

Project Acronym: Cradle-Alp
Project number: ASP0100003

D.1.4.1

Toolset supporting the uptake of technologies fostering Cradle2Cradle

WP n°:	1
Task n°:	A1.4
Author(s):	PP2 TZ Horb
Contributors:	All partners
Dissemination level:	PU
Revision:	FINAL
Due Date:	30.04.2024
Date of submission:	03.05.2024

Cradle-ALP – Transnational ecosystem analysis

Executive Summary

The present toolset provides an overview of tools which have as main purpose to foster the adoption by business of technologies fostering a higher circularity of the products, services and processes of industrial businesses in general, and more specifically technologies fostering the closing of material circles according to the cradle2cradles principles.

The tools displayed in this document have been considered in the specific context of the Cradle-ALP project and do not represent an exhaustive list of tools.

Considering the objectives of the Cradle-ALP project, the partners have decided to classify the most relevant tools according to the following categories:

- Tools for identifying / documenting transformation potential in businesses – focus on technology uptake.
- Tools for generating transregional B2B collaboration / innovation projects – focus on technology uptake.

Cradle-ALP – Transnational ecosystem analysis

Contents

1.	Introduction to the Cradle-Alp project.....	3
2.	Scope of the toolset supporting the uptake of technologies fostering Cradle2Cradle	3
3.	Tools for identifying / documenting transformation potential in businesses – focus on technology uptake.....	5
4.	Tools for generating transregional matchmakings / innovation projects – focus on technology uptake.....	9
5.	Conclusions.....	12
6.	Annexes	15

1. Introduction to the Cradle-Alp project

Cradle-ALP aims for mainstreaming cradle to cradle (C2C) approaches, circular design and circular substitutions (from the alpine region) for linear products in industrial processes, in different industrial sectors. The Alpine Space has many natural resources and the technologies to substitute fossil raw materials and toxic substances from production with circular and environmentally friendly alternatives. This should lead to the fact that materials and products can be led back into a healthy cycle after use. The focus of this project shall be on the substitution of chemical and fossil based/ unsustainable materials with more circular, sustainable and bio-degradable ones.

First, the partners will build a broad awareness and understanding in the public, the relevant industries as well as among stakeholders from policy and innovation intermediaries, for the opportunities, barriers and mechanisms of the transformation of industrial products towards higher circularity by means of C2C approaches, circular design and circular substitutions. Business support providers shall be trained to accompany the transformation of businesses along more circular value chains.

In a second step, the partners will explore in details and test opportunities for implementing C2C approaches, circular design and circular substitutions along specific value chains in the chemistry/plastics and wood/forestry sectors supported by digital technologies. Building on a thorough multidimensional (technology, policy, economy, etc.) roadmapping exercise, transnational groupings of stakeholders – including businesses – will be installed, with the aim to transfer the C2C roadmaps into industrial practice along exemplary value chains.

Finally, the partners will work towards ensuring a transnational policy convergence towards transnational S4 strategies in the priority sectors of the project and initiate common cross border funding instruments for the industrial C2C transformation.

2. Scope of the toolset supporting the uptake of technologies fostering Cradle2Cradle

The present toolset provides an overview of tools which have as main purpose to foster the adoption by business of technologies fostering a higher circularity of the products, services and processes of industrial businesses in general, and more specifically technologies fostering the closing of material circles according to the cradle2cradles principles.

The tools displayed in the present document have been identified by the project partners in the framework of:

- Identification of good practices and lessons learned from previous projects and activities within and outside the Alpine Space,
- A joint capitalisation workshop involving the members of the transnational expert support group,
- The initial steps of developing sectoral Cradle2Cradle industrial transformation roadmaps.

identified by the project partners.

The tools displayed in this document have been considered in the specific context of the Cradle-ALP project and do not represent an exhaustive list of tools.

Cradle-ALP – Transnational ecosystem analysis

Considering the objectives of the Cradle-ALP project, the partners have decided to classify the most relevant tools according to the following categories:

- Tools for identifying / documenting transformation potential in businesses.
- Tools for generating transregional B2B collaboration / innovation projects – focus on technology uptake.

3. Tools for identifying / documenting transformation potential in businesses – focus on technology uptake

Identifying and documenting the transformation potential of businesses regarding the adoption of new technologies is crucial for innovation and transformation processes in general:

- **Identifying Gaps and Opportunities:** By assessing a company's potential to adopt new technologies, businesses can identify gaps in their current technological capabilities and opportunities for improvement. This assessment helps in understanding where the company stands in terms of technological integration and what steps need to be taken to advance. Strategic Planning: Understanding the maturity level of a company in terms of technology adoption enables strategic planning. Companies can develop tailored strategies for technology adoption and innovation based on their current readiness level. This ensures that resources are allocated efficiently and effectively to drive innovation initiatives.
- **Risk Mitigation:** Assessing technology readiness helps in identifying potential risks associated with the adoption of new technologies. It allows businesses to anticipate challenges and develop mitigation strategies to address them. This proactive approach minimises the likelihood of disruptions and ensures the smooth integration of new technologies into existing processes.
- **Optimising Resource Allocation:** Companies can prioritise investments in technology based on their potential assessment. By focusing on areas where the company is less mature in technology adoption, businesses can optimise resource allocation and maximise the impact of innovation efforts. This ensures that investments are directed towards initiatives that have the greatest potential for driving business growth and competitiveness.

Specifically in terms of increasing the circularity of products and processes:

- **Identifying Circular Economy Opportunities:** Assessing technology uptake potentials helps companies identify opportunities for implementing circular economy principles into their products and processes. Technologies such as IoT, blockchain, and advanced analytics can enable better tracking, tracing, and management of resources throughout the product lifecycle, facilitating circularity. Adoption of technology can improve resource efficiency by optimising resource utilisation, reducing waste, and enabling better recycling and reuse practices. Assessing technology readiness helps companies identify the most suitable technologies for enhancing resource efficiency and implementing them effectively.
- **Facilitating Collaboration:** Companies can collaborate with technology providers, research institutions, and other stakeholders to leverage advanced technologies for promoting circularity. Assessing technology uptake potentials allows businesses to identify potential partners and engage in collaborative efforts to develop and implement innovative solutions for circularity.

Overall, assessing the potential of a business to uptake technologies provides valuable insights that enable companies to develop strategic plans, mitigate risks, optimise resource allocation, and identify opportunities for promoting circular economy principles. In the context of Cradle-ALP, such potential assessments are considered to potentially provide a good working basis for the project partners with the SMEs to be supported through transnational/local and collective/individual activities aiming at fostering the take-up of new technologies and/or the

Cradle-ALP – Transnational ecosystem analysis

emergence of new business models and value chains.

The following tools have been identified, assessed and documented:

European and national strategic documents

The initial collections of documents performed by the partners showed that a number of European and national strategic documents are providing input on mature and emerging technologies (or groups of technologies) which can contribute to the transformation of the economy towards a more circular and sustainable one. This includes products and business models building on the zero waste and cradle 2 cradle paradigms.

Some of those strategic documents have been identified by the partners at this initial stage of the project.

Good practices identified:

- ERA Industrial technology roadmap for circular technologies and business models in the textile, construction and energy-intensive industries
- Strategic Research and Innovation Plan for Safe and Sustainable Chemicals and Materials
- EU policy framework on biobased, biodegradable and compostable plastics from 30.11.2022
- Technology Roadmap Sustainable Plastics Solutions, Upper Austria

Ready to apply technologies

In addition to strategic documents highlighting the potential of specific technologies (or groups of technologies) for the circular transformation of the economy, the partners identified a series of specific technologies already proven or even in application.

While it is not possible to aim for an exhaustive list of such technologies, knowing of some of them can be useful for inspiration and possibly provide an initial spark for specific transformation projects. Examples for technologies directly relevant to the Cradle-ALP project have been documented by the partners.

Good practices identified:

- Tech4Biowaste database
- Tracer-Based Sorting with fluorescent markers, Polysecure GmbH
- BioOrmocere - barrier coating for packaging, Fraunhofer ISC
- Cooperation project: “Von der Fliege zum Fisch”/” From a fly to a fish”, Upper Austrian Food Cluster
- EnzATex – Recycling of polymers in textile industry, TCKT – Transfercenter für Kunststofftechnik
- Plasticpreneur, small-scale plastic recycling, Austria

Tools and guides

In the framework of the analysis dimension technologies, tools and guides are mostly digital tools, which enable businesses to assess for instance the recyclability of their products, to estimate the ecological footprint of their activities, to identify suitable bio-based materials according to their requirements, etc.

In a first step some tools were identified in order to get an appreciation of the possibilities already on the market.

Good practices identified:

- Biobase Kompass, Austria
- Circularity compass, KIC Climate
- CHIRA - CHI Recyclability Assessment, Cyclos Institute, Germany
- Cyrcluticics, EllenMacArthur Foundation

Handbooks, guidelines, factsheets

Handbooks, guidelines and factsheets are well-know tools, which do not require much explanation. In the context of Cradle-Alp and the transformation towards a more circular economy, those tools typically address the following aspects:

- Describing the rationale for why circular economy / cradle to cradle is relevant.
- Identifying circular / cradle 3 cradle business models with highest value potential in specific sectors of the economy.
- Analyzing an highlighting different technologies (physical, digital, biological) and how they can contribute to implement circular / cradle 2 cradle business models.
- Outlining required organisational and operational changes.
- Providing a blueprint of a transformation journey for companies to achieve circular advantage, including relevant tools.

The partnership focused, according to the upcoming activities in the project, on practices addressing the transformation process of businesses towards circular / cradle 2 cradle business models as such, rather than to focus on specific single technologies.

Good practices identified:

For policy makers:

- Delivering the circular economy: a toolkit for policymakers, EllenMac Arthur Foundation
- Roadmap for a circular economy, 50 measures, France
- Environmental policy approach (EPR) Toolbox for packaging
- Network C2C Regions in Germany - guideline on C2C oriented public procurement

For businesses:

Cradle-ALP – Transnational ecosystem analysis

- MASDE, Valencia, Spain
- C2C Bauleitfaden from C2C NGO
- CE Playbook SITRA, Finland
- Circular 4.0 Toolbox

4. Tools for generating transregional matchmakings / innovation projects – focus on technology uptake

Business-to-business (B2B) collaborations and collaborative innovation projects play vital roles in fostering the uptake of new technologies by businesses, especially in driving transformation towards a more circular economy:

- **Pooling Resources and Expertise:** B2B collaborations allow businesses to pool their resources, expertise, and capabilities to address common challenges and pursue opportunities. When multiple companies collaborate on innovation projects, they can leverage complementary strengths and knowledge to accelerate the adoption of new technologies. This collaboration reduces the burden on individual companies and enables them to achieve more significant technological advancements together than they could independently.
- **Risk Sharing:** Collaborating on innovation projects allows businesses to share the risks associated with technology adoption. New technologies often involve uncertainties and investment risks, including technical challenges, market acceptance, and regulatory compliance. By collaborating with other companies, businesses can distribute these risks among multiple partners, making technology adoption more feasible and less daunting for each participant.
- **Access to External Networks and Resources:** Collaborative innovation projects provide businesses with access to external networks, expertise, and resources that may not be available internally. Through partnerships with research institutions, technology providers, and other stakeholders, companies can tap into a broader ecosystem of innovation. This access enhances their ability to identify and adopt new technologies relevant to their specific needs, accelerating the pace of technological uptake.
- **Co-Creation and Co-Innovation:** B2B collaborations and collaborative innovation projects facilitate co-creation and co-innovation among participating companies. By working together closely, businesses can jointly develop new technologies, products, and business models that address shared challenges and opportunities. This collaborative approach ensures that innovations are aligned with market needs and have greater relevance and impact when introduced.
- **Scale and Market Reach:** Collaborative efforts enable businesses to achieve scale and extend their market reach more effectively than they could individually. By combining forces, companies can access larger markets, diversify their customer base, and penetrate new geographic regions more efficiently. This scale advantage is particularly beneficial for technology adoption, as it increases the potential for widespread adoption and commercial success.
- **Alignment with Circular Economy Principles:** Collaboration is essential for driving the transition towards a more circular economy, where resources are used more efficiently, waste is minimized, and products are designed for longevity and recyclability. B2B collaborations and collaborative innovation projects enable businesses to develop and implement circular economy solutions collaboratively. This includes technologies for resource recovery, remanufacturing, recycling, and product-as-a-service models. By working together, companies can overcome barriers to circularity, such as investment costs, technology complexity, and supply chain coordination, making circular business models more accessible and viable.
- **Policy and Regulatory Support:** Collaborative initiatives often receive support from

Cradle-ALP – Transnational ecosystem analysis

policymakers and regulators, especially when they contribute to broader societal goals such as sustainability and economic growth. Governments may provide funding, incentives, or regulatory frameworks to encourage collaboration on innovation projects and technology uptake. This support creates a conducive environment for businesses to engage in collaborative efforts and accelerate the adoption of new technologies, including those relevant to the circular economy.

The following tools have been identified, assessed and documented:

Circular economy agencies or hubs - Stakeholder platforms

Circular economy agencies or hubs are still relatively rare. They can be compared in principle to energy agencies or digital hubs / digital innovation hubs, which are more familiar to the European landscape of business support organisations.

Typically, such organisations can cover a broad range of activities such as for instance:

- **Promotion of circular economy** by providing information and resources to local communities, businesses, and governments, and by encouraging the adoption of circular business models and practices.
- **Communication and outreach** to raise awareness of circular economy issues and to build support for related initiatives. This could involve developing public education campaigns, organizing events and workshops, and working with media outlets to share information and promote circular-related topics.
- **Policy development** by developing and implementing circular economy policies and plans at the regional level. This could involve conducting audits and assessments, developing action plans, and providing technical assistance to local governments and businesses.
- **Capacity building and training** by providing training and capacity-building programs to help local communities, businesses, and governments improve their circularity and adopt sustainable practices.
- **Stakeholder engagement and networking** by engaging with a wide range of stakeholders, including businesses, industry associations, environmental organizations, and government agencies. They may facilitate networking and collaboration between these stakeholders to promote circular initiatives and build support for circular policies and programs.
- **Research and innovation:** Circular economy agencies may conduct research and development activities to explore new energy technologies and solutions, and to identify emerging trends and best practices in circular economy. They may also collaborate with universities and research institutions to support innovation and knowledge transfer.
- **Financing and funding:** Circular economy agencies may help to facilitate financing and funding opportunities for circular projects. They may work with financial institutions, investors, and other stakeholders to develop funding mechanisms and to connect project developers with financing options.
- **Monitoring and evaluation:** Circular economy agencies may be responsible for monitoring and evaluating the performance of circular projects and programs. This could involve tracking material consumption, assessing the effectiveness of circular

Cradle-ALP – Transnational ecosystem analysis

policies and programs, and reporting on progress towards related goals.

- **International cooperation:** Circular economy agencies may work with other agencies and organizations at the national and international level to promote circular economy and to address global challenges. This could involve participating in international conferences and forums, collaborating with international partners on research and development initiatives, and supporting global circular economy policy and governance efforts.

Overall, circular economy agencies could become important tools for economic development and innovation policies, providing a focused and targeted approach to promoting sustainable growth and competitiveness in key sectors of the economy.

Stakeholder platforms for the circular economy / cradle to cradle are networks of relevant actors on the European, national, regional, or local level – depending on their focus. Their activities are similar in part to the ones of agencies or hubs, with a stronger focus on promotion, communication and outreach, stakeholder engagement and networking, policy development (lobbying) and capacity building. They can be fully bottom-up initiatives started by motivated actors or part of a concerted policy action.

Good practices identified:

- Zero Waste Scotland
- ICESP-Italian Circular Stakeholder Platform

Public funding schemes

While the activities on funding schemes in Cradle-Alp are focusing on transnational funding opportunities, the partners did collect some examples of funding schemes focusing on the circular economy transformation for SMEs: venture capital funds, voucher schemes, etc.

Good practices identified:

- European Circular Bioeconomy Fund
- Circular Economy Accelerator Programme, Scotland (see also ZWS above)
- Circular Economy Investment Fund, Scotland (see also ZWS above)
- Waldfonds, Austria
- FTI-Initiative Kreislaufwirtschaft, Austria
- Innovation Express

5. Conclusions

The tools listed above have been assessed by the project partners with respect to their potential usefulness in the context of the Cradle-ALP project, more specifically for application in the context of testing the relevance of the industrial C2C transformation roadmaps in selected industrial sectors.

In the context of providing supports to SMEs with their circular transformation, the following tools have been identified as the most suitable.

- **Audit / Maturity assessment**

It appears that there are already many relevant audit/maturity assessment tools on the markets, especially such tools addressing in parallel both the integration of digital technologies and circularity aspects. Considering the high policy relevance of the twin – digital and green – transition of the economy, such tools are considered as the most relevant in the context of a first one to one interaction with businesses. They offer a broad range of opportunities to identify potentials for a circular transformation.

Among the tools available, the tools from the past Interreg Alpine Space project Circular 4.0 are of strong relevance, and have already been tested and validated by different project partners. However, it is important to mention that, in practice, it is difficult for all partners to prioritise the use of one specific assessment tool. Depending on their regional context, they might either need to use another such tool – be it imposed by regional authorities or more convenient because already well known by the relevant actors. Such tools are also evolving over time with the emergence of new technologies (e.g. AI technologies recently).

The most important is therefore not to use one given tool, which would supposedly be better than other, but to integrate the use of a suitable audit/maturity assessment tool in the diagnostic phase when working with SMEs.

- **Life cycle analysis**

Life cycle analysis (LCA) tools are related to audit/maturity assessment tools. Compared to the audit/maturity assessment tools, LCA tools are more specific and more sophisticated. They require higher expertise and a strong commitment of the businesses involved.

LCA offers several benefits for businesses aiming to improve sustainability and make informed decisions about their products and processes:

- **Identifying Environmental Hotspots:** LCA helps businesses identify environmental hotspots throughout the entire life cycle of their products or processes. By analyzing inputs, outputs, and impacts at each stage, companies can pinpoint areas where environmental impacts are most significant. This insight allows for targeted interventions to reduce environmental footprint.
- **Optimizing Resource Use:** Through LCA, businesses can assess resource consumption at each stage of the product life cycle. This enables them to identify opportunities for resource optimization, such as reducing raw material usage, energy consumption, and water usage. By optimizing resource use, companies can improve efficiency and reduce costs.
- **Supporting Product Design and Innovation:** LCA provides valuable information that can guide product design and innovation efforts. By understanding the

Cradle-ALP – Transnational ecosystem analysis

environmental impacts of different design choices, businesses can develop products that minimize environmental harm over their entire life cycle. This can lead to the creation of more sustainable and competitive products in the market.

- **Meeting Regulatory Requirements:** Many jurisdictions have regulations and standards related to environmental impact assessment and reporting. LCA helps businesses comply with these requirements by providing quantitative data on environmental performance. By demonstrating a commitment to sustainability through LCA, companies can enhance their reputation and credibility with regulators, customers, and other stakeholders.
- **Improving Stakeholder Engagement:** Stakeholders, including customers, investors, and community members, are increasingly interested in the environmental performance of businesses. LCA enables companies to transparently communicate their environmental impacts and sustainability efforts to stakeholders. This can enhance trust, build brand loyalty, and attract investment from environmentally conscious stakeholders.
- **Identifying Cost Savings Opportunities:** In addition to environmental benefits, LCA can uncover opportunities for cost savings. By identifying inefficiencies and waste throughout the product life cycle, businesses can implement measures to reduce costs while simultaneously improving environmental performance. This dual benefit enhances the business case for sustainability initiatives.
- **Differentiating Products in the Market:** As consumers become more environmentally conscious, businesses that can demonstrate the sustainability of their products gain a competitive edge. LCA allows companies to quantify and communicate the environmental benefits of their products compared to alternatives. This differentiation can attract environmentally aware consumers and drive market share growth.
- **Fostering Continuous Improvement:** LCA is not a one-time exercise but rather a process that supports continuous improvement. By regularly conducting LCAs and tracking environmental performance metrics, businesses can set targets, measure progress, and identify further opportunities for optimization. This iterative approach fosters a culture of sustainability and innovation within the organization.

Overall, life cycle analysis offers businesses a comprehensive understanding of the environmental impacts of their products and processes, enabling them to make informed decisions, improve sustainability, and drive competitive advantage.

The partner biz-up is currently working on the development of a dedicated LCA tool, which might be tested in the framework of the Cradle-ALP project.

- **Innovation Express**

A second call was opened place from March to June 2024, focusing on transregional circular bioeconomy value chains, key resources and sectors in agriculture, food and beverages, chemistry, polymers and energy.

The call is about two thematic fields:

- 1) Application and development of technology for implementing and upscaling bioeconomy solutions

- a) Circular Production

Cradle-ALP – Transnational ecosystem analysis

b) Bio-Based Materials and Products

2) New Solutions for Climate Protection and Decarbonisation of Supply Chains

a) Sustainable Supply Chains

b) Decarbonized Supply Chains

The call involves 5 regions, out of which (bold) 3 are represented in the Cradle-ALP project: Salzburg (AT), **Upper Austria (AT)**, **Fribourg (CH)**, Brandenburg (DE) and **Bavaria (DE)**.

Further tools, such as technology roadmaps have also been deemed relevant in the context of Cradle-ALP, however rather on a broader level, for instance when developing sectoral industrial transformation roadmaps or when delivering awareness raising activities. They are less suitable for use in the support provided to single SMEs in the framework of the Cradle-ALP pilot activities.

6. Annexes

In the following, the tools mentioned in the report are shortly described – links to further sources of information are provided.

European and national strategic documents

Good practices identified:

- ERA Industrial technology roadmap for circular technologies and business models in the textile, construction and energy-intensive industries
- Strategic Research and Innovation Plan for Safe and Sustainable Chemicals and Materials
- EU policy framework on biobased, biodegradable and compostable plastics from 30.11.2022
- Technology Roadmap Sustainable Plastics Solutions, Upper Austria

In the following, the above practices are shortly described:

- **ERA Industrial technology roadmap for circular technologies and business models in the textile, construction and energy-intensive industries**

This second industrial technology roadmap, under the European Research Area, sets out 92 circular technologies in the textile, construction and energy-intensive industries, which address all stages of a material and product lifecycle. It indicates the means to develop and adopt these technologies, which can help reduce the impact of these industries on climate and the environment. It finds a leading position of EU companies in circular technologies, but also looks at the substantial research & innovation investment needs at EU and national levels and necessary framework conditions to put in place. It builds on contributions from industry, other R&I stakeholders, Member States, and relevant European partnerships.

Source for further information: [Publication Office of the European Union](#)

- **Strategic Research and Innovation Plan for Safe and Sustainable Chemicals and Materials**

The current Strategic Research and Innovation Plan (SRIP) for Safe and Sustainable Chemicals and Materials highlights current research and innovation (R&I) areas crucial for accelerating the transition to chemicals and materials that are safe and sustainable. This SRIP is a result of extensive consultations with different stakeholder groups and reflects the R&I needs flagged during these consultations. It provides a comprehensive outlook of R&I needs for chemicals and materials across their lifecycle, i.e., from production to (re)use, disposal and pollution remediation.

Source for further information: [Publication Office of the European Union](#)

- **EU policy framework on biobased, biodegradable and compostable plastics from 30.11.2022**

Cradle-ALP – Transnational ecosystem analysis

This EU policy framework for biobased, biodegradable and compostable plastics aims to contribute to a sustainable plastics economy by

- improving the understanding around these materials and clarify where these plastics can bring genuine environmental benefits, under which conditions and applications
- guiding citizens, public authorities and businesses in their policy, purchasing or investing decisions
- preventing differences at national level and fragmentation of the market by promoting a shared understanding across the EU on the production and use of these plastics

Source for further information: environment.ec.europa.eu/

- **Technology Roadmap Sustainable Plastics Solutions, Upper Austria**

Upper Austria aims to become a model region for the circular economy. Since Austria, and Upper Austria in particular has a very strong and diversified plastics industry, the focus is on implementing sustainable plastics solutions along the entire value chain. Together with business, research, and political representatives, a roadmap (strategic plan) was developed to make plastics more sustainable and circular. The workshops with stakeholders in the value chain resulted in three sets of topics with different measures that are necessary for Upper Austria to be perceived as a model region for the plastics circular economy.

Source for further information: www.uppervision.at

Ready to apply technologies

Good practices identified:

- Tech4Biowaste database
- Tracer-Based Sorting with fluorescent markers, Polysecure GmbH
- BioOrmocere - barrier coating for packaging, Fraunhofer ISC
- Cooperation project: “Von der Fliege zum Fisch”/” From a fly to a fish”, Upper Austrian Food Cluster
- EnzATex – Recycling of polymers in textile industry, TCKT – Transfercenter für Kunststofftechnik
- Plasticpreneur, small-scale plastic recycling, Austria

In the following, the above practices are shortly described:

- **Tech4Biowaste database**

The Tech4Biowaste project aims to provide the bio-based industry with a complete overview of existing and emerging technologies with a Technology Readiness Level (TRL) 4 and higher for biowaste utilisation and valorisation. The technology database contains up-to-date information and will be user-friendly, well-maintained and accessible to everybody. The database will be helpful for a large number of stakeholders in and after the project duration. It provides information and technical details on the

Cradle-ALP – Transnational ecosystem analysis

technologies for interested stakeholders and provide a platform for technology providers to show innovative technologies.

Source for further information: [Link](#)

- **Tracer-Based Sorting with fluorescent markers, Polysecure GmbH**

Polysecure GmbH has developed a unique technology platform of marker materials and detection processes, materials and products can be invisibly marked, robustly authenticated and tracked in a forgery-proof manner.

Materials and products can be invisibly marked, practicably authenticated and tracked to reliably sort waste streams into all desired fractions. May be used for product passport/authentication, material tracking and precise sorting.

Source for further information: [Link](#)

- **BioOrmocere - barrier coating for packaging, Fraunhofer ISC**

High-performance biobased and biodegradable functional layers for coating of packaging materials to improve performance of conventional bio-packaging systems. Via inorganic-organic material combinations the properties can be optimized to meet the requirements of specific products.

German Packaging Award 2020, Sustainability Awards 2020

Source for further information: [Link](#)

- **EnzATex – Recycling of polymers in textile industry, TCKT – Transfercenter für Kunststofftechnik**

In Austria, large quantities of textile waste are generated, of which only a small amount is collected sorted by type and the majority ends up in mixed waste. Used textiles in mixed waste end up almost exclusively in thermal recycling. A significant increase in the recycling rate of used textiles should therefore be aimed for. Since most textiles consist of two or more fiber types, recycling is not efficiently possible with current technologies. Therefore, the aim of the project is to solve this problem and make it possible to recycle polymers from textiles. The core of this is enzymatic hydrolysis, which separates those components from a fiber mixture that are present in small proportions so that the remaining polymer can be made available as a raw material for the textile processing chain. Depending on the polymer, a recycled fiber can be produced in a melt or solvent spinning process, which can subsequently be processed into a yarn and finally into a textile.

In the project, partners along the entire value chain - from collection and sorting of textiles to shredding and processing, recycling, fiber and textile production, and finishing - are working to close this loop.

The project creates the basis for the high-quality, mechanical recycling of textile waste and thus closes the cycle, which was not possible before. Based on the results generated along the entire value chain, a recycling process can be developed which, on the one hand, enables a major contribution to resource conservation and, on the other hand, also creates new sources of raw materials for textiles locally.

Source for further information: [Link](#)

- **Plasticpreneur, small-scale plastic recycling, Austria**

Plasticpreneur is an Austrian-based start-up company with a global vision. Their mission is to create affordable access to small-scale plastic recycling solutions

Cradle-ALP – Transnational ecosystem analysis

worldwide. Plasticpreneur produces mobile recycling machines that allow easy plastic recycling from anywhere. These machines are designed for low-threshold use, enabling recycled plastic to be incorporated into product development processes, from prototype development to small-scale production².

Source for further information: [Link](#)

Tools and guides

Good practices identified:

- Biobase Kompass, Austria
- CHIRA - CHI Recyclability Assessment, Cyclos Institute, Germany
- Cyrculitcics, EllenMacArthur Foundation

In the following, the above practices are shortly described:

▪ **Biobase Kompass, Austria**

Biobase is a platform for bioeconomy and circular economy, with the goal to push innovation in this area. They created the “Biobase Kompass”, which is a database displaying material flows in different sectors. The Kompass shows important information for the transformation of classical value chains towards biobased resources and provides background information for this transition towards bioeconomy. The focus is on biobased materials, but also fossils or minerals are included in the growing database. The Kompass is displaying different materials with the related inputs and outputs and the companies working with the materials. This information allows companies to identify alternative raw materials. Secondary raw materials and waste streams play an important role in circular economy.

The Kompass allows to get an overview of materials flows in the bioeconomy and make the biobased value chain more transparent. The interactions of different stakeholders are displayed and both SME and big companies are involved. The Kompass is mainly generating information and displaying it so, that it can be used by companies who want to find alternative raw materials. Additionally, the biobased rises awareness for biobased raw materials and the future relevance of this topic.

Source for further information: [Link](#)

▪ **CHIRA - CHI Recyclability Assessment, Cyclos Institute, Germany**

Assessing recyclability can provide critical information for the optimisation of packaging and goods. For this it is necessary to create a scientifically proven, comprehensible and transparent basis for requirements and evaluation criteria.

The Institute cyclos-HTP has designed a catalogue for requirements and evaluation (Catalogue R & A) for assessing and certifying the recyclability of packaging and goods. Based on the requirements of the catalogue will

- packaging materials be analysed,
- sorting, processing and recycling capabilities be tested,

Cradle-ALP – Transnational ecosystem analysis

- certificates and reports be issued, and (if desired) authorisation for use of a label be granted.

Source for further information: [Link](#)

▪ **Circulytics, EllenMacArthur Foundation**

Circulytics is a framework of indicators for tracking circular economy performance. It allows companies to highlight successes in their transition and identify where to focus efforts for improvement in line with the three principles of a circular economy, all driven by design: eliminate waste and pollution, circulate products and materials, and regenerate nature.

As of 31 August 2023, Circulytics platform is closed to submissions. The assessment methodology is available for reference only. It details the Circulytics scoring and weighting approach previously used by the Foundation.

Source for further information: [Link](#)

Handbooks, guidelines, factsheets

Good practices identified:

For policy makers:

- Delivering the circular economy: a toolkit for policymakers, EllenMac Arthur Foundation
- Roadmap for a circular economy, 50 measures, France
- Environmental policy approach (EPR) Toolbox for packaging
- Network C2C Regions in Germany - guideline on C2C oriented public procurement

For businesses:

- MASDE, Valencia, Spain
- C2C Bauleitfaden from C2C NGO
- CE Playbook SITRA, Finland
- Circular 4.0 Toolbox

In the following, the above practices are shortly described:

For policy makers:

- **Delivering the circular economy: a toolkit for policymakers, EllenMac Arthur Foundation**

The Toolkit identifies eight key insights, details policy options, opportunities and barriers, and demonstrates how the tools may be applied in a pilot study of Denmark.

Part 2 comprises a how-to guide for policymakers who want to design a strategy to accelerate the transition towards the circular economy. It offers a detailed step-by-step methodology to explore and prioritise circular economy opportunities; quantify their impact; identify the barriers limiting these opportunities; and map and prioritise the policy interventions to overcome these barriers

Source for further information: [Link](#)

- **Roadmap for a circular economy, 50 measures, France**

The document outlines a roadmap for transitioning to a 100% circular economy, focusing on better production, consumption, and waste management practices. The key objectives include using more secondary raw materials in products, supporting productive investment, assisting voluntary companies in resource efficiency, and enabling Extended Producer Responsibility (EPR) schemes for industrial recycling sectors. The roadmap emphasizes the importance of incorporating recycled materials, sustainable resources, and eco-design principles in products to ensure environmental sustainability. It also highlights the need for efficient waste management practices, including simplifying waste sorting processes, collecting biowaste, and implementing pricing incentives for waste management. The document aims to mobilize all actors towards achieving a more sustainable and circular economy by engaging businesses, consumers, and policymakers in adopting responsible practices.

Overall, the document positions the circular economy as a solution that not only benefits the environment by reducing waste and emissions but also drives economic growth and innovation, ultimately reconciling the economy with environmental sustainability.

Source for further information: [Link](#)

- **Extended Producer Responsibility (EPR) Toolbox for packaging**

Extended Producer Responsibility (EPR) is a key concept for ‘closing the loop’ in the packaging value chain. The EPR Toolbox is a collection of internationally relevant knowledge on the topic of EPR for packaging. Its aim is to promote knowledge exchange and enhance development of EPR systems worldwide. The EPR Toolbox contains detailed training materials on EPR, practical country examples and a set of FAQs.

Source for further information: [Link](#)

- **Network C2C Regions in Germany - guideline on C2C oriented public procurement**

The Network C2C Regions is aimed at

- Cities & municipalities - that act in a climate and resource positive way and want to act and introduce C2C as a holistic guiding principle;
- Companies - who already manufacture products according to the criteria of C2C, have aligned their business processes accordingly or want to be a demonstrable regional driver for C2C;
- Organisations - such as foundations, associations, NGOs & research institutions that want to actively participate in shaping a positive ecological footprint of entire communities.

The Network C2C Regions offers ...

- an exchange platform for expertise and knowledge; one voice, big impact - bundling of positions and representation of interests; potential for regional networking of companies, organisations and political actors; use of network logo for positioning the C2C commitment and integration on the network's website;
- practical implementation - support of C2C projects through qualification, assistance & communicative accompaniment;

Cradle-ALP – Transnational ecosystem analysis

- publications - development and provision of guidelines, factsheets, formulation aids, case studies, etc.;
- events - regular/annual network meetings; possible inclusion at C2C NGO events; thematic workshop series, roundtables and keynote speeches for network members; etc.

Source for further information: [Link](#)

For businesses:

- **MASDE, Valencia, Spain**

MASDE is a business support mechanism that implies a deployment of business support actions and tools improving strategic planning at a company level under a co-creation model between companies and the main actors in the ecosystem at a sectorial level (CLUSTER- TECH INSTITUTE and RDA):

- MASDE allows companies to analyze their status and make a strategic reflection on their current situation.
- MASDE allows companies to establish changes in their business strategy to adapt to the new challenges in their sector.
- Work on a co-creation model with the entities that make up the territory's innovation and financing ecosystem
- MASDE Design a series of computer support tools, as well as public and private financing instruments to finance strategic planning actions.

This framework aims at making it easier for companies to find the most appropriate strategic combination for sustainable development. At the same time, it facilitates obtaining necessary funding for their sustainable investment plans.

The tool has partly been developed with European public funds and is partly available in English. IVACE is ready/interested to collaborate with transnational partners.

Source for further information: [Link](#)

- **C2C Bauleitfaden from C2C NGO**

The „C2C IM BAU: ORIENTIERUNG FÜR KOMMUNEN“ is a recommendation for C2C buildings for municipalities and all other actors in the building sector. It was developed by the C2C NGO in collaboration with the Nordakademie-Stiftung with experts from the building sector. Since the building sector is a big impact on the global resource demand, it can be seen as leverage point in circular economy. The recommendation introducing cradle to cradle to stakeholders in the building sector. The document is divided in 15 different chapters related to C2C and buildings.

Source for further information: [Link](#)

- **CE Playbook SITRA, Finland**

This playbook is tailored to companies in the Finnish manufacturing industry giving examples for the following four sub-sectors: (1) Machinery & Equipment, (2) Marine, (3) Energy and (4) Transportation.

It specifically addresses companies that want to

- Better meet customer expectations and deliver customer outcomes
- Enable outcome-oriented solutions and new levels of efficiency through technology and digitalisation
- Improve resource utilisation and mitigate risk from regulatory, investor and societal pressure

Cradle-ALP – Transnational ecosystem analysis

The playbook calls for action by

- Describing the rationale for why circular economy is relevant
- Identifying circular business models with highest value potential per sub-sector
- Outlining required organisational and operational changes
- Providing a blueprint of a transformation journey for companies to achieve circular advantage

It describes thereby a full methodology for the transformation journey towards circular business models. One of the business models highlighted is called the ‘Circular Supply Chain’, which fits well to the scope of the Cradle-ALP project. An interesting feature of the Playbook is the analysis of different technologies (physical, digital, biological) and how they can contribute to implement circular business models.

The Playbook also contains a series of tools, which can be used by any company as well as examples from businesses and their circular transformation:

- Business model development toolkit
- Value case tool
- Capability maturity assessment
- Technology maturity assessment tool
- Ecosystem partner identification
- Funding requirement analysis
- Roadmap development
- Business model canvas

Source for further information: [Link](#)

▪ **Circular 4.0 Toolbox**

The main objective of the CIRCULAR4.0 project was to strengthen digitalisation processes by SMEs to foster innovation processes and accelerate the transition to the Circular Economy in Alpine Space.

Circular 4.0 has created an easy toolkit to assess companies and see how circular they are. The toolkit is free, and it offers:

- **CAS & DMA Tools** Assess your level of digital technology readiness and commitment or assess the level of maturity and commitment of target firms for circular transformation.
- **OTC Training modules for intermediary organisations** (operators) providing knowledge and skills needed for understanding key circular economy principles, the application of the digital technologies and assessing company’s investment opportunities.
- **CAT 4.0 Training Modular training course as a tool for SMEs** to be delivered by the operators. CAT4.0 is designed to steer and facilitate the circular transformation by deployment of digital technologies.

Materials provided here support this objective through a complete set of training materials and tools needed to assist companies with accelerating their transformation.

Source for further information: [Link](#)

Circular economy agencies or hubs - Stakeholder platforms

Good practices identified:

- Zero Waste Scotland
- ICESP-Italian Circular Stakeholder Platform

In the following, the above practices are shortly described:

▪ **Zero Waste Scotland**

Zero Waste Scotland (ZWS) exists to lead Scotland to use products and resources responsibly, focusing on where it can have the greatest impact on climate change. ZWS is funded by the Scottish Government and receives funding from the European Structural Funds Programme to help accelerate the circular economy and resource efficiency work with SMEs in Scotland. ZWS has about 160 employees and offers a broad range of services and support of cities and regions as well as businesses.

The current main support programme to business is the Resource Efficient Circular Economy Accelerator Programme - RECEAP (European Regional Development Funds) £ 73m – EUR 83m. It offers financial and non-financial support:

- Circular Economy Business Support
 - Focussed on business planning development and execution (Non-financial investment)
 - Supported via specialist contractors
- Circular Economy Investment Fund
 - Grant programme to commercialise innovation and acceleration in the circular economy (Financial investment)
 - Key metrics: Carbon Savings, Leverage private & or Institutional Investment & Jobs

Source for further information: [Link](#)

▪ **ICESP-Italian Circular Stakeholder Platform**

ICESP is an Italian platform that was created to bring initiatives together, to share experiences, to highlight critical issues and indicate perspectives in order to represent Italian specificities in the field of circular economy in Europe and to promote circular economy in Italy through specific dedicated actions.

ICESP is promoted by ENEA (Italian National Agency for New Technologies, Energy and Sustainable Economic Development) as an initiative that mirrors and integrates with ECESP, the European Platform for the Circular Economy, with the aim of spreading knowledge on circular economy, mapping good circular economy practices, and fostering multi-stakeholder dialogue.

ICESP is a network whose objective is to create a national convergence on initiatives, experiences, critical issues, perspectives, and expectations on circular economy that are presented in Europe with a single voice, promoting the Italian way of making circular economy also through specific dedicated actions.

GOALS:

- to promote knowledge dissemination
- to foster dialogue and possible synergies between the Italian players involved in the initiatives
- to map Italian good practices

Cradle-ALP – Transnational ecosystem analysis

- to promote the integration of initiatives at the Italian level
- to create a permanent operational tool that can promote and facilitate intersectoral dialogue and interactions
- to spreading Italian excellence and the Italian way of making a circular economy starting from the traditions and typical features of our country and the related cultural, social, and business models.

The platform has adopted a Charter (manifesto) and a Regulation that allow organizations to share commitment to achieve common circular economy goals.

Source for further information: [Link](#)

Public funding schemes

Good practices identified:

- European Circular Bioeconomy Fund
- Circular Economy Accelerator Programme, Scotland (see also ZWS above)
- Circular Economy Investment Fund, Scotland (see also ZWS above)
- Waldfonds, Austria
- FTI-Initiative Kreislaufwirtschaft, Austria
- Innovation Express

In the following, the above practices are shortly described:

- **European Circular Bioeconomy Fund**

As the first venture capital fund exclusively dedicated to the (circular-) bioeconomy, ECBF aims to catalyze the transition towards a sustainable future.

In 2017, the European Investment Bank (EIB) published a study stating that companies and projects in the European bioeconomy lack financing in the growth phase. This funding gap is affecting the transformation process in Europe from a linear to a sustainable circular economy. To address this gap, the EU has allocated EUR 100 million to establish a market-oriented European Growth Fund. At the end of 2018, the EIB launched a tender for the fund project. In a competitive process, the EIB selected the ECBF Management GmbH. ECBF's ESG guidelines, which guide the fund's investments, ensure that Europe's transformation to a more sustainable economy is supported.

Source for further information: [Link](#)

- **Waldfonds, Austria**

The Waldfonds is a funding instrument from the BML for forestry and wood value chain with a dedicated budget of € 350 mio running for four years (until 2025). The budget was divided in 10 different topics, e.g. actions on reforestation, bark beetle or forest fires or research on future forests and wood as material or energy and education in this field. This program offers a unique opportunity for the wood-based bioeconomy in Austria because the funded projects accelerate the transition towards a wood-based bioeconomy.

Source for further information: [Link](#)

- **FTI-Initiative Kreislaufwirtschaft, Austria**

The FTI-Initiatives are an Austrian funding instrument for research, technology, and innovation with four different focus areas: energy transition, circular economy, mobility transition and climate-neutral city. For circular economy (CE) two calls were published, one in 2021 with € 10 mio and one in 2022 with € 12 mio. In 2021 the addressed topics were: innovation for a CE, circular procurement and manufacturing, intensification of use and recycling. Within this framework 10 projects were funded in 2021. In 2022 the addressed topics were innovation for a CE, intensification of the use of goods and residual materials and recycling. Within this framework different research projects were funded.

The funding of the FTI initiative in the CE was supporting different projects towards a more circular future. Stakeholders addressed with this initiative were research institutes on the one hand and companies on the other hand. In total a budget of € 22 mio was allocated to these projects. Additionally the publication of the circular economy strategy in December 2022 raised awareness on CE in the public.

Source for further information: [Link](#)

- **Innovation Express**

The Innovation Express is a funding instrument aiming at facilitating internationalization, development of innovative solutions in two given scopes for projects by developing transnational and transregional linkages among SMEs, research institutions and other business organizations. It works on the basis of calls for proposals funded by existing national/regional funding programmes and managed by participating funding agencies to initiate, develop or enhance transnational exchange activities among applicants and their project proposals to be funded. Applications are evaluated based on their potential to create benefits for participating applicants and in accordance with the criteria from the respective regional/national funding programmes.

The first Innovation Express call took place in 2021 and brought together the regions of Baden-Württemberg (Germany), Brandenburg (Germany), Fribourg (Switzerland) and Salzburg (Austria). The concept can be repeated with different groupings of regions.

Source for further information: [Link](#)