas the content will be developed within T2.1 following this canvas.

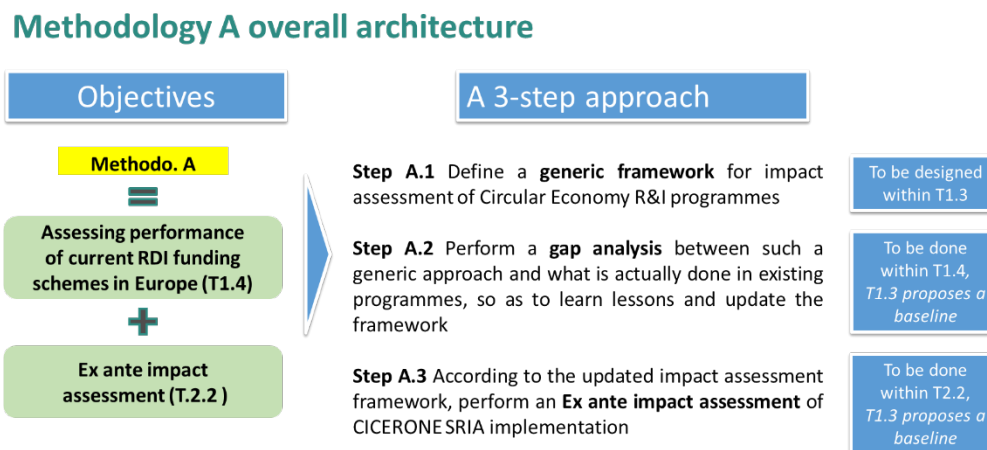
To sum-up, Figure 5 shows the correspondence between the methodologies developed in T1.3 and the tasks where they will be used in CICERONE.



**Figure 5 : Correspondence between methodologies and tasks**

### 3.1 Assessing Circular Economy R&I programmes (related tasks in CICERONE: T1.4 & T2.2)

Considering its relation with CICERONE other tasks, T1.3 “Strategic Planning Methodology A” is about building up a framework of evaluation for Circular Economy Research & Innovation programmes so as to use it for the assessment of performance of current RDI funding schemes (task 1.4) and the *Ex ante* impact assessment of implementing CICERONE SRIA (Task 2.2). This will be done in three steps, as indicated in Figure 6:



**Figure 6: Methodology A, a three-step approach**

#### 3.1.1 Generic framework for impact assessment of Circular Economy R&I programmes (A.1)

Circular Economy is a paradigm for organizing all aspects of production, distribution and consumption in society and the economy, and this goes through a wide set of actions (such as eco-design, repair, reuse, recycling, sharing economy or industrial symbiosis). With such a wide scope, intermediate **tangible KPIs are hardly setup**. Indeed this would need to widely integrate all dimensions of circular economy whilst being applicable to all sorts of products, services and economic or societal activities. It appears clearly when reviewing literature on progress assessment and programme evaluation within the field of circular economy (see hereby examples of documents reviewed by Task 1.3 partners) that there are two possible ways to overcome this issue, either by;

- **Being more focused** and addressing **specific projects / actions** and/or possibly **specific economic themes or challenges**, or
- Sticking to a wider approach with only considering the overall **coherence of the program structure with Circular Economy paradigm** and overarching impact criteria.

The first approach appears to be the one used most often by RDI program owners when they consider evaluating their programs in terms of circularity, and how to compare different projects (as it was reported from the SCREENLab project, Deliverable 3.3). This can be a very useful decision-making tool for fund allocations as an example or for project monitoring. Building from this background and with the intention to avoid duplicating previous work at state-of-art, the objective of T1.3 “Methodology A” within CICERONE is rather to widely embrace Circular Economy issues **at a program structure level**, rather than at project level. This means that the proposed generic

#### Literature review

- EC COM and key reports
- EU roadmaps (SPIRE)
- National strategies for CE
- FUTURING bibliography
- SCREENLab project
- Memo on “The adoption drivers for CE business models for SMEs” (PNO/GKZ)

framework for impact assessment of Circular economy R&I programmes is built in order to answer two main questions:

- **Is the programme well-structured for supporting progress towards Circular Economy?**

This is considered based on three aspects:

- **Alignment of the programme with other European, national or regional Circular Economy programmes, roadmaps and frameworks**, especially CICERONE SRIA once it will be made available to European stakeholders. The alignment applying here mostly at the level of chosen strategic objectives and financial distribution of the programme instruments.
- **A Governance involving stakeholders with a balanced representation of Circular Economy pillars**, i.e. representatives of the economic communities (companies), of society (such as political representatives or citizen associations, unions and environmental defenders).
- **A monitoring and self-evaluation process coherent with Circular Economy objectives**, i.e. taking into account all production, consumption and disposal opportunities and not only favouring a single type of action, typically recycling. This does not mean that more focussed programmes are not relevant, but the condition is obviously that the focus is to be chosen with considering the overall picture – systems, value chains and lifecycles – or there is a risk that supported solutions are not necessarily the best options.

- **How performing is the programme?**

KPIs and performance criteria cannot be generic, but any impact assessment of a Circular Economy R&I programme has to monitor its performance and do so along Circular Economy pillars, i.e.:

- **Environmental aspects**
- **Social aspects**
- **Economic aspects**
- **Indirect aspects** of circular economy framework conditions / building blocks.

These categories of impacts have to be better defined within each programme depending on the priorities of the programme owner, and the impact assessment process of Innovations Fields, as described hereafter (p. 16 and subsequent) can be better characterized with going through all proposed criteria of assessment.

Figure 7 summarizes the two-level framework for assessing RDI performance proposed in CICERONE. Figure 8 is describing more in details the list of criteria underlying impact assessment.

## A.1. Generic framework for impact assessment of Circular Economy R&I programmes



Figure 7: A two-level framework for assessing RDI performance

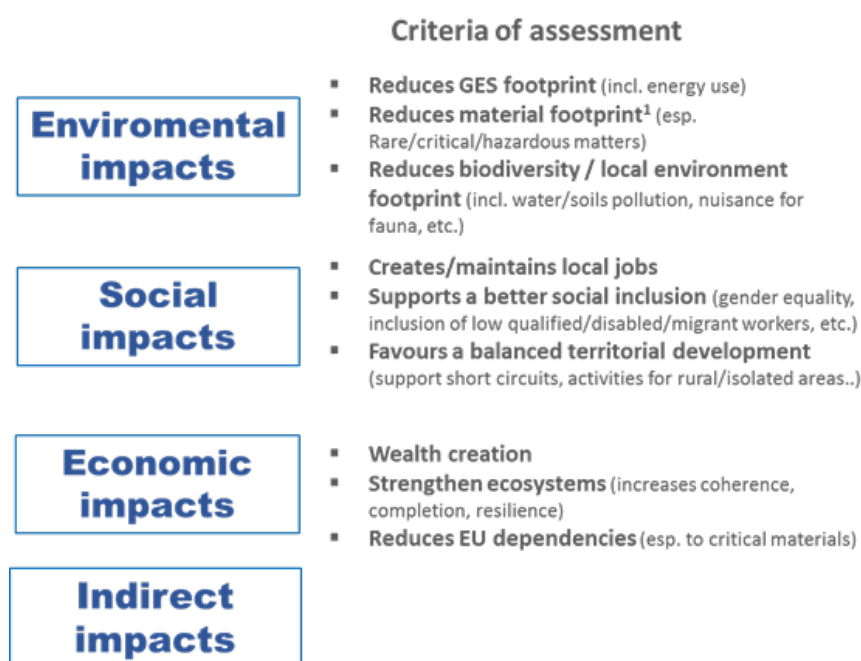


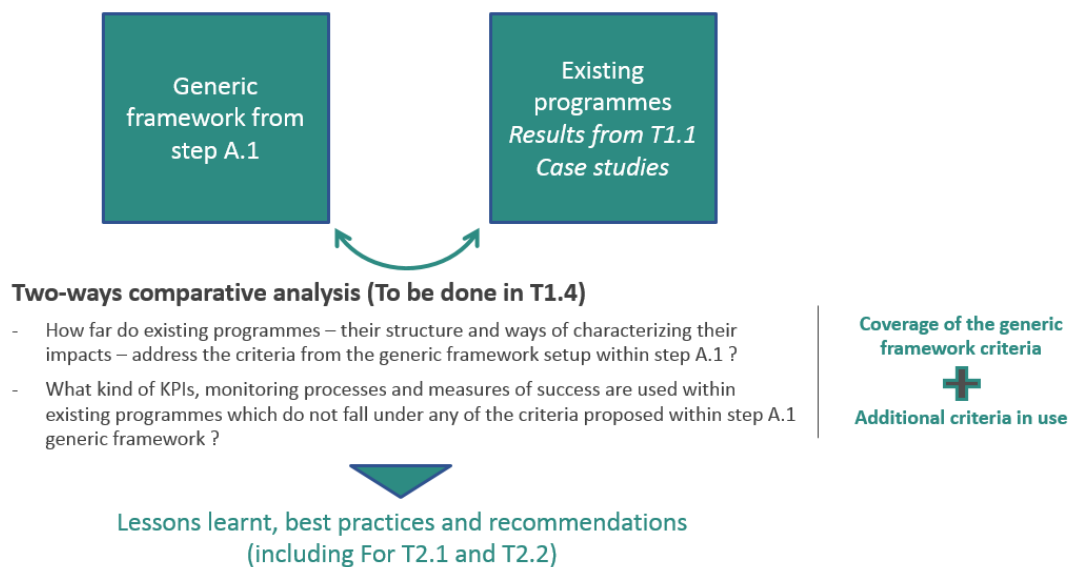
Figure 8: List of criteria underlying impact assessment, as developed hereafter within Methodology B (see as from p.16)

The selection of criteria above is based on the literature review, the Lyon workshop outcomes, several telco meetings with T1.4 participants and CICERONE other tasks inputs (see Figure 1). It was initially decided to limit the criteria evaluation with a simple Yes-No-Undecidable scale in order to keep the methodology as simple as possible. Introducing more levels or relative weights could result in a too complex calculation process, presenting a potential risk for the methodology uptake. It should be noted that it may sometimes be difficult to rate a criteria with a high level of confidence due to lack of information. A binary methodology can thus ensure a differentiation at first order and avoid introducing too many choices in the prioritization, where decisions are mainly led with basic estimations. **More information on potential risks can be found in the SRIA currently being developed as outcome from T2.1.**

### 3.1.2 Gap analysis with existing programmes (A.2)

Second step of Methodology A will be used for Task 1.4. and aims at comparing the way existing European Circular Economy programmes are actually evaluated and evaluate themselves with the generic framework established in Step A.1, so as to cross-check the approach with real cases, take advantage of best practices and lessons to be learnt **to improve the theoretical generic framework** in view of its future implementation, and possibly formulate recommendations for stakeholders to improve programme evaluation and monitoring practices. By doing this gap analysis between a theoretical framework and practical return of experiments from the field, it will be possible to adjust the SRIA as good as possible to have indicators that are complete enough while practically feasible to monitor and assess on a regular basis, and in a user-friendly way as explained in Figure 9.

## A.2.Gap analysis with existing programmes



**Figure 9: Assessing Circular Economy R&I programmes, lessons to be learnt from existing programme evaluations**

### 3.1.3 Ex ante impact assessment (A.3)

CICERONE Task 2.2 is expected to deliver an evaluation of the potential impact for Europe to successfully implement the actions recommended within the SRIA. To do so, Task 2.2 will rely on the use of **econometric approaches**, based on the expert use of databases. Exact indicators to be considered will be chosen within T2.2, considering data availability and technical assessment feasibility, but the generic assessment framework developed in Task 1.3 Methodology A, upgraded based on Task 1.4 implementation, has been preliminary **beta tested during T1.3** and **will be the reference scheme from which these indicators should be chosen** to ensure an overall consistency at project level. In particular, this generic scheme will be used as a reference for T2.2 partners to make sure they are able to evaluate impacts with considering all dimensions of Circular Economy.

### A.3.Ex ante impact assessment

Generic framework from step  
A.1 (updated after step A.2  
application in T1.4)



#### T2.2 Ex ante impact assessment is about anticipating on the potential impact for EU to implement CICERONE SRIA

- T2.2 will decide on which **indicators** can be best used to estimate the impact of the SRIA, and the level at which they have to be analyzed and consolidated (overall SRIA / per challenge / per priority theme / per innovation field)
- Criteria used within the generic framework from T1.3 Step A.1 (also used for T1.3 Methodology B IF assessment) will be a **reference** to make sure all CE dimensions of impact are considered in anticipating on the impact of the SRIA
- To estimate these impacts, TNO (as coordinator of T2.2) plans to use its **Exiobase 3.0 tool**, feeded with a lot of economic and environmental statistics at EU and national levels and able to simulate the impacts of introducing systemic changes.
- In order to make sure the impacts of implementing the SRIA can be estimated by such a tool, objectives and Innovation Fields identified in T1.3 Methodology B need to be as **quantitative** as possible.

Environmental  
impacts

Social  
impacts

Economic  
impacts

Indirect  
impacts

Impact criteria as explored in T1.3 are to  
be used as a reference for T2.2

CICERONE

**Figure 10: Relation between Task 1.3 Methodology A and Task 2.2**

NB: Regarding the requirement of performing within Task 2.2 a wide ex ante impact assessment of implementing CICERONE SRIA, the methodology B described hereafter to plan the SRIA has to consider its approach – as much as possible – with **quantitative inputs** (such as SMART objectives).

### 3.2 Prioritizing and planning the SRIA (related task in CICERONE: T2.1)

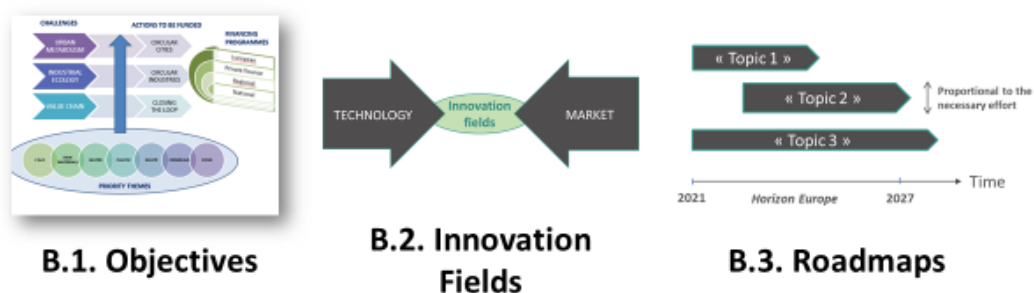
According to CICERONE Workshop 1 report: *“Investment in research and development to upscale materials and production technologies towards eco-design was highlighted as one of the most important needs. Although it is a difficult approach, it deserves our attention because of its high impact on transition to circular economy”.*

This methodology B is about the way to identify and prioritize RDI actions to be undertaken to support the effective implementation of a circular economy in Europe, such actions being then integrated into a series of roadmaps constituting a strategic research and innovation agenda for the EU. Task 1.3 is about exploring and building up such a construction methodology, whereas the effective implementation within CICERONE project will be performed in Task 2.1. Even though the chosen approach aims at being practical and strong relations are established between the two task teams, the effective implementation within Task 2.1 may vary somewhat from what is proposed in Task 1.3.

The overall approach chosen for Prioritizing and planning the SRIA is “market-pulled” in its essence, or rather said pulled by societal, environmental and economic needs associated with circular economy paradigm. This is achieved through a three-step approach:

1. **Mapping the objectives** to be pursued throughout the SRIA
2. From the objectives, deriving fields where innovation is to be supported, called **Innovation Fields**
3. Integrating these Innovation Fields into implementation **roadmaps**

## Methodology B overall architecture



**Figure 11 : Building up the SRIA, a three steps approach**

This overall methodology is inspired from the one developed and implemented between 2013 and 2017 in the ROcKETs<sup>2</sup> and KET4DUAL<sup>3</sup> projects (themselves inspired from previous European projects such as NANO futures roadmap and AGAPE project), adapted to circular economy concerns based on analysis performed within the FUTURING<sup>4</sup> Horizon2020 project.

### 3.2.1 Identifying objectives (B.1)

CICERONE relies on a structure of challenges and priority themes (see paragraph 2.3). Based on an in-depth review of relevant sources, task partners identify circular economy objectives applying to each of the challenges and themes.

#### Objectives identified at Challenges level

Objectives to be identified by partner in charge of each challenge

Challenge	Objective (Starting with a verb ; By default, at EU level ; As much as possible, quantitative and with a given date of achievement)	Objective ID	Source (use source ID)	Additional details on the objective, if available (type of stakeholders in charge, KPIs, must-have/nice-to-have...)
Urban Areas		Obj_UA#1		
		Obj_UA#2		
Industrial Systems		Obj_IS#1		
		Obj_IS#2		
Territory and Sea		Obj_TS#1		
		Obj_TS#2		
Value Chains		O_VC#1		
		O_VC#2		

**Figure 12 : Extract from the tool used to map objectives**

<sup>2</sup> Methodology, work plan and ROadmap for cross-cutting Key Enabling Technologies activities in Horizon 2020, [https://ec.europa.eu/growth/industry/policy/key-enabling-technologies/eu-actions/ro-ckets\\_en](https://ec.europa.eu/growth/industry/policy/key-enabling-technologies/eu-actions/ro-ckets_en)

<sup>3</sup> Dual-use potential of Key Enabling Technologies, <https://eda.europa.eu/info-hub/events/2016/10/25/default-calendar/ket4dual-final-joint-workshop>

<sup>4</sup> <http://www.futuring-project.eu/the-project>



Considered sources for objectives are other SRIAs – as long as they include Circular Economy related aspects – but also joint programming roadmaps or policy framework documents. The list of reviewed sources will be part of the deliverables of Task 2.1.

Within these source documents, task partners will be looking for objectives:

- **Addressing all aspects** (or as much as possibly available) **of circular economy** (eco-design, repair, re-use and recycling, sharing economy, material substitution, industrial symbiosis...), and all dimensions (technological and non-technological) but strictly related to circular economy;
- Worded as **homogeneously** as possible, especially starting with a verb to enable a proper interpretation and a common understanding of all objectives;
- As much as possible, associated with **quantifiable achievements**<sup>5</sup>
- As much as possible, associated with a **target date** of achievement.

In order to remain focussed on most important aspects, partners are asked to identify **no more than five objectives per challenge / priority theme**. Of course this will remain a soft rule and may be overpassed if real good reasons for identifying more objectives are made clear.

For traceability purpose, unique numbers will be attributed to each objective, and partners will be invited to collect additional information on the objectives, such as the type of stakeholder in charge of achieving it, the key performance indicators chosen to follow up progress, if it is considered as a mandatory objective or rather a “nice-to-have” one, etc.

### 3.2.2 Defining Innovation Fields (B.2)

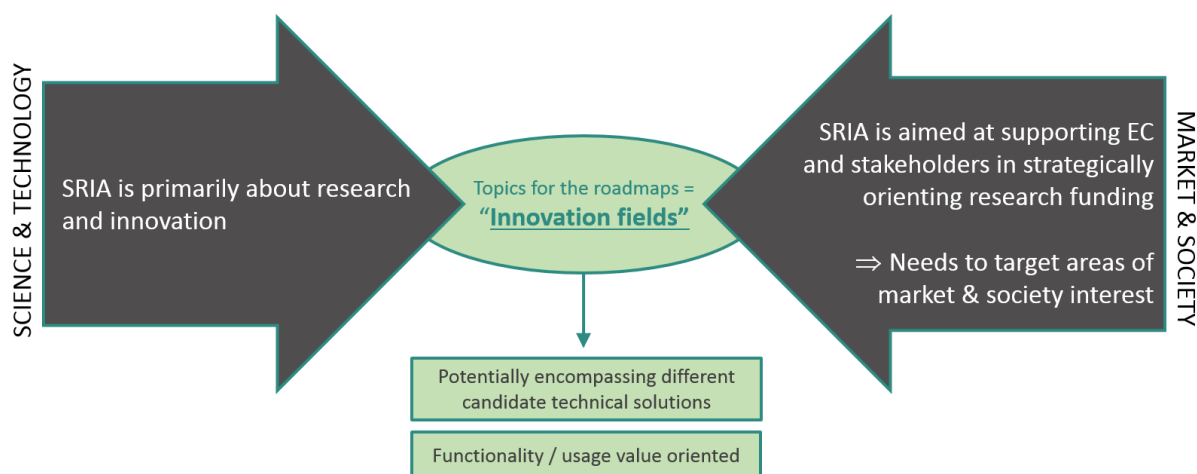
A strategic research and innovation agenda is primarily about identifying and prioritizing “areas” where specific R&D efforts need to be developed. Such areas are to be defined at the right level, associated enough with clear objectives to make sure that research will be oriented towards impactful achievements, focussed enough to make sure research achievements are realistically likely to reach the objectives within a reasonable timeframe, yet still open enough to ensure a certain level of technology/innovation neutrality, so that doors are left open for competing RDI solutions.

Such an issue of finding the right balance between market and society needs and science & technology capabilities was addressed in the abovementioned RO-cKETs and KET4DUAL projects, with setting-up the concept of **Innovation Fields**, as described in Figure 13.

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<sup>5</sup> This requirement comes as a support to CICERONE Task 2.2, ex ante impact assessment, since quantitative objectives will better support assessing the impact of implementing the SRIA.





**Example**

Label: « Advanced water filtration solutions »

Description: Membrane filtration/separation processes for municipal and industrial wastewater treatment, characterized by superior product water quality, reduced footprint at plant level and reduced energy consumption

Underlying technologies: micro/nano-filtration systems, reverse osmosis, membrane Bio-Reactors, etc.

Market requirements /objectives addressed: safeguarding water resources through better retreatment

**Figure 13: The concept of Innovation Field**

*NB: even though without using the Innovation field concept, most – if not all – SRIAs are built around “topics” which could endorse the Innovation Field definition.*

Within CICERONE, the identification of Innovation Fields will be done by Task 2.1 partners based on the identified objectives and according to the distribution of work proposed by T2.1 leader (IVL)

### Identification of Innovation Fields from the list of identified CE objectives

Identification of Ifs to be done by each partner based on the distribution of objectives per challenge and per theme, as proposed by task coordinator

Objective ID	Partner in charge	Objective (as from the consolidated lists of challenge-level or theme-level objectives)	Innovation Field (formulated so as to address clear requirements and encompass technical/scientific solutions, e.g. "Efficient and safe substitutes to toxic chemicals" or "Matter embedded traceability solutions")
Obj_UA#1			

**Figure 14: Template table for Innovation Field identification**

As shown in Figure 14, each partner in charge will identify **one to three Innovation Fields per objective** (the limit of three Innovation Fields per objective being once again a soft rule aimed at keeping the number of Innovation Fields under control, to be overpassed in specific situations). Then, the task coordinator will **consolidate a single list**. To do so, all identifies Innovation Fields will be carefully reviewed so as to capture redundancies, proximities and non-conform wordings. Depending

on the situations, Innovation Fields will be merged, reworded or abandoned, whilst keeping track of the link with overarching objectives and thus to challenges and roadmaps. In the end, a single consolidated list of Innovation Fields will be made available to partners for review and each will be attributed a unique identification number as described in Figure 15.

### Consolidation of the list of Innovation Fields

Consolidation of a single list of IFs to be done by task coordinator based on the collection performed by partners

Innovation Field (as from previous tab or modified so as to consolidate a single list of IFs)	Stemming from... (one or several objective)	Applying to...												Innovation Field ID
		Urban areas	Industrial systems	Territory & Sea	Value Chains	Raw Materials	Water	Plastic	Waste	Chemicals	Food	Biomass	Construction & Demolition	
	Objective ID		x					x						IF#1

Figure 15: Consolidation of a single list of Innovation Fields

### 3.2.3 Building Roadmaps (B.3)

Based on the list of Innovation Fields, roadmaps are to be built for challenges and priority themes. This will be done in CICERONE in two main steps:

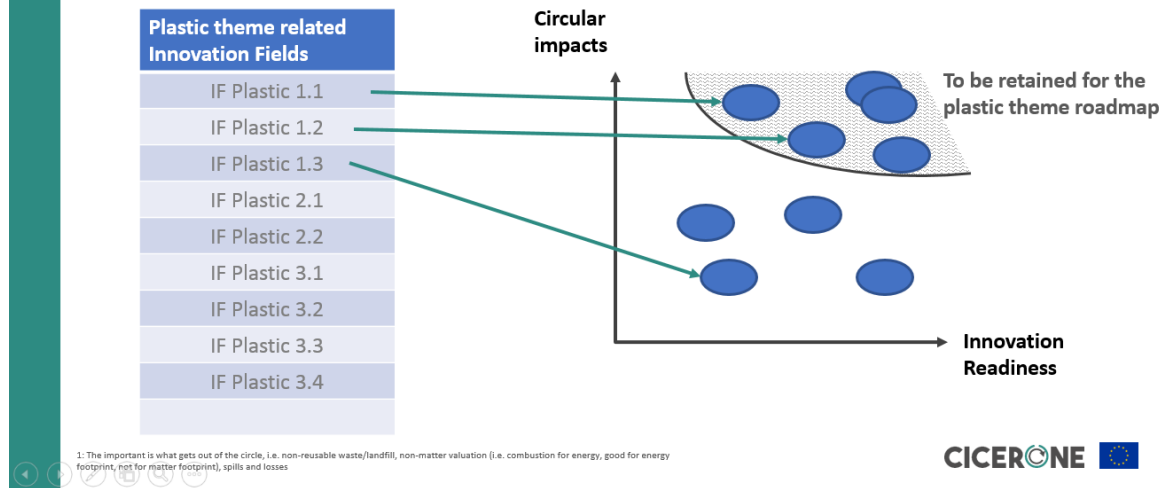
- Prioritization of Innovation Fields
- Building up of the roadmaps

#### 3.2.3.1 Prioritization of Innovation Fields

All Innovation Fields derived from all sorts of circular as identified with previous steps will not be of equal relevance for supporting the transition of Europe towards a more circular economy. This is why each Innovation Field will be plotted with regards to two axes: Circular Impacts and Innovation Readiness as described in Figure 16.

## B.3- Build roadmaps

### - B.3.3 Prioritization of IFs



**Figure 16: Schematic view of the Innovation Field prioritization process**

**Circular Impacts** is a synthetic aggregate of **impact assessment** along the three impact axes for a sustainable economy (as explored e.g. within the FUTURING project), i.e. Environment, Society and Economy. Each of these axes are assessed based on the expected impact of successfully implementing the Innovation Field, considering impact axes in their broadest meaning:

- **Environment axis** considers the effect of implementing the Innovation Field with regards to greenhouse effect gases emissions and global warming, also with regards the material footprint of human activities (considering not only volumes but also criticality of materials<sup>6</sup>) and the effect of activities on local pollutions, health of ecosystems and biodiversity.
- **Society axis** includes jobs protection and creation, social inclusion such as on gender equality or disabled workers), and supports a balanced territorial development through supporting short distribution circuits or fostering activities in rural or isolated areas.
- **Economic axis** gathers direct economic value / wealth creation (including new enterprises as a complement of creating/maintaining new jobs) and more long term effect such as the consolidation of European ecosystems and value chains and supporting EU strategic non-dependency.

As shown summarized in Figure 17, considering several tenths of Innovation Fields are likely to be identified and all need to be assessed along these numerous and complex impact criteria, **a basic Positive/Neutral/Negative impact assessment scale is chosen**, to be applied through a Red-Orange-Green colour attribution for each criterion, based on CICERONE partners' expertise. Considering there are nine underlying impact criterion to be considered, the result of the assessment will be a shade of colour with many possible values, thus leading to a smooth distribution of the Innovation Fields along the impact axis.

<sup>6</sup> [http://ec.europa.eu/growth/sectors/raw-materials/specific-interest/critical\\_fr](http://ec.europa.eu/growth/sectors/raw-materials/specific-interest/critical_fr)

## B.3- Build roadmaps

### - B.3.1 Qualify Circular Impacts 1/2

	Criteria of assessment	Qualitative assessment (based on expert judgement)	Synthetic circular impact index
<b>Environmental impacts</b>	<ul style="list-style-type: none"> <li>Reduces GES footprint (incl. energy use)</li> <li>Reduces material footprint<sup>1</sup> (esp. Rare/critical/hazardous matters)</li> <li>Reduces biodiversity / local environment footprint (incl. water/soils pollution, nuisance for fauna, etc.)</li> </ul>	<p><b>High impact – Neutral – Negative impact</b></p> <p><b>Positive impact:</b>  Significant positive impact of implementing the IF on the criteria</p> <p><b>Neutral/undecidable/ ambiguous impact :</b>  The overall impact of implementing the IF can definitely not be decided as positive or negative, because of assessment complexity, contradictory effects or ambiguity.</p> <p><b>Negative impact:</b>  Significant negative impact of implementing the IF on the criteria</p>	
<b>Social impacts</b>	<ul style="list-style-type: none"> <li>Creates/maintains local jobs</li> <li>Supports a better social inclusion (gender equality, inclusion of low qualified/disabled/migrant workers, etc.)</li> <li>Favors a balanced territorial development (support short circuits, activities for rural/isolated areas..)</li> </ul>		
<b>Economic impacts</b>	<ul style="list-style-type: none"> <li>Wealth creation</li> <li>Strengthen ecosystems (increases coherence, completion, resilience)</li> <li>Reduces EU dependencies (esp. to critical materials)</li> </ul>		

1: The important is what gets out of the circle, i.e. non-reusable waste/landfill, non-matter valuation (i.e. combustion for energy, good for GES footprint, not for matter footprint), all sorts of spills and losses

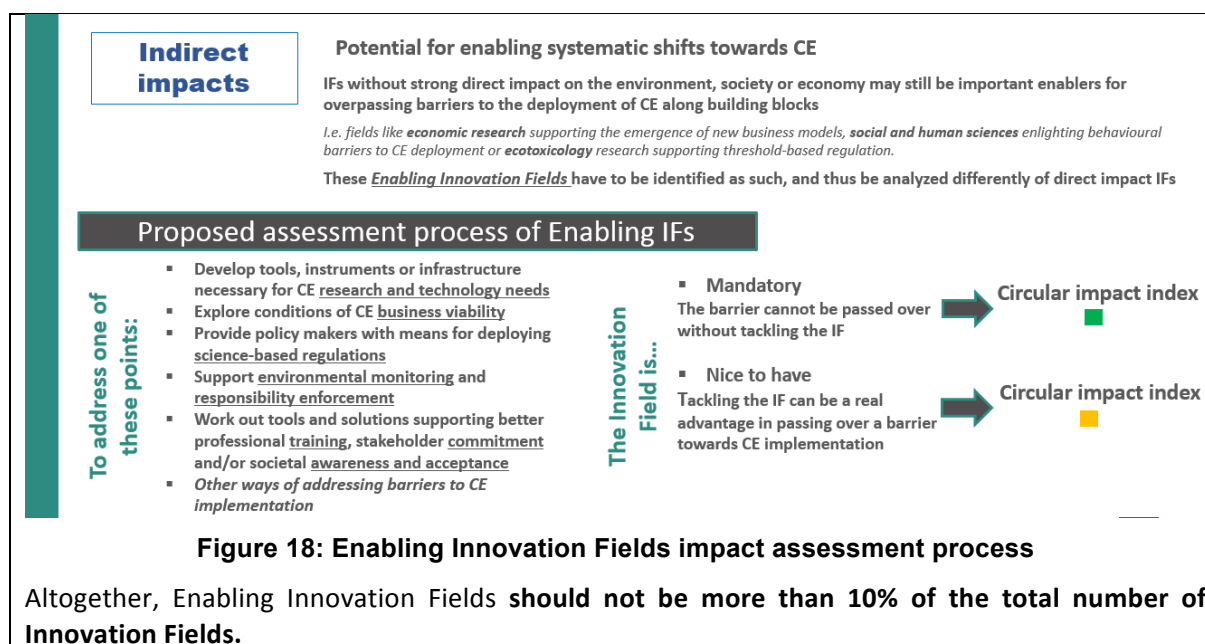
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**Figure 17: Multi-criteria assessment of impacts**

It is to be noted that even though for practical reasons the assessment is done by individual partners and no detailed proof-reading or validation of the evaluation of each criteria for each Innovation Field is planned in the process, the role of task 1.3 in CICERONE project is to make sure all partners involved in assessing Innovation Fields share a common understanding of the process. The project structure involves several stakeholder review and validation opportunities which will enable ex post correction of incidental errors.

#### Enabling Innovation Fields

Circular economy is about **systemic shifts** within production, distribution and consumption social processes. Systemic shifts by nature involve many parameters considered within CICERONE through the *building blocks* concept (as determined within FUTURING project and reminded in paragraph 2.3). Working out research and innovation activities with an impact on these building blocks – i.e. activities which improve the framework conditions under which Circular Economy paradigm can be implemented – is probably as important for the overall impact of the shift effort as working out activities with a more direct impact on the environment, society or the economy. To take this fact into account, a specific type of Innovation Fields is introduced – namely **Enabling Innovation Fields** – with a special assessment process based on the recognition of the fact that these Innovation Fields are mandatory, or at least very helpful, to overpass a barrier affecting one or several building blocks.



The assessment exercise itself is to be performed based on a unique table as presented in Figure 19.

Circular Impacts										
Environmental impacts			Social impacts			Economic impacts			Indirect impacts	
Reduces GES footprint (incl. energy use)	Reduces material footprint (especially Rare/critical/hazardous matters)	Reduces footprint on biodiversity / local environment (incl. water/soils pollution, nuisance for fauna, etc.)	Creates/ maintains local jobs	Supports a better social inclusion (gender equality, inclusion of low qualified/ disabled/migrant workers, etc.)	Favors a balanced territorial development (support short circuits, activities for rural/isolated areas..)	Creates wealth	Strengthen ecosystems (increases coherence, completion, resilience)	Reduces EU dependencies (especially to critical materials)	The IF is a CE enabler for... (qualify the IF contribution to leveraging CE potential ; only if direct impacts are not assessed)	Criticality from CE enabling IFs (to be filled in only if direct impacts not assessed)

**Figure 19: Extract from the Innovation Field impact assessment table (complete table in Annex)**

**Innovation Readiness** is the second Innovation Field prioritization axis, aimed at measuring how far society and markets in Europe are open and ready for effectively hosting and taking advantage of the innovation from this field. In other words, the “Circular impact” axis is evaluating the potential impacts of the Innovation Fields, and the “Innovation readiness” axis is intended to evaluate if the Innovation Field is likely to deliver this potential impact.

As for circular impacts, this assessment is performed through considering a number of underlying criteria and assessing each Innovation Field with regards to each of them according to a **quite basic Yes-No-Undecidable scale**.

## B.3- Build roadmaps

### - B.3.2 Qualify Innovation Readiness

Criteria of assessment	Related Building Blocks	Weight	Qualitative assessment	Doability mark
<u>With-research feasibility</u> : existence of at least 1 identified but still needing research technical solution to address the IF (if technological TRL3-7)	Science & Technology	≈40%	Yes– No - Undecidable	Yes No Undecidable
<u>Business readiness</u> : existence of business models coherent with the IF and related value chains & markets in EU	Business & Innovation	≈15%	Yes– No - Undecidable	Yes No Undecidable
<u>Legal applicability</u> : existence of a regulation and responsibility framework for the IF	Policy & Finance Environmental responsibility	≈15%	Yes– No - Undecidable	Yes No Undecidable
<u>HR doability</u> : skills are available for effective IF deployment (no shortage)	Education and training	≈15%	Yes– No - Undecidable	Yes No Undecidable
<u>Social acceptability</u> : the IF faces no <i>a priori</i> barrier to its social acceptance	Human being and society Education and training	≈15%	Yes– No - Undecidable	Yes No Undecidable

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**Figure 20: Assessment process of Innovation Fields along the Innovation Readiness axis**

As summarized in Figure 20, the five underlying criteria are all about **potential barriers to the effective deployment of innovations** stemming from the given Innovation Fields, i.e. evaluating if RDI actions undertaken within the Innovation Field will have to face issues in relation with:

- **Research /technical feasibility**
- **Business models,**
- **Legal framework**
- **Availability of necessary skills**
- **Social acceptance.**

The “With research feasibility” criteria deserves a specific comment, since the issue here is about making sure an Innovation Field is built on demonstrated concepts and/or technologies, so that undertaken research relies on sound science and technology assets and can thus reasonably be considered likely to lead to viable products and solutions (even though there obviously always remains a risk inherent to research activities). Yet, another point for an Innovation Field to be eligible to appear on the SRIA roadmaps is that **it still embraces research challenges**, meaning that mature or too near-market solutions have also to be excluded. Innovation fields are not technologies – and are not necessarily technology-based – but as a guideline it is considered that a technology-based Innovation Field is valid according to this criteria if it encompasses technologies between TR3 and TRL7.

Considering the quite crucial importance of making sure that Innovation Fields retained to be in CICERONE SRIA roadmaps are eligible for RDI action support and thus effectively pass this “With research feasibility” criterion, **a weighting factor is considered**. The exact weighting will be adapted once CICERONE Task 2.1 partners have all Innovations Fields in hand and can see the impacts of fine-tuning the values to reach consistent results, but it *a priori* seems relevant to consider that within a circular economy paradigm which highlights the importance of non-technical aspects the business, legal, skills and social acceptability criteria have to bear a major weight in the assessment (≈60%), but that the technical feasibility criterion alone has nevertheless to endorse a strong minority weight (≈40%).

As for circular impacts, the Innovation Readiness assessment will be performed within a single table to be filled in by reviewing partners as presented in Figure 21

Innovation readiness					
With research feasibility: existence of solutions mature enough to address the IF (if technology based, TRL3-7)	Business readiness: existence of business models coherent with the IF and related value chains & markets in EU	Legal applicability: existence of a regulation and responsibility framework for the IF	HR doability: there is no shortage of skills to impede IF deployment	Social acceptability: there is no identified barrier to social acceptance of the IF	Innovation readiness synthetic mark
		Yes			
		No			
		Undecidable			

**Figure 21: Innovation readiness assessment table**

**Final prioritization:** once each Innovation Field is given synthetic marks with regards to circular impacts and innovation readiness, Innovation Fields are plotted in a single graph (automated operations in the excel tool).

### Prioritization of Innovation Fields and selection of those to be retained for the roadmaps

Innovation Field full name	Innovation Field ID	Circular impact synthetic mark <small>As per IF information tab column P</small>	Innovation readiness synthetic mark <small>As per IF information tab column V</small>	Retained for roadmaps
	IF#1	3	5	
	IF#2	1,5	4	Yes
	IF#3	7,3	6	No
	IF#4	9,1	5,2	
	IF#5	4,8	9	

IF Prioritization graph

ID	X (Circular impact)	Y (Innovation readiness)
IF#1	3	5
IF#2	1,5	4
IF#3	7,3	6
IF#4	9,1	5,2
IF#5	4,8	9

**Figure 22: Final prioritization of Innovation Fields to be retained for the SRIA roadmaps**

The horizontal and vertical thresholds for Innovation Field priority selection will be decided based on the global picture, but it is to be noted that the selectivity can probably be stricter on the impact axis – only high impact Innovation Field being expected to appear in the SRIA – than on the Innovation Readiness axis – which reflects a contextual assessment likely to be addressed with non-research political actions... or through supporting Enabling Innovation Fields focussed on breaking barriers and thus improving the innovation readiness of other topics.

### 3.2.3.2 Building up the roadmaps

Once prioritization of Innovation Fields is achieved, the CICERONE partners will know which ones are to be positioned on the roadmaps which will be the backbone of the SRIA and need still a few additional information to build up the roadmaps, such as the date when the Innovation Field should start being a target for RDI funding, and when it can be supposed to become ready for market introduction and thus should probably not remain anymore in the list of top priorities to be funded.

A tentative assessment will also be tried out concerning the importance of the necessary effort for maturing the solutions encompassed within the Innovation Field. This will of course not be made within CICERONE extensively enough to provide actual figures of the amounts needed for any of the Innovation Fields, but a broad comparative evaluation should be feasible to highlight which Innovation Fields need more or less efforts than others.

In case there can be identified dependencies between Innovation Fields or any other prerequisites to Innovation Field exploration, a given field within the assessment table will be open to reviewing partner remarks, which can later be either made visible on the roadmaps or used to build up recommendations to be included as a support to the SRIA.

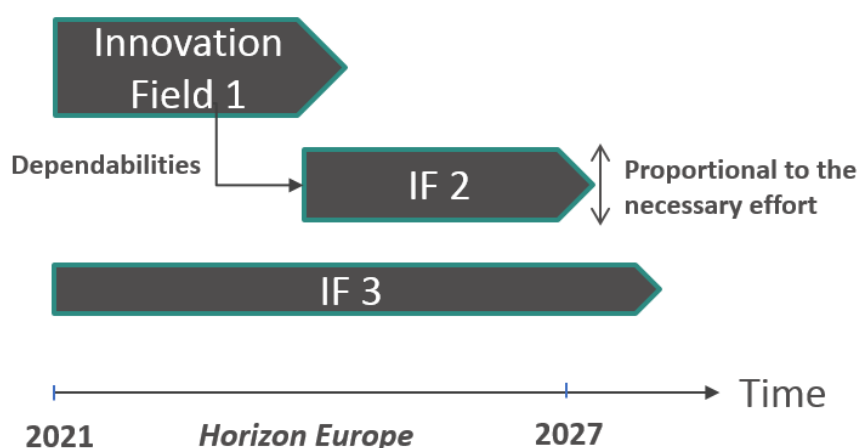


Last, a question will be asked to reviewing partners on the potential of the Innovation Field to be part of an integrated pilot / joint programming initiative. This has no direct link with building up the roadmaps, but will be a useful support for subsequent actions within CICERONE.

Roadmapping information				
Support start time When the IF is ready to be a target for RDI funding (if technological, when it is expected to reach TRL 3)	Market ready time When we can expect the IF to be ready for industrial market insertion developments (if technological, when it is expected to reach TRL 7)	(Relative) effort needed Assessment of the effort for maturing solutions, mainly in comparison with other IFs	Potential to be part of an integrated pilot / joint programming initiative ? As a support to further analysis of potential pilots within CICERONE	Critical prerequisites If maturing the IF requires preliminary actions (open field, mainly thoughts for supporting recommendations)
2019-2020 2021-2022 2023-2025 2026 and above				

**Figure 23: Roadmapping information to be collected on each Innovation Field**

Based on these elements, roadmaps will be built up, for each CICERONE challenge and each priority theme, which aggregate useful information and show off priorities to be supported along Horizon Europe timeline and beyond. An indicative representation of final roadmap is given in Figure 24.



**Figure 24: Indicative representation of a final theme or challenge Roadmap constituting the CICERONE SRIA**

### 3.3 Synthesis

Finally, the structuration of the CICERONE SRIA will take into account the need that all roadmaps integrate into a coordinated scheme, clearly highlighting links between themes and challenges' roadmaps as well **opportunities for Innovation Fields to be part of an integrated pilot or joint**

**programming initiative.** Indeed, pilots will be high investment programs, involving public authorities at regional/national/level that will address different themes (“integrated”) for a given challenge. As a virtual example : at an eco-industrial park level, it would mean implementing a set of complementary priority Innovation Fields (defined in the SRIA built in T2.1) from raw materials, water and plastics that will offer systemic solutions and avoid the too usual fragmentation of theme-specific projects that limit their overall impact. **T1.3 doesn’t include any criteria for prioritizing the pilots** but intends to establish a reference on how they will eventually be connected with themes / challenges and respective Innovation Fields, as shown in Figure 25. The key considerations to keep in mind for the next phases of the project regarding pilots according to the methodology presented here are:

- **A challenge is a compilation of key IFs selected from several relevant themes** – plus other possible IFs that may not have a clear link to a specific theme
- **A pilot can be the synthesis of different key IFs within a challenge that, all together, would match the PO expectations.** Thus, this selection will have to be commonly discussed and validated later on in the project, with all the CICERONE consortium, and by involving with the POs that will support their funding and implementation.

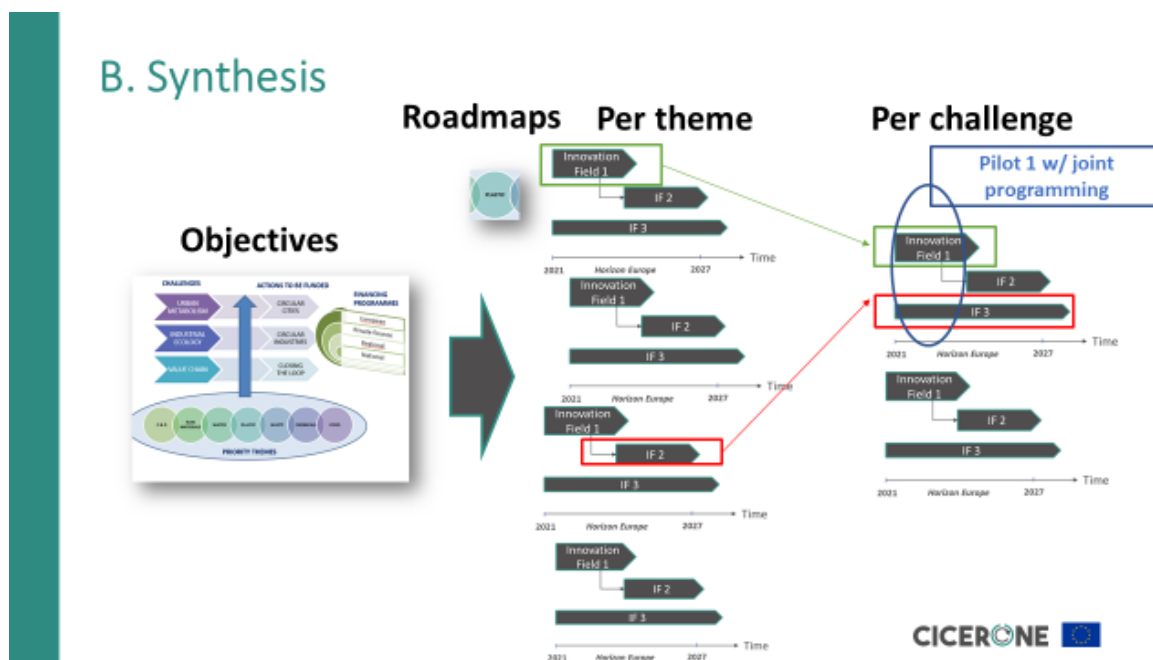


Figure 25: Final integration of roadmaps and related Innovation Fields into pilots

## 4 EXCEL TOOL PRESENTATION FOR PRIORITIZATION AND PLANNING OF THE SRIA

### 4.1 Mapping objectives

This tool is a file with 3 tabs (see excel file in annex)

- **Sources\_mapping tab**, to be used by task coordinator for:
  - Listing all sorts of strategic agendas, strategic roadmaps, policy communications and other documents likely to include information on objectives to be pursued in various domains for successfully implementing a circular economy in Europe;
  - Attributing a single identification number to each source

- Distribute such sources between partners so as to distribute the work to be done within the task
- In the end after all partners have identified objectives from the different sources and to the CICERONE challenges and priority themes, keep track of the contribution of each source to these challenges and themes
- **Challenges\_Obj and Themes\_Obj tabs**, to be used by each partner involved in this part of the task to:
  - Identify objectives in relation with each Challenge or Priority Theme
  - Attribute a unique identification number to each objective
  - Keep track of the source where the objective originates from
  - Capture additional information on the objective (type of stakeholders in charge, KPIs, must-have/nice-to-have...)

*NB: the file includes comments and guidelines designed to harmonize the understanding of partners in the way to fill in the different fields.*

## 4.2 Mapping and prioritizing Innovation Fields

**This tool is a file with 5 tabs (see excel files in annex)**

- **IFs\_from\_Objectives tab**, to be used by each partner involved in this part of the task to identify and formulate Innovation Fields so as to answer to objectives mapped in Excel File B.
- **Consolidated\_IF\_list tab**, to be used by task coordinator for:
  - Merge lists of Innovation Fields from the partners, merge or reword Innovation Fields when needed and consolidate a single unified list
  - Keep track of the objectives where the Innovation fields stem from
  - Map the challenges and themes to which Innovation Fields apply
  - Attribute each Innovation Field a unique identification number
- **IF\_information tab**, to be used by each partner involved in this part of the task to collect all useful information about each innovation field under its responsibility:
  - Decide whether it is a direct impact Innovation Field or an enabling one, and depending on this choice, quote the impacts along all criteria (*the file will automatically compute a synthetic circular impact mark*)
  - Quote the Innovation field along the five innovation readiness criteria (*the file will automatically compute a synthetic innovation readiness mark*)
  - Fill in the relevant road mapping information
- **IF\_Prioritization tab**, to be used by task coordinator to recollect innovation fields marks on the two circular impact and innovation readiness axes and plot each one on the prioritization graph, so as to tick the ones to be retained for roadmaps
- **Wrap\_up\_for\_roadmaps tab**, to be used by task coordinator to wrap up for retained innovation fields all useful data disseminated along the different tabs into a single table aggregating the necessary information to build up the roadmaps.

*NB: the file includes comments and guidelines designed to harmonize the understanding of partners in the way to fill in the different fields.*

## CONCLUSION

This report has presented the results from T1.3 on methods for a circular economy strategic planning that will be used in the upcoming tasks of the CICERONE project. Besides, they could also be useful for other initiatives related to circular economy programming by POs to feed analysis in terms of prioritization and assessment. The first methodology (A) will be used for T1.4 and T2.2. and the main criteria for the assessment of current and future programs have been highlighted. They will serve as

a theoretical reference in order to be compared to results from the field in order to make a gap analysis and to structure the future SRIA so that it can ensure the most efficient and suitable impact assessment, performed in T2.2 using the same methodology and comparative analysis. The second methodology (B) has been developed and structured in order to make the future SRIA based on a collection, assessment and prioritization of objectives, innovation fields toward roadmaps per themes and per challenges. At the end, it will allow to propose key integrated pilots that rely on the highest priorities in innovation fields to be funded. Specific and user-friendly tools have been designed to perform the assessment of innovation fields.

## ANNEXES

**Annex A: Summary of CICERONE challenges and themes** (from summary of terms and definitions WP2.1)

### Summary of CICERONE challenges:

Challenge	Activities and geographic coverage	Examples of applying micro/meso/macro level thinking
<b>1. Urban Areas</b> Sustainability challenges related to the management and development of areas where humans live in concentration.	Commonly includes housing, urban transport, sanitation, utilities, land use and communication. Covers urban and peri-urban areas.	<ul style="list-style-type: none"> <li>• Micro: individual households and buildings</li> <li>• Meso: individual city level</li> <li>• Macro: Interactions between cities and sister cities within or across countries</li> </ul>
<b>2. Industrial Systems</b> Sustainability challenges related to the production of goods and related services for human use.	Commonly includes manufacturing, industrial production, mining and industrial agriculture. Also includes product design but material sourcing issues are more focused in <u>Value Chains</u> challenge.	<ul style="list-style-type: none"> <li>• Micro: individual factory or plant</li> <li>• Meso: industrial parks, eco-industrial parks</li> <li>• Macro: N/A (tackled in Value Chains)</li> </ul>
<b>3. Territory and Sea</b> Sustainability challenges related to activities that occur at the interface between land and open waters and on open waters.	Includes port/harbour management and connectivity to cities, shipping, Fisheries and other marine activities. Covers ports, harbourscoastal areas.	<ul style="list-style-type: none"> <li>• Micro: small harbours, local touristic ports, harbours focusing on local fishery, maritime touristic communities.</li> <li>• Macro: Big commercial, touristic and industrial harbours.</li> </ul>
<b>4. Value Chains</b> Sustainability challenges related to the multi-national and global movement of materials and goods within global supply chains.	Focus is on material sourcing and circularity (closing the loop) particularly in supply chains/products	<p>Raw Materials : closing the loop of specific materials (i.e. Critical Raw Materials or others)</p> <p>Products (i.e. plastic packaging, WEEE, tyres, etc.)</p> <p>Supply chains (such as buildings, agro-industry, textile, etc.).</p>

Summary of CICERONE themes:

- **Raw materials**
- **Water**
- **Plastic**
- **Waste**
- **Chemicals**
- **Food**
- **Biomass**
- **Construction and demolition**

The linear economy model basically involves the conversion of raw materials into waste. Virgin **raw materials** are not only limited resources, but are often subject to importation and therefore to supply uncertainty. Their recovery and reintroduction in the production process as secondary raw materials in a circular scheme is not only important for economic reasons, but often for the sake of the environment and society.

**Water** is a notoriously limited resource whose use must be made more efficient in industrial systems, in agriculture, but also by consumers in urban areas. It is monitored by legislation, imposing controls either on distributed water and on collected water, to check its quality, prevent contamination and encourage its use in closed circuits.

**Plastic** is the material of excellence of the last century. It has made so many technologies possible and it has changed the quality of our lives. Plastic good qualities (durability, chemical resistance, low cost, etc) are at the same time its main drawback. In fact, its careless use has posed critical environmental problems that are undermining the future balance of the Earth. Marine litter is already threatening life in the seas. Plastics economy needs to change from a system that produces waste by design to one that preserves the value and benefits of plastics, but eliminates these drawbacks.

Great attention must be paid to the use of **chemicals** that pose a risk to health or environment. For some of them the use is already limited or forbidden, for others it will become (REACH regulation). This constitutes a problem in the recovery / recycling of the products that contain them, because the recovery / recycling perpetuates the presence of substances of concern on the market and therefore the exposure of man and of the environment.

**Food** is a renewable but extremely precious resource. Its management must not be subject to waste either for moral and economic reasons. At any level it is necessary to promote practices that valorise food waste, even in sectors other than food. In a hierarchy that favours human and therefore animal nutrition, the residues must be collected and addressed to other productions or, lastly, to energy recovery.

In fact **biomass** has to be considered firstly a consistent source for the production of chemicals and biological-based materials, together to substrates for **biotechnological productions** that, in turn, can provide products with added value: fine chemicals, materials and finally biofuel fuels. Energy production has to be considered the last choice for closing the loop.

**Construction and demolition** waste accounts for around 40% of special waste in Europe. Given their nature, the only alternative to recycling is landfilling, a solution that is obviously not acceptable. We need to be aware of the need for a more careful use of building materials and technologies that allow the quality use of waste.

**Annex B: Memo on “The adoption drivers for CE business models for SMEs”**

**Annex C: MappingObjectives.xlsx** : see excel file attached

**Annex D: MappingInnovationFields.xlsx** : see excel file attached