

# Synergic Circular Economy across European Regions SCREEN

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## Deliverable D 2.1

## Screen Mapping Tool: Scope and Guidelines

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### Executive Summary

The availability of a structured and formalized knowledge basis concerning the existing capabilities and best practices being developed within the European Regions is of paramount importance to support the identification of promising local and cross-regional value-chains and to boost a transition to new circular economy business opportunities in Europe. Indeed, by analysing such information, missing links in the product and material loops as well as potential cross-sectorial best practice transferring mechanisms can be identified. However, a similar knowledge base is currently poorly deployed, thus bounding the opportunities for Regional cooperation in the identification of specific actions to unlock circular economy potentials. To overcome such limitation, the *SCREEN mapping tool* has been designed within the Screen project to collect data about existing capabilities in the Screen Regions, also considering the Smart Specialization Strategies and the key industry sectors. This tool represents the first pillar of the overall Screen methodology, consisting in the following three main steps:

- 1. **Data Collection:** Collect data about existing capabilities in the Screen Regions, also considering the Smart Specialization Strategies and the key industry sectors.
- 2. **Analysis:** Analyse the existing capabilities through a twofold data-driven and interaction-driven approach and identify the existence of regional hotspots and cross-regional opportunities and emerging ideas.
- 3. **Synthesis:** Synthesis and formalization of the existing cross-regional value-chains and specific opportunities that can potentially result in actions to be implemented through cross-regional cooperation.

This document presents the key features and the structure of the SCREEN mapping tool as well as the guidelines for supporting Regions while collecting information and populating the SCREEN mapping tool. The SCREEN mapping tool consists in a pre-formatted excel file, containing the metadata structure for supporting the mapping of the Regional capabilities, under common criteria. It is provided as an annex to this document and it will be compiled by the participating Regions during the course of the Screen project.

In this document, the data collection structure is explained and the procedure and tools to correctly carry out the mapping activities are reported. These guidelines will provide useful information to cover the mapping framework in order to create the Regional metadata step by step, presenting and detailing the topics related to each relevant area.

This activity is part of the Work Package 2 of Screen and supports the following objectives:

- To develop a methodology for the assessment of regional capabilities and best practices in the involved regions, grounding on their existing Smart Specialization Strategies.
- To identify specific synergies and complementarities among sectors, value chains and markets, in order to highlight and evaluate potential strategic business cases that could significantly contribute to the transition towards new circular economy business models.

The proposed methodology defines a simple information structure for the analysis of the existing regional capabilities and the emerging innovation opportunities in the region. The data collection framework is inspired by the approach adopted in the multi-regional Vanguard Pilot on "De-and Remanufacturing for Circular Economy" and considers general inputs from the Policymakers toolkit proposed by the Ellen Mc Arthur foundation. However, these data structures are adapted to the scope of the Screen project. In the following, after a general overview of the mapping tool, each area is discussed in details. The reference framework to which the Screen tool is referred to is described in the Annex. This approach has been

presented to the consortium and validated through several Question and Answers (Q&A) web-meetings, where the major aspects of improvement and the major barriers to the compilation were gathered and used for improvement.

The data collected by this framework will constitute the knowledge basis and the reference database for the future activities of Screen, including the local analysis in each region (T2.2), the cross-regional value chain analysis (T2.3 and T3.1) and will be topic of discussion during the workshops (WP4). The compiled tools collected by the Regions will also be the basis for the identification of the cross-regional value-chains and the investment opportunities across multiple sectors, through specific mechanisms that are briefly introduced in this document and will be further detailed within WP5.

### 1. The SCREEN mapping tool: general overview

In this paragraph, the Screen mapping tool and the related framework are presented. The main objective is to map within a comprehensive framework the current baseline situation in the Screen Regions in terms of existing technological, industrial, research and innovation, and education capabilities, as well as emerging Circular Economy initiatives, in line with the RIS3 strategy of the region. The metadata contained in the excel file were organized in six steps corresponding to six different areas of interest for the Regions, according to the framework reported in Figure 1.



Pre-Proposals for Circular-economy solutions Figure 1: the SCREEN mapping Framework

Each area is classified as *Mandatory, Strongly Recommended*, or *Optional. Mandatory data* is referred to data required for the subsequent analysis of local and cross-regional valuechains that will be carried out in T2.2, T2.3 and T3.1 (steps 1, 2, and 3). *Strongly Recommended data* (step 4) refer to already existing and identified emerging ideas proposed by regional stakeholders that could represent future areas of development of Circular Economy initiatives within the Region. While areas from 1 to 4 are focused on technological and strategic perspectives, *Optional data* refers to the analysis of non-technological barriers (areas 5 and 6). This analysis can help defining existing conditions, which can slow or foster the implementation of new circular value chains. The first area is related to existing legal frameworks at both national and regional level. The second area relates to the identification of existing support instruments that could foster the implementation and development of the most innovative circular economy initiatives. For each entry line, the data source can be reported. This option has been included in order to improve data traceability and reporting capabilities.

The introduction of different levels of importance of the SCREEN Mapping Tool areas is due to need of dealing with different degrees of maturity of European Regions with respect to sectorial and business data collection, statistical analysis and monitoring. The idea is that while regional institutions where specific units focused on data collection and analysis are already established would complete all the areas of the tool, those regional authorities which are less structured with respect to data collection and analysis would only focus on mandatory data. However, a learning process is expected that will lead, in the medium term, to a wider population of the SCREEN tool by European Regions.

In the following paragraphs the metadata structure will be detailed, and the guidelines for compilation will be drawn. A common approach for the presentation of each area has been followed, consisting in summarizing the objective of the area, the expected outputs, as well as the suggested data sources and data gathering processes. The sheets of the complete Excel Tool, along with some examples for its compilation, are found in Annex **C**. An overview of the SCREEN Mapping tool areas and sub-areas is provided in the figure below.



Figure 2: the SCREEN tool areas and sub-areas.

## 2. The SCREEN Mapping Tool Areas

#### 2.1 Area 1: RIS 3, strategic areas, SWOT analysis

Objectives

Highlight the most strategic innovation areas in the Region in view of supporting the transition to circular economy.

#### Output

RIS3 summary dealing with circular economy topics, SWOT analysis of the Region.

The first area aims at collecting information about the strategic positioning of each region towards Circular Economy in relation to the specific RIS3 strategies, when existing. With the objective of simplifying data entry, the metadata of this area are divided among two excel sheets, namely *RIS* 3 and *SWOT Analysis*.

*RIS* **3** is dedicated to data collection with respect to the Smart Specialization Strategies of the mapped region, with specific focus to Circular Economy topics. Since Smart Specialization Strategy documents of European Regions do not follow a unified template, Circular Economy topics may be found in different areas of Smart Specialization strategies (usually related to environment, waste management and industry). For this reason, a free structure enabling multiple entries has been proposed in the framework, with the section *Brief Description* dedicated to an explanation of the link between the areas of specialization and CE.

## How to gather the required data?

Smart Specialization Strategies can be found in the related documents produced by the regional institutions, if available. Some regions may have also developed policy lines or strategic agendas in which CE related topics are included. It is interesting to report relevant items composing these documents.

# How to gather the required data?

SWOT entries can be defined in two ways. The first is through the analysis of regional and sectoral reports, which report the current trends in the region. The second way is based on the involvement of key regional stakeholders, such as clusters, technology parks, think and other institutions thanks, developing regional development studies and roadmapping activities. The SWOT Analysis should bring together key figures, in order to provide a synthetic picture of the development state of the Region.

The **SWOT** Analysis proposes an open framework to reflect and highlight the main strengths, weaknesses, opportunities and trends of the Region with respect to Circular Economy initiatives. Different regions have in fact different pre-conditions and best practices that can drive the prioritization of those specific CE initiatives that are more clearly aligned with the existing regional capabilities and policies. Moreover, Regions can have specific sectorial strengths that can drive decisions on investment areas for circular economy.

The structure of the *SWOT Analysis* is open, meaning that every region is free to report and analyse points of interest with the preferred level of detail. The user providing data in the *SWOT Analysis* area has the capability to classify the entries with respect to the type of feature, including *Environmental*, *Economic*, *Social*, *Regulatory*, or *Other*.

In the Annex examples of entry lines for the SWOT Analysis are reported. It can be noted that a SWOT analysis may encompass more entry lines regarding one area, if there are different subjects that are interesting to report.

#### 2.2 Area 2: Focus sectors and companies

**Objectives:** Identify the role of sectors in regional economy

**Output:** A broad understanding of industrial situation to set specific opportunities

The second area relates to the identification, classification and analysis of the focus sectors for Circular Economy innovation, and the related industrial best practices in the Region. In the tool, the metadata related to this area are split among two sheets, namely *Focus Sectors* and *Companies*.

#### *How to gather the required data?*

The sectorial statistics can be found in public databases. If no data is available for the combination of the needed NUTS2 and NACE Sector, this simple formula can be used to esteem the data (other aggregation methods can be adopted as well, please report the adopted formula within the tool, if needed):

$$I_{r,s} = \partial \times I_{n,s}$$
$$\partial = \frac{GDP_{Region}}{GDP_{Nation}}$$

Where:

 $I_{r,s}$  = Indicator of interest with regional focus, for sector s; e.g. turnover in the region of sector s.

 $I_{n,s}$ = indicator of interest with national focus, for sector s (from Eurostat); e.g. turnover in the state of sector s.  $GDP_{Nation}$ = GDP of the state.

 $GDP_{Region} = GDP$  of the Region (NUTS2 Level).

The sub-area Focus Sectors requires the identification and brief analysis of the economic sectors within the region, with a relevant potential for circular economy. The identification of sectors is done by the means of NACE codes<sup>1</sup>. This will allow a standardized way of defining economic sectors among regions, since the existing local classifications are highly heterogeneous. The NACE code based classification is implemented in the tool and a selection process is required to the user.

Along with the identification of the sector, a primary analysis of sectorial statistics is required (*Employees in the region; Turnover; Gross Value Added; Number of companies in the region*). Each of these values should be referred to each specific NACE code sector, on a Regional basis (NUTS 2 level). If such data is not already

available in public or private accessible databases, it is suggested to provide estimates calculated with the method proposed in the box aside.

After this preliminary analysis, it is required to provide indicators to infer the circularity potential for each sector. This potential is inferred with the use of specific indicators, suggested in [1]<sup>2</sup>. The circularity potential of a sector is thus calculated using four indicators: *Volume of waste generated by the sector, Share of waste recycled, landfilled and incinerated.* It has to be noted that the sum of shares can also be lower than 100%, if some data about waste treatment are missing. Also in this case, if these data are not already included in public or private databases, it is suggested to provide estimates calculated with the aggregation method proposed in the box.

The Regional sectorial figures and the circularity potentials figures are connected to facilitate the analysis of local and cross-regional value-chains and innovation potentials that will be carried out in T2.2, T2.3 and T3.1. In particular, it is included with the scope of identifying and

http://ec.europa.eu/competition/mergers/cases/index/nace\_all.html for all the details of each sector.

<sup>&</sup>lt;sup>1</sup> Since there are different classifications, please refer to

<sup>&</sup>lt;sup>2</sup>https://www.ellenmacarthurfoundation.org/assets/downloads/publications/EllenMacArthurFoundation\_ PolicymakerToolkit.pdf

prioritizing initiatives which are strongly aligned with existing regional development strategies in order to avoid the dispersion of resources towards non target sectors. However, the selection of the most promising sectors for circular economy in each region is left to the user of the tool and the regional authority. One Region may decide to concentrate on best practices and emerging ideas related to mature industrial sectors that have not yet reached the full circular economy targets, for example with respect to waste management. On the contrary, another Region may decide to invest in emerging sectors, which have not yet reached the maturity level but have interesting potential for critical material preservation ad waste reduction. Thanks to the availability of data collected within this area of the tool such discussions can be triggered and full alignment between regional development strategies and investment areas can be achieved, thus positively affecting the effectiveness of efficiency of the regional investments by targeting on key priorities.

The sub-area "Companies" requires the identification and analysis of industrial best practices, within the identified focus sectors. The aim of this analysis is to concretely understand the existing potential for regional industrial stakeholders to set up innovative circular economy businesses and value chains, thus combining a strategic top-down approach (previous areas) with a concrete bottom-up approach. The mapped companies should have an operative office, research facility or production facility in the region under analysis, not necessarily the headquarter. The mapping of the industrial best practices in each region within the **companies sub-area** is based on a framework developed in Screen to locate different industrial activities with respect to a "Circular Value Chain" model. This model is explained in detail in the Annex A "Circular Value Chain Framework" of this deliverable, and constitutes the underline backbone for the excel sheet completion.

For each industrial best practice, the required data are as follows:

- Identification of the NACE code of the economic sector in which the company operates.
- *Name* of the company.
- Position in the circular value chain (see Annex A). The company may cover more positions of the value chain: in that case, multiple entries are allowed. This area is important to support the identification of missing links and gaps within a value-chain to be fulfilled potentially by cross-regional cooperation.
- Application Domain of Circular Economy activities (see Annex A). The company may cover none or more than one of these activities.
- *Technological capabilities*: It is requested to identify and describe the relevant technological capabilities of the company.
- *Input Materials*: this area requires a description of the input materials needed by the company to operate the core business and to produce the core product. Since this data can be sensitive, only data about the *type* of materials, and aggregated yearly quantities, is required. If more precise data in terms of quantities and mix are available, they should be reported in order to facilitate the circular material flow related analysis that will be carried out in T2.3.
- *Output Materials*: this area requires a description of the output, product, subcomponent or materials delivered by the core processes operated by the company. Can be a specific product with related by-products, or different material flows.

The data about industrial best practice gathered within the tool do not need to be exhaustive, but significant for CE potentials. For example, the focus of the selected company can be on one specific product, which is of particular interest for circular economy. If more than one product, process or service needs to be mapped for a single company, multiple entries can be included for the same company.

#### 2.3 Area 3: Research, Development and Innovation Capabilities

*Objectives* Create a circular economy related overview of R&D, innovation and education capabilities

*Output* Analysis of expertise to address circular economy opportunities

The third area requires the identification, classification and analysis of Research, Development and Innovation capabilities within the region. The metadata related to this area are split, in the tool, among four excel sheets, namely *General Overview, R&D Capability, Innovation Capability, Education Capability.* The overall objective of this area is to gather information about the existing capabilities in the Region that could provide the technical basis to develop and bring to implementation the synergies that will be identified in the next phases of the Screen project. In particular, research and innovation capabilities provide potential to support market uptake of innovative solutions that could support the implementation of new products/services in the domain of circular economy. Moreover, the existence of education capabilities in the Region is a pre-condition to be exploited for the long-term sustainability of the identified circular economy synergies and innovations.

The sub-area dealing with the **General Overview** of R&D&I capabilities requires the indication of aggregate statistics about the Region and the reporting of relevant research project involving regional stakeholders. The required statistics are as follows:

- Gross Domestic Expenditure on R&D of the region.
- *EU funding for research and Innovation.* It refers to the part of European funds attracted in the region through the participation of regional stakeholders to European R&I initiatives.
- Number of total patent applications.
- People employed in R&D in the Region.

Moreover, a list of past and ongoing projects, of relevance for Circular Economy, involving regional stakeholders is required. The information that should be reported refers to the *Project Name*, the *Funding source*, the *Abstract*, the *Total budget*, the *Requested funding*, the *Consortium of the project*, the *Regional partners*, the *Target sectors* (by NACE code). All in all, this set of information will be useful to gather an overall overview of

How to gather the required data?

Regional R&D&I capabilities are usually linked to universities, research centres and mediumlarge companies. They can be mapped through interviews to those actors, or through the analysis of regional databases.

the relevance of R&D&I initiatives within the Region, and, in turn, on the relevance of circular economy among the R&D&I topics. The absence of relevant CE-related R&D&I initiatives within the Region would highlight a clear structural gap to be fulfilled by specific actions in the future.

The sub-area "**R&D Capability**" reports information about the existing capability to carry out research activities in the Region on Circular Economy topics. The core entities in this mapping activity are research centres and universities. For each research centre/university, it is required to list the relevant *Departments* or *Institutes*. For each Department, the following information is requested:

- Number of Researchers, who are working on circular economy topics.
- Application Domains, covered by the Department.
- Enabling technologies on which the research centre/university is focused.
- Number of Spin-off and Start-up stemming from the research centre/university.

The sub-area "*Innovation Capability*" requires information about pilot plants and facilities existing in the region, used to test and to demonstrate innovative circular economy solutions. In general, these infrastructures will be dedicated to support the pre-industrialization of specific innovative technologies or solutions. The required description elements are as follows:

- Name of the existing facility or pilot plant.
- Application domains of the solutions demonstrated in the facility/pilot plant.
- *Enabling technologies* developed and demonstrated in the facility/pilot plant. This also includes machinery and equipment.
- Structure of governance of the facility, i.e. the facility owner(s).
- Types of access to support the use of the facility.
- Services and activities that are supported by the operation of the facility.

The sub-area "*Education Capability*" requires information about the capability of the regional education system to deliver courses and provide skills that are requested in Circular Economy businesses. In order to support the creation of Regional Circular Eco-systems, the human capital and specific education schemes represent fundamental assets. If such schema is not yet implemented, this may represent a significant gap that the region itself may overcome by supporting specific educational programs. This would enable to fully exploit the Circular Economy potentials to support job creation. For each existing course, the following information is required:

- Name of the delivering institute.
- *Name* of provided course.
- Area/sector of the course.
- *Type of course*: this refers to the level of education for which the course is addressed (i.e. Bachelor, Master, PhD, MBA, Orientation levels).
- The approximate *number of students* to which the course is delivered.

#### 2.4 Area 4: Emerging Ideas

**Objectives:** Map the emerging innovation ideas in the Region

## How to gather the required data?

Emerging ideas can be gathered from regional stakeholders, with the support of interviews. A possible set of guidelines for data gathering is reported in the Annex B. Specific thematic workshops can support the data gathering activity. **Output:** List of actions/ideas to be prioritised in each Region

The fourth area, generally called *Emerging Ideas*, aims at listing and classifying according to the Screen framework the most innovative emerging activities, driven by the regional stakeholders, in view of new Circular Economy businesses and initiatives. Such emerging activities may be latent, implicit and not yet well-formalized nor implemented innovation ideas that, if efficiently boosted, could result in new circular businesses with high impact for the Regional stakeholders. Proposers can be different stakeholders, includina industrial. research and education organizations or associations and clusters. These emerging ideas shall bring significant expected impacts, considering economic, social and environmental impacts. A preliminary discussion of these impacts is required,

although specific impact figures may be difficult to report due to the low maturity level of the initiative. Typical emerging ideas may include technological solutions, proposals for policy changes in order to improve the enabling conditions, new business models, etc. It is worth to highlight that emerging ideas are different from best practices. While best practices should have some evidence of benefits and impacts and should be already implemented, to a certain extent, emerging ideas are still in the preparatory phase. In the framework of the Screen tool, the best practices form the regional capabilities (industrial, R&D&I, education, policy making) while the emerging ideas represent opportunities that regional stakeholders propose to further boost CE in the region and launch innovative circular businesses.

In order to gather data about these emerging ideas, a specific set of guidelines for stakeholders' interviews is proposed (Annex B). The gathering of data will be then supported by the deployment of interviews by the mapper. Once data is gathered, it should be processed and fit into the excel template.

For each emerging idea, the excel template requires the following entries:

- *Abstract*: A short and free-format explanation of the idea, the related solution and enabling technologies, as well as the involved stakeholders is requested, with a recommended word limit of 400 words.
- Potential Partnership: If the stakeholder proposing the idea already foresees the need of creating partnerships to address the innovation, this information shall be specified in this area. If specific stakeholders suitable for the cooperation are not known, general indication of suitable partner characteristics may be reported (e.g. target sectors, required technological capabilities, etc.): this may support potential partner identification within WP2.
- Target Sectors that the idea should impact, or affect.
- Position in the Value Chain of the stakeholder proposing the idea.
- Target product/material/service: Specifies the object of the emerging idea.
- *Expected Impact*: This area requires a preliminary analysis of economic, social and environmental impacts. Examples of impact areas and the related Key Performance Indicators (KPIs) can be found in Table 1. It is intended to be a <u>non-exhaustive</u> list of

areas and indicators. Depending on the level of formalization of the emerging ideas, more quantitative or qualitative descriptions of the impacts shall be included.

Economic		Environmental		Social	
Regional Economy	- GDP Increase	Emissions	-CO <sub>2</sub> equivalent generated by process -CO <sub>2</sub> equivalent generated in the Product Life Cycle - acidification/ eutrophication potential of wasted fraction	Safety	-No. of accidents -Absence due to injuries/illness -Elimination of hazardous workplaces
Regional Export	-Exported goods increase -Share of export on GDP -Export of highly technological goods	Energy Consumption	-energy intensity of manufacturing/ remanufacturing processes -energy efficiency of m./rem. processes	Human Health	-Integration of consumer health and safety concerns in products, such as content of contaminants/nutrients -recovery and treatment of carcinogenics/ respiratory organics,
Company Economy	-NPV of Project -ROI of project -total cost of ownership of industrial relationships	Land Depletion	-share of waste landfilled -share of waste recycled (mass) -eco-toxicity potential of wasted fraction	Education and Training	-No. of training hours per employee -No. training programs launched -Level of education of employees
Industrial Network	-number of new business relationships -increase in companies' network width -density of the industrial network	Natural Resource Depletion	-amount of raw material recovered from waste/wastewater -amount of raw material acquired by the company -share of recycled material used in production (mass; mass*value; mass*material criticality, )	Labour Management Relations	-rate of temporary workers -male to female ratio -cross functional teams of improvement (yes/no, #)
Financial Risk of Supply Chain	-expected change in inventories (magnitude and/or value) -Value at risk (derived by commercial processes) -probability of supply chain disruption			Human Capital	-company wage in comparison to local/sector average wage -No. of new employees -Employee turnover -Promotion opportunities for employees -Clear job descriptions (yes/no)

Table 1: examples of impact areas and related KPIs.

#### 2.5 Area 5: Existing Circular Economy Legislation

**Objectives:** Map sector-specific legislation and policies

Output: List of regulations and policies

The fifth area requires the identification of *Existing/under development legislation* which can impact, both fostering and bounding, solutions in the domain of circular economy. The metadata related to this area is contained in one single sheet, divided in two main areas: *Regulatory Framework* and *Policy Implementation Mechanisms*. This area is relevant since the legislative framework in the Region could limit and constrain the development of innovative solutions in specific sectors, or constitute prioritization criteria among competing circular economy initiatives.

About the *Regulatory Framework* sub-area, it is required to report policies (e.g. laws) that can impact the development of Circular Economy value chains, and classify them according to two axes:

- *Regional vs. national*: it refers to the source of the policy (e.g. law/initiative), and the governmental level which developed it.
- *Existing vs. under development*: a policy proposal that is not yet under operation may have impact on the feasibility of emerging ideas, therefore it is important to identify qualitatively its future effect.

About the *Policy Implementation Mechanisms*, the metadata offers a predefined classification, according to the scope of each possible mechanism. It is important to understand which mechanisms are put in place by the regional/national authorities, to implement Circular Economy policies. The categories of implementation mechanisms can be divided accordingly:

- Education, Information and awareness actions: "Since the concept of the circular economy is still not widely spread among the public or in the business community, policy interventions aimed at increasing information and awareness play an important role. These policies aim to change ingrained patterns of behaviour and ways of thinking that companies and individuals have developed over long periods of time. They also seek to plug gaps in information that prevent or restrict circular economy opportunities" [1].
- Collaboration Platforms: "When pursuing circular economy opportunities, businesses incur transaction costs finding, and interacting with, suitable collaboration partners along and across value chains. Similarly, circular economy opportunities can be held back by a lack of commercially viable technology. In both cases, there is a case for policy support to facilitate partnerships either between businesses or across business and academia. Collaboration platforms can take various forms, including industrial symbiosis, public-private agreements, R&D clusters and voluntary industry initiatives" [1].
- Business support schemes: "In seeking out circular economy opportunities, companies can face economic barriers such as lack of access to technology, capital and in some cases challenges to profitability, and market failures such as insufficient competition, split incentives and transaction costs. Policy interventions in this area can take the form of financial support, such as grants and subsidies, and capital injections and financial guarantees, but also importantly technical support, advice, training, demonstration of best practices and development of new business models. A particular focus of these support schemes will likely be SMEs, which can lack the internal capacity, capabilities and financial resources to take advantage of these new opportunities. Examples on the ground are often instruments that offer a mixture of both financial and non-financial support"[1].

- Incentive mechanisms for circular economy: other kinds of policies which have the objective of fostering circular economy solutions, which cannot be classified inside one of the other three categories.

Please note that it is important to list the target beneficiaries of these instruments.

#### 2.6 Area 6: Existing Funding Instruments

ObjectivesOutputReview of the existing portfolio of investmentList of funding opportunities at regionalinstruments for supporting circular economy innovationslevel

The sixth area relates to the analysis of *Funding Instruments* already available in the regions to promote the development of innovative Circular Economy solutions. This information is relevant to combine emerging ideas with existing funding instruments in order to support the identification of potential requirements and gaps for new funding instruments or to exploit the synergies among funds. This aspect will be considered in detail within T3.4. Moreover, it enables to gather examples and hints about best practices that can fuel the Screen policy lab.

The metadata is structured in one sheet of the excel file, and requires the compilation of two main areas: *Financial instruments stemming from European Regional Development Funds (ERDF)* and *Other financial instruments*.

About the *ERDF/Regional Operative Plan*, it is required to identify the Pillars which are relevant to Circular Economy and in which financial instruments that can support these initiatives are clustered. Inside these pillars, specific points of the action plan should be identified and, eventually, the financial instruments put in place in order to implement the action plan should be listed. It is important to <u>list the target beneficiaries</u> of these instruments, in order to support the matching between innovative solutions/synergies and funding instruments.

Within the sub-area *Other Financial Instruments*, these instruments are divided according to different categories. This means that the structure is slightly different, since each column is independent. The possible funding instruments can be divided in:

- Regional R&D Support Programmes.
- Regional Innovation Support Programs.
- Vouchers for Industry.
- Start-Up Programs.

Also in this case, it is important to <u>list the target beneficiaries</u> of these instruments, in order to support the matching between innovative solutions/synergies and funding instruments.

#### 3. Mechanisms to identify synergies

In this section, a preliminary overview of the existing mechanisms to exploit the availability of information contained in the SCREEN mapping tools compiled by the regions to identify potential local and cross-regional synergies and initiatives targeted to new circular economy business cases is provided. This list of mechanisms is not exhaustive and will be further detailed within WP5.

Regional capabilities and best practices are not transferable between regions as such, but a post-processing of the information contained within the different Screen mapping tools compiled by the Regions needs to be carried out in order to understand transferring potentials. This objective can be achieved through the application of different synergy identification mechanisms:

• **Mechanism 1:** *value-chain analysis.* By analysing the information contained in the "Company" sub-area, complete value-chain representations can be obtained, both at regional level and at cross-regional level (see for example Figure 3). This will make it possible to have a compact overview of the value-chain coverage in the geographical area of interest and to identify missing nodes in the value-chain that prevent from a transition from a linear to a circular value-chain. If stakeholders from more than one region are involved, this representation provides a clear identification of a potential cross-regional synergy to be exploited to close the loop in the region.

**Mechanism 2:** *material-driven analysis.* By analysing the information contained in the "Company" sub-area, input and output material types for each stakeholder can be gathered and possible upstream-downstream material links can be identified through proper material flow-charts. For example, if a region has a stakeholder in a specific step of the value-chain that generates waste that is potentially acceptable as input by another stakeholder of a different region positioned in another value-chain, there is an option for a circular economy synergy resulting in a cross-sectorial and cross-regional innovation.

- **Mechanism 3:** *Matching capabilities with emerging ideas.* By analysing the information in the area 3 related to "Capabilities" and in the area 4 related to "Emerging Ideas" it is possible to identify existing capabilities that, if exploited, could support the implementation of the emerging idea. This provides potential for best practice/capability transfer among sectors (local) and Regions (cross-regional). For example, if a region expressed an emerging idea that has been already addressed within another region as a best practice (or capability) there is an option for transferring the best practice.
- **Mechanism 4:** *Transferring of boundary non-technical preconditions.* By analysing the strategic vision of the Region (area 1) and the non-technical areas 5 and 6, the need for possible cross-regional or cross-sectorial transferring of legislation and funding instruments can be identified, in order to drive the alignment of innovation activity with the regional development strategies.

Further examples on these mechanisms and their use in the framework of synergy identification will be provided in D3.1 and WP5.



Figure 3. Example of application of Mechanism 1 "Value-chain analysis" for the "Transport and mobility" sector.

### 4. Preliminary collected feedback from users

In order to gather feedback on the usability of the tool, several tutorial sessions have been activated where partners had the possibility to address questions and suggest improvements. After these web-meetings, the Screen mapping tool was considered as accepted and understood by the Screen Regions. In particular, the following general comments on the effectiveness of the Screen Mapping tool were gathered:

- Useful tool for <u>systematic value-chains identification</u> that can be integrated with other EC initiatives.
- Useful as a <u>continuous review process</u>.
- Triggers practical examples, learning from best practices.
- Strong interaction with stakeholders.
- Support <u>avoiding replication of initiatives</u>.
- Need for new <u>CE KPIs</u> for rating emerging ideas.
- Need for close interaction with <u>data analytics</u> regional offices.

Moreover, a questionnaire was prepared to monitor the degree of complexity of the tool population process by the Regions. The results of the collection of feedback and recommendations will be reported in extended way within D5.1.

### 5. Conclusions

This deliverable has reported the objectives and the features of the Screen Mapping tool, developed as part of Task T2.1. The tool provides a systematic procedure to collect information about the existing regional Circular Economy oriented capabilities and emerging ideas within the Screen regions. Moreover, it supports the identification of existing gaps and challenges that shall be addressed to establish stable regional eco-systems with capability to boost circular economy in the Region as well as cross-regional and cross-sectorial value chains for improved business opportunities.

In this deliverable, the tool has been thoroughly described, emphasising the required information and potential sources to gather such data, thus simplifying the work of the regional stakeholders feeding data into the tool. The fields of the framework have been classified as *Mandatory*, *Strongly Recommended*, or *Optional* to make it possible for Regions with very different baseline situations to complete relevant data. For the same reason, the framework supports collecting data at very different levels of detail. As a consequence, it is predicted that Regions will continuously update input data during the Screen project by an iterative approach as long as familiarity with the tool is acquired and new information becomes available.

The tool is designed to be modular and easily applicable to an expanded set of Regions in Europe with widely diverse eco-systems and cultural backgrounds. Therefore, future work will be devoted to improve the tool by exploiting the users feedback that will be collected throughout the Screen project life. In parallel, the effectiveness of the tool will be tested towards wider implementation within European Regions at different level of CE maturity. The final objective will be to make this tool a standard reference approach for local and cross-regional synergy identification, in view of a more effective cooperation among European regions towards the implementation of innovative circular economy initiatives and businesses in Europe.

#### 6. Annexes

#### Annex A: Glossary

#### A.1 Circular Value-Chain Framework

The objective of this framework is to provide a common representation of circular valuechains, providing the capability to map the position of a specific company in the respective phase of the circular value chain. The framework is presented by following and incremental approach, starting from a traditional linear value-chain (make-take-dispose). The phases of a typical linear value chain are presented in Figure . An explanation of the different phases follows.



- **Gathering of Core Resources**: this encompasses all the activities referred to the gathering of raw materials. Some examples are ores mining, agriculture and farming.
- **Primary Material Processing**: this encompasses all the activities that pre-process the "core" material, before production in the narrow sense. Some examples are separation of impure material to increase the grade of purity of the core resource, filtering, sieving, metal continuous casting, etc...
- **Production**: this encompasses all the production activities, i.e. the activities and processes which act on the pre-processed input material and transform it to generate the core value-added product within the value chain. Some examples are manufacturing (e.g. of parts for breaking systems in automotive), assembly, food processing, etc...
- **Packaging & Distribution**: this encompasses all the operations dealing with the packaging of the value-added final product, and its distribution to the users. Some examples are warehousing, transportation and retail operations.
- Use/Service: this encompasses the use of the product and the related services.
- **Collection**: this encompasses all the reverse logistics operations of collection of post-use products or material.
- **Disposal**: This encompasses all the activities concurrent to the non-circular disposal of the product of a value chain or its materials. Some examples are landfilling, or incineration for energy recovery.

Within the framework, each linear value chain is related to a particular **product flow** (core resources transformation), which will be referred to as the "**Primary Flow**". For each position in the linear value chain, it is possible to identify "**Secondary Flows**". They could be input flows (e.g. materials, water and energy) or output flows (e.g. by-products, such as solid waste and wastewater) of a specific position in the value chain. These latter can result in "Primary Flows" of other value chain as well<sup>3</sup>. Examples of "Secondary Flows" are showed Figure :

<sup>&</sup>lt;sup>3</sup> Please note that the property of a product/material flow of being "Primary" or "Secondary" depends on the value chain under analysis. As an example, the machining phase of a metallic brake support for a car is analysed: considering the value chain of the brake system manufacturer, the primary flow consists in gathering metal, process the metal to produce the brake support, ship the product to the car manufacturer, etc. The secondary flow



Figure 5. Primary and Secondary Flows in the Value Chain.

The transition from a linear to a circular value chain requires the introduction of reverse flows that close the loop at different levels of the value chain according to the waste management hierarchy, by exploiting appropriate technologies and capabilities [9]. The proposed framework aims at capturing the "circular" perspective, leveraging both on Primary and Secondary Flows. At technical levels, different business options for circular economy and different levels to close the loop have been proposed to generate benefits by exploiting different value-creation mechanisms. The representation of the circular value-chain is reported in Figure [9].

encompasses, among others, the use of cooling lubricant machining fluids, which are needed by the machining processes and washed away once the workpiece is complete, producing wastewater. Considering the value chain of a service company, which guarantees the wastewater treatment, its core resource is the secondary flow of the brake system manufacturers: the value chain includes the collection of water and machining fluid mixture, and its treatment with chemical additives (i.e. secondary flow) to purify water.



Figure 6. Circular value-chain representation.

Each solution is further detailed:

- a) **Maintenance**: it is referred to operations performed on a product, in order to extend its useful life-time. This reduces the demand for both production and collection, thus preserving raw materials (production) and environment (disposed fraction after collection). It is usually delivered as a service.
- b) **Reuse**: It refers to all operations where a return product is put back into service, essentially in the same form, with or without repair or remediation [2].
- c) **Repair**: includes the correction of specified faults in a product [2]. Repair refers to actions performed in order to return a product or component purely to a functioning condition after a failure has been detected [4]. Repair can take place either in service or after discard.
- d) Remanufacturing: it is defined as a standardized industrial process aiming at restoring or upgrading the functions of a product, in line with technical specifications. The remanufacturing process usually involves disassembly, inspection, cleaning and re-machining or replacing of components [3]. It is strongly related to the use of manufacturing and assembly/disassembly technologies, in order to restore the original performance and functions of a post-use product. A main distinction can be made between remanufacturing for function restore and remanufacturing for function upgrade. In the first case, remanufacturing aims to return a used product to at least its original performance with a warranty that is equivalent or better than that of the newly manufactured product. A remanufactured product fulfils a similar function to the original [5]. Remanufacturing with upgrade is the process of providing new functionalities to products through remanufacturing. Remanufacturing with upgrade aims to extend products' value life enabling the introduction of technological innovation into remanufactured products in order to satisfy evolving customers' preferences and, at the same time, preserving as much as possible the physical resources employed in the process [6].
- e) **Closed Loop Recycling**: is defined as "a resource recovery method involving the collection and treatment of waste products for use as raw material in the manufacture

of the same or a similar product"[7]. In closed-loop recycling, the inherent properties of the recycled material are not considerably different from those of the virgin material, thus substitution is possible. Resources recycled in this way are used as input materials for the same value chain they are collected from. Closed-loop recycling, in particular, is a more sustainable concept than Open Loop Recycling, because recycling of a material can be done indefinitely without degradation<sup>4</sup> of properties.

- f) Open Loop Recycling: the conversion of material from one or more products into a new product, involving a change in the inherent properties of the material itself (often a degradation in quality). In open-loop recycling, the inherent properties of the recycled material differ from those of the virgin material in a way that it is only usable for other product applications, mostly substituting other materials [8]. In open-loop recycling a material is not recycled indefinitely, and is eventually excluded from the utilization loop, becoming waste.
- g) Biochemical Feedstock Recovery: "recovery" is an activity applicable to materials, energy and waste. It is a process of restoring materials found in the waste stream to a beneficial use which may be for purposes other than the original use"[7], e.g. conversion of the organic fraction of a waste stream into natural gas or heat. In particular, the extraction of energetic power from biological material before disposal allows an increase in resource productivity.

<sup>&</sup>lt;sup>4</sup> The term degradation could be understood as "a biological, chemical or physical process, which results in the loss of productive potential" [7]

#### Annex B: guidelines for the interviews (Step 4)

In this annex, some guidelines are given to carry out the interviews supporting the gathering of emerging ideas (Step 4). The objective of the interviews is to collect in a structured way the emerging ideas to be prioritized in each Region. For each emerging idea, the excel template requires the following entries:

- Name of the proposer (stakeholder)
- Abstract
- Potential Partnership
- Target Sectors
- Position in the value chain
- Target product/material/service
- Expected impact
  - Social
  - Economic
  - o Environmental

A standard list of questions is suggested to perform the interviews. The interviewer is free to add, remove and modify questions. Note that the process should take the form of a semistructured interview.

**Q1**: "What is the name of your company/association/institute, and which is its general field of work?"

Q2: "Can you describe in few words the key aspects of your emerging idea?"

Q3: "What are the business opportunities of your idea?"

**Q4**: "Do you think you need a consortium to implement the idea? If yes, please specify the role of the partners you recommend (knowledge transfer, technology providers, logistic providers, commercial channels, consultancy, financial investors, etc.)."

**Q5**: "Did you already identify potential partners?"

Q6: "Can you list the main sectors affected by the implementation of your idea?"

**Q7**: "Please briefly describe the supply chain of your company in the current situation, also highlighting the possible effects of your emerging idea on its structure."

**Q8**: "What is the most important breakthrough impact/effect generated by the implementation of the idea?"

**Q9**: "Could you list the major impacts on your company performance, in terms of economic, social and environmental aspects?" (see Table 1 for some examples)

**Q10**: "Which could be the proper indicators to measure the impacts on the performance areas discussed in the previous answers?" (see Table 1 for some examples)

Qualitative data (e.g. answers) gathered by means of the semi-structured interview should be then analysed, processed and synthetized according to the given template. Records, notes and other material used to gather data within the Screen project are available upon request.

#### Annex C: SCREEN Tool

In this appendix is reported the complete Excel Tool delivered in WP2. The wider Steps of the Tool are divided in different parts, for visualization purposes. The parts should be joined horizontally.



Name of the Region:

	Name	Surname	Mail	Phone number
Regional Contact point/s:				
Technical referent/s:				

Figure 7: Front Page of the Excel Tool

		Type of data requested		
Name of SCREEN mapping step	Mandatory	Strictly recommended	Optional	
Objective		Outputs		
Text		Text		

Data Required 1	Data Required 2	Data Required 3	Data Required n	Source
Gr	ey colour cell = Pr	e-Compiled Exam	ple	
	(Lombardy	region data)		
Data Entry 1	Green col	our cells = Space t	o compile	
Data Entry 2	(It is poss	ible to add or rem	ove lines)	
Data Entry 3				Please specify
Data Entry 4				data
Data Entry 5				
Data Entry 6				

Figure 8: Guide of the Excel Tool

RIS 3 Strategic Areas and SWOT Analysis			
Objective Outputs			
Highlight the most strategic innovation areas in the			
Region in view of supporting the transition to circular	RIS3 summary dealing with circular economy topics, SWOT analysis of the Region		
economy			

S3	Area of specialization	Brief Description	Source
		In Lombardy, this is declined in 5 sub-areas. Each sub-area has different related	
		thematics of development (ToD).	
		1. Production with Innovative Processes (Relevant ToD: development of technologies	
		and innovative systems for the production of smart and evironmentally friendly	
		packaging)	
		2. Adaptive and Evolutive Production Systems (Relevant ToD: Methods and	
		technologies for the reconfiguration of machines and production systems, their reuse	
		in different layouts, their remanufacturing, the reuse of components and the recycle of	
Advanced Manufacturing	Advanced Manufacturing	materials at end-of-life)	
		3. High-Efficiency Production Systems	
		4. Manufacturing for personalised products	
		5. Manufacturing Systems for Environmental Sustainability (Relevant ToD:	
		Development of innovative technologies for the increment of sustainability of	
		production processes, for the development of energy-autonomous factories, for the	
		implementation of sustainable end-of-life processes; development of new business	
		models and supply chain models for manufacturing sustainability, which leverage the	
		potential of new technologies according to circular economy paradygms)	
Smart Specialization Strategy			
1			
Smart Specialization Strategy			
2			

Figure 9: Step 1.2 of the Excel tool: RIS 3

	RIS 3 Strategic Areas and SWOT Analysis					
Objective			Outputs			
Highlight the most strategic innovation areas in the Region in view of supporting the transition to circular economy		RIS3 summary dealing with circular economy topics, SWOT analysis of the Region				
	Area	Strenghts	Weaknesses	Opportunities	Threats	
	Economic	Great potential in exploiting Circular Economy value chains in manufacturing. In fact Lombardy's turnover and value added mostly concentrated in high-tech manufacturing and enabling technologies, which are material and energy intensive businesses	Possible caution of the industries in investing in Circular Economy approaches, without a preliminary financial plan and previous best practices	Creation of competitive sustainable manufacturing, exploting the knowledge of high-tech product producers, technologies providers (knowledge on manufacturing and automation technologies and possible developers of new solutions), recyclers and remanufacturers.	Variability of raw materials, energy prices and collection rates	
	Environmental	<ul> <li>Great availability of water</li> <li>resources</li> <li>Territorial morphology supports</li> <li>settlements and exchanges</li> </ul>	High levels of water, air , noise and electromagnetic- waves pollution	<ul> <li>Limited natural resources make it essential to develop circular economy</li> <li>Optimize the use of available resources</li> </ul>	<ul> <li>Deterioration of</li> <li>environmental quality to</li> <li>irreversible limits due to non-</li> <li>decision-action on</li> <li>sustainability</li> <li>Saturated urbanistically</li> </ul>	
	Social	Overall good school and university system, with particular reference to scientific research, also in terms of geographical spread	High unemployement rate, especially in the young segment of the popultion. The rate is below average if compared to other italian NUTS2 regions	High number of people willing to start working in a new sector	Danger of brain drain, if the workforce in unemployed for a long period of time. This is a greater threat consiedering the young segment of the population	
	Regulatory	Regional administration strongly committed to encouraging the development of circular economy		Regione can adopt regulations that encourage the development of circular- economy in the areas of its competence	In some areas of regulation, the possibility of regional legislation is limited	

Figure 10: Step 1.2 of the Excel Tool: SWOT Analysis

Focus Sectors: Industrial sectorial analysis at regional level			
Objective	Outputs		
Identify the role of sectors in regional economy	A broad understanding of industrial situation to set		
	specific opportunities		

	Role in the regional economy					
NACE Code	Employees in the region (n°)	Turnover (B€)	Gross Value Added (B€)	Companies in the region (n°)		
C27 - Manufacture of electrical equipment	50974	22	5,8	2905		

Figure 11: Step 2.1 of the Excel Sheet: Focus Sectors - Part 1 of 2

	Circularity	y potential	Source	
Volume of waste generated	Share of waste recycled	Share of waste incinerated	Share of waste landfilled	١
274468,9	89,10%	0,01%	0,00%	"Employees" and "companies": 2014 data from eurostat; "Turnover" and "Gross Value added": use of formula in D2.1 Guidelines, based on Eurostat data 2014 Data for italy and its NUTS2 Regions; Circularity Potential Indicators: Database of Environmental Directorate General of Lombardy Region

Figure 12: Step 2.1 of the Excel Sheet: Focus Sectors - Part 2 of 2

Focus Sectors: Companies				
Objective	Outputs			
Identify the role of sectors in regional economy	A broad understanding of industrial situation			
	to set specific opportunities			

NACE Code	Company name	Position in the circul	<b>ar value-chain on the ba</b> (can be multiple)	sis of the framework
C26 - Manufacture of computer, electronic and optical products	Italtel	d. Packaging & Distribution	e. Use/Service	

Figure 13: Step 2.2 of the Excel Tool: Companies - Part 1 of 3

Application Domain of Circular Economy activities (if Any), on the basis of the framework provided in Annex A: Glossary (they can be multiple)						
a. Maintenance	b. Reuse	c. Refurbish	f. Recycling (Closed Loop)	h. Biochemical Feedstock Recovery		

Figure 14: Step 2.2 of the Excel Tool: Companies - Part 2 of 3

Technological canabilities	Input Materials/Co	mponents	Output Materials/Components		Source
	Туре	Quantity (t/year)	Туре	Quantity (t/year)	١
<ol> <li>Electronic products and PCBs design</li> <li>Strategies and management for maintenance</li> </ol>	Metals, polymers and composites for complex telecommunication systems.		Printed Circuit Boards		

Figure 15: Step 2.2 of the Excel Tool: Companies - Part 3 of 3

R&D, Innovation and Education capabilities: general overview			
Objectiv	е		Outputs
Create a circular economy related overview of R&D, innovation and education capabilities		innovation and	Analysis of expertise to address circular economy opportunities
	Se	ource	
Gross domestic expenditure on R&D			
EU funding for research and innovation			
Number of total patent applications on			
the selected enabling technologies			
People employed in R&D			

<b>Project Name</b> (past and ongoing projects)	Funding Source	Funding Program	Project Abstract
<b>HYDROWEEE DEMO</b> - Innovative Hydrometallurgical Processes to recover Metals from WEEE including lamps and batteries - Demonstration.	EU	FP7 - ENVIRONMENT. ENV.2012.6.5-2 - Demonstration and exploitation of most promising prototypes and tools derived from European research activities	The recycling business is traditionally dominated by SMEs. In the last 5 years a general trend in the electronics recycling sector to bigger companies is very visible. Hence the previous project HydroWEEE (03/2009–02/2012) dealt with the recovery of rare and precious metals from WEEE. The idea has been to develop a mobile plant using hydrometallurgical processes to extract metals like yttrium, indium, lithium, cobalt, zinc, copper, gold, silver, nickel, lead, tin in a high purity. By making this plant mobile several SMEs can benefit from the same plant. By making the processes universal several fractions (lamps, CRTs, LCDs, printed circuit boards and Li-batteries) can be treated in the same mobile plant in batches. This reduces the minimum quantities and necessary investments. These innovative HydroWEEE processes produce pure enough materials that can be directly used for electroplating and other applications. The objective of HydroWEEE Demo is to build 2 industrial, real-life demonstration plants (1 stationary and 1 mobile) in order to test the performance and prove the viability of the processes from an integrated point of view.

Figure 16: Step 3 of the Excel Tool: Capabilities View - Part 1 of 3

Total Budget (M€)	Requested Funding (M€)	Consortium	Regional Partners
3.758	2.671	<ol> <li>Kopacek KEG (AU);</li> <li>Relight SRL (IT);</li> <li>Greentronics SRL (RO);</li> <li>Ecorecycling SRL (IT);</li> <li>COMPANY FOR MANAGEMENT AND ECOLOGICAL RESEARCHES SE TRADE DOO BELGRADE (SE)</li> <li>Institut Mihalo Pupin (SE)</li> <li>Università degli studi dell'aquila (IT)</li> <li>Unversità degli studi di Roma la Sapienza (IT)</li> <li>Università Politecnica delle Marche (IT)</li> </ol>	1. Relight SRL;

Figure 17: Step 3 of the Excel Tool: Capabilities View - part 2 of 3

Target Sectors(s)					Source
E38 - Waste collection, treatment and disposal activities; materials recovery	E39 - Remediation activities and other waste management services	C26 - Manufacture of computer, electronic and optical products			

Figure 18: Step 3 of the Excel Tool: Capabilities View - Part 3 of 3

R&D Capabilities					
Obje	ective	Outputs			
Create a circular economy related over capal	view of R&D, innovation and education bilities	Analysis of expertise to address	circular economy opportunities		
Name of Research Centre/University potentially involved in Circular Economy framework	<b>Departments</b> that address the selected enabling technologies (see righmost Column)	Number of researchers working on the selected enabling technology in the Departmement	Application domains		
manework	(see lighthost column)	Departmentent			
	Department of Mechanical Engineering (POLIMI_MECC)	100	<ol> <li>Automotive;</li> <li>Automation;</li> <li>Manufacturing;</li> <li>Mechanicals</li> </ol>		
Politecnico di Milano	Department of Chemistry, Materials and Chemical Engineering 'Giulio Natta' (CMIC_POLIMI)	110	<ol> <li>Materials production and characterization;</li> <li>Process Control;</li> <li>Environment and Safety;</li> <li>Industrial Safety;</li> <li>Material for Manufacturing and Design</li> </ol>		
Research Centre/University 1					
Research Centre/University 2					

Figure 3: Step 3.1 of the Excel Tool: R&D Capabilities - Part 1 of 2

<b>Enabling technologies</b> on which the research centre is focused	Number of Spin-off or start-up	Source
<ol> <li>Mechatronics for high-efficiency;</li> <li>Modelling for the optimization of production systems performance;         <ol> <li>ICT for high-efficiency manufacturing;</li> <li>Technologies for new materials increasing system's efficiency;</li> <li>Technologies for re-manufacturing and recycling;</li> <li>Near-to-zero emissions in manufacturing industries;</li> <li>Modelling and simulation techniques for sustainability</li> </ol> </li> </ol>	4	
<ol> <li>Technologies for re-manufacturing and recycling;</li> <li>Modelling and simulation techniques for sustainability;</li> <li>Technologies for material consumption;</li> <li>Technologies for new materials increasing system's efficiency</li> </ol>		

Figure 20: Step 3.1 of the Excel Tool: R&D Capabilities - Part 2 of 2

Existing Facility 1

Existing Facility 2

	Innovation Capabilities						
	Objective	Outputs					
Create exhaustive o	verview of R&D, innovation and	Analysis of expertise to address circular economy					
educe	ation capabilities	opportunities					
Name of existing facility (Pilot Plants)	Application domain of the existing demo centre/pilot line	List of enabling and available technology & Machinery					
Do and	d. Repair	1 Pobotic disassambly call:					
Remanufacturing	e. Remanufacturing	2. PCBs components disassembly and rework cell;					
Pilot Plant	g. Recycling (OpenLoop)	3. Mechanical shredding and separation cell					

Figure 21: Step 3.1 of the Excel Tool: Innovation Capabilities - Part 1 of 2

Owner	Type of access to the demo centre/pilot line	Supported activities/services	Source
ITIA-CNR (100%)	The lab belongs to the CNR. Access limited to internal personnel and cooperating stakeholders upon requests.	<ol> <li>Development, Testing and validation of scientific results and innovations (TRL3-6);</li> <li>Learning factory;</li> <li>New technology development</li> <li>Business models validation</li> </ol>	

Figure 22: Step 3.2 of the Excel Tool: Innovation Capabilities - Part 2 of 2

Education Capabilities				
Objective	Outputs			
Create exhaustive overview of R&D, innovation and	Analysis of expertise to address circular economy			
education capabilities	opportunities			

Name of University	Name of provided courses	Area/Sectors of the courses	<b>Type of course</b> (i.e. orientation, bachelor, master, MBA, PhD)	Number of students per year	Source
	Demanufacturing technologies and systems	Industrial Engineering	Master level	50	
Politecnico di Milano	Polymer Technology and Sustanability	Chemical Engineering	Master level	50	
	Chemistry and Materials for the Environment	Chemical Engineering	Master level	100	
Name of University 1					
Name of University 2					

Figure 23: Step 3.3 of the Excel Tool: Education Capabilities

Emerging Ideas				
Objective	Outputs			
Man the emerging innovation ideas in the Pagion	List of actions/ideas to be			
	prioritised in each Region			

Proposer	Abstract	Potential partnership
Alkematec S.r.l.	WASTEWATER RECYCLING IN INDUSTRIAL APPLICATIONS: In all production systems water is used: sometimes directly in the production process, sometime as a service (e.g. in heat, air conditioning and vapour systems supporting production facilities, or in indirect cooling of equipment), sometimes in both. The constant challenge is to reuse as much water as possible. This company conducted a study which focused, in particular, in the mechanical sector, where the needs of reusing water arises from the objective of reducing the cost of water catchment and discharge, and from the objective of energy saving. In the latter case, it has to be highlighted that discharged water usually is around 60-70°C, and with its disposal the company incurs in an additional energetic cost. The technology developed by this company allows to design in-plant wastewater treatment systems which allow to recycle of up to 90% of used water, in settings as: all the phases of the process of washing – rinsing – phosphatization - cleaning of metallic pieces; wastewater coming from tumbling; wastewater from the cleaning and rinsing within the degreasing process of metal pieces; wastewater originated during the stages of engine testing in automotive companies, wastewater from fish farming.	Intecna srl, ITIA-CNR, Polimi
Name of Proposer 1		
Name of Proposer 2		

Figure 24: Step 4 of the Excel Tool: Emerging Ideas - Part 1 of 3

	Target	Position in the value-chain	Target product/material/ service		
A3 - Fishing and aquaculture	B7 - Mining of metal ores	C17 - Manufacture of paper and paper products	C24 - Manufacture of basic metals	c. Production	Water

Figure 25: Step 4 of the Excel Tool: Emerging Ideas - Part 2 of 3

Expected impact				
Social	Economic	Environmental		
	Water recycling, costs reduction	Reduction of environmental impact increase in the energy efficiency of the production plant		

Figure 26: Step 4 of the Excel Tool: Emerging Ideas - Part 3 of 3

Existing Circular Economy Legislation				
Objective Outputs				
Map sector-specific legislation and policies	List of regulations and policies			

Regulatory Framework Regional Level National Level			Policy Implementation Mechanism					
Existing	Under Development	Existing	Under Development	Education, Information and Awareness Actions	Collaboration Platforms	Business Support Schemes	Incentive mechanisms for Circular Economy	Sources

Figure 27: Step 5 of the Excel Tool: Existing Circular Economy Legislation

Existing Funding Instruments				
Objective	Outputs			
Review of the existing portfolio of investment instruments for supporting circular economy innovations	List of funding opportunities at regional level			

ERDF/Regional Operative Plan			Other financial instruments				
Pillars	Action Plan	Financial Instruments	Regional R&D Support Programs	Regional Innovation Support Programs	Vouchers for Industry	Start-Up Support Programs	Sources

Figure 28: Step 6 of the Excel Tool: Existing Funding Instruments

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