Interreg Co-funded by the European Union

Alpine Space

Cradle-ALP

Chemie Cluster Bayern

Project Acronym: Cradle-Alp

Project number: ASP0100003

D.2.1.2

Transnational sectoral working groups (TSWG)

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Activity n°:	2.1
TSWG:	Chemistry/Materials
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Table of content

1. Introduction to 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. Objectives and scope of the sectoral Cradle2Cradle industrial transformation roadmaps

By the end of period 2 (April 2024) the Cradle-ALP partners will elaborate **5 circular transformation roadmaps** for the 5 industrial sectors identified as key sectors for the Alpine space:

- Chemistry/Materials
- Polymers/Composites
- Packaging
- Textiles/Fibres
- Wood/Furniture

The roadmap methodology was prepared by Chemie Cluster Bayern, leader of WP2 **Roadmaps to Cradle2Cradle transformation**, and Polymeris, leader of Activity 2.1 **Develop sectoral Cradle2Cradle industrial transformation roadmaps in five selected sectors**, with the support of all Cradle-ALP partners.

Roadmapping is a process that generates information on the status of products and technologies in an innovation context at a specific point in time and on the type, speed and

direction of possible research and technology developments, aggregating possible challenges and translating them into activities, requirements and milestones. The goal of the Cradle-ALP Transformation roadmaps is to have a structured guidance on how to foster the transformation of industrial practices towards circularity & cradle-to-cradle approaches in the 5 key industrial sectors for the Alpine Space.

The first step of the Cradle-ALP roadmapping process was to define a vision that aligns the stakeholders from each of the 5 industrial sectors (businesses, public authorities, academics etc.) on a joint understanding of what is the ideal scenario for the future in their industrial sector, in a given time-frame. It refers to a clear and inspirational description of the future state that an industry aims to achieve in order to become more circular.

To do so, the partners first worked on analyzing their industrial sector ecosystem in the Alpine Space region with respect to circular economy in general and the cradle to cradle principles in particular. Based on the information collected by each partner within its region, the TSWG leader elaborated a sectoral ecosystem analysis that was then presented to the experts during the expert's workshops in order to engage discussion and collect input and recommendation (for more information see D2.1.1). Experts from each sector gave input and recommendation on the ecosystem analysis but also on the definition of an overall and realistic goal that the Cradle-ALP partners could set for each of the 5 transformation roadmaps.

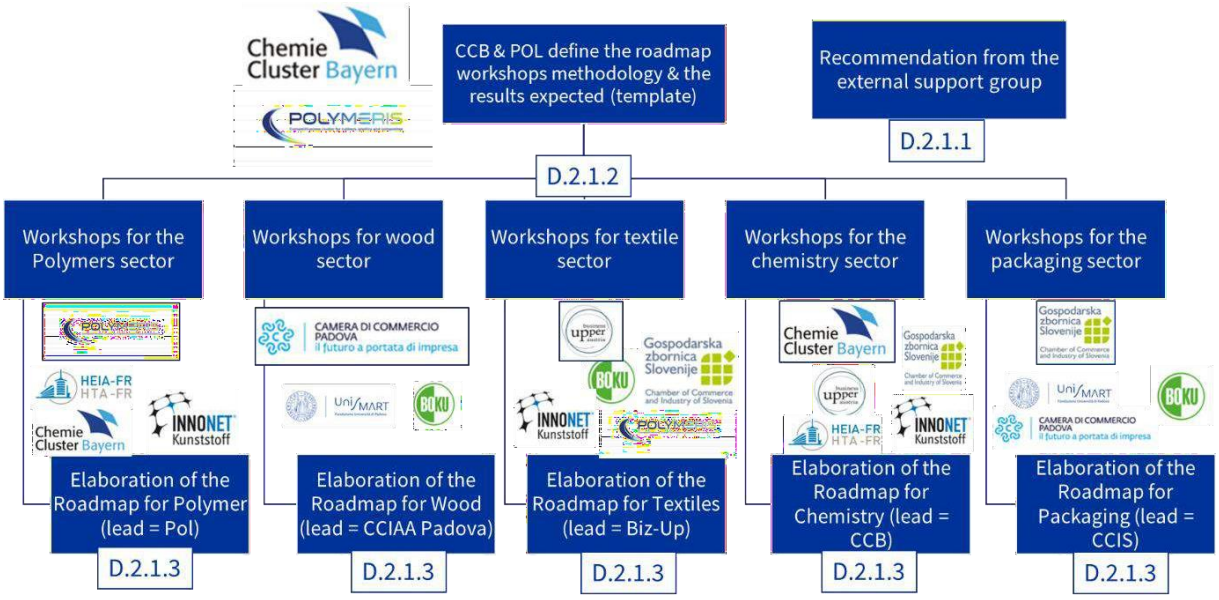
Following the exchanges and collection of input from the experts, each TSWG gathered to reflect and identify, based on the information collected, a common vision to set for their industrial circular transformation roadmap. It was also decided to organize 3 roadmapping workshops focusing on the 3 main level of the industrial value-chain : the first workshop was dedicated to materials & resources, the second one to circular product design and the third one to value-recovery & the management of the products' end-of-life.

The 3 workshops followed the same roadmapping process and engaged the participants on 3 key exercises:

1) Identifying potential gaps and barriers in knowledge, technology limitations, market structural barriers, regulatory limitations, public acceptance or other gaps and barriers preventing the industry to achieve the vision set-out following the experts' workshop.
2) Defining solutions and key activities to implement in order to overcome the gaps and barriers previously identified. Those key activities must concern each component of the industrial sector, including technology development and deployment, development of business models and market opportunities, development of regulations and standards, policy formulation, creation of financing mechanisms, and public engagement
3) Assigning the solutions and key activities according to their field (Technology, Business Model, legal/political) and their time-frame (short-term, mid-term, long-term) and voting on the activities that are the most important to implement and achieve.

3. Transnational Sectoral Working Groups implementation

In order to implement the roadmap methodology, 5 transnational sectoral working groups were established and composed of partners with an expertise on the industrial sectors. The composition of the 5 TSWG is illustrated below, in figure 1.



Each industrial sectoral group is composed of partners from at least 3 different regions in order to insure cross-regional exchanges in the elaboration of the Transformation roadmap workshops. The only exception was for the Wood/Furniture sector which gather partners from Italy and Austria, so the Cradle-ALP partners agreed to all participate in participating to the TSWG and promoting the workshops within their own ecosystem in order to gather enterprises from different Alpin Space regions. The lead partner in charge of implementing the TSWG methodology is framed for each industrial sector. This composition of each TSWG was definitively validated by all partners during the Ljubljana project's meeting in July 2023.

Alongisde the roadmap methodolody, Chemie Cluster Bayern and Polymeris elaborated a workflow process with key deadlines and activities to follow by each TSWG in order to implement the roadmapping methodology in their industrial sector.

The TSWG roadmap workflow and methodology is schematized in the figure below.

Each TSWG had to follow the same methodology in order to define joint procedures for the elaboration and testing of the industrial transformation roadmaps.

4. TSWG CHEMISTRY/MATERIALS

4.1 Composition

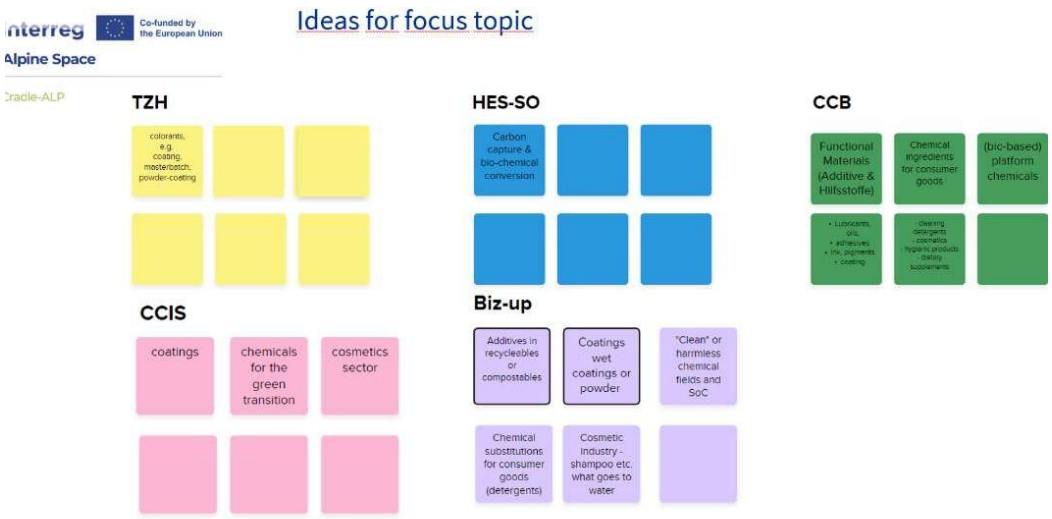
The TSWG Chemistry/Materials is led by the **PP3 – Chemie-Cluster Bayern. Supporting partners for this topic include PP2 - Technologiezentrum Horb, PP5 - Business Upper Austria, PP7 - Chamber of Commerce and Industry of Slovenia and PP9 - School of Engineering and Architecture of Fribourg.**

Accordingly, the regions of Austria, Slovenia, Switzerland, Bavaria and Baden Wuerttemberg were involved in the work on the transformation roadmap in the sector of chemistry/materials

4.2 Internal preparatory meetings

Each TSWG leader was responsible of organising a virtual "kick-off" meeting with all the partners involved in its sectorial group before the 15th of September. The goal of this meeting was to identify the sub-sectors on which each TSWG will focus for the roadmapping activities (ACT2.1) and the Pilot action (ACT2.2), to identify a list of tools that would be of interest for assisting SMEs in the Pilot action and to start the reflexion on potential SMEs and experts to involve in the roadmapping workshops and Pilot actions. Below is a brief summary of the results of the kick-off meetings organized by each TWSG.

The kick-off meeting of the TSWG Chemistry/Materials took place online on September 7th 2024 with all TSWG partners participating. Brainstorming using a Mural Whiteboard was used to collect ideas for the focus topic within the chemistry sector.



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By voting the TSWG participants decided to focus on “Chemicals as additives” as the focus topic for the transformation roadmap. This means that primarily companies and research institutions being active in this field should be invited to contribute to the roadmap development. It was defined that this focus topics includes the following aspects.

Chemicals as additives (for different functional materials):

- Adhesives
- Fillers, lubricants, colorants, inks, pigments
- Coatings, powder-coating, wet coatings
- Additives (plasticizer, UV protection, flame retardant, catalysts, …)
- Additives in/for recycleable materials and compostable materials

This focus also includes the discussion on

- substitutes for ‚Substances of Concern‘ according to REACH
- Chemicals for green transition
- Chemicals made by carbon capture & utilisation (CCU)

However, the roadmap should not focus on bulk chemicals and platform chemicals only to avoid a potential overlap to the other sector roadmaps, especially polymers.

In addition to the determination of the focus topic, the TSWG collected ideas for tools and activities that could be used in the pilots actions (A2.2.) and are summarized in the transformation toolbox D1.4.

These ideas comprise different activities for knowledge transfer such as expert workshops, Design Thinking approaches and workshops on Foresight or Sustainable/Circular Business Model design, 1:1 support activities such as the Circularity Compass and networking activities such as matchmaking, speed-dating or bilateral meetings to match the right partners assisted by Cradle-Alp project partners.

The results of the kick-off meetings were presented during the Cradle-ALP project meeting organized in Linz on the 23rd and 24th of October 2023. Beginning of November a second

online meeting of the TSWG Chemistry/Materials took place to discuss the next necessary steps for the roadmap development.

4.3 Sectoral ecosystem analysis

Following the identification of sub-topics of focus for the Transformation roadmap and in line with the D1.2.1 ecosystem analysis conducted by each partner in their regional ecosystem, CCB and POL organized a workshop during the Linz project meeting (October 2023) to develop a sectoral ecosystem analysis. Each TSWG gathered gaps, barriers, drivers and potential for their industrial sector and the TSWG leader was in charge of elaborating a transnational sectoral ecosystem analysis taking into consideration the input from each region and partner. This analysis enabled the partner to better define the scopes and objectives of the Transformation roadmap and served as a basis for discussion with the external support group workshop in order to define a vision for each sector.

Gaps

- Lack of **material data sheets** (info on recycled/ biobased material)
- Lack of **alternatives** to fossil mat.
- **Additives** for circular products
- Compound **analytics** in recyc mat.
- **No targets/requirem.** for circ prod.
- No obligatory **design specs**
- Acceptance from customers

Barriers

- **Complexity/Diversity** of products
- Complexity of **value chains**
- Mix of fossil/biobased chemicals
- Uncertainty about **legal requ. for declaration of recycled** material
- Existing waste regulations **restrict** use of residual materials
- Virgin material is **cheaper**
- **Profitability** is still too low
- Insufficient public funding

Drivers

- Functionality vs. Sustainability
- **Chemical recycling** of polymers
- Strengthening the **enforcement** of waste regulations/laws
- **Increasing prices** for undesirable economic practices
- **Mandatory quotas** for recycling
- Funding for companies/academia
- Advantages in the allocation of project funds for CE project
- Economic **incentives** (e.g. tax)

Potentials

- **Improved processes** for waste separation
- Functionality vs. Sustainability
- Europe as **domestic recycling market**
- Waste as **valuable resource**
- Reduction of CO2 emissions
- **CO2 as resource**

The gaps, barriers, drivers and potential shown above are results combined from the regional ecosystem analysis, the workshop during the meeting in Linz and the received input from the external expert support group workshop beginning of December 2023.

For the focus topic on additives in the TSWG Chemistry/Materials it is necessary to mention that the above listed gaps, barriers, drivers and potentials are more of a general type and not solely valid for the additive sector.

4.4 External expert support group workshop

The external expert support group workshop was organised online on Dec 7th 2023 with the objective to discuss with experts the roadmap vision for the five sectors and to cross check if any gaps, barriers, drivers and potentials are missing. The following aspects were added:

- Gaps: Lack of complete/comprehensive Life Cycle Assessments proofing the positive impact of a development
- Barriers: Energy-intensive processes such as recycling, especially chemical recycling
- Drivers/Potential: Opportunity to achieve less complex/simplified value chains

The complete overview is found in D2.1.1.

Roadmapping is the process that generates information on the status of products and technologies in an innovation context. A roadmap is a strategic tool to achieve a goal, many times displayed as a visual graphic. It provides information on the type and status quo of research, technological developments and possible challenges translating them into activities, requirements and milestones. To set the frame for discussion with experts from different backgrounds and regions a common vision is necessary for the roadmapping process. The vision formulates an hypothetic objective or, generally speaking, an idea of how the future is imagined.

Based on the discussion and input of the experts, for the TSWG Chemistry/Materials the following vision was elaborated: **'Clean material cycles by sustainable chemicals available at scale in the Alpine Space by 2035'**.

The final decision for the vision in the TSWG Chemistry/Materials was taken at the TSWG meeting on December 14th 2023.

4.5 Organization of the TSWG roadmapping workshops

Each TSWG decided individually on the dates and organization of the 3 roadmapping workshops.

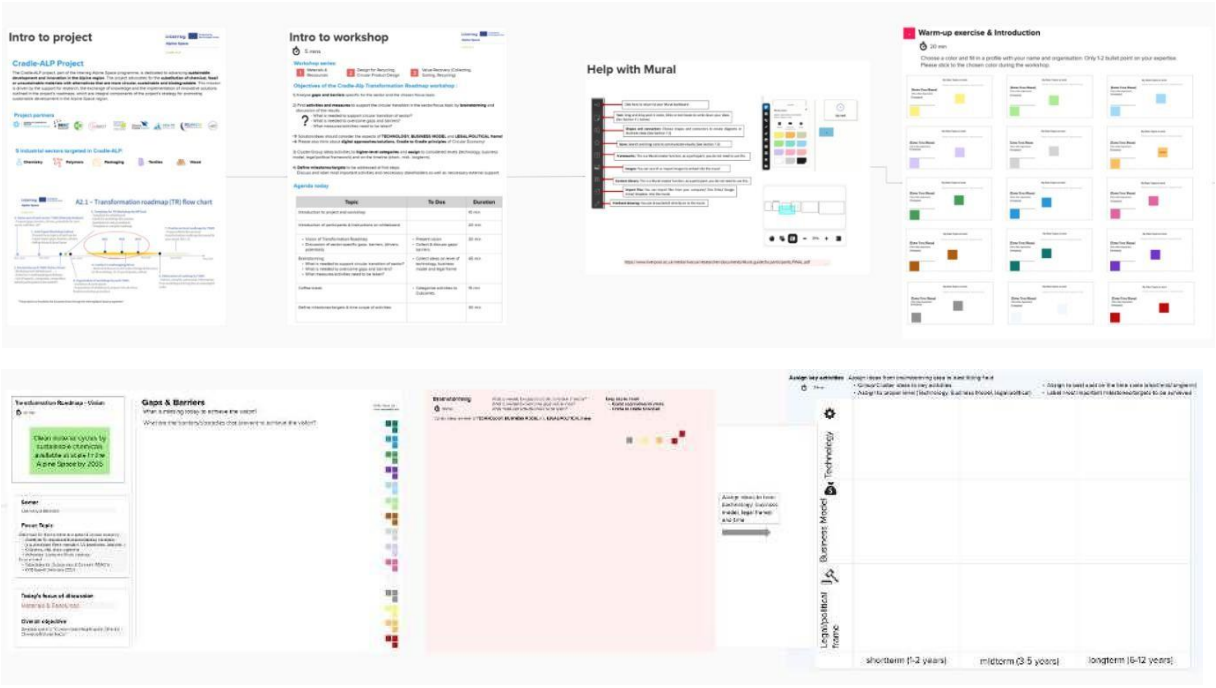
The dates and discussion topics of the workshops were as follows:

- Workshop 1: (Raw) materials/resources, February 5th, 2024
- Workshop 2: Product design/Design for recycling, February 28th, 2024
- Workshop 3: Value recovery (collecting, sorting, recycling), March 12th, 2024

For the further organization of the online roadmapping workshops, the TSWG Chemistry/Materials met several times, January 9th, January 30th and a few days prior to each workshop, to elaborate a list of suitable companies and research experts from the involved

regions, to elaborate an invitation letter and the registration process for the workshop participants, and to decide on roles (moderators) and responsibilities (introduction, moderation of separate parts, notes, screenshots, technical support) of each partner during the workshops.

For the online workshops MS Teams and a MURAL whiteboard were used. The Mural template was designed by CCB in order to provide guidelines and a joint methodology for the roadmapping exercises.



On January 31st, 2024 CCB and POL organized a training session for all Cradle-Alp consortium partners in order to familiarize with the template and exercises and to provide guidance in the roadmapping methodology. The session was recorded and is available on the project internal collaborative tool (Trello).

The TSWG Chemistry/Materials identified 51 experts for the Chemistry/Materials topic (see Annex 1). These experts were invited by e-mail in the beginning of January 2024 through all TSWG partners and could register online (see Annex 2).

All three workshop had the objective to collect information on technologies, business models and the legal/political framework from the participating industry and research experts through brainstorming activities and discussions. The procedure of each of the three workshops followed the same step by step approach. After a brief introduction to the Cradle-Alp project, the general objective of the roadmapping process and the workshop agenda, participants were invited to briefly introduce themselves.

A first step comprised the finding and discussion of gaps and barriers on all three levels (technology, business model, legal/political framework) impeding and preventing the transformation from a linear to a circular value chain as seen from the industry perspective of

the participants. These gaps and barriers served as a basis of the brainstorming process to find necessary measures and novel solutions that help to establish circular processes along the value chain. Subsequently, the collected ideas and suggestions were consolidated where meaningful and assigned to different time periods (short-, mid-, longterm). Afterwards, the participants voted for the most important activities/measures to be taken.

The first workshop focused on the aspects of resources, raw materials and materials needed in the chemicals/materials sector. In the second workshop the participants were asked to discuss important issues regarding design for recycling and circular product design in the contect of chemicals used as additives. The third workshop comprised the topic of value recovery and especially collecting, sorting and recycling facets.

Workshop 1 – Chemistry/Materials

Focus topic:
Resources and (raw) materials in the context of chemicals used as additives such as adhesives, fillers, coatings, etc. and their implication on the development of circular value chains/cradle to cradle approaches.

Date: 05.02.2024, 13:30 – 16:00
Experts invited: 51 from 4 regions
Experts registered: 18
Experts participated: 18
Cradle-Alp partners participated: 7

The participants confirmed gaps and barriers prefilled on the whiteboard and added several others, such as:

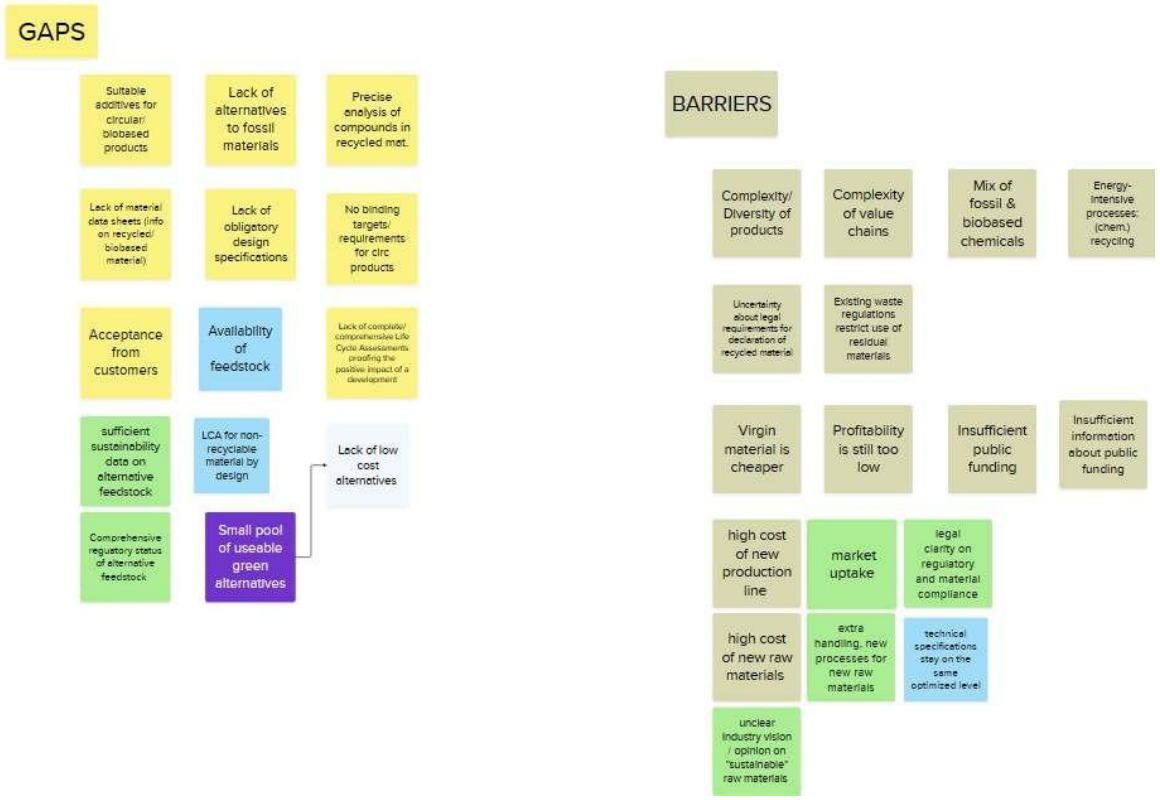
- **Gaps:**
  - Suitable additives for circular/ biobased products
  - Lack of alternatives to fossil materials
  - Precise analysis of compounds in recycled mat.
  - Lack of material data sheets (info on recycled/ biobased material)
  - Lack of obligatory design specifications
  - No binding targets/requirements for circ products
  - Acceptance from customers
  - Lack of complete/comprehensive Life Cycle Assessments proofing the positive impact of a development
  - Availability of feedstock
  - Sufficient sustainability data on alternative feedstocks
  - Comprehensive regulatory status of alternative feedstocks
  - Small pool of useable green alternatives → lack of low cost alternatives

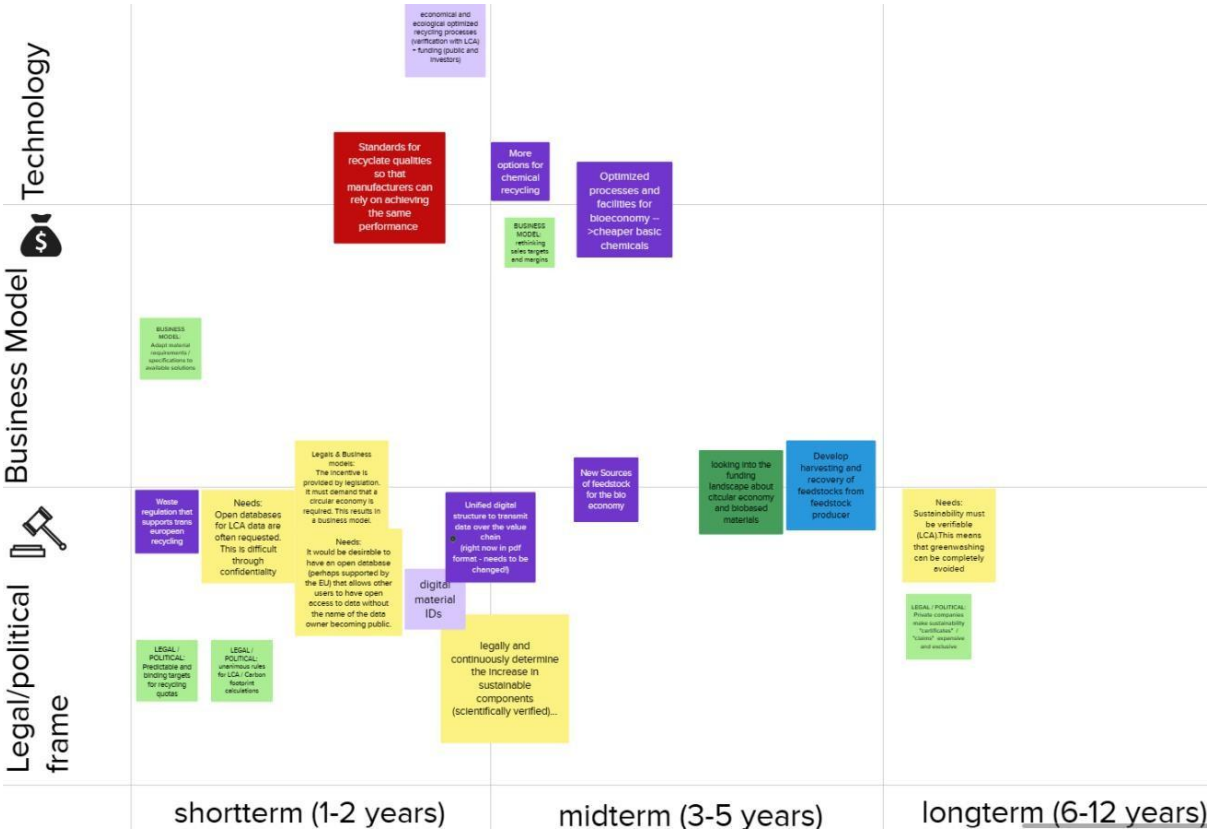
- **Barriers:**
  - Complexity/Diversity of products and value chains
  - Energy-intensive processes: (chem.) recycling
  - Uncertainty about legal requirements for declaration of recycled material
  - Existing waste regulations restrict use of residual materials
  - Unclear industry vision/opinion on sustainable raw materials
  - Need for extra handling and new processes for new raw materials
  - Missing legal clarity on regulatory and material compliance
  - Virgin material is cheaper, Profitability is still too low
  - Market uptake
  - Technical specifications stay on same optimized level
  - Insufficient public funding

Gaps & Barriers

What is missing today to achieve the vision?

What are the barriers/obstacles that prevent to achieve the vision?





The brainstorming activity and discussion resulted in the following output.

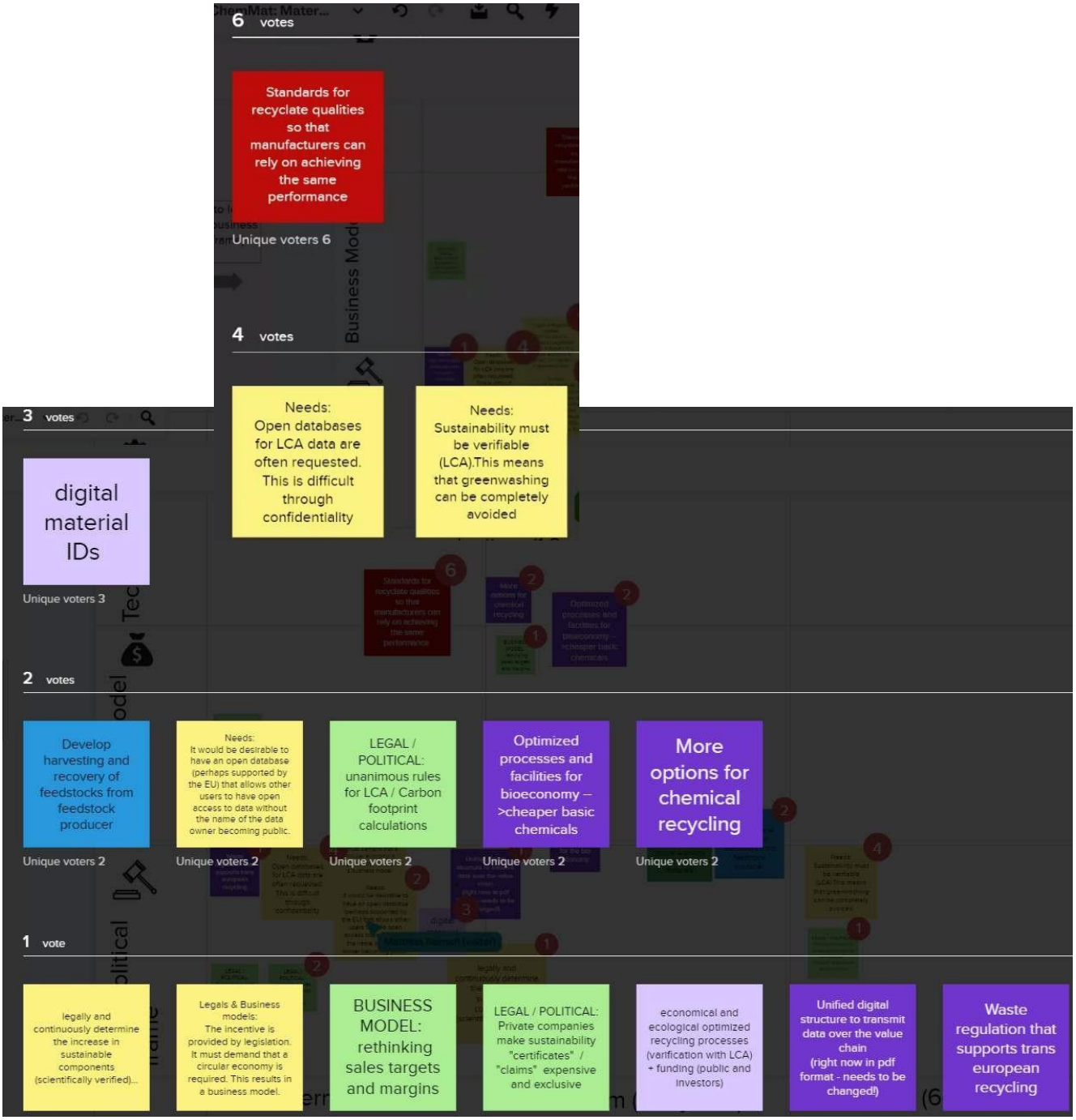
- **Technologies:**
  - Standards for recyclate qualities so that manufacturers can rely on achieving the same performance (shortterm)
  - More options for chemical recycling (midterm)
  - Optimized processes and facilities for bioeconomy -->cheaper basic chemicals (midterm)
  - Develop harvesting and recovery of feedstocks from feedstock producer (midterm)
  - Digital material IDs (shortterm)
  - New Sources of feedstock for the bio economy

- **Business Models:**
  - Adapt material requirements / specifications to available solutions
  - Rethinking sales targets and margins
  - Funding landscape about circular economy and biobased materials

- **Legal/political frame:**
  - Waste regulation that supports trans european recycling (shortterm)
  - Predictable and binding targets for recycling quotas (shortterm)
  - unanimous rules for LCA / Carbon footprint calculations (shortterm)
  - Needs: Open databases for LCA data are often requested. This is difficult through confidentiality (shortterm)
  - Legals & Business models: ´The incentive is provided by legislation. It must demand that a circular economy is required. This results in a business model.
  - Needs: It would be desirable to have an open database (perhaps supported by the EU) that allows other users to have open access to data without the name of the data owner becoming public. (shortterm)
  - Digital material IDs (shortterm)
  - Unified digital structure to transmit data over the value chain (right now in pdf format - needs to be changed!) (short/midterm)
  - Legally and continuously determine the increase in sustainable components (scientifically verified) (short/midterm)
  - Needs: Sustainability must be verifiable (LCA).This means that greenwashing can be completely avoided (longterm)
  - Private companies make sustainability "certificates" / "claims" expensive and exclusive (longterm)

The above underlined findings were considered as the most important ones:

- Standards for recyclate qualities so that manufacturers can rely on achieving the same performance
- Open databases for LCA data
- Sustainability must be verifiable (LCA).


6 votes
Standards for recyclate qualities so that manufacturers can rely on achieving the same performance
Unique voters 6
4 votes
Needs: Open databases for LCA data are often requested. This is difficult through confidentiality
Needs: Sustainability must be verifiable (LCA).This means that greenwashing can be completely avoided
3 votes
digital material IDs
Unique voters 3
2 votes
Develop harvesting and recovery of feedstocks from feedstock producer
Unique voters 2
Needs: It would be desirable to have an open database (perhaps supported by the EU) that allows other users to have open access to data without the name of the data owner becoming public.
Unique voters 2
LEGAL / POLITICAL: unanimous rules for LCA / Carbon footprint calculations
Unique voters 2
Optimized processes and facilities for bioeconomy – >cheaper basic chemicals
Unique voters 2
More options for chemical recycling
Unique voters 2
1 vote
legally and continuously determine the increase in sustainable components (scientifically verified)...
Legals & Business models: The incentive is provided by legislation. It must demand that a circular economy is required. This results in a business model.
BUSINESS MODEL: rethinking sales targets and margins
LEGAL / POLITICAL: Private companies make sustainability "certificates" / "claims" expensive and exclusive
economical and ecological optimized recycling processes (varification with LCA) + funding (public and investors)
Unified digital structure to transmit data over the value chain (right now in pdf format - needs to be changed!)
Waste regulation that supports trans european recycling

Workshop 2 - Design for recycling and circular product design

Focus topic:
Focus on design for recycling and circular product design regarding additives as defined above.

Date: 28.02.2024, 13:30 – 16:00
Experts invited: 51
Experts registered: 16
Experts participated: 8
Cradle-Alp partners participated: 7

During the first workshop the moderators realized that the participants easily formulated various gaps and barriers. However, it was hard for most of the participants to come up with specific solutions or measures that need to be taken to support the transition to circular value chains.

Therefore, the TSWG Chemistry/Materials decided to change the workshop procedure for the second workshop. For the brainstorming discussion the participants were divided into groups which discussed and elaborated solutions in separate breakout sessions. The results were presented to all participants subsequently and then assigned on the time line followed by a voting for the most important measures.

The following gaps and barriers, already sorted in the three different levels of technology, business models and legal/political frame, were mentioned:

- **Technologies:**

  - Lack of knowledge about metabolite forming of additives during life time or recycling
  - How to bring new chemicals to scale?
  - Specifications of recycled materials
  - Availability of carbon neutral or biobased starting monomers
  - Resource availability and quality
  - Return to a functional basic product (no multimaterials, ...)
  - How will substances of concern behave in circular economy and how to know which substances will occur (metabolites, concentration effect)
  - Composites made from a mono-material
  - Is it possible to build "switching points" into the products that can be utilised for recycling? ... e.g. as predetermined breaking points for chemical recycling?
  - Information System to track the sustainability of materials along value chain. How to model the sustainability of materials (metrics, standards)?

- **Business Models:**
  - High costs for testing (from regulatory to performance)
  - High cost of new production line
  - New is cheaper than recycling
  - High costs at the beginning and no acceptance
  - A benefit system (as business model) must be established as an incentive for companies to develop more sustainable (& expensive) chemical products ?
  - High costs for testing (from regulatory to performance)
  - How to connect academia & industry
  - What I put into a recycling-friendly chemistry design at the beginning I get back later as profit.

- **Legal/political frame:**
  - Uncertainty about legal requirements for declaration of recycled material
  - Lack of guidelines for recycling methods and how the product have to be designed
  - Mandatory usage of biobased solvents if available
  - Regulatory hurdles for new production lines / new technology
  - REACH
  - Is it possible to develop a guideline (for product developers) for sustainable chemical design?.... and perhaps later design standards from this?
  - Financial support for the purchase and use of green materials and recyclates to push the transition from fossil to bio/circular economy
  - Why should plastic packaging be coloured at all? You can't get the colour out in recycling!

Following the gaps and barriers discussion the participant were split into two separate break-out groups that discussed the challenges to identify putative solutions. Subsequently, these solutions were presented to the whole auditorium and assigned to the timeline as listed below:

- **Technologies:**

  - Restriction of polymer colorization to make recycling possible (shorterm)
  - Definition of products, that can't be produced with recycled material (e.g. airplane seatbelts)
    VW has a project, to produce more of their materials only with monomaterials (shorterm)
  - Standardization of LCAs to enable comparability between used tools and results (shorterm)
  - Data Model with standardized content, "LCA Wikipedia" (shorterm)
    Primary Data and background data (transportation costs, chemical prices, energy mix)
  - Fibre production out of monomers (shorterm)
  - Education on the impact of certain design choices (shor/midterm)
  - Design guideline; scope of guidelines / restrictions of innovations possible?
    Design for recycling based on specific external impact to trigger the process (midterm)
  - Webportal for Information/Data Sharing: standardized/comprehensive information system needed (midterm)
    Data structure and confidentiality through for example CMDB Overall Co2 Footprint labelling for products to make them comparable

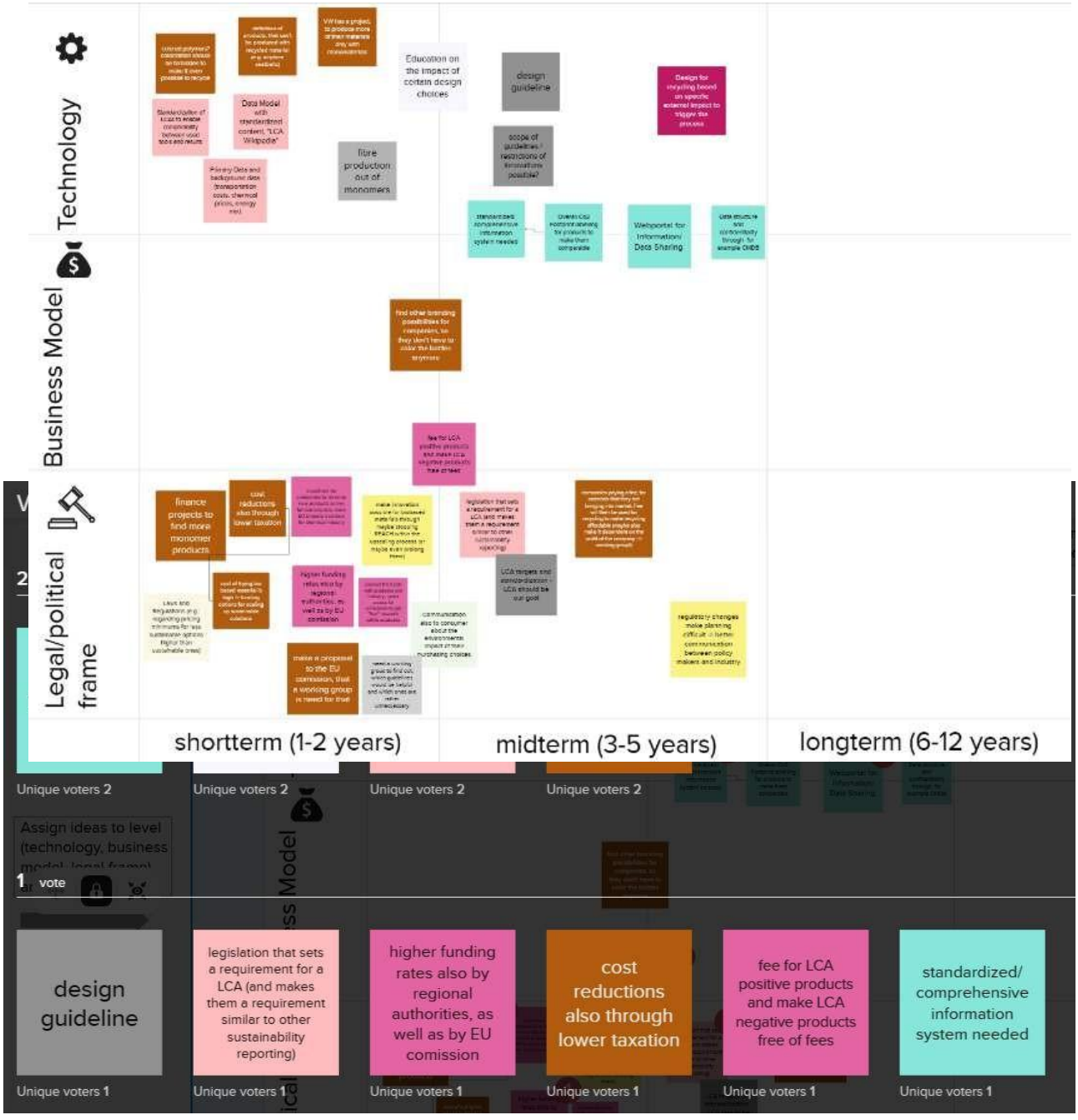
- **Business Models:**
  - Find other branding possibilities for companies, so they don't have to color the bottles anymore
  - Fee for LCA positive products and make LCA negative products free of fees

- **Legal/political frame:**
  - raw materials monomers: high uncertainty for biobased materials for companies - if you have an upscale process you could get taken out of REACH maybe? (shorterm)
  - Incentives for companies to develop new products as like funded projects; more EU projects available for chemical industry (shorterm)
    Finance projects to find more monomer products
  - Higher funding rates also by regional authorities, as well as by EU commission (shorterm)
  - Cost reductions also through lower taxation (shorterm)
    cost of trying bio based material is high -> funding options for scaling up sustainable solutions
    Laws and Regulations (e.g.: regarding pricing minimums for less sustainable options higher than sustainable ones)
  - EU working group to find out, which guidelines would be helpful and which ones are rather unnecessary (shorterm)
  - Make innovation possible for biobased materials through stopping REACH within the upscaling process (or maybe even prolong them) (shorterm)
  - Connect the funds with academia and industry - grant access for companies to get "free" research within academia (shorterm)
  - Legislation that sets a requirement for a LCA (and makes them a requirement similar to other sustainability reporting) (midterm)
  - Companies paying a fee, for materials that they are bringing into market. Fee will then be used for recycling to make recycling affordable (midterm)
  - LCA targets and standardization (midterm)

- Communication also to consumer about the environmental impact of their purchasing choices (midterm)
  Regulatory changes make planning difficult -> better communication between policy makers and industry

The above underlined findings were considered as the most important ones:

- Webportal for Information/Data Sharing:
- Education on the impact of certain design choices
- Standardization of LCAs
- Finance projects to find more monomer products



Workshop 3 - Value recovery (collecting, sorting and recycling)

Focus topic:
Necessary steps for value recovery and closing the loop (collecting, sorting and recycling) in the chemicals/materials sector with focus on additives.

Date: 12.03.2024, 13:30 – 15:30
Experts invited: 51
Experts registered: 17
Experts participated: 6
Cradle-Alp partners participated: 7

Slight changes in the gaps and barriers discussion comprised the presorting of the mentioned gaps and barriers into the three different levels. The participants also confirmed gaps and barriers prefilled on the whiteboard and added several others, such as:

- **Gaps and barriers – Technologies:**
  - Need for specialized infrastructure for certain chemicals, proposing the creation of an overview of existing technology providers and infrastructure to improve access to recycling facilities.
  - Challenges posed by differing waste regulations, particularly concerning the transportation of hazardous chemicals.
  - Lack of scalability in some technologies.
  - Identifying suitable additives for circular/biobased products.
  - Establishing information systems, structured data models, and standard metrics.
  - Addressing traceability issues, especially concerning the tracking of materials back to their source.
  - Determining criteria for when chemical or mechanical recycling is appropriate.

- **Gaps and barriers – Business models:**
  - Economic incentive for reuse of chemicals is missing.
  - Knowledge provider for recycling infrastructure & solutions providers

- **Gaps and barriers – Legal frame:**
  - Uncertainty regarding legal requirements for declaration of recycled materials.
  - Existing waste regulations restrict use of residual materials.
  - Para-political institutions to create/manage registries and circulate information about business needs to exhibit business opportunities.
  - The new money "Carbon" requires an information system similar to the traditional money system

During the brainstorming activity of the third workshop participants focused their efforts on technology, business models, and legal framework regarding recovery of materials and closing the loop topics. The discussions resulted in the following output:

- **Technologies:**
  - Establish service centres tailored for SMEs to access analytic services, potentially improving their competitiveness, and facilitating collaborations with relevant stakeholders.
  - Consider creating organizations with a hybrid profit/non-profit model to offer services required by companies.
  - Reevaluate the role of university service centres, suggesting a more specialized approach focusing on areas such as PET, composites, polyamide, etc., to better align with Circular Economy principles.
  - Universities of Applied Science can act as "pool managers". If the pool is large enough, they create a spin-off
  - Identifying high impact chemicals**:** Prioritizing the identification and recycling of high-impact chemicals can significantly reduce environmental harm. By focusing efforts on these substances, resources can be allocated more efficiently to mitigate their adverse effects.
  - Recognizing the external costs associated with toxicity, climate impact, and pollution is crucial for incentivizing sustainable practices. By internalizing these costs, industries are encouraged to adopt environmentally friendly methods and technologies, ultimately leading to a more sustainable and responsible approach to production and consumption.
  - Reporting CO2 values of materials: Implementing a system to report the CO2 values of materials, including those derived from recycling, enhances transparency and accountability in supply chains.

- **Business Models:**
  - Economic incentive for reuse of chemicals is missing.
    - ➔ Proposed solutions: Consider implementing carbon or waste taxes to provide economic incentives, promote the use of sustainable alternatives, or explore making chemical reuse more cost-effective than utilizing raw materials.
    - ➔ Incentivize the use/application of sustainable alternatives

- **Legal/political frame:**
  - Providing best practices for startups and SMEs in terms of reporting / monitoring
    - ➔ Standardized tools/data/ libraries for SMEs for sustainability monitoring/reporting
    - ➔ Harmonized reporting systems across the supply chain
    - ➔ Access to hands-on experts
  - International waste stream that combines all the data – on specific waste number? (Uncertainty regarding legal requirements for declaration of recycled materials)

There was no assignment on the time line and no voting for the most important activity done by the participants.

Instead the third workshop was finished by a discussion on the kind of support the Cradle-Alp project could offer SMEs to assist and support effectively in circular economy/cradle to cradle approaches. According to the participants, the following topics were raised:

- Streamlining Big Data management: currently, there is a lack of standardized tools for managing CO2 data, with each business employing its own system. To address this issue, providing tools tailored for SMEs to manage their data efficiently would be beneficial.
- Facilitating best practice sharing: encouraging the exchange of best practices among SMEs can foster innovation and efficiency. By creating platforms or forums for SMEs to share insights and experiences, valuable knowledge can be disseminated throughout the community, empowering businesses to learn from one another and improve their operations.
- Providing expert guidance: offering access to experts who can provide comprehensive overviews on regulatory compliance, materials sourcing. This expert guidance ensures that SMEs have access to reliable information and support, helping them navigate complex regulatory landscapes and make informed decisions.
- Developing a centralized database that all stakeholders, including SMEs, can access and contribute to, promotes transparency and collaboration. Such a database would serve as a repository of relevant information, facilitating data sharing and collaboration across the industry.
- Advocating for governmental support: collaborating with governmental entities to advocate for policies and initiatives that support SMEs in the industry is crucial. By engaging with policymakers and advocating for supportive measures, such as funding opportunities or regulatory simplification, SMEs can receive the necessary support to thrive and innovate.
- Ensuring inclusion in projects
- Providing support services: Offering support services tailored to the needs of SMEs, such as connecting them with consultants for regulatory guidance, facilitating partnerships can enhance their capabilities and competitiveness in the industry.

5. Conclusion

In general, a roadmapping process is always a laborious task. In the specific case of the Cradle-Alp project this was even more complex as we had to find subtopics for each of the five targeted industry sectors (chemicals/materials, polymers, packaging, textile, wood/furniture) to avoid that we elaborate roadmaps with similar content.

For example for the chemistry/material sector it was decided to focus on additives. Therefore, the five involved partners in this TSWG had to find suitable experts for this focus field. This restricted the choice and number of experts to be invited. Nevertheless, about 50 experts were identified and invited.

In alignment with the proposal it was decided that the roadmaps will cover three levels (technologies, business models, legal/political framework) and that the experts should discuss three separate topics with in the scope of circular economy/cradle to cradle: resources/(raw) materials, design for recycling, value recovery/closing the loop. Therefore, it was the aim to invite experts for each of these three topics. In the end, it turned out that most experts participated in several workshops not distinguishing between the separate focus topics. This made the discussions more general and outcomes more repetitive and not as specific as expected.

A second difficulty was the requirement to involve experts from industry and academia across borders in the roadmapping workshops. To find a sufficient number of experts it was decided to organize online workshops in English language. This had the disadvantage that not everyone might feel comfortable and is able to express fluently. On the other hand it allowed us to bring different experts together to share their views and opinions. There were no major issues with MS Teams and Mural as collaboration and workshop tools.

Generally, the response of experts was good. Although the participation rate dropped from the first to the last workshop, there was a sufficient number of participants to work on the roadmap topics. All participants were interested in the general topic and open for discussion and contribution. The majority of participants stayed until end of workshop and the duration of 2.5 hours seemed to be well accepted. Initially, there was a short break after the brainstorming part. In the end, the impression is that it is better to keep the participants focused if the workshop is conducted without any breaks.

The TSWG decide to split the tasks and roles of workshop moderation. The responsibility of moderation was changed between three partners, the others were responsible to take additional notes, screenshots and to provide technical support. Taking notes was very useful as it allowed to summarize the information much faster afterwards.

As the participants need time to think and write down notes sometimes silence occurred. It is important that the moderators provide time for this but give a precise timing to keep participants attracted. In general, finding gaps and barriers and naming current challenges was a easy task for most participants. After the first workshop, several participants mentioned that it was hard to create real solutions after the gaps and barriers discussion. Therefore, the TSWG Chemistry/Materials decided to change the workshop procedure for the second workshop as described in the section above on workshop 2. The brainstorming and discussion in separate

breakout sessions were more productive. However, additional moderators were necessary. For every breakout session, one moderator kept the discussion running and involved the participants, the second summarized the discussion input in sticky notes and presorted them. For the following steps it was important to present the result of each breakout group in the plenum. The final assignment on the time line of the elaborated solutions is a good way for a renewed discussion to get a better understanding of some of the created ideas. Sometimes it was difficult to go through all post-its and get a precise understanding of the idea.