CICERONE

Coordination and Support Action (CSA)

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Final report on online consultation

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Summary

This report contains the results of pursuing stakeholder dialogue between the workshops and attempting to reach a widescale multilingual consultation by using the digital collective intelligence platform Assembl. This deliverable is linked to Task 4.3. associated to the online consultation in the Stakeholder engagement Work Package (WP4) and to the Deliverable 4.8 presenting the collective intelligence online platform used for the online consultation. The online consultation was opened from June 3 to August 28, 2019 and had the objective to align circular economy European, national, regional and local policy and funding, and understand various priorities across the European territory. The consultation invited circular economy stakeholders to share their vision of the circular economy objectives to be achieved by 2030 across various themes (plastics, construction, food, etc.). This consultation followed a first benchmark of circular economy funding programmes in the EU, a definition of key priorities circular economy Research & Innovation, and a survey to understand programme owners and funders' needs for a joint programming platform. This report presents a quantitative and qualitative analysis of the online consultation, on both participants and content. It also contains a series of key learnings and recommendations for the following actions of the CICERONE project.

Approval

Date	By
2020-03-03 15:36:25	Mr. Thomas WAGNER (CKIC)
2020-03-03 15:36:44	Mr. Thomas WAGNER (CKIC)

WP4 - CICERONE OPEN CONSULTATION

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EXECUTIVE SUMMARY

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KEYWORDS

Online consultation, Collective intelligence, Innovation fields, Objectives, Key figures, Content analysis, Evaluation and prioritization,

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INTRODUCTION

1.1 Objectives of the online consultation

The purpose of this consultation was to collect feedback and spark discussion on draft ideas for research and innovation actions on circular economy in the EU (aka. *Innovation fields*). The Innovation fields were compiled based on a review and benchmarking of circular economy research programs in the EU and worldwide, existing Strategic Research and Innovation Agendas (SRIAs) on topics related to circular economy, and the first CICERONE stakeholder consultation workshop in Antwerp, February 2019. Other tasks leading to the consultation also include **a drafting of key priorities of circular economy Research & Innovation** and a survey to understand programme owners (POs) and funders' needs for a **joint programming platform**.

The outcome of the above actions was a list of draft Innovation fields, to feed as input to the online consultation.

1.2 A two phases approach

The online consultation included two phases.

The first **discussion phase** mobilized circular economy actors having an interest in this field to share their vision on the circular economy **objectives to be achieved by 2030** across various themes (plastics, construction, food, etc.) and **define Innovation fields for the circular economy.** An Innovation field is defined as a **particular aspect to be funded in a specific priority theme.** This first phase of the consultation was opened to all circular economy actors to benefit from a broader collective intelligence exercise: Programme Owners, Industry, SMEs, Academia, RTOs, policy makers, NGOs, civil society, etc.

While the original idea was to carry out the consultation for a shorter period in June, due to the time limitations, CICERONE partners decided to conduct the first part of the consultation over the summer and extend the consultation period instead, in order to try to capture more inputs as stakeholders are leaving for and returning from their summery holidays at different periods. Thus, the consultation was open for three months from June 4 to August 28.

The discussion phase was followed by an **evaluation phase,** where the CICERONE Consortium partners with expertise in the relevant thematic areas were invited to evaluate the Innovation fields collected from all contributors. The CICERONE consortium covers a wide set of knowledge areas, expertise and networks. Therefore, the evaluation phase was limited to CICERONE partners only to ensure that we receive high quality, expert input. It was also a valuable opportunity to engage the rest of the consortium in this key step of the CICERONE project.

The results of the consultation aim to better understand where future efforts and funding should be directed and contribute to shaping the **European Circular Economy Strategic Agenda for Research and Innovation.**

The final calendar of the consultation:

- 4 June: Launch of the online consultation discussion phase
- 28 August: Closure of the discussion phase
- 28 - 30 August: Compilation of the online consultation outcomes into a Raw Innovation fields list by bluenove

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- 2 – 11 September: Creation of a shortlist based on the synthesis and reformulation of the Raw Innovation fields list by the Theme leaders
- 12 September: Launch of the evaluation phase
- 27 September: Closure of the evaluation phase

1.3 The collective intelligence platform and method

In order to reach an inclusive consultation, the CICERONE project decided to implement a massive online consultation by deploying Assembl: an open source collective intelligence platform initially conceived with the MIT and developed within the FP7 Catalyst project (2013-2015) by bluenove. Assembl enables the creation of new knowledge through interactions between community members. It is based on innovative facilitation roles optimising 1) the engagement of large numbers of people and 2) the structuring of co-produced new knowledge. Assembl is the first software specifically designed to facilitate massive multilingual collective intelligence. It enables to categorise incoming messages, curate them and synthetize them within a formalized deliverable through a multi-staged process conceived to promote deep content and dynamic structuring of ideas.

More general information on Assembl's collective intelligence technology and method can be found in the Deliverable 4.8. and also, on bluenove website[1]. The specific method used for this consultation is presented across this document.

The **Figure 1** below shows two views from the consultation platform: the homepage and the different themes and challenges proposed.

The homepages displays the main figures of the consultation (number of votes, participants and messages) and a short description of the project as follows:

"*The Circular Economy Platform for European Priorities Strategic Agenda (CICERONE) is a project that aims to build a joint platform and strategic agenda for making circular economy research and innovation programs more efficient. CICERONE works in close cooperation with a variety of practitioners including government bodies, research & technology organisations, civil society, industry, innovative SMEs, start-ups, cities and investors. The goal is to enhance alignment between EU member states on where research and innovation efforts should be focused to accelerate the transition to a circular economy. Based on circular economy objectives at the European level, CICERONE has developed corresponding research and innovation suggestions (aka. Innovation fields) for the European Circular Economy Strategic Research & Innovation Agenda. The Innovation fields are categorized under 12 areas. You are invited to share your point of view and knowledge to challenge or enrich them! Click on the Participate button above to join the debate! For any questions, please contact us at contact@cicerone-h2020.eu. »*

[1] https://bluenove.com/en/offers/assembl/

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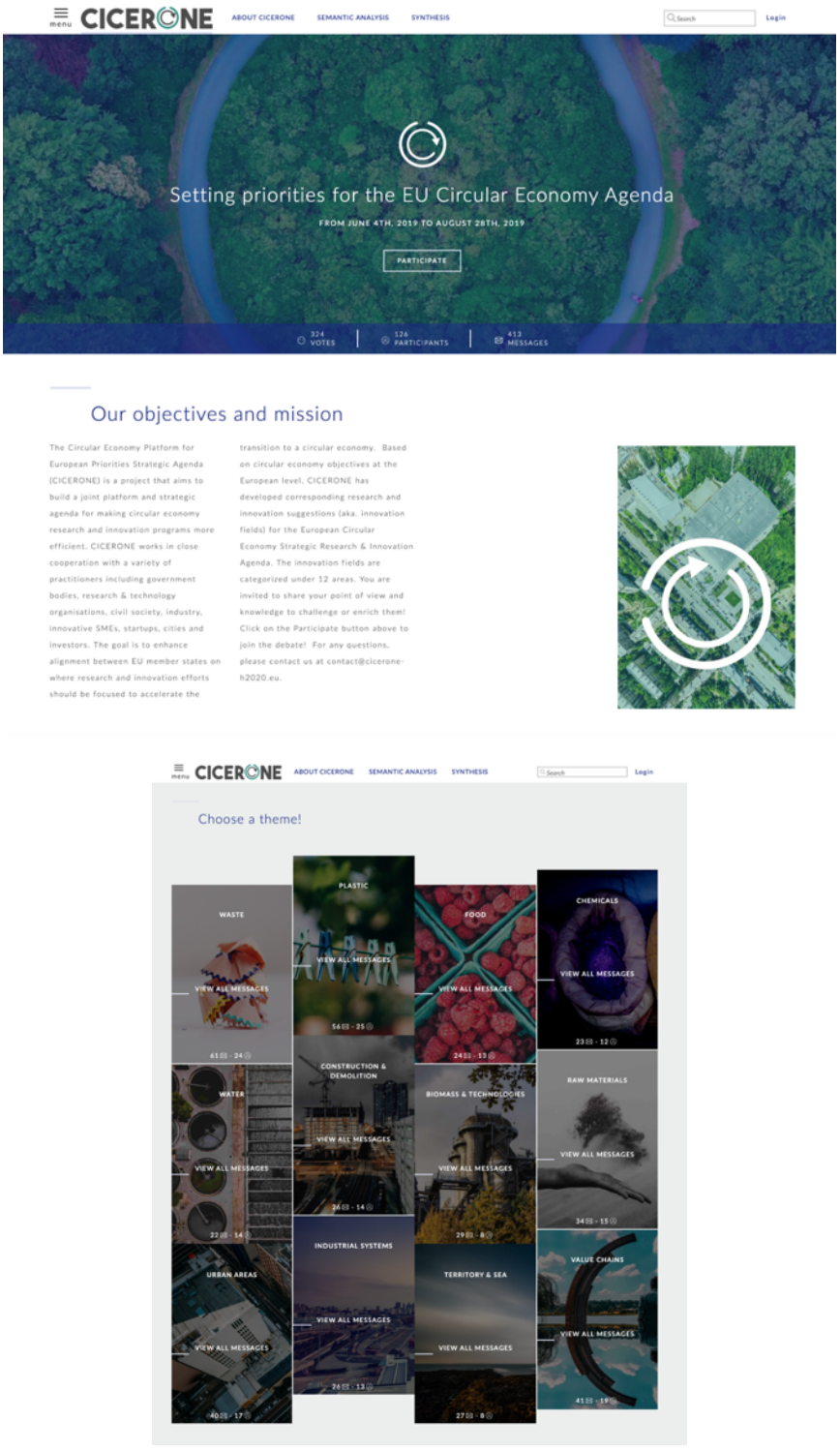

Figure 1: Views of the online consultation platform

The consultation was structured as a conversation per themes. The list of themes and challenges shown in the Figure 1 for the online consultation was based on the framework that was developed in the proposal stage of the CICERONE project. The themes are also partly based on the EU Circular Economy Action Plan.

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The list contains eight themes and four challenges[2]. The definitions given by the members of the Consortium working on the building of SRIA are presented below.

The themes represent material flows - both raw and manufactured, primary and secondary materials that crosscut the challenges. They can represent both resources and/or waste depending on the sector and challenge applied. In some cases, certain materials are also better attributed to specific sectors. The themes are:

- Raw materials
- Water
- Plastic
- Waste
- Chemicals
- Food
- Biomass
- Construction and demolition materials (including waste)

The four challenges refer to the various geographical and societal levels on which circular economy is applied. It is based on an adaptation of the micro, meso and macro systems framework of viewing circular economy as described by Kirchherr, Reike and Hekkert (2017):

- Micro perspective: product level, firms and/or consumers, individual buildings and factories
- Meso perspective: interactions between individual buildings and installations (e.g. eco-industrial parks), regional (i.e. sub-national) level
- Macro perspective: national, multi-national and global levels, or overall industry structure

The challenges are:

- Urban Areas
- Industrial Systems
- Territory and Sea
- Value Chains

Each theme and challenge led to a dedicated forum, in which participants could participate actively by sharing their point of view or reacting to the contribution of the other participants.

Different modules can be activated and combined on the online platform to mobilize stakeholders, either in addition to participation in face-to-face workshops or as a means of exclusive participation in the process. A “thread module” was activated for this consultation in order to promote the exchange between participants and the enrichment of ideas on different themes (see Figure 2).

The user contributes by writing a message to open a new topic or by responding to other participants. He can also simply react to a message to indicate his agreement, disagreement, misunderstanding or his request for additional information.

This module allows to **co-construct new solutions**, **interact between participants** and **share rich content.**

[2] Definitions and references on the choice of themes and challenges is given by the Work Package 2 in the deliverables related to the Building of SRIA (D2.1)

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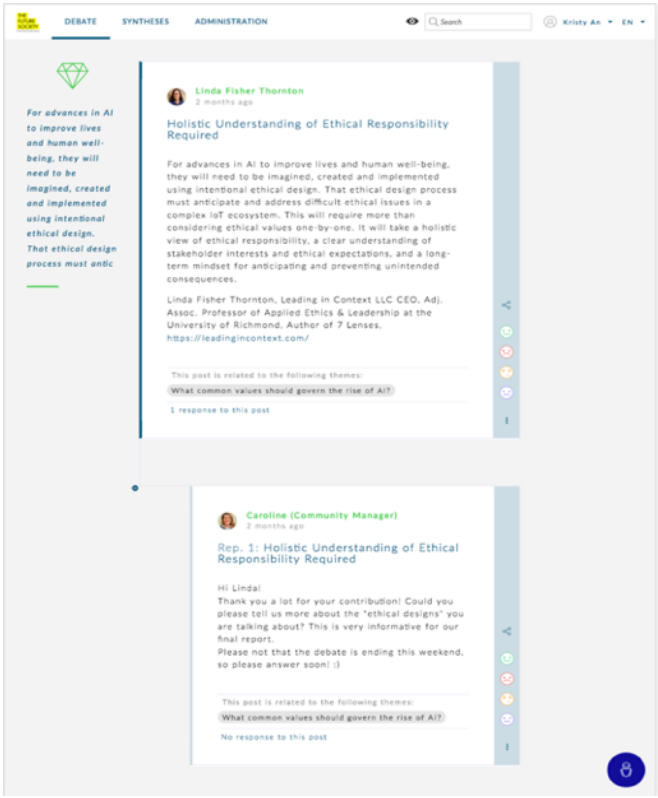

Figure 2: Illustration of the "Thread Module"

The second part of this report analyses the behaviour and the profile of the participants on the platform during the consultation.

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2 KEY FIGURES OF THE CONSULTATION

2.1 Participants

2.1.1 Quantitative analysis

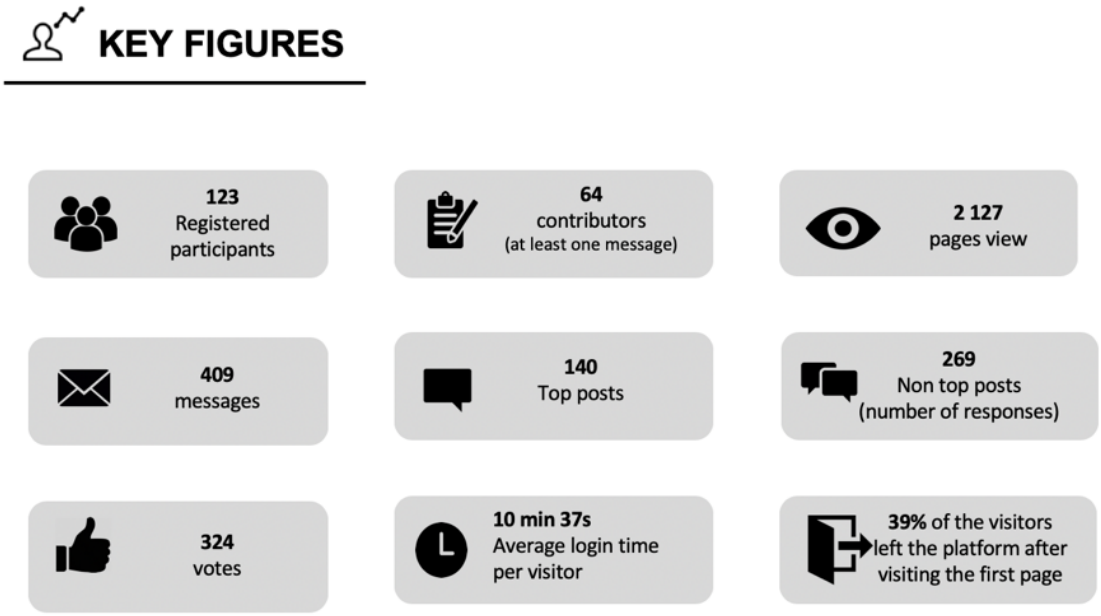

Figure 3: Final key figures of the consultation

A series of **quantitative elements** referred to as "Key figures" (see Figure 3) are used to evaluate the performance of a consultation. Monitoring the key figures of the debate is important for the purposes of:

- Measuring the attractiveness of the debate to the target population

- Guiding the communication plan according to the results

- Ensuring the diversity of the arguments shared in the debate

- Highlighting the approach among the partners.

The key figures are given by Assembl's tracking tool, Matomo which is a free and open source web analytics application developed by a team of international developers.

The following list of key figures was presented to the team of partners involved in the monitoring of the consultation on a weekly basis:

- Participants: the number of users who register by creating an account on the platform
- Contributors: the number of participants who publish at least one message
- Pages view: the total number of times the content was viewed
- The total number of messages posted
- Top posts: the number of discussion threads
- Non-top posts: the number of responses to existing discussions threads
- Votes: the number of reactions to the messages posted (*I agree, I disagree, Did not get it, More info please*).

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- Average login time per visitor: the average amount of time visitors spent on the platform
- Bounce rate: the percentage of visits that only had a single pageview. This means, that the visitor left the website directly from the entrance page.

The final key figures show that more than 100 participants registered on the platform and more than 60 posted at least one message.

The platform gained traction and interest and participant visits averaged 10 minutes per session. The high number of messages related to the number of participants shows that participants registered on the platform to express an opinion on the subject and to bring something to the discussions and not only to read or react to the content. The significant number of non-top posts (responses to existing threads) demonstrates that participants read the messages and engaged in conversations. Creating a genuine discussion and debate was one of the objectives of the consultation.

However, the figures remain relatively low compared to the number of countries involved and given the scope of the consultation. Several factors explain the performance of the debate:

- **The target:** while the consultation was open to every person interested in the topic, it specifically targeted an expert audience at the European level to ensure a high quality of input easily exploitable for the project
- **The timing:** the calendar of the project required a short time frame for the online consultation. Thus, it was decided to conduct the first part of the consultation over the summer and extend the consultation period instead, in order to try to capture more inputs as stakeholders are leaving for and returning from their summery holidays at different periods.
- **The modalities**: some of the Programme Owners (POs) and external partners sent their input directly to the CICERONE partners who then deposited it on the platform. This method distorts the final figures and do not reflect the real external stakeholders' outreach.

As the consultation was specifically targeting Programme Owners, i.e. owners and funders of national and regional circular economy programmes, the number of participants was expected to be lower in comparison to a general public consultation. As noted across various consultation throughout the project, the number of Circular Economy programme owners across Europe, although growing, is still relatively low. Taking into account this and the time required to participate in the online consultation, the project is satisfied with the results and number of engagements.

However, it is important to note that the online consultation was one step in a series of consultations around the objectives and innovation fields for the future Circular Economy SRIA developed within WP2. On top of the collective intelligence consultation on the Assemble platform, the following inputs were gathered to better understand CE R&I priorities:

- The EU benchmark of CE programmes in WP1, including direct interviews with POs, provided a good overview of which innovation is currently being prioritised by national and regional funding programmes

- The initial PO survey within WP4 also provided an overview of key research priorities of public funding bodies for circular economy

- Workshop 1 at the World Resources forum help d hands-on working session to gather inputs from POs and other stakeholders on where future Circular Economy R&I funding should be heading

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- Expert knowledge from the 24 CICERONE partners is continuously leverages throughout the project's activities to feed in extra information that may have been missed via consultation

Conversion rate

The conversion rate (see Figure 4) is an indicator used to measure the degree of involvement of a participant on the platform. Several levels of involvement exist:

- Visit the platform
- Register
- Contribute (post a message or a reaction)

The conversion rate is a ratio of participants that follow these steps. In this consultation the conversion rate is very high, meaning that people who visited the platform were genuinely interested in the content and wanted to participate.

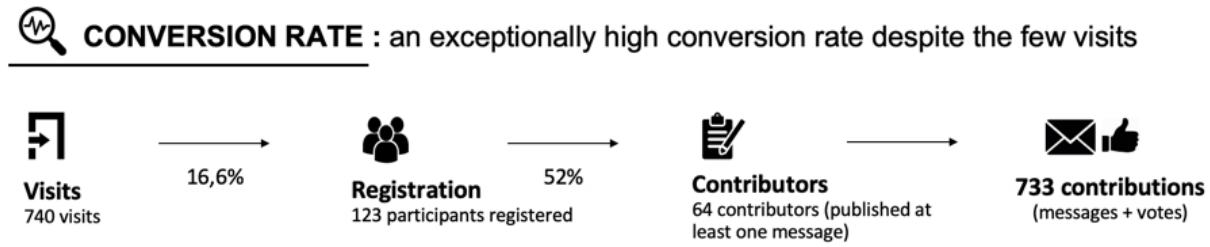

Figure 4: Conversion rate between visitors and contributors

Participants acquisition

A significant part of visitors entered the platform through the official CICERONE website. This indicates that the participants are people who follow the CICERONE project activity. The consultation was also mentioned on the EU Circular Economy Stakeholder Platform and a few participants entered the platform through this channel.

Social media mobilisation actions also managed to gather some participants, especially from LinkedIn, evidence that the consultation captivated a professional audience. More information on the participants' profile is given in the following parts of the report.

The figures below present further information on the other websites that referred the visitors to the online consultation platform.

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WEBSITE	VISITS
cicerone-h2020.eu	67
bluenove.com	16
t.co	14
www.linkedin.com	11
www.portugal2020.pt	8
com.linkedin.android	6
www.ncps-care.eu	6
circulareconomy.europa.eu	4
r.sb.cec.org.pt	4
scg.ch	4
www.adcoesao.pt	4
email.ncku.edu.tw	3

Social Networks

SOCIAL NETWORK	VISITS	ACTIONS	ACTIONS PER VISIT	AVG. TIME ON WEBSITE
LinkedIn	17	30	1.8	4 min 45s
Twitter	16	45	2.8	2 min 41s
Facebook	7	17	2.4	6 min 10s

Figure 5: Acquisition: how the participants entered the consultation

2.1.2 Participants profile

Organisations & background

Among the registered participants, 61 are affiliated to a partner organization and 57 belong to an external organization.

The figure below indicates the number of participants and the messages posted for consortium partners and external organisations.

Overall, the members of the CICERONE consortium participated to the consultation and posted a significant share of the total number of messages. Among the partners, two types of audience can be mentioned. On the one hand, the project team (T2.1) had a role of facilitation and promotion of the discussions but also a posture of experts and acting as a bridge for the POs who could not participate on the platform for various reasons (e.g. Legal impediment). On the other hand, the rest of the consortium partners had a role of knowledge persons given their expertise on the different topics addressed in the consultation. Some CICERONE partners also put input based on desktop research of current innovation strategies of POs.

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Source organization	Participants	Number of messages
External participants	57	90
Partners	61	319
Total	**118**	**409**

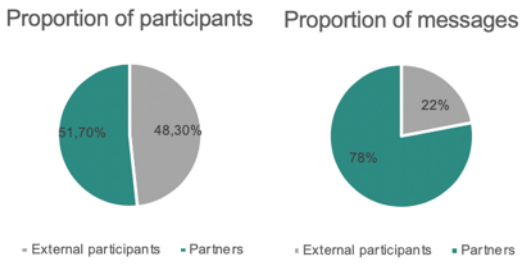

Figure 6: Comparative analysis: external participants/CICERONE partners

Registered external participants come from **46 different organisations** and together **posted 90 messages.**

Academia and R&D members are the most represented among the participants whereas NGOs and private companies are the less accounted for (see Figure 7). This suggests that the consultation was mostly accessible to experts and more precisely to researchers and people with scientific or technical background in circular economy.

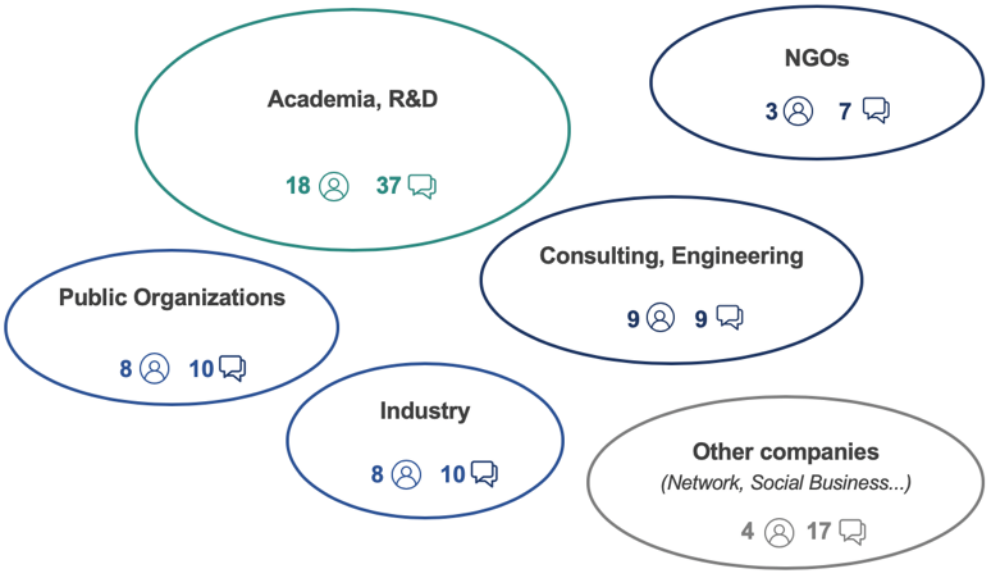

Figure 7: Type of organizations that participated to the online consultation

The number of partners and external participants is almost equal. However, partners posted significantly more messages for the various reasons mentioned above. Among them, 5 partners organisations cumulated 52,3% of the total number of messages. **The most active partners were**

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absolutely key in the consultation process and deepening as they represented personal views but also official stances from the organisations that mandated them.

Overall, the debate remained expert-oriented and was not targeting citizen participation (no dedicated event, non-accessible language).

2.1.3 Engagement pyramid

Collective intelligence happens with a variety of actions and profiles. That is why we cannot only measure the activity by tracking the number of messages or visits, but we also have to identify the different profiles of participants. During the debate, all these profiles interact to support the community to discover new insights and their actions foster engagement of the ones who post, react and read.

The profiles we identify during a collective intelligence project:

- **Proactive:** spontaneously initiate threads;
- **Reactive:** respond to threads initiated by others;
- **Peri-active:** give their feeling via the "like / dislike;
- **Learners:** registered and read the content.

The illustration of this identification can be seen in the Figure below. **For this consultation, the number of proactives is 3 times higher than the usual (see Figure 11).**

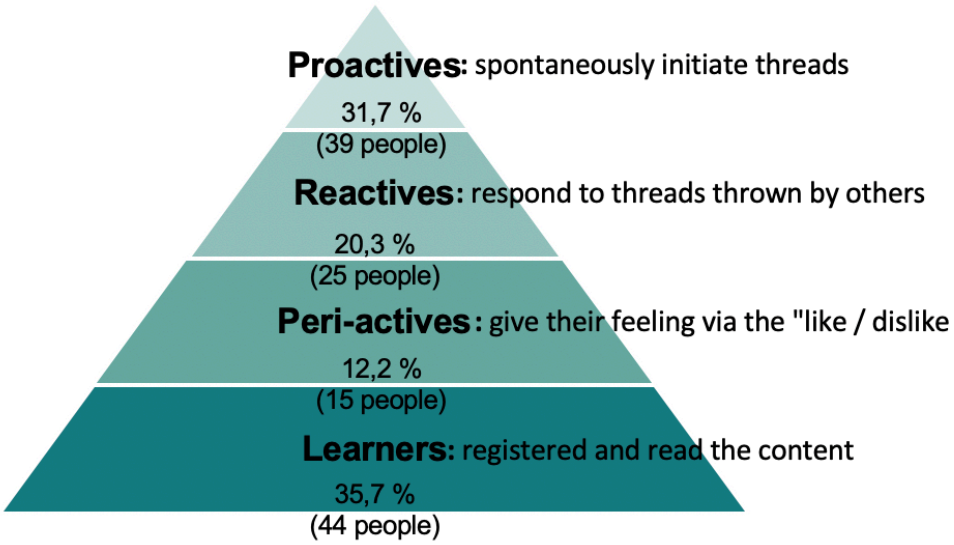

Figure 8: Engagement pyramid

Indeed, compared to the other consultations on Assembl (Figure 9), the conversion rate of the number of people who visited the platform to those who registered is significantly higher (percentage of visitors that registered on the platform). It reveals that visitors are involved and want to take part to the discussions. Additionally, the consultation beneficiated from a large coordination group that contributed to the discussions but also to the promotion of the consultation.

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However, the number of visits is relatively low given the scope of the consultation and its international nature. It must be noted that despite the fact that every person interested could register and participate, the consultation was more targeted towards an expert audience than the other public consultations mentioned below. This must be taken into consideration when comparing these figures.

Measurable value	SWIM 2030 (Company)	Villet et Territoirres de Demain (French Ministry)	Governing the rise of AI (The Future Society)	Good Goût (Company)	CICERONE
Duration	5 weeks	3,5 months	1 year	5 months	**3 months**
Visits	11000	140000	12000	10700	**740**
Participants	302	1597	726	187	**123**
Visits / participants ratio	2,75%	1,14%	6,05%	1,75%	**16,6%**
Number of messages	370	2966	1291	1049	**409**
Ratio participants / number of messages	1,23	1,86	1,78	5,61	**5,21**

Figure 9: Comparative analysis of Assembl consultations carried out by bluenove

2.2 Content

2.2.1 Quantitative analysis

The total number of messages posted on the platform across the different themes was 409. Among these messages, 140 were top posts (new discussion threads) and 269 non top posts (responses to the other messages). Contributors could also react to other people's messages by choosing a button for: "Agree", "Disagree", "Did not get it" or "More info please". There were 324 reactions during the consultation.

Some themes and challenges generated more conversations. It is for example the case for Waste, Plastic and Value Chains. On the contrary, the themes with the lower number of messages are: Water, Chemicals and Food. This gap can be explained by the differences in interest of stakeholders on the topics and because different topics are more well-known or visible. There tends to be more sustainability professionals who understand and have knowledge on plastics and waste than chemicals, for example.

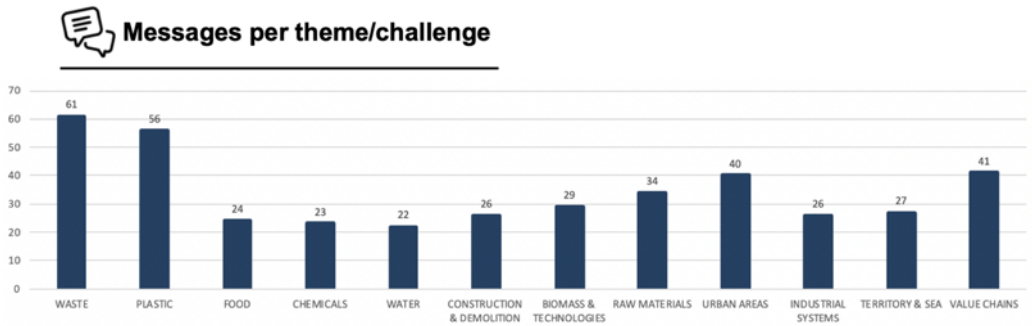

Figure 10: Number of messages per theme/challenge

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The figure 11 below indicates the frequency of the messages posted. Since on Mondays drop-in help sessions were organized for the partners, the higher number of visits at the beginning of the week can be linked to this. Indeed, at the beginning on a weekly basis and the last months every two weeks, one-hour WebEx were organized by the core team in order to present some key figures of the consultation and answer the questions asked by the member of the Consortium. In the same way, these sessions have helped maintain engagement on a regular basis thanks to a series of guidelines and specific challenges shared with the participants (see Figure 12).

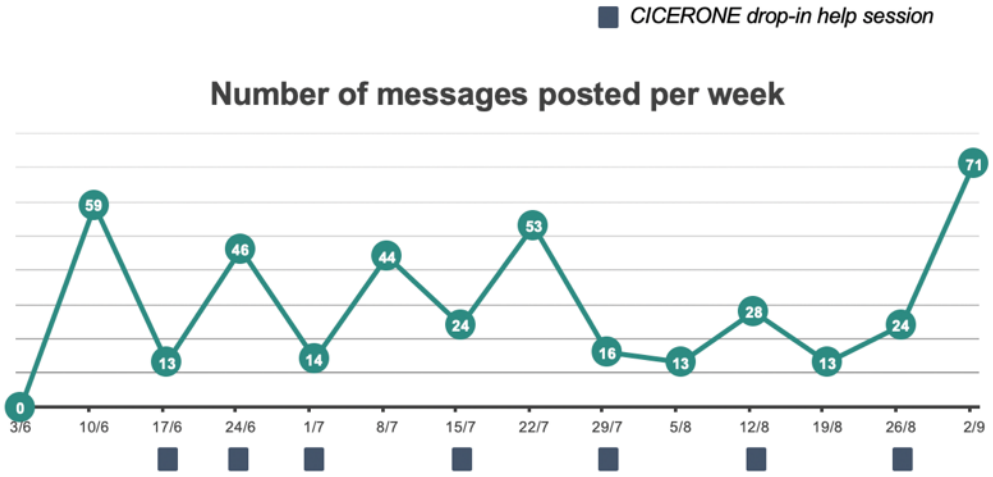

Figure 11: Frequency of the messages posted

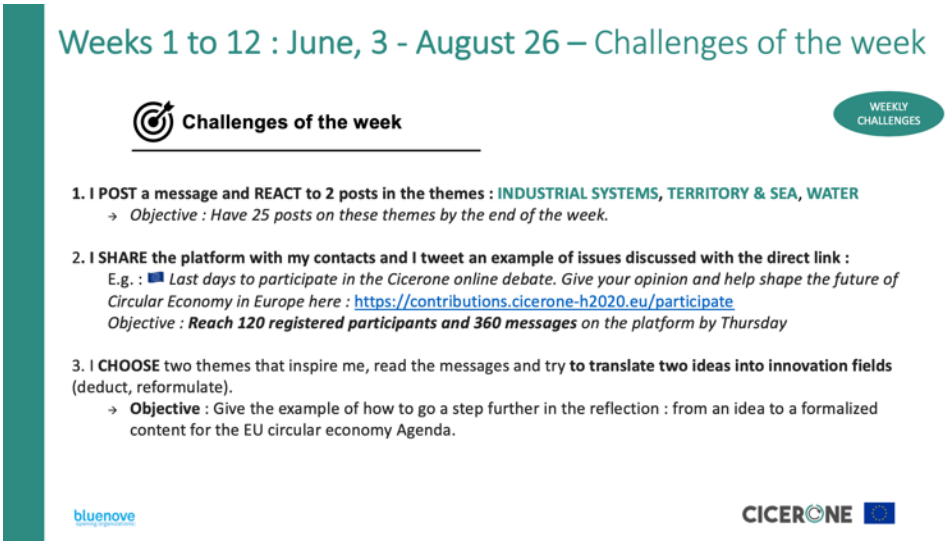

Figure 12: View from a presentation during a Drop-in help session

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3 CONTENT ANALYSIS

3.1 Nature of the discussions

3.1.1 Guidelines for conversations

The first messages posted by the partners were formalized according to a methodology development by CEA within WP1 (CICERONE partner): Objective – Source – Innovation fields. Indeed, a method was developed to structure the content collected from the online consultation in order to make the input easily exploitable for the following phases of the project. It was decided to ask participants to formalize their messages in the following manner:

- Start by presenting the general objective of the idea: what main issue does it address? What is the final goal of the solution presented?
- Give a source: indicate academic or institutional references
- Share the Innovation fields associated: specific technical or scientific solution

An innovation field is defined by 3 main criteria:

- Circular impact: good balance of positive impacts for the environment, the economy and the society;
- Innovation readiness: research feasibility, business readiness, legal applicability, HR doability, social acceptability;
- Roadmapping information: support start time, market ready time, (relative) effort needed, potential to be part of an integrated pilot, critic prerequisites.

However, in order to create genuine discussions, the guidelines changed to invite to more open and simple messages. This enhanced the debate. People started to interact on the platform rapidly. The messages were more accessible, debatable, less technical after the consultation was opened to the public. The external content and references shared by the participants were essentially public technical papers and research documents, so the platform was an opportunity to share external resources.

Below is a list of **guidelines given to partners to help them create conversations on a technical topic**.

TIPS FOR IDEAL MESSAGING *- Call for a conversation or a debate:*

· Consider your reader as a novice, non-expert: write short, simple sentences.

· Ask questions to the other participants on their point of view, alternatives or other sources to share, or even on a precise point you would like to debate with them!

· Use the bold, italic and bullet points to shape your message in the platform. Including sources or pictures to your messages will also give consistency.

· Avoid structured codes to open the topic as a conversation, such as numbering such as Objective 1 // "Objective 2: ..." OR "6. A. Innovation field: ...", giving the impression of a non-debatable content.

Although the simplifying of the guidelines helped enhancing the discussions, this made it more difficult to exploit the content posted on the platform. Since the final format of the output respected the initial guidelines, a synthesis and interpretation work was conducted by the core team to extract the objectives, sources and innovations fields to be evaluated and used for the next steps of the CICERONE project.

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3.1.2 Types of discussions

Across the themes, people agreed overall with the various ideas shared. The answers mostly ask questions, complete with new information or give examples.

However, a few topics created a debate with some divergent opinions, especially in the Plastic theme where the highest number of messages was published.

To illustrate the different types of discussions identified, several concrete examples are presented. The choice of the examples respects a criterion of relevance for the point raised but does not reflect the diversity of messages posted by the participants.

Divergent opinions

Plastic theme: The issue of bioplastic raises the questions of recyclability. Some participants consider it as a solution whereas others explain that bioplastic is not viable since they cannot be included in the recycling process.

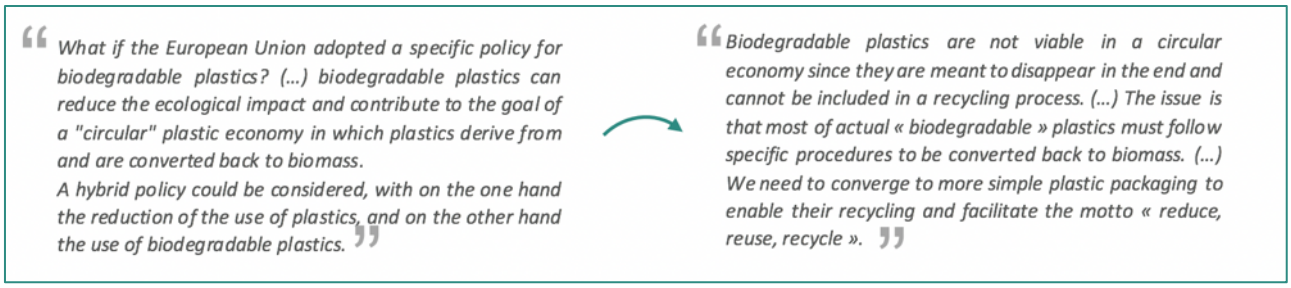

Figure 13: Example of discussion on recyclability and bioplastic

Plastic theme: A discussion on plastic bags revealed opposite opinions. A participant proposes high taxes as a solution for diminishing their use. Another participant considers that taxes are not a viable solution and there should rather be more alternatives to plastic bags.

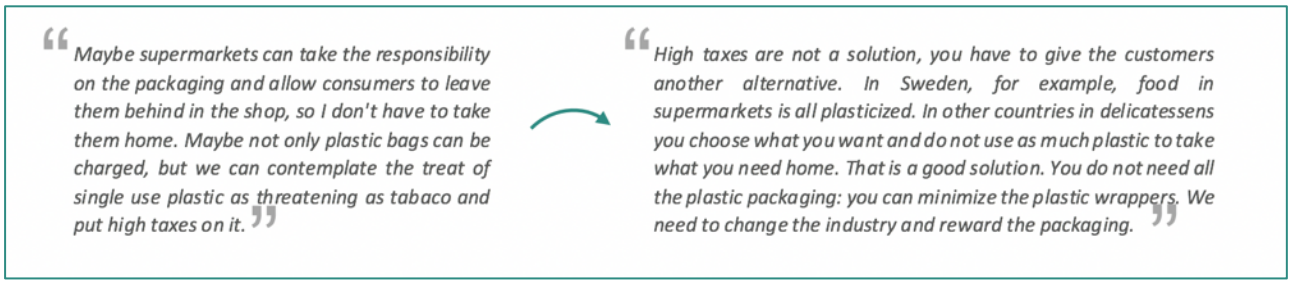

Figure 14: Discussion on plastic bags

Biomass & Technologies theme: For the discussion thread presenting the objective "To ensure secure and sustainable biomass feedstock supply chains" some participants disagreed on the idea to intensify land use for biomass production. Their argument was to use land for food production and waste and by-products for biomass feedstock.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 820707.

Figure 15: Discussion on intensification of land use

Examples of initiatives and existing programs

Some participants presented initiatives or programs that have already been adopted in a European Union country for example. The following elements represent a non-exhaustive list of information given during the consultation.

- **The NFEP&WM (National Fund for Environmental Protection and Water Management) approach to R&I programmes**

The participant presents the Department of Innovation and Expertise at the NFEP&WM in Poland. He also promotes the Strategy for National Smart Specialisation, prepared by the Polish Government, which concerns Circular Economy – Water, Fossil Raw Materials and Waste. The message was thus published in these three themes.

Figure 16: The NFEP&WM approach to R&I programmes in the Raw Materials theme

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- **Policy priorities according to Progress II**

According to the theme, the participant gave the guidelines set out in the German Resource Efficiency Program II. These examples have been published in the following themes: Plastic, Food, Construction and Demolition, Raw Materials, Value Chains, Urban Areas.

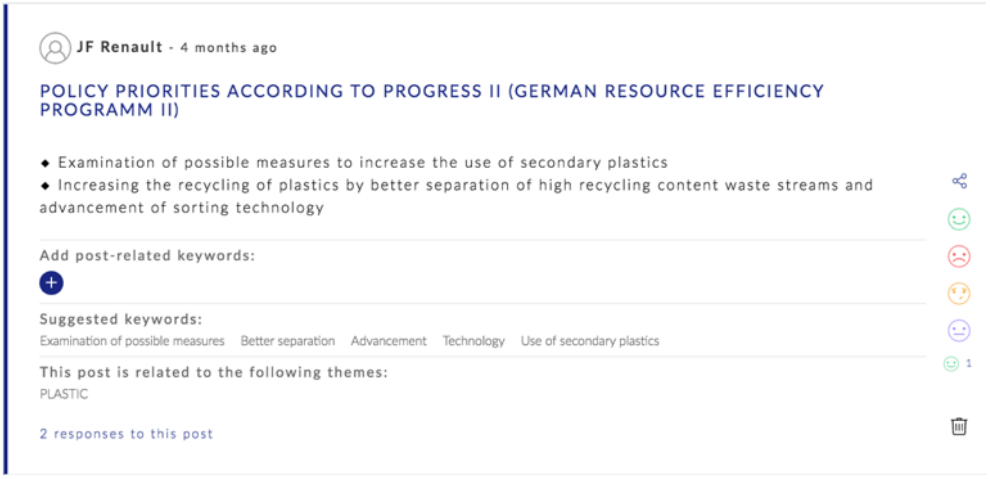

Figure 17: Policy priorities according to Progress II in the Plastic theme

- **Sanshodhan, an e-waste exchange**

Some participants also used the consultation to promote a social or circular economy enterprise. For example, in the Figure 18, the participant presented Sanshodhan, a circular economy company specializing in e-waste aggregation. The message was posted in Industrial Systems; Raw Materials; Value Chains.

Figure 18: Presentation of Sanshodhan in the Raw Materials theme

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3.1.3 Maturity of the contributions

The content of the CICERONE consultation was rich and very valuable according to the core team and given bluenove's experience. Contributions with very different maturity levels were identified. It is often the case in this type of panel discussion open to the general public.

Here is a list of 4 types of contributions, classified according to their maturity.

1. *DIAGNOSTIC*

Some contributions were presented in the form of a diagnosis. They generally established the observation of a current situation presenting an issue. Among these messages, many of them deal with the way circular economy operates today.

As an example, this contribution argues that very often the focus is on process optimization and recycling in the circular economy:

> **VALUE CHAINS**
> *Circularity is often translated in 8 to 10 R-strategies, of which the Refuse, ReThink, ReDesign, and ReUse are the first ones, and Recycle is one of the last.*
> *The analysis of Cicerone of past research and innovation projects (ref. Cicerone project update June 019) shows, among others, that focus is often on process optimalisation and end-of-life management by recycling. That will not lead to the systemic change needed for ambitious goals of a low-carbon, safe and circular economy.*

Figure 19: A diagnostic on the way Circular Economy operates

2. *PROBLEMATIZATION*

In some discussions, participants take the time to describe a situation and raise the main issues. They can sometimes express an expectation or a major problem, very often for the general public through the figure of the consumer.

3. *SUGGESTIONS*

This type of contributions presents possible first ideas of solutions to address fully or partially an issue raised in the discussions. However, they usually require additional information to be implemented in practice because they indicate a general direction more than a concrete action.

Here are two examples of suggestions in the CICERONE consultation, one in the theme "**Raw Materials",** and another one in the challenge "**Value Chains".**

E.g.: **Raw Materials:** "The UN or the EU could govern the proper use of resources."

E.g.: **Value Chains":** "Developing sustainable and economically viable processes to recycle lithium batteries"

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4. CONCRETE SOLUTIONS

Some participants propose concrete and detailed solutions to be implemented. They give the objective, the specific action and sometimes explanations on the possible consequences to be taken into consideration.

WASTE

"Developing an EU taxonomy in order to classify climate, environmentally, and socially sustainable activities from a circular point of view, and thereby support financial institutions in making their portfolio more circular"

RAW MATERIALS

"Boost research on wind turbine blade recycling, since it contains fiber-reinforced polymer thermoset composites that are challenging to recycle."

3.2 Identification of objectives and Innovation fields

The aim of the CICERONE consultation was to set the priorities of the EU Circular Economy agenda. As explained in the previous section, the format of the output of the consultation followed a specific structure around objectives, sources and Innovation fields.

In this section, the methodology used for identifying objectives and Innovation fields is presented, as well as a more detailed description of the content collected.

3.2.1 Analysis method

The analysis method bluenove used for the consultation is depicted in the figure 21 below.

	bluenove analysis method
1.	A bluenove consultant harvests manually extracts of messages directly on the platform using Assembl's taxonomy: a problem, a concept, an area of knowledge, an example, an argument or a solution. This allows to map and synthesize all the conversations each week and animate the participation in order to deepen the topics to be further explored and developed, and to strengthen the most advanced topics and discussions. In order to analyse of all messages for the CICERONE consortium, bluenove also used a specific API to augment our ability to read the key concepts of contributions. Each contribution was analysed by IBM Watson, which provided a proposal of key words identified in the contribution. Our analyst validated and specified the list of tags. It allowed us to better classify the messages of the consultation.
2.	bluenove compares the results with the CICERONE methodology and classifies the content into **Objectives**, **Innovation Fields,** and **arguments/feedback/examples** given on the objectives and Innovation fields discussed. The content tagged as "argument.feedback/example" is to be analyzed and classified by an expert.
3.	The column "bluenove remarks" includes additional analysis and comments by bluenove: • interpretation or rephrasing of an argument as an innovation field or objective • message needing* to be moved from its original theme or objective in the platform • relevant additional information or observations (e.g. IF considered as a priority by the participants)

Remarks	
	*bluenove only reclassifies messages if it considers, with its non-expert view, that the message is clearly related to another theme or objective. *the direct link to the message in the platform is indicated when only a part of the message is extracted or when there is an interpretation of the content

Figure 20: bluenove analysis method

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To analyse the content on the Assembl platform a specific harvesting method is used. The most interesting and relevant content is selected and tagged according to a defined taxonomy.

In this case, the taxonomy used was adapted to the format of the final output of the online consultation defined with CICERONE partners in charge of the SRIA[3]. As it can be noticed in the figure below, different parts of the message are selected and tagged as *Objectives* (in red), or *Innovation fields* (in blue). Other categories used were *Arguments,* for ideas that support a proposition or gives additional information, and *Knowledge,* for the sources, external content and references quoted.

Figure 21: Taxonomy of contributions on the Assembl platform

Once the pieces of message have been qualified, they are integrated by theme in an Excel file (Figure 22) that allows a grouping of the Innovation fields by objective.

One specific column in the file is dedicated to the "Arguments/Feedback/Examples" on Objectives and Innovation fields, as well as other bluenove remarks on the content (e. g. content debated, IF considered important, etc.).

[3] Circular economy Strategic Research and Innovation Agenda (SRIA), key deliverable of the CICERONE project.

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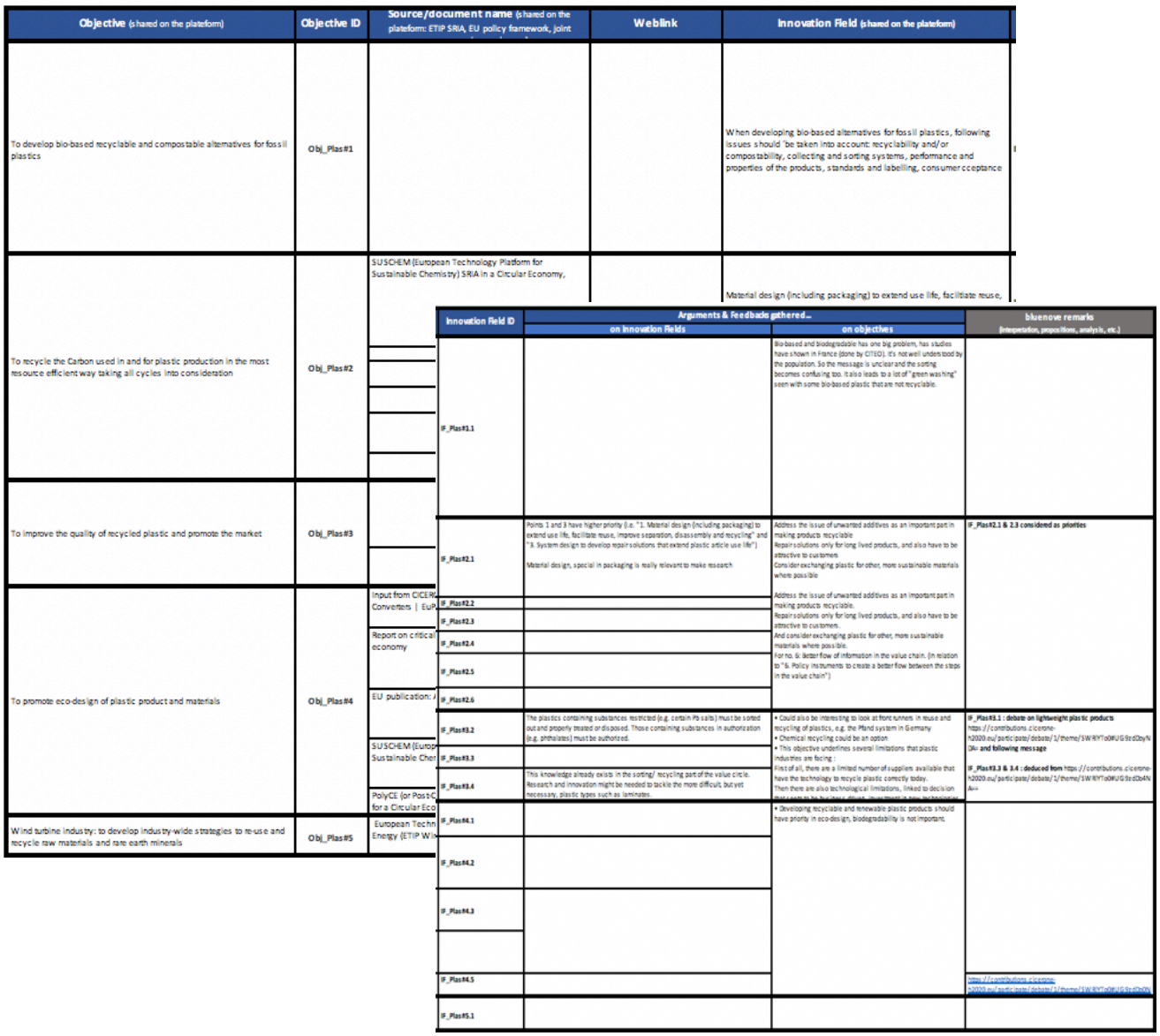

Objective (shared on the plateform)	Objective ID	Source/document name (shared on the plateform: ETIP SRIA, EU policy framework, joint	Weblink	Innovation Field (shared on the plateform)
To develop bio-based recyclable and compostable alternatives for fossil plastics	Obj_Plas#1			When developing bio-based alternatives for fossil plastics, following issues should 'be taken into account: recyclability and/or compostability, collecting and sorting systems, performance and properties of the products, standards and labelling, consumer acceptance
To recycle the Carbon used in and for plastic production in the most resource efficient way taking all cycles into consideration	Obj_Plas#2	SUSCHEM (European Technology Platform for Sustainable Chemistry) SRIA in a Circular Economy,		Material design (including packaging) to extend use life, facilitate reuse,
To improve the quality of recycled plastic and promote the market	Obj_Plas#3			
To promote eco-design of plastic product and materials	Obj_Plas#4	Input from CICERO Converters | EuP Report on critical economy EU publication: / SUSCHEM (Europ Sustainable Cher PolyCE (or Post-C for a Circular Eco		
Wind turbine industry: to develop industry-wide strategies to re-use and recycle raw materials and rare earth minerals	Obj_Plas#5	European Techn Energy (ETIP Wi		

Innovation Field ID	Arguments & Feedbacks gathered...		bluenove remarks (interpretation, propositions, analysis, etc.)
	on innovation fields	on objectives	
IF_Plas#1.1		Bio-based and biodegradable has one big problem, has studies have shown in France (done by CITEO), it's not well understood by the population. So the message is unclear and the sorting becomes confusing too. It also leads to a lot of "green washing" seen with some bio-based plastic that are not recyclable.	
IF_Plas#2.1	Points 1 and 3 have higher priority (i.e. "1. Material design (including packaging) to extend use life, facilitate reuse, improve separation, disassembly and recycling" and "3. System design to develop repair solutions that extend plastic article use life") Material design, special in packaging is really relevant to make research	Address the issue of unwanted additives as an important part in making products recyclable Repair solutions only for long lived products, and also have to be attractive to customers Consider exchanging plastic for other, more sustainable materials where possible	IF_Plas#2.1 & 2.3 considered as priorities
IF_Plas#2.2		Address the issue of unwanted additives as an important part in making products recyclable. Repair solutions only for long lived products, and also have to be attractive to customers. And consider exchanging plastic for other, more sustainable materials where possible. For no. 6: better flow of information in the value chain. (In relation to "6. Policy instruments to create a better flow between the steps in the value chain")	
IF_Plas#2.3			
IF_Plas#2.4			
IF_Plas#2.5			
IF_Plas#2.6			
IF_Plas#3.2	The plastics containing substances restricted (e.g. certain Pb salts) must be sorted out and properly treated or disposed. Those containing substances in authorization (e.g. phthalates) must be authorized.	• Could also be interesting to look at front runners in reuse and recycling of plastics, e.g. the Pfand system in Germany • Chemical recycling could be an option • This objective underlines several limitations that plastic industries are facing : First of all, there are a limited number of suppliers available that have the technology to recycle plastic correctly today. Then there are also technological limitations, linked to decision	IF_Plas#3.1 : debate on lightweight plastic products https://contributions.cicerone-h2020.eu/participate/debate/1/theme/SWRYTe0#UGSedDayN0&l- and following message IF_Plas#3.3 & 3.4 : deduced from https://contributions.cicerone-h2020.eu/participate/debate/1/theme/SWRYTe0#UGSedDa4NA=-
IF_Plas#3.3			
IF_Plas#3.4	This knowledge already exists in the sorting/ recycling part of the value circle. Research and innovation might be needed to tackle the more difficult, but yet necessary, plastic types such as laminates.		
IF_Plas#4.1		• Developing recyclable and renewable plastic products should have priority in eco-design, biodegradability is not important.	
IF_Plas#4.2			
IF_Plas#4.3			
IF_Plas#4.5			https://contributions.cicerone-h2020.eu/participate/debate/1/theme/SWRYTe0#UGSedDa4N
IF_Plas#5.1			

Figure 22: Mapping of Objectives and Innovation fields for the Plastic theme

Most Innovation fields were already integrated into the relevant objectives. Some of them had to be moved and linked to the objectives that were more appropriate. They were reclassified only when considered that the message was clearly related to another theme or objective (see example below).

> **WASTE**
>
> Better and more efficient collection systems for different types of waste in another area where innovation is needed

This Innovation Field was initially posted as an answer to the objective *"To promote low-waste product design to reduce waste quantities"*. It has been moved to the objective *"To reduce landfill & incineration through advancing waste management technologies", because it was more in line with this objective.*

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3.2.2 Quantitative analysis

Of the more than 400 contributions, 746 extracts of messages were harvested. Among these 746 messages, there were identified:

- **104** Objectives
- **393** Innovations Fields
- **141** Arguments/Feedback on contributions
- **36** Examples of existing initiatives
- **72** Sources (references to existing documents or reports)

Each theme did not generate the same level of debate: the proposed objectives and Innovation fields were not equally distributed according to the themes. The table below (Figure 23) indicates the raw number of Objectives and Innovation fields published by theme.

The theme leaders worked on the consolidation and synthesis of the objectives and Innovation fields diminishing their number.

THEME	OBJECTIVES	INNOVATION FIELDS
WASTE	16	65
PLASTIC	15	43
FOOD	8	25
CHEMICALS	8	44
WATER	6	22
CONSTRUCTION & DEMOLITION	9	19
BIOMASS & TECHNOLOGIES	5	26
RAW MATERIALS	6	29
URBAN AREAS	10	31
INDUSTRIAL SYSTEMS	8	31
TERRITORY & SEA	5	28
VALUE CHAINS	8	30

Figure 23: Table listing the number of objectives and Innovation fields by theme

3.2.3 Analysis of the objectives and Innovation fields

During the consultation, different types of **objectives** were identified.
The majority of the objectives expressed one or more major actions to be taken in order to achieve an optimal situation. Action verbs were often used for objectives: e.g. "develop", "regulate", "implement".

Three main categories of objectives were identified:

- **Objectives were very strategic or theoretical.**

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E.g.: "Educate the eaters"

- **Objectives that sought to develop existing systems or methods**

E.g.: "Scale up circular best practice across Europe"

- **Objectives that sought to solve a specific problem**

E.g.: “Improve safety and quality of urban water systems"

The **Innovation fields** expressed were also of a very different nature. Most of them were formulated as goals to be achieved.

They can be divided into 6 categories, depending on the goals sought by the participants.

1. EXPLORATION

Some messages included proposals for the exploration of a new field of research, either to boost knowledge on a specific topic or to understand a problem.
Many areas of research were mentioned. Most of them relate to new technologies or technical and scientific fields.
E.g.:
- INDUSTRIAL SYSTEMS: "*Research to understand what the waste infrastructure would need to look like to comply with EU Circular Economy legislation coming down the track*";
- WASTE: "*Research on calculating the external impacts along multiple lifecycles for all end products*"

2. ACTION IMPLEMENTATION

This type of Innovation fields was about implementing an action to directly or indirectly achieve the objective.
Different actions were discussed. They mainly relate to product design or to the implementation of procedures to propose new solutions.
E.g.: FOOD: "*Mapping food consumption and transport systems in urban areas*"

3. NEW METHODS

Many contributions proposed new tools or methods to solve the current situation or to address the issues discussed.
E.g.: CHEMICALS: "*Methods and digital tools for integrating knowledge of toxicity into early design and to evaluate the sustainability impacts throughout the life cycle"*

4. DESIGNING NEW STANDARDS

Some Innovation fields focused on the design of new standards or improve the existing ones to regulate production or recycling.
E.g.:
- CONSTRUCTION & DEMOLITION: “*To enlarge certificates for sustainable construction with CE aspects"*
- FOOD: "*To work with national and international organisations that set standards for food product expiration"*

5. CONNECTING SHAREHOLDERS

The idea to create connexions between the different stakeholders was mentioned in almost all the themes. It can be done via platforms, agreements or data sharing.

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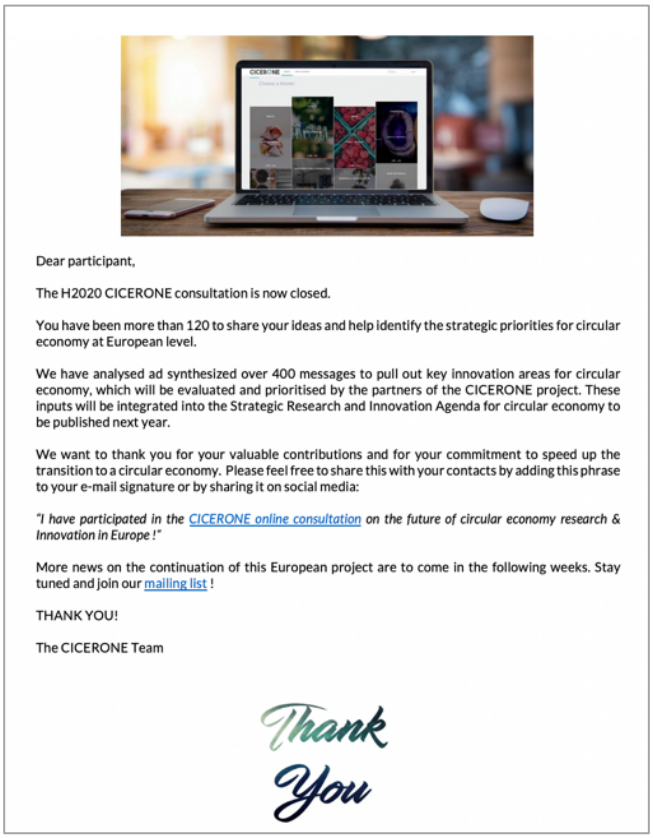
E.g.*:*
- CHEMICALS: "Network building as objective or condition in funded projects"
- WASTE: "Develop Platforms for data sharing, marketplace platforms, stakeholders' platforms, Industrial Data Platforms (IDPs)"

6. RAISING PUBLIC AWARENESS

In most of the 12 themes and challenges, *citizen awareness and training* is a recurring theme. Many participants consider that this is a subject that is at the heart of the circular economy. Things will not improve until attitudes change.
E.g.:
- URBAN AREAS: *"Raise awareness and build citizen knowledge on sharing economy models "*
- FOOD: *"Propose short agriculture training to employees in urban farms"*

At the end of the online consultation, the CICERONE partners members of the Task 2.1 retrieved the document compiling all the results collected from the discussions (see example in **Figure 23 Mapping of Objectives and Innovation fields for the Plastic theme).** The theme leaders did a work of synthetization and consolidation in order to prepare the list of Innovation fields for the phase of evaluation.

The participants received a final e-mail (Figure 24) to thank them for their participation, present the main results through a short synthesis of the discussions and inform them about the next steps.



Dear participant,

The H2020 CICERONE consultation is now closed.

You have been more than 120 to share your ideas and help identify the strategic priorities for circular economy at European level.

We have analysed ad synthesized over 400 messages to pull out key innovation areas for circular economy, which will be evaluated and prioritised by the partners of the CICERONE project. These inputs will be integrated into the Strategic Research and Innovation Agenda for circular economy to be published next year.

We want to thank you for your valuable contributions and for your commitment to speed up the transition to a circular economy. Please feel free to share this with your contacts by adding this phrase to your e-mail signature or by sharing it on social media:

"I have participated in the CICERONE online consultation on the future of circular economy research & Innovation in Europe !"

More news on the continuation of this European project are to come in the following weeks. Stay tuned and join our mailing list !

THANK YOU!

The CICERONE Team

Thank You

Figure 24: View of the e-mail sent to the participants at the end of the consultation

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4 EVALUATION AND PRIORITIZATION

4.1 Method and tools

The second step of the online consultation was the evaluation and prioritization phase. Once the theme leaders consolidated and synthesized the Innovation fields according to a method defined by IVL (CICERONE partner, Task2.1) the list was submitted to evaluation by the partners. It was decided to keep the evaluation phase open only to partners in order to beneficiate of the expert view of the members of the Consortium but also to avoid stakeholders' fatigue by solicitating them too much. Indeed, they are also invited to participate to the upcoming CICERONE Workshop in Berlin.

An allocation system was implemented to mobilize partners on 3 to 4 themes (see figure below).

	1. Theme: Construction and demolition	2. Theme: Raw materials	3. Theme: Water	4. Theme: Plastic	5. Theme: Waste	6. Theme: Chemicals	7. Theme: Food	8. Theme: Biomass and biotechnologies	9. Challenge: Urban areas	10. Challenge: Industrial systems	11. Challenge: Value chains	12. Challenge: Territory and sea	Sum of expected evaluations
IVL (Alexandra Wu)			1	1		1	1		1				5
CKIC (Thomas Wagner)							1			1	1		3
CEA (Arnaud Witomski)		1			1			1					3
LGI (Joanne Schanté)					1						1	1	3
JUELICH (JF Renault)	1	1							1				3
IETU (Izabela Ratman)					1		1		1				3
TNO (Hettie)		1		1									2
ETAg (Ülle Napa)													2
UEFISCDI (Elena Simion)		1							1				2
VITO (Dirk & Kévin)	1			1	1								3
RVO (Nicole; Antoinet)									1			1	2
Univ of Maribor (Rebeka, Vasja, ...)	1					1				1			3
WRFA (Bas, Shahrzad)		1							1		1		3
WI (Carina, Bettina)					1		1				1		3
VTT (Henna Sundqvist-Andberg)				1		1		1					2
NCKU(Walker, Sophie)				1	1			1					3
EIT Rawmaterials (Ignacio)		1	1							1			3
GKZ (Meng Chun Lee)		1								1	1		3
PNO (Tjerk and Rosa)				1	1				1				3
Sofia Development Association			1						1				2
Xunta (Ana, Samuel)	1			1	1								3
CEPS (Jorge, Vasileios, Cristian)		1							1		1		3
ENEA (Roberta De Carolis)						1				1	1	1	4
													66
Expected evaluations per theme	4	8	3	7	9	3	4	4	9	5	7	3	
	1	Theme/challenge leader											
	1	Allocated											

Figure 25: Allocation of Themes & Challenges per partner

The method for the evaluation phase was prepared by members from CEA and IVL (CICERONE partners). The evaluation criteria included criteria on *circular impacts* (environmental impact, social impact, economic impact and indirect impact), *innovation readiness and roadmapping information.* For Innovation fields under themes, a question on identifying relevant challenges was included as the final SRIA will be divided into the four challenges.

Since the number of criteria and the number of Innovation fields was very high, the Assembl platform was not adapted to use in terms of user experience.

Thus, the Survey Monkey platform was used to create surveys for each theme and challenge. The questions were multiple choice and some answer fields allowed participants to give feedback or explain their choices.

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4.2 Evaluation period

The evaluation and prioritization phase started on September 12th and ended on the September 27th. The partners had two weeks to evaluate the IFs of the themes and challenges allocated.

Several webinar sessions were organized to give guidelines to partners and answer their questions.

CICERONE H2020 Stakeholder Consultation
BIOMASS & TECHNOLOGIES THEME
IF_BIO#1: New generation of sustainable biomass

IF Description: Advanced biotechnology to create new, renewable biomass in a sustainable manner.

Underlying technologies: Advanced biotechnology, synthetic biology

- Environmental impact

* 1. Would this IF reduce Greenhouse Gas Emissions (GHG) footprint?

Significantly Insignificantly Undecidable

* 2. Would this IF reduce material footprint?

Significantly Insignificantly Undecidable

* 3. Would this IF reduce footprint on biodiversity/local environment?

Significantly Insignificantly Undecidable

- Social impact

* 4. Would this IF create or maintain local (highly and low-qualified, sustainable) jobs?

Significantly Insignificantly Undecidable

Figure 26: View from the Biomass & Technologies Theme survey

The surveys were organized by theme and challenge. The first page contained the guidelines and the list of Innovation fields for the respective theme. Each innovation field was presented on one page with 25 questions evaluating the different criteria already mentioned above. The last page of the surveys contained comparative questions on the Roadmapping: support start time, market ready time and relative effort needed.

4.3 Results analysis

The results of the evaluation were used to complete a document consolidating all the answers per theme and challenge tracking the answers of each partner.

Each answer has a mathematical weighting that gives synthetic marks for Circular impact and Innovation readiness (see figure below).

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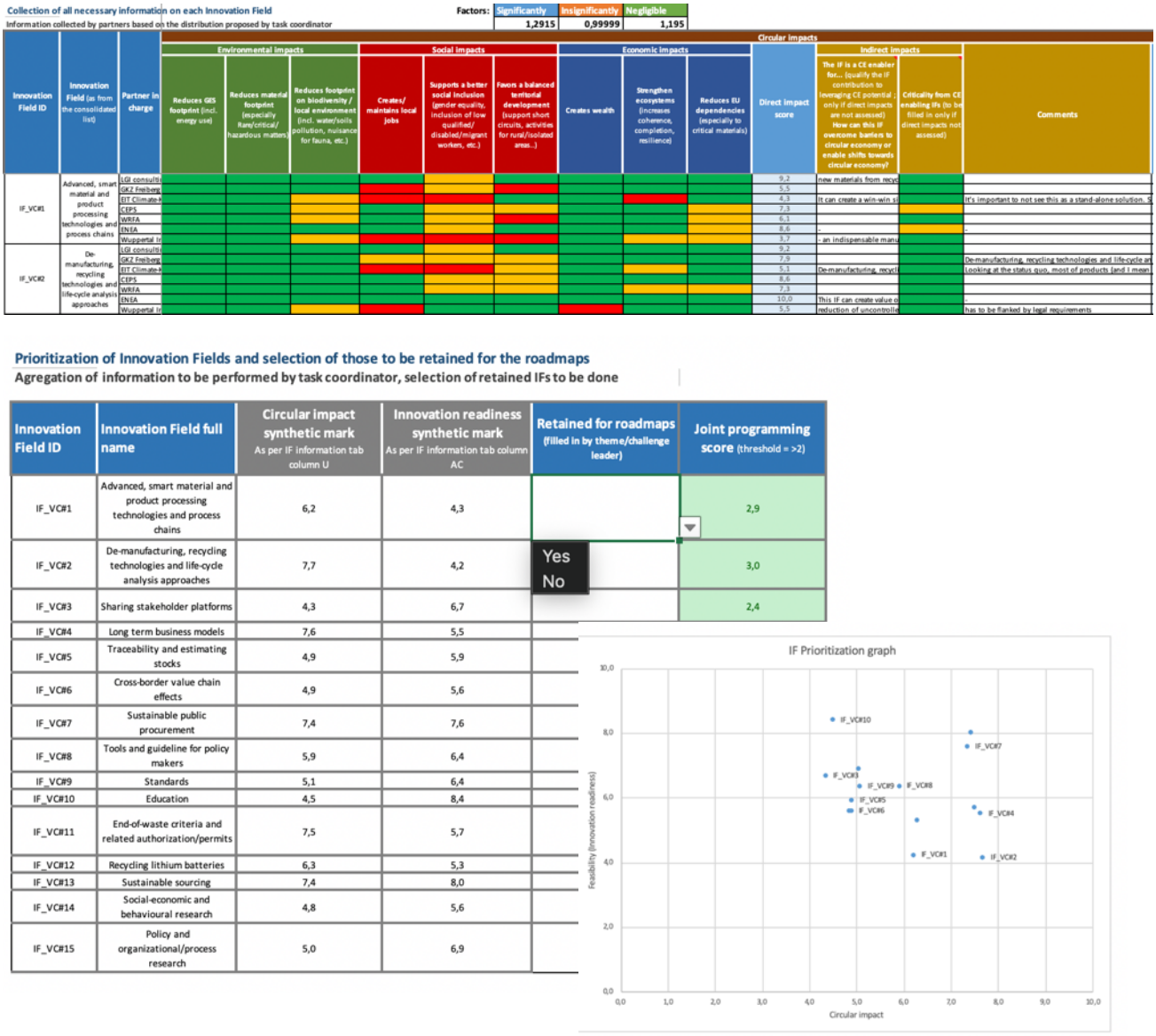

Collection of all necessary information on each Innovation Field

Information collected by partners based on the distribution proposed by task coordinator

Factors: Significantly 1,2915 | Insignificantly 0,99999 | Negligible 1,195

Innovation Field ID	Innovation Field (as from the consolidated list)	Partner in charge	Environmental 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.)	Social impacts: 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..)	Economic impacts: Creates wealth	Strengthen ecosystems (increases coherence, completion, resilience)	Reduces EU dependencies (especially to critical materials)	Direct impact score	Indirect impacts: The IF is a CE enabler for... (qualify the IF contribution to leveraging CE potential ; only if direct impacts are not assessed) How can this IF overcome barriers to circular economy or enable shifts towards circular economy?	Criticality from CE enabling IFs (to be filled in only if direct impacts not assessed)	Comments
IF_VC#1	Advanced, smart material and product processing technologies and process chains	LGI consulti										9,2	new materials from recyc		
		GKZ Freiberg										5,5			
		EIT Climate-K										4,3	It can create a win-win si		It's important to not see this as a stand-alone solution. S
		CEPS										7,3			
		WRFA										6,1			
		ENEA										8,6			-
		Wuppertal In										3,7	- an indispensable manu		
IF_VC#2	De-manufacturing, recycling technologies and life-cycle analysis approaches	LGI consulti										9,2			
		GKZ Freiberg										7,9			De-manufacturing, recycling technologies and life-cycle ar
		EIT Climate-K										5,1	De-manufacturing, recycli		Looking at the status quo, most of products (and I mean
		CEPS										8,6			
		WRFA										7,3			
		ENEA										10,0	This IF can create value o		-
		Wuppertal In										5,5	reduction of uncontrolle		has to be flanked by legal requirements

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

Agregation of information to be performed by task coordinator, selection of retained IFs to be done

Innovation Field ID	Innovation Field full name	Circular impact synthetic mark As per IF information tab column U	Innovation readiness synthetic mark As per IF information tab column AC	Retained for roadmaps (filled in by theme/challenge leader)	Joint programming score (threshold = >2)
IF_VC#1	Advanced, smart material and product processing technologies and process chains	6,2	4,3		2,9
IF_VC#2	De-manufacturing, recycling technologies and life-cycle analysis approaches	7,7	4,2	Yes / No	3,0
IF_VC#3	Sharing stakeholder platforms	4,3	6,7		2,4
IF_VC#4	Long term business models	7,6	5,5		
IF_VC#5	Traceability and estimating stocks	4,9	5,9		
IF_VC#6	Cross-border value chain effects	4,9	5,6		
IF_VC#7	Sustainable public procurement	7,4	7,6		
IF_VC#8	Tools and guideline for policy makers	5,9	6,4		
IF_VC#9	Standards	5,1	6,4		
IF_VC#10	Education	4,5	8,4		
IF_VC#11	End-of-waste criteria and related authorization/permits	7,5	5,7		
IF_VC#12	Recycling lithium batteries	6,3	5,3		
IF_VC#13	Sustainable sourcing	7,4	8,0		
IF_VC#14	Social-economic and behavioural research	4,8	5,6		
IF_VC#15	Policy and organizational/process research	5,0	6,9		

Figure 27: Screenshot of inputs from the evaluation for the Value chains challenge

At a first glance, partners mostly agreed on the evaluation of the environmental impact and economic impact of the Innovation fields. A great majority of the Innovation fields evaluated have a significant environmental impact.

The most difficult criteria to evaluate seemed to be social impact because it collected the more divergent opinions and multiple “undecidable” answers.

The input collected in the evaluation phase was the levels of impact and feasibility that each partner perceived on the various Innovation fields. A calculation method was developed to analyse their inputs and determine which of the Innovation fields should be prioritized and included in the SRIA. The prioritized IFs will then be compiled into roadmaps and joint programs in the SRIA.

This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No. 820707.

A significant number of Innovation fields were considered as having a high potential to be part of an integrated pilot or joint programming initiative (more than 50%). For the purpose of the CICERONE project, in general terms a joint program will be a research and innovation funding program on circular economy with clearly identified objectives and scope on what kind of topics will be included. The starting framework are the four challenges, each forming a joint program - on Urban areas, Industrial systems, Value chains and Territory & sea. Each program will have identified a set of relevant themes and Innovation fields that are linked to the program. Joint programs are also intended to be multi-disciplinary.

However, it is important to note that the development of CICERONE joint programs will be further discussed in the latter stages of the project and in consultation with the WP on the governance platform, given the vital role of the platform and program owners in implementing the joint programs. This is a key part of the upcoming CICERONE workshop in Berlin in November 2019.

Whereas the first phase of the consultation aimed at a mass gathering of potential innovation fields for future Circular Economy Research & Innovation, the second phase, otherwise names “evaluation phase”, enabled the project to specifically analyse the R&I priorities themselves and thus refine the ones to be included int the SRIA not only based on Po direction, but also on circularity potential. Using the questionnaire mentioned above and available in Annex 1, key innovation fields selected and refined per challenge area, building a basis for building joint programmes, to be tested during the CICERONE Workshop 2 in Berlin. The full list of innovation fields synthesised and regrouped into the four challenges can be found in Annex 2.

4.4 Recommendations on the evaluation

For the Innovation fields where the dissensus is strong, meaning that there are multiple divergent opinions (significantly and insignificantly, high and low, etc.) further discussions seem necessary. For example, in the challenge *Value chains*, the innovation field “*Creation of awareness campaigns and educational program at various level, as well as dedicated incentives mechanism*” generated high dissensus on every criterion. Different interpretations of the innovation field or different degrees of knowledge on the topic can lead to a strong dissensus. In these cases, discussions can help to propose a more accurate evaluation.

For some Innovation fields, where the undecidable proportion is very high, further precisions and details can be necessary. It can be a framing problem or a need for more deepening. It is the case for example for the innovation field “*Mechanisms of antimicrobial activity with new chemical-material combinations (raw materials combinations & design approaches)* » in the *Chemicals theme* where the majority of answers are “Undecidable”.

The theme leaders analyse the results of the evaluation and take the measures they consider relevant for each case mentioned above.

This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No. 820707.

5 CONCLUSION

5.1 Final recommendations

The online consultation was an opportunity to define key Research & Innovation priorities for CE in Europe. The numerous stakeholders and participants gave their opinion and shared their knowledge to define together the key innovation priorities for the circular economy by proposing Research and Innovation fields.

The inputs from the online consultation will directly impact the Strategic Research and Innovation Agenda (SRIA), one of the key deliverables to the European Commission in the CICERONE project.

Based on bluenove's experience with collective intelligence approaches and as a conclusion of this online consultation, a few key recommendations can be made.

1. **Communication & ecosystem engagement**

Given the relatively low share of contributors for a consultation of this scope, in topic and target audience. The adherence and engagement of the stakeholders are to be strengthened in order to create a European ecosystem around the CICERONE project.

2. **Diversity of stakeholders and content**

To ensure different point of view in an open consultation, a variety of methods and tools can be used. For example, to allow non-scientific expert participants to contribute a less technical language should be preferred. In the same manner, to ensure a high quality of debate and mature contributions, "knowledge guarantors" can be named in order to challenge and bring more verified content in the discussions. This type of methods are key to bring to light collective intelligence.

5.2 Insights from the core team CICERONE partners

IVL

"The contributions given by the participants were useful to help us understand what people believe are important priorities or actions in different areas of circular economy.

The topics were fairly diverse as mentioned in the six categories above. One gap we faced is that the level of innovativeness found in the participants' inputs was sometimes limited. However, this may be simply due to the fact that coming up with ideas for innovation often requires more extensive and dynamic interaction between individuals.

Despite the challenges and limitations faced, the online consultation was useful to collect diverse inputs and ideas on the Innovation fields proposed by the CICERONE project. After the inputs were synthesized, the project integrated them to revise the draft Innovation fields on circular economy. It has been further evaluated and prioritized and will form the basis of the strategic research and innovation agenda for circular economy in the EU."

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ENEA

"As scientific coordinator, ENEA was involved both as a consultation partner and as moderator and "stimulating actor" during the consultation, as well as "Hub" for Italian stakeholders. Our general comment on the process is aligned with Bluenove insight and in particular with the fact that the figures remain low compared to the number of countries involved and given the scope of the consultation. Further communication efforts will be needed to increase the visibility and the endorsement of the roadmap at the European level'.

Specific comments related to general feeling are listed here below:

1 *Consultation period was not the best due to European vacation (July for Central and North Europe, August for Southern): this could have affected overall participation.*
2 *Language barrier could be another affecting factor*
3 *Industries (in particular big players) were less active, maybe due to different commitment*
4 *As far as our experience with Italian POs, this kind of instrument should be more "official" to get "official feedbacks". However, we tried to overcome this issue involving POs-related agencies*

Regarding differences in topics:

From our point of view, Plastic is on the top on public debate in this historical moment, as well as Waste is always an attractive topic. Therefore it was not surprising to see these themes attractive for the participants. However, the general concept of waste still appears "before circular economy", where the concept aims to be abandoned."

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 820707.

Annex 1

Example of Survey for one Innovation field in the theme “Biomass & Technologies”.

Annex 2

List of synthesized Innovation fields regrouped into the 4 challenges: Urban Areas, Industrial Systems, Value Chains, Territory and Sea.

This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No. 820707.

CICERONE H2020 Stakeholder Consultation
BIOMASS & TECHNOLOGIES THEME
Evaluation and prioritization of Innovation Fields

Welcome to this evaluation survey!

Over the summer we have gathered inputs from stakeholders on where circular economy research and innovation activities should be conducted in the EU (aka. innovation fields (IFs)). These areas are split into 8 themes (raw materials, water, plastic, waste, chemicals, food, biomass & biotechnologies and construction & demolition) and four challenges (urban areas, industrial systems, value chains, and territory & sea).

The input from the online consultation has been compiled into a list of IFs for evaluation and prioritization, which you will now do in this survey. The purpose of this survey is to assess each IF for their Circular Impact, Innovation Readiness and considerations on Roadmapping. Your input to the evaluation will directly impact the Strategic Research and Innovation Agenda (SRIA), one of our key deliverables to the European Commission in the CICERONE project.

In this survey, you will be given descriptions of innovation fields and then asked a series of questions to assess the circular impact, innovation readiness and considerations on roadmapping for the innovation field. All the main questions will be in multiple choice, and you can further motivate your answers in the short answer fields available. Please read the innovation fields carefully before answering the questions.

This survey will be open from 12-27 September to CICERONE partners only.

If you have any questions, please feel free to contact Alexandra Wu (alexandra.wu@ivl.se) or Adina Tatar (adina.tatar@bluenove.com) for IT issues

We thank you in advance for your valuable input to the survey!

T2.1 Team

* 1. Participant information

Name	
Organization	
Email Address	

IF_BIO#1
IF Label: New generation of sustainalable biomass
IF Description: Advanced biotechnology to create new, renewable biomass in a sustainable manner.
Underlying technologies Advanced biotechnology, synthetic biology

IF_BIO#2
IF Label: Efficient biomass cultivation systems
IF Description: Sustainable and efficienct cultivation systems with closed-loop approaches and recycling of nutrients. Intensification of land use of un- or underused, abandoned land, including phytoremediation driven energy crops production to increase yield and availability of forestly and agricultural biomass.
Underlying technologies: Nutrient recycling, close-loop cultivation systems, phytoremediation, genetic engineering, ICT-based solutions and related technologies (including robotics and photonics)

IF_BIO#3
IF Label: Biomass feedstock from co-products, side streams and residual streams
IF Description: Management and utilisation of biomass feedstock from different side-, residual and co-product streams, including safety in material circulation (cyber safety and health issues)
Underlying technologies: ICT based solutions and related technologies (e.g. photonics and robotics) , sustainable supply chain management

IF_BIO#4
IF Label: Resource efficient biomass pre-treatments and conversion
IF Description: Develop and demonstrate advanced, energy and carbon efficient, biomass pre-treatment and conversion technologies (chemical, thermochemical and biochemical) to produce energy, fuels and biobased products for lignocellulosic ethanol, syngas fermentation, biogas, biochar, alcohols, sugars to hydrocarbon, high added value molecules and products. Process integration towards cascading processes, including capturing and utilising CO2 in processes.
Underlying technologies: Biomass fractionation, extraction and purification technologies, CCU, conversion technologies,

IF_BIO#5
IF Label: Development and processing of biopolymers into new competitive products and applications
IF Description: Development and processing of biopolymers into new competitive products (e.g. bioplastics without pthalates) and applications (e.g. films, fibres, packaging, structural composites) according to circular principles, which include material and product design for reuse or recycling.
Underlying technologies: Conversion technologies, organic chemistry, packaging technology, fibre technology, biopolymer processing technologies, eco-design

IF_BIO#6
IF Label: High performance materials and food from captured CO2
IF Description: Develop feasible technological solutions to produce high performance materials and nutritious food from CO2 captured from industrial processes (and from atmosphere), including feasible production technologies for hydrogen that is required to reduce CO2 to hydrocarbons.
Underlying technologies: CCU technologies, hydrogen production technologies

IF_BIO#7
IF Label: Biorefinery process integration
IF Description: Develop simulation and modelling tools, process technologies and logistic solutions for biorefinery process optimization and integration towards cascading and circular approaches. Ensure safety in material circulation.
Underlying technologies: Logistics and sustainable supply chain management, process technologies, simulation and modelling

IF_BIO#8
IF Label: Sustainability and circularity of biomass and bio-based products
IF Description: Develop sustainability criteria and circularity metrics for different biomass feedstocks and biobased products.
Underlying technologies: LCA, IT solutions and technologies

IF_BIO#9
IF Label: Policy development to promote circular principles in bioeconomy
IF Description: Incentives are needed to increase the cascading use of biomass, valorisation of biomass, and capturing and utilisation of CO2 to produce value added materials and products. Policy (and instruments) mixes should be studied and developed which encourage investments in sustainable technologies.

CICERONE H2020 Stakeholder Consultation
BIOMASS & TECHNOLOGIES THEME
IF_BIO#1: New generation of sustainable biomass

IF Description: Advanced biotechnology to create new, renewable biomass in a sustainable manner.

Underlying technologies: Advanced biotechnology, synthetic biology

- Environmental impact

* 1. Would this IF reduce Greenhouse Gas Emissions (GHG) footprint?

◯ Significantly ◯ Insignificantly ◯ Undecidable

* 2. Would this IF reduce material footprint?

◯ Significantly ◯ Insignificantly ◯ Undecidable

* 3. Would this IF reduce footprint on biodiversity/local environment?

◯ Significantly ◯ Insignificantly ◯ Undecidable

- Social impact

* 4. Would this IF create or maintain local (highly and low-qualified, sustainable) jobs?

◯ Significantly ◯ Insignificantly ◯ Undecidable

* 5. Would this IF support better social inclusion (gender equality, inclusion of low qualified/ disabled/migrant workers, etc.)?

◯ Significantly ◯ Insignificantly ◯ Undecidable

* 6. Would this IF favor a balanced territorial development (e.g. supports short circuits, activities for rural/isolated areas)?

◯ Significantly ◯ Insignificantly ◯ Undecidable

• Economic impact

* 7. Would this IF create wealth in the EU?

◯ Significantly ◯ Insignificantly ◯ Undecidable

* 8. Would this IF strengthen ecosystems (increase coherence, completion, resilience)?

◯ Significantly

◯ Insignificantly

◯ Undecidable

* 9. Would this IF reduce EU dependencies (especially to critical materials)?

◯ Significantly

◯ Insignificantly

◯ Undecidable

• Indirect impact

Some innovation fields can potentially overcome barriers and enable systemic shifts toward circular economy, but without strong direct impacts to the environment, society or economy. E.g. economic research that support emergence of new business models, social and human sciences that overcome behavioural barriers to circular economy.

10. How can this IF overcome barriers to circular economy or enable shifts towards circular economy? (Optional)

11. How critical is this IF to overcome barriers or enable shifts to circular economy? (Optional)

- ◯ Mandatory
- ◯ Nice to have
- ◯ Negligible

12. Please feel free to provide any further comments or explanations to your answers above on the potential environmental, social, economic and indirect impacts of this IF (optional).

• Innovation readiness

* 13. Research feasibility (i.e. the existence of solutions mature enough to address this IF (if technology based, technology readiness level 3-7)) is...

◯ High ◯ Low ◯ Undecidable

* 14. Business readiness (i.e. the existence of business models coherent with this IF and related value chains & markets in EU) is...

◯ High ◯ Low ◯ Undecidable

* **15. Legal applicability (i.e. the existence of a regulation and responsibility framework for this IF) is...**

◯ High ◯ Low ◯ Undecidable

* **16. HR doability (i.e. there is no shortage of skills to impede deployment of this IF) is...**

◯ High ◯ Low ◯ Undecidable

* **17. Social acceptability (i.e. there is no identified barrier to social acceptance of this IF) is...**

◯ High ◯ Low ◯ Undecidable

18. Please feel free to provide any further comments or explanations to your answers above on the innovation readiness of this IF (optional)

• Roadmapping information

* **19. What is the potential of this IF to be part of an integrated pilot / joint programming initiative (as a support to further analysis of potential pilots within CICERONE)?**

◯ High ◯ Medium ◯ Low

20. Critical prerequisites: What are the preliminary actions required to mature this IF? What other comments or input do you have to the above on the roadmapping of this IF? (Optional, mainly thoughts for supporting recommendations)

Relevance to challenges: rank the relevance to the four challenges on a qualitative scale. You can explain your choice in the space below.

* 21. **Urban areas**
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.

- Micro: individual households and buildings
- Meso: individual city level
- Macro: Interactions between cities, agglomerations and sister cities (with social/political/cultural ties or partnerships)

◯ Highly relevant ◯ Relevant ◯ Not relevant

* 22. **Value chains**
Sustainability challenges related to the local, regional, national and global movement of materials and goods within supply chains. Focus is on material sourcing and circularity (closing the loop) particularly in supply chains/products.

- Raw Materials : closing the loop and limiting sourcing radius of specific materials (i.e. Critical Raw Materials or others)
- Products (i.e. plastic packaging, WEEE, tyres, etc.)
- Supply chains (such as buildings, agro-industry, textile, etc.).

◯ Highly relevant ◯ Relevant ◯ Not relevant

* 23. **Industrial systems**
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 Value Chains challenge.

- **Micro: individual factory or plant**
- **Meso: industrial parks, eco-industrial parks with industrial symbiosis relationships**
- **Macro: N/A (tackled in Value Chains)**

◯ **Highly relevant** ◯ **Relevant** ◯ **Not relevant**

* 24. **Territory and Sea**
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, tourism and other marine activities. Covers ports, harbours and coastal areas.

- **Micro: small harbours, local touristic ports, harbours focusing on local fishery, maritime touristic communities.**
- **Macro: Big commercial, touristic and industrial harbours.**

◯ **Highly relevant** ◯ **Relevant** ◯ **Not relevant**

25. I explain my choice for the above (questions 21-24).

INDUSTRIAL SYSTEMS: INNOVATION FIELDS

Objective 1: Developing new technologies, standards and methods for producing new materials and characterizing resources and waste

INDUSTRIAL SYSTEMS

High value manufacturing integrating eco-design

High value manufacturing integrating eco-design in the process, additive manufacturing" instead of "subtracting manufacturing".

BIOMASS

Sustainable management of biomass feedstocks from co-products, side streams and residual streams

Sustainable management and utilisation of biomass feedstock from different side-, residual and co-product streams. Development of sustainability criteria and circularity metrics for different biomass feedstocks (and related bioproducts). Ensure safety in material circulation, including cyber safety and health issues.

Resource efficient biomass pre-treatments and conversion into competitive products and applications

Develop and demonstrate advanced, energy and carbon efficient, biomass pre-treatment and conversion technologies (chemical, thermochemical and biochemical) to produce energy, fuels and bio-based products. This includes development and processing of biopolymers into new competitive products (e.g. bioplastics without pthalates) and applications (e.g. films, fibres, packaging, structural composites). Process integration towards cascading processes, including capturing and utilising CO2 in processes.

FOOD

Biorefinery process optimization and integration towards circularity

Develop simulation and modelling tools, process technologies and logistic solutions for biorefinery process optimization and integration towards cascading and circular approaches. Ensure safety in material circulation.

Lifecycle mapping and scenario modelling of EU food systems

Mapping and scenario modelling of food systems with the aim to understand food production, supply chain, consumption and transport systems considering urban-rural

interactions. Consider issues on food quality and safety, energy balance, economic sustainability, stakeholder attitudes and resource efficiency.

Recommercialization of commercial and agricultural food waste

Technological innovations and regulatory changes to recommercialize expired retail and commercial food including related aspects such as transport logistics. For food and organic waste from the agricultural sector, promote and upscale the use of byproducts (e.g. crop waste in animal feed, manure in fertilizer and other nutrient recovery from organic wastes). Traceability should be integrated to safeguard human, animal and environmental health, and ensure social acceptance

PLASTIC

Design for sustainable plastic consumption and smarter use

Including both material design and design for reuse/recycling. Policy to enhance the importance of design. Also including social aspects, behaviour etc. Also including aspects on using plastic vs other materials and reducing the consumption of plastic.

Traceability and information in the plastic value chain

Increasing the traceability and transparency in the plastic value chains.

Improve recycling technologies including chemical recycling

Development of recycling technologies to handle more parts of the plastic flows. Including chemical recycling

Biobased plastics in a circular system

Development of biobased plastics in relation to the existing system, making them circular also in terms of recycling and in some cases integrate considerations of degradability.

RAW MATERIALS

Mapping & valorisation of secondary feedstock

Design and production processes supporting an increased supply of materials from the optimal mix of primary and secondary sources, to address existing or new applications. Scalable solutions for exploring, inventing and sharing the information about material streams and potential sources for extracting secondary raw materials over European territories, including urban and landfill mining as well as industrial residues

Efficient primary mining & resource assessment

Resource/water/energy efficient mining, mineral processing and metallurgy, including for more complex and lower grade ores and minerals, enabling a safe, low environmental and sanitary impact and economically viable exploitation of primary raw materials in Europe. This also includes holistic knowledge of global resources, social and

environmental conditions of extraction, toxicity, geostrategic and economic factors regarding each of the critical, toxic and technological materials

Advanced remanufacturing processes for safe and efficient material recovery

Processes and logistics for safe and efficient collection, disassembly, recovery and reuse of valuable materials, especially for complex, composite and hazardous assemblies

Efficiently aggregating valuable materials in waste collection

Waste circuits ensuring an efficient aggregation of valuable material flows, especially with regards to energy technologies, transport and WEEE

Efficient and effective material detection & separation

Cost-efficient, robust and low-environmental impact detection and extractive processes, delivering secondary feedstocks, including for multi-material recovery

Safe and efficient product dismantling and sorting

Safe and efficient processes for depolluting and disassembling complex products, aiming at concentrating material rates and enable highly selective recycling

WASTE

Improve product design to extend product's lifespan and to enable reuse and remanufacturing

Improve product robustness and reliability (with limited resource use). Innovative approaches for modularity, circular design, ecodesign. Improve material design to facilitate separation, disassembly, recycling, reuse, refurbishment and repair.

Innovations to accelerate recycling and secondary markets

This includes: Innovative systems that improve the traceability of materials and chemicals in the supply chain to stimulate re-use and recycling; Improving secondary resources distribution for industrial symbiosis; Build system, technology and policy design to facilitate and accelerate the development of a competitive market and economy for recycled materials; and Stimulating the demand for secondary raw materials through quality requirements and harmonized end-of waste criteria.

WATER

Advanced wastewater treatment for material recovery and safety

Advanced, cost-effective industrial and urban wastewater treatment technologies characterized by the recovery of valuable products and pollutants (e.g. metals, minerals, nutrients and chemicals), microplastic filtration/treatment and water capture and reuse from agricultural liquid and solid wastes. This may also involve increasing operational efficiency of wastewater treatment facilities.

Holistic water management integrating technology, socioeconomics and policy

Integration between technological innovations, socioeconomic research and policy/financial incentives to facilitate sustainable water management

INDUSTRIAL SYSTEMS: INNOVATION FIELDS

Objective 2: Enabling industrial symbiosis networks and foster digitalization to master complexity of products, processes and systems

INDUSTRIAL SYSTEMS

Support biorefineries in chemicals, plastics, biofuel and energy

Support biorefineries either for chemicals and plastics production and for biofuel or energy production

BIOMASS

Sustainable management of biomass feedstocks from co-products, side streams and residual streams

Sustainable management and utilisation of biomass feedstock from different side-, residual and co-product streams. Development of sustainability criteria and circularity metrics for different biomass feedstocks (and related bioproducts). Ensure safety in material circulation, including cyber safety and health issues.

Resource efficient biomass pre-treatments and conversion into competitive products and applications

Develop and demonstrate advanced, energy and carbon efficient, biomass pre-treatment and conversion technologies (chemical, thermochemical and biochemical) to produce energy, fuels and bio-based products. This includes development and processing of biopolymers into new competitive products (e.g. bioplastics without pthalates) and applications (e.g. films, fibres, packaging, structural composites). Process integration towards cascading processes, including capturing and utilising CO2 in processes.

FOOD

Biorefinery process optimization and integration towards circularity

Develop simulation and modelling tools, process technologies and logistic solutions for biorefinery process optimization and integration towards cascading and circular approaches. Ensure safety in material circulation.

Lifecycle mapping and scenario modelling of EU food systems

Mapping and scenario modelling of food systems with the aim to understand food production, supply chain, consumption and transport systems considering urban-rural interactions. Consider issues on food quality and safety, energy balance, economic sustainability, stakeholder attitudes and resource efficiency.

Recommercialization of commercial and agricultural food waste

Technological innovations and regulatory changes to recommercialize expired retail and commercial food including related aspects such as transport logistics. For food and organic waste from the agricultural sector, promote and upscale the use of byproducts (e.g. crop waste in animal feed, manure in fertilizer and other nutrient recovery from organic wastes). Traceability should be integrated to safeguard human, animal and environmental health, and ensure social acceptance

PLASTIC

Design for sustainable plastic consumption and smarter use

Including both material design and design for reuse/recycling. Policy to enhance the importance of design. Also including social aspects, behaviour etc. Also including aspects on using plastic vs other materials and reducing the consumption of plastic.

Traceability and information in the plastic value chain

Increasing the traceability and transparency in the plastic value chains.

Improve recycling technologies including chemical recycling

Development of recycling technologies to handle more parts of the plastic flows. Including chemical recycling

Biobased plastics in a circular system

Development of biobased plastics in relation to the existing system, making them circular also in terms of recycling and in some cases integrate considerations of degradability.

RAW MATERIALS

Mapping & valorisation of secondary feedstock

Design and production processes supporting an increased supply of materials from the optimal mix of primary and secondary sources, to address existing or new applications. Scalable solutions for exploring, inventing and sharing the information about material streams and potential sources for extracting secondary raw materials over European territories, including urban and landfill mining as well as industrial residues

Efficient primary mining & resource assessment

Resource/water/energy efficient mining, mineral processing and metallurgy, including for more complex and lower grade ores and minerals, enabling a safe, low environmental and sanitary impact and economically viable exploitation of primary raw materials in Europe. This also includes holistic knowledge of global resources, social and environmental conditions of extraction, toxicity, geostrategic and economic factors regarding each of the critical, toxic and technological materials

Advanced remanufacturing processes for safe and efficient material recovery

Processes and logistics for safe and efficient collection, disassembly, recovery and reuse of valuable materials, especially for complex, composite and hazardous assemblies

Efficiently aggregating valuable materials in waste collection

Waste circuits ensuring an efficient aggregation of valuable material flows, especially with regards to energy technologies, transport and WEEE

Efficient and effective material detection & separation

Cost-efficient, robust and low-environmental impact detection and extractive processes, delivering secondary feedstocks, including for multi-material recovery

Safe and efficient product dismantling and sorting

Safe and efficient processes for depolluting and disassembling complex products, aiming at concentrating material rates and enable highly selective recycling

WASTE

Improve product design to extend product's lifespan and to enable reuse and remanufacturing

Improve product robustness and reliability (with limited resource use). Innovative approaches for modularity, circular design, ecodesign. Improve material design to facilitate separation, disassembly, recycling, reuse, refurbishment and repair.

Innovations to accelerate recycling and secondary markets

This includes: Innovative systems that improve the traceability of materials and chemicals in the supply chain to stimulate re-use and recycling; Improving secondary resources distribution for industrial symbiosis; Build system, technology and policy design to facilitate and accelerate the development of a competitive market and economy for recycled materials; and Stimulating the demand for secondary raw materials through quality requirements and harmonized end-of waste criteria.

WATER

Advanced wastewater treatment for material recovery and safety

Advanced, cost-effective industrial and urban wastewater treatment technologies characterized by the recovery of valuable products and pollutants (e.g. metals, minerals, nutrients and chemicals), microplastic filtration/treatment and water capture and reuse from agricultural liquid and solid wastes. This may also involve increasing operational efficiency of wastewater treatment facilities.

Holistic water management integrating technology, socioeconomics and policy

Integration between technological innovations, socioeconomic research and policy/financial incentives to facilitate sustainable water management

TERRITORY AND SEA: INNOVATION FIELDS

Objective 1: Designing and promoting sustainable maritime transport

TERRITORY AND SEA

Remanufacturing for shipping industry

Transition to a circular shipping industry through product, process and system innovations (i.e. use of recyclable composite fibres in the ships production)

FOOD

Lifecycle mapping and scenario modelling of EU food systems

Mapping and scenario modelling of food systems with the aim to understand food production, supply chain, consumption and transport systems considering urban-rural

interactions. Consider issues on food quality and safety, energy balance, economic sustainability, stakeholder attitudes and resource efficiency.

PLASTIC

Biobased plastics in a circular system

Development of biobased plastics in relation to the existing system, making them circular also in terms of recycling and in some cases integrate considerations of degradability.

RAW MATERIALS

Mapping & valorisation of secondary feedstock

Design and production processes supporting an increased supply of materials from the optimal mix of primary and secondary sources, to address existing or new applications. Scalable solutions for exploring, inventing and sharing the information about material streams and potential sources for extracting secondary raw materials over European territories, including urban and landfill mining as well as industrial residues

Efficiently aggregating valuable materials in waste collection

Waste circuits ensuring an efficient aggregation of valuable material flows, especially with regards to energy technologies, transport and WEEE

Efficient and effective material detection & separation

Cost-efficient, robust and low-environmental impact detection and extractive processes, delivering secondary feedstocks, including for multi-material recovery

Safe and efficient product dismantling and sorting

Safe and efficient processes for depolluting and disassembling complex products, aiming at concentrating material rates and enable highly selective recycling

WATER

Advanced wastewater treatment for material recovery and safety

Advanced, cost-effective industrial and urban wastewater treatment technologies characterized by the recovery of valuable products and pollutants (e.g. metals, minerals, nutrients and chemicals), microplastic filtration/treatment and water capture and reuse from agricultural liquid and solid wastes. This may also involve increasing operational efficiency of wastewater treatment facilities.

Integrated water network systems for resilience and securing supply

Integrated water network systems with improved resilience and capacity, that boost the performance of rainwater drainage networks (preferably using nature-based solutions) and increase supply for potable water and irrigation.

TERRITORY AND SEA: INNOVATION FIELDS

Objective 2: Promoting efficient resource use in port areas and surroundings with a long-term perspective

TERRITORY AND SEA
Integrated resource management approaches working at territorial level with a holistic and circular perspective Implementation of circular, integrated and holistic resources management systems at territorial level through eco-innovation actions at product, process, system, value chain and sector level with a long term perspective for a transition to a circular economy
Optimal fishing and aquaculture strategies Circular resources management in the aquaculture and fisheries sectors through the optimal resource use and the valorization of by-products, discards and wastes with industrial symbiosis implementation
FOOD
Lifecycle mapping and scenario modelling of EU food systems Mapping and scenario modelling of food systems with the aim to understand food production, supply chain, consumption and transport systems considering urban-rural interactions. Consider issues on food quality and safety, energy balance, economic sustainability, stakeholder attitudes and resource efficiency.
PLASTIC
Biobased plastics in a circular system Development of biobased plastics in relation to the existing system, making them circular also in terms of recycling and in some cases integrate considerations of degradability.
RAW MATERIALS
Mapping & valorisation of secondary feedstock

Design and production processes supporting an increased supply of materials from the optimal mix of primary and secondary sources, to address existing or new applications. Scalable solutions for exploring, inventing and sharing the information about material streams and potential sources for extracting secondary raw materials over European territories, including urban and landfill mining as well as industrial residues

Efficiently aggregating valuable materials in waste collection

Waste circuits ensuring an efficient aggregation of valuable material flows, especially with regards to energy technologies, transport and WEEE

Efficient and effective material detection & separation

Cost-efficient, robust and low-environmental impact detection and extractive processes, delivering secondary feedstocks, including for multi-material recovery

Safe and efficient product dismantling and sorting

Safe and efficient processes for depolluting and disassembling complex products, aiming at concentrating material rates and enable highly selective recycling

WATER

Advanced wastewater treatment for material recovery and safety

Advanced, cost-effective industrial and urban wastewater treatment technologies characterized by the recovery of valuable products and pollutants (e.g. metals, minerals, nutrients and chemicals), microplastic filtration/treatment and water capture and reuse from agricultural liquid and solid wastes. This may also involve increasing operational efficiency of wastewater treatment facilities.

Integrated water network systems for resilience and securing supply

Integrated water network systems with improved resilience and capacity, that boost the performance of rainwater drainage networks (preferably using nature-based solutions) and increase supply for potable water and irrigation.

URBAN AREAS: INNOVATION FIELDS

Objective 1: Improving resource management (especially water and soils) in cities and in industrial agriculture

URBAN AREAS

Advanced water treatment systems to promote circularity

Upgrading water treatment systems to increase recycling and reuse as well including risk analysis

Advanced waste management systems for circularity

New and improved waste systems for circular collection systems

CHEMICALS

Introduce traceability for chemicals of concern in products

Introducing traceability systems for chemicals of concern, for example by introducing a scorecard rating for all products and promoting eco-labelling

CONSTRUCTION AND DEMOLITION

Planning and design for re-use and recycling

Integrating the following aspects in the planning and design phases of buildings to minimize waste generation: reversibility, ease of transformation, deconstruction & disassembly, future reuse and recycling of building components

Technical solutions, regulations, tools for policy makers

The creation of incentives, technical solutions, tools and guidelines for policy makers, that are flexible and adaptable to local features and conditions

FOOD

Lifecycle mapping and scenario modelling of EU food systems

Mapping and scenario modelling of food systems with the aim to understand food production, supply chain, consumption and transport systems considering urban-rural interactions. Consider issues on food quality and safety, energy balance, economic sustainability, stakeholder attitudes and resource efficiency.

Recommercialization of commercial and agricultural food waste

Technological innovations and regulatory changes to recommercialize expired retail and commercial food including related aspects such as transport logistics. For food and organic waste from the agricultural sector, promote and upscale the use of byproducts (e.g. crop waste in animal feed, manure in fertilizer and other nutrient recovery from organic wastes). Traceability should be integrated to safeguard human, animal and environmental health, and ensure social acceptance

General upscaling of market-friendly circular economy innovations in the food sector

Adopt a systems approach to scale up market-friendly innovations and solutions (e.g. zero-packaging supermarkets) to the mass market for wide commercial adoption

PLASTIC

Improve recycling technologies including chemical recycling

Development of recycling technologies to handle more parts of the plastic flows. Including chemical recycling

RAW MATERIALS

Optimizing value per kg of raw materials

Systemic organizational solutions maximising the material usage value, based on product servitization, sharing and operational lifetime optimization

Efficiently aggregating valuable materials in waste collection

Waste circuits ensuring an efficient aggregation of valuable material flows, especially with regards to energy technologies, transport and WEEE

WASTE

Circular business models to extend product's lifespan, remanufacturing and reuse

Setting up circular business model to extend the product's lifespan, based on pay-per-use (or sharing models) rather than paying for product ownership to enable the reduction of waste quantities and extend product lifetime. Setting up circular business model to strengthen the reuse and remanufacturing of used products.

Reducing packaging in retail and food

Reducing packaging (innovation in distribution, unpackaged shops, packaging reduction in supermarkets through expansion of the range of unpackaged food products, introduction of reusable packaging)

Advanced and safe waste treatment, sorting and collection for circularity

This includes: Developing new sorting technologies and new technologies for treatment of multi-material products and composite materials. Quick and affordable methods to detect substances of very high concern (SVHCs) in waste streams. Application of chemical markers (linked to sorting systems) as a solution coupling complex product development with better materials sorting, with strong focus on non-metallic fractions.

This also includes: Exploring smart waste bins and platforms for monitoring and route optimisation. Testing sensor-supported waste collection with weight measurement or electronic sensors in containers to manage remote collection systems.

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URBAN AREAS: INNOVATION FIELDS

Objective 2: Improving waste management, recycling and second-hand markets in cities

URBAN AREAS
Circular systems for used products Systems for sharing, repair and circulation of used products. **Green public procurement programs** Identifying programs for 2nd hand markets.
CHEMICALS
Introduce traceability for chemicals of concern in products Introducing traceability systems for chemicals of concern, for example by introducing a scorecard rating for all products and promoting eco-labelling
CONSTRUCTION AND DEMOLITION
Planning and design for re-use and recycling

Integrating the following aspects in the planning and design phases of buildings to minimize waste generation: reversibility, ease of transformation, deconstruction & disassembly, future reuse and recycling of building components

Technical solutions, regulations, tools for policy makers

The creation of incentives, technical solutions, tools and guidelines for policy makers, that are flexible and adaptable to local features and conditions

FOOD

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General upscaling of market-friendly circular economy innovations in the food sector

Adopt a systems approach to scale up market-friendly innovations and solutions (e.g. zero-packaging supermarkets) to the mass market for wide commercial adoption

PLASTIC

Improve recycling technologies including chemical recycling

Development of recycling technologies to handle more parts of the plastic flows. Including chemical recycling

RAW MATERIALS

Optimizing value per kg of raw materials

Systemic organizational solutions maximising the material usage value, based on product servitization, sharing and operational lifetime optimization

Efficiently aggregating valuable materials in waste collection

Waste circuits ensuring an efficient aggregation of valuable material flows, especially with regards to energy technologies, transport and WEEE

WASTE

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Setting up circular business model to extend the product's lifespan, based on pay-per-use (or sharing models) rather than paying for product ownership to enable the reduction of waste quantities and extend product lifetime. Setting up circular business model to strengthen the reuse and remanufacturing of used products.

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This also includes: Exploring smart waste bins and platforms for monitoring and route optimisation. Testing sensor-supported waste collection with weight measurement or electronic sensors in containers to manage remote collection systems.

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Integrated water network systems for resilience and securing supply

Integrated water network systems with improved resilience and capacity, that boost the performance of rainwater drainage networks (preferably using nature-based solutions) and increase supply for potable water and irrigation.

Holistic water management integrating technology, socioeconomics and policy

Integration between technological innovations, socioeconomic research and policy/financial incentives to facilitate sustainable water management

VALUE CHAINS: INNOVATION FIELDS

Objective 1: Promoting systemic change in value chains, dematerialization and sustainable sourcing

VALUE CHAINS
Sustainable sourcing To promote sustainable sourcing
BIOMASS
Sustainable management of biomass feedstocks from co-products, side streams and residual streams Sustainable management and utilisation of biomass feedstock from different side-, residual and co-product streams. Development of sustainability criteria and circularity metrics for different biomass feedstocks (and related bioproducts). Ensure safety in material circulation, including cyber safety and health issues. **Resource efficient biomass pre-treatments and conversion into competitive products and applications** Develop and demonstrate advanced, energy and carbon efficient, biomass pre-treatment and conversion technologies (chemical, thermochemical and biochemical) to produce energy, fuels and bio-based products. This includes development and processing of biopolymers into new competitive products (e.g. bioplastics without pthalates) and applications (e.g. films, fibres, packaging, structural composites). Process integration towards cascading processes, including capturing and utilising CO2 in processes.
CONSTRUCTION AND DEMOLITION
Planning and design for re-use and recycling Integrating the following aspects in the planning and design phases of buildings to minimize waste generation: reversibility, ease of transformation, deconstruction & disassembly, future reuse and recycling of building components

Effective material recovery and decontamination techniques

Use of effective and flexible techniques for the sorting and recycling of construction and demolition waste (CDW) and for safely managing hazardous CDW, always assuring traceability

Methodologies for assessment of (environmental) life cycle costs

Development of a common framework that enables the assessment of the technical, economic and environmental performance of a building or a construction material over its entire life cycle

Technical solutions, regulations, tools for policy makers

The creation of incentives, technical solutions, tools and guidelines for policy makers, that are flexible and adaptable to local features and conditions

FOOD

Smart, sustainable and productive farming systems

Smart and sustainable farming systems (including urban agriculture) that maintain natural resources, increase production efficiency and promote high food quality, sustainability and awareness, characterized by logistical innovations that promote healthy, local and seasonal foods.

Lifecycle mapping and scenario modelling of EU food systems

Mapping and scenario modelling of food systems with the aim to understand food production, supply chain, consumption and transport systems considering urban-rural interactions. Consider issues on food quality and safety, energy balance, economic sustainability, stakeholder attitudes and resource efficiency.

Recommercialization of commercial and agricultural food waste

Technological innovations and regulatory changes to recommercialize expired retail and commercial food including related aspects such as transport logistics. For food and organic waste from the agricultural sector, promote and upscale the use of byproducts (e.g. crop waste in animal feed, manure in fertilizer and other nutrient recovery from organic wastes). Traceability should be integrated to safeguard human, animal and environmental health, and ensure social acceptance

General upscaling of market-friendly circular economy innovations in the food sector

Adopt a systems approach to scale up market-friendly innovations and solutions (e.g. zero-packaging supermarkets) to the mass market for wide commercial adoption

PLASTIC

Design for sustainable plastic consumption and smarter use

Including both material design and design for reuse/recycling. Policy to enhance the importance of design. Also including social aspects, behaviour etc. Also including aspects on using plastic vs other materials and reducing the consumption of plastic.

Traceability and information in the plastic value chain

Increasing the traceability and transparency in the plastic value chains.

Improve recycling technologies including chemical recycling

Development of recycling technologies to handle more parts of the plastic flows. Including chemical recycling

Biobased plastics in a circular system

Development of biobased plastics in relation to the existing system, making them circular also in terms of recycling and in some cases integrate considerations of degradability.

RAW MATERIALS

Mapping & valorisation of secondary feedstock

Design and production processes supporting an increased supply of materials from the optimal mix of primary and secondary sources, to address existing or new applications. Scalable solutions for exploring, inventing and sharing the information about material streams and potential sources for extracting secondary raw materials over European territories, including urban and landfill mining as well as industrial residues

Efficiently aggregating valuable materials in waste collection

Waste circuits ensuring an efficient aggregation of valuable material flows, especially with regards to energy technologies, transport and WEEE

Safe and efficient product dismantling and sorting

Safe and efficient processes for depolluting and disassembling complex products, aiming at concentrating material rates and enable highly selective recycling

WASTE

Circular Business models to extend product's lifespan, remanufacturing and reuse

Setting up circular business model to extend the product's lifespan, based on pay-per-use (or sharing models) rather than paying for product ownership to enable the reduction of waste quantities and extend product lifetime. Setting up circular business model to strengthen the reuse and remanufacturing of used products.

Improve product design to extend product's lifespan and to enable reuse and remanufacturing

Improve product robustness and reliability (with limited resource use). Innovative approaches for modularity, circular design, ecodesign. Improve material design to facilitate separation, disassembly, recycling, reuse, refurbishment and repair.

Reducing packaging in retail and food

Reducing packaging (innovation in distribution, unpackaged shops, packaging reduction in supermarkets through expansion of the range of unpackaged food products, introduction of reusable packaging)

Advanced and safe waste treatment, sorting and collection for circularity

This includes: Developing new sorting technologies and new technologies for treatment of multi-material products and composite materials. Quick and affordable methods to detect substances of very high concern (SVHCs) in waste streams. Application of chemical markers (linked to sorting systems) as a solution coupling complex product development with better materials sorting, with strong focus on non-metallic fractions.

This also includes: Exploring smart waste bins and platforms for monitoring and route optimisation. Testing sensor-supported waste collection with weight measurement or electronic sensors in containers to manage remote collection systems.

Innovations to accelerate recycling and secondary markets

This includes: Innovative systems that improve the traceability of materials and chemicals in the supply chain to stimulate re-use and recycling; Improving secondary resources distribution for industrial symbiosis; Build system, technology and policy design to facilitate and accelerate the development of a competitive market and economy for recycled materials; and Stimulating the demand for secondary raw materials through quality requirements and harmonized end-of waste criteria.

VALUE CHAINS: INNOVATION FIELDS

Objective 2: Addressing substances of concern to human and environmental health

VALUE CHAINS
Sustainable public procurement Develop criteria for circularity and establish a uniform method for governments in sustainable public procurement
BIOMASS
Sustainable management of biomass feedstocks from co-products, side streams and residual streams Sustainable management and utilisation of biomass feedstock from different side-, residual and co-product streams. Development of sustainability criteria and circularity metrics for different biomass feedstocks (and related bioproducts). Ensure safety in material circulation, including cyber safety and health issues. **Resource efficient biomass pre-treatments and conversion into competitive products and applications** Develop and demonstrate advanced, energy and carbon efficient, biomass pre-treatment and conversion technologies (chemical, thermochemical and biochemical) to produce energy, fuels and bio-based products. This includes development and processing of biopolymers into new competitive products (e.g. bioplastics without pthalates) and applications (e.g. films, fibres, packaging, structural composites). Process integration towards cascading processes, including capturing and utilising CO2 in processes.
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