

CIRCE2020

DT1.2.4 LOCAL REPORT ON ENABLING & CRITICAL FACTORS DEFINING MUTUAL RELATIONSHIPS IN THE PILOT AREA

Version 1
05 2018

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Pilot Area: Tyrol, Austria





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1. Assessment of critical factors for modelling closed-loop systems in the selected industrial park

1.1. Basic Pilot Area Characterization

Table 1: Pilot Area Description

Name / Location Pilot Area: Province of Tyrol, Austria
Number of Enterprises in the Pilot Area: 43,443 (including all enterprises), 19,728 (enterprises with min 1 employee)
Number of Manufacturing Enterprises in the Pilot Area: 6,570 (enterprises with min 1 employee)
<p>Number of Enterprises Involved in the Pilot Study include the following:</p> <p>Enterprises which are involved in the pilot study (i.e.WP3) are not yet defined. Therefore numbers below refer to the entire pilot region Tyrol.</p> <p>SME- Small and Medium Sized entities: 44,599</p> <p>Large-sized entities*: 109</p> <p>Industrial Sectors: 32% manufacturing, 30% tourism, 21% wholesale and retail, 11% information and consulting, 6% transport and traffic, 1% bank and insurance.</p> <p>Within the manufacturing sector: 20.3% construction, 15% carpenters, 10.4% metal, 9.7% auxiliary construction businesses, 9.1% automotive industry, 7.7% food, 5.9% roofers, glazer & tinsmiths, 4.8% mechatronics, 4.2% wood processing, 4.1% gardeners, 3.9% tilers, 2.6% wearing apparel, 1.6% arts, 0.6% plastic processing</p>

* Large-size entities are companies: Employing more than 250 employees; OR Having an annual net revenue more than 50m euros, AND having an aggregate amount of the balance sheet more than 43m euros.

1.2. Circular Economy Awareness and Current Practices

Please characterize your pilot area based on the factors included in Table 2 below! If feasible provide percentages for your aggregated pilot area's data.

The information below refers to 27 interviews with stakeholders representing SMEs, large enterprises, business support organizations, NGOs, R&D/Universities, interest groups, and public authorities. Of those, 12 stakeholders represented enterprises which produce some products, even if it is not their main business line (e.g. a supermarket chain which makes its own gin).



Table 2: Circular Economy Awareness & Current Practices in the Pilot Area

	Pilot Area Aggregated Data <i>(Please fill-in)</i>
1. What percentage of the respondents have heard of the circular economy / closed loop economy?	All stakeholders have heard of Circular Economy, though not all of them knew exactly what it is about.
2. What percentage of the respondents are: a) Purely in a linear system. b) In a linear system with some elements of circularity within the manufacturing process. c) In a linear system with some elements of circularity, occurring outside of the company facility (<i>a waste material is sent to a recycling facility</i>) d) In a linear system with some elements of circularity, occurring outside of the company facility (<i>a waste material is sent to another facility as a secondary raw material</i>) e) In a circular system.	a) None b) Eight c) Virtually all (i.e. paper, cardboard, plastics, organic wastes are sent to recycling facilities) d) At least six of the companies e) none
3. What percentage of the respondents apply eco-design directives?	This was not discussed in the interviews.



	Pilot Area Aggregated Data <i>(Please fill-in)</i>
4. What percentage of the respondents make an effort to reduce packaging waste?	<p>This question was not explicitly discussed in the interviews.</p> <p>Generally, all companies with more than 20 employees need to have a waste management concept, which defines strategies to reduce waste and therefore also includes packaging waste.</p> <p>Furthermore, in particular the disposal of wood packaging causes high costs and subsequently companies aim to reduce the amount of this waste.</p> <p>Companies apply a mix of using bio-degradable materials (food retail) and smart designs in their production process (e.g. cutting of wooden boards) so as to reduce wood waste.</p> <p>Most companies producing large quantities of products and pack these in bulks, in order to reduce individual packaging waste.</p>

1.3. Scope and Availability of Preliminary Modeling Data

Please characterize your pilot area based on the factors included in Table 3 below! If feasible provide percentages for your aggregated pilot area's data.

Table 3: Scope and Availability of Preliminary Modeling Data

	Pilot Area Aggregated Data <i>(Please fill-in)</i>
What percentage of companies provided information regarding their primary material in-flows?	Two companies gave information regarding selected primary in-flow materials.
If information was not provided, what reason(s) were given for not providing the information?	<p>Probably all companies would have provided this information, providing that:</p> <ul style="list-style-type: none"> - Respecting confidentially - Not too time consuming for the enterprise to retrieve these data - Considered as needed and useful for both parties (project and



	Pilot Area Aggregated Data <i>(Please fill-in)</i>
	company)
<p>What percentage of companies provided information regarding waste generation (out-flows)?</p> <p>Of those that responded, generally speaking, how complete was the information?</p> <p>a) Complete b) Mostly complete c) Incomplete d) No information provided</p>	<p>All companies gave information regarding their waste generation and disposal.</p> <p>The information that was requested in order to meet the project intents and objectives was provided by the companies completely.</p>
If information regarding was not provided, generally speaking, can the information be obtained through public records?	NO

1.4. Conclusions and Recommendations for Overcoming Barriers in Obtaining Data

Please summarize your experiences with obtaining information from companies in your Pilot Area. Give recommendations for your pilot area, which can help in obtaining material flow data- for instance, overcoming confidentiality, etc.

Most importantly is to work with companies which are cooperative. Usually if companies find the project (its goals, purposes, etc.) generally useful, and specifically beneficial for them (e.g. provides some solution or idea for cost efficiency, is in line with the company's philosophy and vision) according to our experience it is not very difficult to obtain this kind of information.

Generally it has to be clear that data from companies will be treated confidential. In case - like in our - that we are not an authority of course confidence needs to be developed or as mentioned above only companies who are willing take part. We also tried to work out the advantages for companies when participating - specifically CIRCE2020 could even solve some waste problems etc.

2. Assessment of market barriers analysis for the creation of an efficient model of industrial symbiosis

2.1. Local legislative environment

Please fill out the table below based on your knowledge of your Pilot Area.

Please also see D1.2.3 Environmental and legal constraints to circular economy in the CIRCE2020 regions/pilot areas

Table 4: Characteristics of Legislative Environment

SECTOR <i>(eg. Waste, Use of specific recycled materials, Energy efficiency, Wastewater, Air emissions, Green taxes/refunds)</i>	LAW REFERENCE	TITLE OF LEGISLATION	RELEVANCY TO CIRCULAR ECONOMY	DOES THE LEGISLATION ENCOURAGE A CIRCULAR ECONOMY? (YES / NO)	DOES THE LEGISLATION CREATE A BARRIER TO A CIRCULAR ECONOMY? (YES / NO)
General Waste Management	BGBL I Nr. 1002/2002 idF 163/2015	Waste Management Act 2002	Incorporates and advocates CE, waste hierarchy	YES	No
Building Materials	BGBL II Nr. 181/2015	Ordinance on Recycling of building materials	Separation of building materials to encourage recycling of bulding wastes	YES	No
Organic wastes	BGBL II Nr 68/1992 idF 456/1994	Organic wastes ordinance	Regulates separat collection, storage and treatment of organic	YES	No

SECTOR (eg. Waste, Use of specific recycled materials, Energy efficiency, Wastewater, Air emissions, Green taxes/refunds)	LAW REFERENCE	TITLE OF LEGISLATION	RELEVANCY TO CIRCULAR ECONOMY	DOES THE LEGISLATION ENCOURAGE A CIRCULAR ECONOMY? (YES / NO)	DOES THE LEGISLATION CREATE A BARRIER TO A CIRCULAR ECONOMY? (YES / NO)
			wastes		
Packaging materials	BGBL. II Nr. 184/2014	Packaging ordinance	Reuse and recycling and prevention of packaging wastes	YES	No
Compost	BGBL. II Nr. 292/2001	Ordinance on compost	Regulation on production, introduction and labelling of compost	YES	YES
End-of-Life vehicles	BGBL. II Nr. 407/2002 idf 13/2014	End-of-Life vehicles ordinance	Regulation to avoid hazardous wastes from vehicels and to encourage reuse and recovery	YES	/
Waste Electrical & Electronic Equipment	BGBL. II Nr. 121/2005 idf 71/2016	Ordinance on WEEE	Regulation to avoid, reduce impacts of resource use, and limit the use of hazardous materials in electronics and electrical equipment	YES	/

SECTOR <i>(eg. Waste, Use of specific recycled materials, Energy efficiency, Wastewater, Air emissions, Green taxes/refunds)</i>	LAW REFERENCE	TITLE OF LEGISLATION	RELEVANCY TO CIRCULAR ECONOMY	DOES THE LEGISLATION ENCOURAGE A CIRCULAR ECONOMY? (YES / NO)	DOES THE LEGISLATION CREATE A BARRIER TO A CIRCULAR ECONOMY? (YES / NO)
Landfill	BGBL. II NR. 39/2008 idF 104/2014	Landfill Ordinance	Regulates requirements to reduce negative environmental impacts of existing landfill sites	YES	/
Batteries	BGBL. II Nr. 159/2008/ idF 109/2015	Battery Ordinance	Regulates the prohibition of certain materials, the labeling, take-back and collecting system	YES	/
Waste wood	BGBL. II Nr. 160/2012	Ordinance on the Recycling of Wood Waste	Regulates the no-impact recycling of wood wastes and avoids the accumulation of pollutants in the product cycle	YES	YES
Incineration	BGBL. II Nr. 389/2002 idF 135/2013	Ordinance on Waste Incineration	Regulates standards for all waste incinerating units and what kinds of materials are allowed	YES	YES
Energy	BGBL. I Nr. 72/2014	Austrian Energy Efficiency Law	Regulates the energy efficiency at several organisational levels (private companies,	YES	/

SECTOR (eg. Waste, Use of specific recycled materials, Energy efficiency, Wastewater, Air emissions, Green taxes/refunds)	LAW REFERENCE	TITLE OF LEGISLATION	RELEVANCY TO CIRCULAR ECONOMY	DOES THE LEGISLATION ENCOURAGE A CIRCULAR ECONOMY? (YES / NO)	DOES THE LEGISLATION CREATE A BARRIER TO A CIRCULAR ECONOMY? (YES / NO)
			public authorities, energy providers), defines the auditing and monitoring system		
Energy	/	Tyrolean Energy Strategy	Is based on the federal and EU energy strategy. Builds the foundation for the future development, sets clear targets (Tyrol 2020 and Tyrol 2050)	YES	/
Air emissions	BGBL. I Nr.115/1997	Immision Protection Law Air	Defines limits for certain air pollutants, regulates their monitoring and adherence	YES	YES
Waste water	BGBL. Nr. 186/1996	Ordinance on Waste Water Emissions in running waters and canalisation	Regulates and defines limits of water pollutants, relevant for several sectors.	YES	YES
Nitrate	BGBL. II Nr. 385/2017	Ordinance on the Nitrate Action Programme	Regulates the spreading of nitrates containing fertilizers in agriculture	/	YES (e.g. leaving surplus vegetables on the field)

SECTOR (eg. Waste, Use of specific recycled materials, Energy efficiency, Wastewater, Air emissions, Green taxes/refunds)	LAW REFERENCE	TITLE OF LEGISLATION	RELEVANCY TO CIRCULAR ECONOMY	DOES THE LEGISLATION ENCOURAGE A CIRCULAR ECONOMY? (YES / NO)	DOES THE LEGISLATION CREATE A BARRIER TO A CIRCULAR ECONOMY? (YES / NO)
Soil from Waste	ÖNORM S 2122	Austrian Standard on Soil from Wastes	Describes standards to use excavated soil (from construction works), defines quality standard regarding the soil content	/	YES
CO ₂ Emissions	ISO 14067	International Standard on Carbon emission as part of Life Cycle Assessments	International norm to assess carbon footprint	YES	/
CO ₂ Balance transport logistic	ÖNORM EN 16258	Methodology for calculating and declaring energy consumption and greenhouse gas emissions from transport services (freight and passenger transport)	Regulates consistent standards to assess, account and declare the CO ₂ balance	YES	/

2.2. Assessment of Market factors

2.2.1. Absence or Presence of Waste Types

Do you have information on the presence of certain – reusable/recyclable – wastes which can be used as secondary raw material in the pilot area? If yes, please describe.

In Austria, and therefore also in Tyrol, packaging materials are collected by the Austrian recyclables collection system ARA. Packaging materials (hollow glass containers, beverage cartons, plastic and plastic-composite packaging, and metal packaging, such as cans and seals), collected by ARA in Tyrol in 2016, summed up to 56.4 % (146,210t) of the entire collected wastes, not including the fraction of paper and paperboard packaging, which is collected together with used print and office paper products and therefore is not accounted for in the available data (Tiroler Landesregierung, 2018b). The recyclable materials collected in Tyrolean communities comprise of the following fractions:

Table 5: Fractions of packaging wastes and their recycled amount.

	Amount (tons)
Mixed paper	59,946.10
Glass	28,803.37
Plastic packaging	23,978.44
Wood packaging	20,908.03
Scrap metal (households)	8,918.81
Metal packaging	3,655.25
Sum	146,210

Approximately 77 % of these materials are recycled and used as secondary materials, and 23 % are incinerated and serve as energy recovery. This average, however, is highly variable. Depending on the fraction, approx. 10 % to approx. 97 % of the recyclables undergo material recovery.

In addition to packaging materials, several more waste fractions are recycled and used as secondary raw materials (Table 6).

Table 6: Recycled wastes besides packaging wastes.

	Collecting system	Use as secondary raw material	Recycling rate
Scrape paper	Municipal recycling centres	Recycling paper	79% (Austria wide)
Textiles	Socio-economic associations	<ul style="list-style-type: none"> - Second hand use - Cleaning cloths and rags 	90% Second hand clothes, 3% cleaning cloths & rags, 7% disposal



Nespresso capsules	Individual collecting sites coordinated by Nespresso	Separation of left over coffee powder from the aluminium capsule <ul style="list-style-type: none"> - Left over coffee powder used in co-fermentation for biogas production - Aluminium granulate for new aluminium 	100% coffee powder recycling, 100% aluminium
Flat glass	Company internally	Recycled and reprocessed. Used as tiny glass beads in reflectory road marking	Glass manufacturer in the pilot region recycle 100% of their waste glass
Building debris	Municipal recycling centres	Aggregates for the production of masonry, concrete and lightweight concrete, backfill, tipping, cement production, and substrates	Ca. 65% recycled (Austria wide)
Used cooking oil	Municipal recycling centres	Separation of oil from food remains. Recycled as: <ul style="list-style-type: none"> - Oil → Bio diesel - Food remains (10%) → Biogas via co-fermentation 	Overall 100% recycling rate, of which are: <ul style="list-style-type: none"> - 90% bio diesel - 10% biogas
Scrap tyres	Municipal recycling centres	Used as secondary raw material input for: <ul style="list-style-type: none"> - formed parts - plastic coatings - plastic mats - flat room protection mats - insulation materials - floor coverings - shoe soles - rubber mats for animal husbandry - oil binding agents - bumpers, cladding, dashboards, rests, etc. In the automotive industry - for use in the construction of children's playgrounds (as fall protection, use as toys, etc.) - sports facilities (pitches, running tracks, tennis courts, substrate and spreading granulate in artificial grass installations, etc.) - as aggregate in road construction (in the form of "rubber asphalt") 	Ca. 65% undergo material recovery (Austria wide)

Do you have information on the absence of certain secondary raw materials that are in demand in the pilot area? If yes, please describe.

Generally, companies obtain their input materials at the open/global market, not differentiating between primary and secondary raw materials. Therefore, there is no information available on the demand for certain secondary raw materials.

2.2.2. Demand for Critical Raw Materials

Is there a shortage of certain critical raw materials in your Pilot Area? If yes, please describe.

No critical raw materials were mentioned from the interviewed stakeholders.

2.2.3. Motivating Factors and Cooperation

Please characterize your pilot area based on the factors included in Table 5 below! If feasible provide percentages for your aggregated pilot area's data.

Table 7: Motivating Factors and Cooperation in the Pilot Area

	Pilot Area Aggregated Data (Please fill-in)
<p>1. What percentage of the respondents would benefit from the following:</p> <ul style="list-style-type: none"> a) Reduced waste management cost b) Income from selling waste as a secondary raw material c) Obtaining raw materials (especially limitedly available materials) at a lower cost d) Minimizing costs related to green taxes e) Receiving state allowances/refunds related to circularity/sustainability f) Marketing benefits from green operation (eco-labeling) 	<ul style="list-style-type: none"> a) All b) All c) All d) All e) All f) All
<p>2. Assessment of Cooperation</p> <ul style="list-style-type: none"> a) What percentage of the respondents would cooperate in a multi-company (industrial area wide) circular economy scheme b) What percentage of the respondents would be willing to sell or use a secondary raw material? c) What percentage of the respondents would be willing to sell or use waste heat or water? d) What percentage of the respondents feel that it would be feasible to find a cooperation partner(s) to work together toward closing material loops? 	<ul style="list-style-type: none"> a) All b) All companies would be willing to sell secondary raw materials. Probably most companies would be open to use secondary raw materials, if specific (quality) standards were met and if it wasn't too time- and cost-consuming to change production processes.



	<p>c) A number of companies already feed their waste heat into the district heating system.</p> <p>If this system expands and is accessible to other companies, virtually all would be willing to connect to this system. Waste water is no resource and no market exists for waste water. Generally WW has to be treated in WWTPs and companies have to pay for it.</p> <p>d) All</p>
3. What percentage of the respondents feel that questions of confidentiality and potential business secrets would make the sharing of information difficult?	<p>Confidentiality seems to be an issue for most companies. However, if data protection is taken care of, companies are willing to cooperate in the CIRCE2020 project and to share openly their information.</p>

2.2.4. Availability of Infrastructure

Discuss what types of infrastructure are available in the vicinity of the pilot area that can be used for waste management. For example is there a recycling facility, or a waste sorting facility, or a re-manufacturing facility, or a facility that facilitates reuse nearby?

This section is described in detail in the report of D.T1.3.3. “Report of the present destinations of industrial wastes”.

2.3. Conclusions and recommendations

Please give relevant recommendations for your pilot area, which can help in overcoming market barriers. For instance, suggested legislative changes, the creation of waste management infrastructure, etc.

In several cases it could be observed that a sharing platform for secondary raw materials is needed and wanted. Up to now no market for secondary raw materials exists, which is also one of the reasons why thermal recovery is still preferred to material recovery. Raising awareness and a more adequate waste management could help overcoming this situation.

3. Assessment of availability industrial & waste management information

3.1. Accessibility of waste generation /management information

Please fill out the table below based on your knowledge of your Pilot Area.

There are several sources of information and data regarding waste generation and waste management. Although all data regarding waste origin and destination are annually collected and managed within EDM, very strict data protection laws make it impossible to extract and analyse any of these data. Available data are fragmented, have various different origins, sources, scale, reference base, reference year, etc.

For a detailed description of available information please see DT1.3.2 “Report of the quantity of industrial waste in the Circe2020 pilot region”, chapter 1.3.

3.2. Recommendations for information exchange

Please give recommendations that are relevant for your pilot area, which can help in improving information exchange between waste generator, waste management companies, and companies looking to purchase waste to use as secondary raw materials.

Similar to a secondary raw material market, a platform to share and trade materials retrieved from waste streams could be a good option. Here, companies who provide materials (wastes) could be linked to companies who are in need of (secondary) raw materials.

Such a platform could also attract start-up businesses, which specialize in making waste materials market-ready and usable for potential buyers.



4. Assessment of limits to access mature cleanup techs

4.1. Mapping waste management technologies in the environment of the selected pilot area

Please provide a list of local practices or technologies which are available for reuse, recycling, or remanufacturing waste in your pilot area.

This chapter is the content of following Workpackage AT2.1 - Deliverable DT2.1.1 & DT2.1.2.

4.2. Gap analysis of waste recycling /management technologies

Please fill out the table below based on your knowledge of your Pilot Area.

Table 8: Availability of Waste Management Practices/Technologies

WASTE FLOWS	AVAILABLE PRACTICE(S)/TECHNOLOGY(S)		GAP ANALYSIS		
	Name of the Practice/ Technology	Description of the Practice/ Technology	DOES NOT EXIST	EXISTS but LACKING CAPACITY or LOCALLY NOT AVAILABLE	EXISTS and AVAILABLE FOR USE
Plastics	Waste sorting plants	Plastic from packaging waste or in residual waste is treated in waste sorting plants and separated into different fractions according to their heating capacity. Only small amounts - due to mixture and contamination - can be used for recycling		In order to increase the recycling content of plastics a better collection system e.g. directly from households and companies according to different qualities (e.g. PE, PP,...) needs to be installed.	
Critical Raw Materials (eg. metals, minerals)	Recycling plants for metals	<ul style="list-style-type: none"> - Copper mill - Treatment of metals 		Metals	Copper
Construction waste	Mobile and stationary treatment plants	Treatment of construction waste and using it as secondary raw			X



WASTE FLOWS	AVAILABLE PRACTICE(S)/TECHNOLOGY(S)		GAP ANALYSIS		
		material in the production of e.g. masonry, concrete and lightweight concrete, backfill, tipping, cement production and substrates			
Food Waste	a) Compost b) Biogas plant c) Waste water treatment plant	Aerobic or anaerobic treatment of food waste to produce either a) compost, b) biogas or c) heat and energy			X
Biomass (eg. wood, paper, biofuels)	Closed organic tank system	Collection system for retail and gastronomy including 5 steps: organic waste → chrushing tank and mixing with water→ storage in a closed tank → collection with suction nozzles →biogas plant		Is currently being established	
Wood wastes	Wood gas power plant	In a wood gas power plant, a solid, dry, biogenic fuel such as wood chips is converted into a gaseous fuel by means of thermochemical processes and then the gas is converted into electricity and heat in a gas engine.			x



4.3. Recommendations to improve availability of waste management technologies in the environment of the pilot area

Please give recommendations that are relevant for your pilot area, which can improve the availability of waste management technologies - for example financial support of start-ups, etc.

Currently the use of organic compounds in residual waste as energy source in waste water treatment plants is tested and demonstrated in Tyrol. For this, the residual waste needs to be separated in non-organic and organic fraction. The organic fraction then will be transferred to WWTPs to produce biogas and heat. Of course financial support / funding would help to speed up the demonstration phase and conversion into full-scale operation phase.

In the above mentioned case also legal constraints needs to be solved. A close cooperation with public authorities and an information flow is needed to be realized, both technically as well as legally. New technologies for obtaining secondary raw materials out of waste are in most cases affected by the “end of waste” discussion and the legal situation. As said before involvement of public authorities in an early stage helps to gain approval and permissions.

5. References

Please list your references below. For example if you used publically available information, or a published article, please list the source below.

Bundesministerium für Land- und Forstwirtschaft, Umwelt und Wasserwirtschaft (2011) Federal Waste Management Plan 2011. Vienna

Bundesministerium für Land- und Forstwirtschaft, Umwelt und Wasserwirtschaft (2017) Bundes-Abfall-Wirtschaftsplan 2017. Teil 1. Wien.

Tiroler Landesregierung (2018) Landesstatistik Tirol Website, Landesstatistik Tirol