

# Circular makerspaces: training program



# FOREWORD

Welcome to the training program on circular economy designed specifically for makerspaces! In a world where sustainability and resource efficiency are paramount, this program is tailored to empower makerspace enthusiasts with the knowledge and skills to thrive in the dynamic intersection of creativity and circular principles. Explore the essential concepts and working methods driving sustainable innovation and join us in reshaping the future of making through this immersive learning experience.

In the changing field of innovation, makerspaces play a crucial role in shaping the future of creative projects. As we navigate a world increasingly focused on sustainability and responsible resource management, the need for a circular mindset within makerspaces becomes ever more apparent. This circular training program is designed to empower makers with the knowledge, skills, and inspiration to infuse circular principles into their projects, fostering a community of innovators committed to both creativity and environmental responsibility. Welcome to a transformative journey, where making meets sustainability, and together, we shape a more circular and thoughtful future.

**Circular Spaces Project Team**

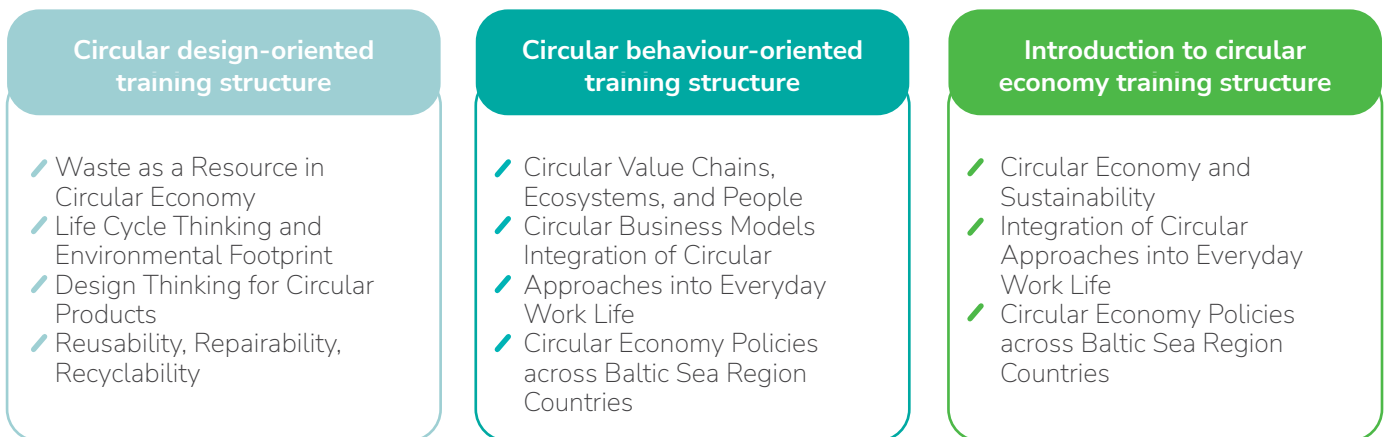
*Empowering makerspace communities with a comprehensive view on circular economy principles, fostering sustainable innovation, resource efficiency, and a circular mindset*

# How to make use of this program?

Circular makerspaces training program consists of 9 Topics closely complementing each other. Topics 1-4 and 9 focus on building trainees' theoretical knowledge regarding different aspects of circular economy, while Topics 5-8 target practical application of gained insights.

1. Circular Economy and Sustainability
2. Waste as a Resource in Circular Economy
3. Circular Value Chains, Ecosystems, and People
4. Circular Business Models
5. Life Cycle Thinking and Environmental Footprint
6. Design Thinking for Circular Products
7. Reusability, Repairability, Recyclability
8. Integration of Circular Approaches into Everyday Work Life
9. Circular Economy Policies across Baltic Sea Region Countries

While the most benefits for trainees come from the exploration of all Topics, each trainer can decide individually how to structure their organization of trainings by utilizing different selected topics. Examples below suggest a few formations of such option.



**Each Topic begins with methodological notes** which serve as a guiding material for trainers during the preparation and the organization of training activities. These notes include a summary of each Topic, expected training outcomes, defined training benefits for different target groups, training plan and other necessary information for carrying out the training.

**Action required tasks**, such as discussions, workshops or case analyses, are marked with **blue text** and activity icon. It is up to the trainer to decide how these tasks will be carried out. For example, trainees can go through the theoretical materials individually and implement action required tasks in groups.



Activity icon

In addition to this document, **each Topic is accompanied with slides** which can be utilized as a supporting material for trainers when presenting training content. The slides can be freely accessed **here**.

This document can be used both as an **instruction manual for the trainer** and as **informational material for the trainees**. Training organisers are invited to add their own insights, local best practices or creative practical exercises to the material presented.

# Circular Value Chains, Ecosystems, and People

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Developed by  
Valmiera County Council

Topic **3**

This training Topic is aimed at explanation and analysis of the value chain and stakeholders' role from circularity aspects. Different examples of businesses and society are presented and discussed. When analysing circularity for local communities, the question of ecosystems becomes important. Also, barriers and drivers of CE are observed and compared.

## Expected training outcomes

After completing this Topic, trainees will...

- ... ability to recognize and analyse stakeholders in circular economy;
- ... understanding of circular value chains;
- ... ability to identify / recognize barriers and ecosystems;
- ... examples of ideas on how to involve companies, and people in circular thinking;
- ... skills on how to perform changes in people's attitudes.

### Notes for target groups

Different target groups can achieve the following benefits of this training Topic.

#### Makers

Acquiring knowledge on value-chains, stakeholders in circular economy.

#### Makerspaces

Transitioning towards an ecologically and circularity-focused approach in value chains.

#### Suppliers

Grasping the circular strategy through the circular value chain and real examples.

#### Students/Pupils

Developing an understanding of circular practices in value-chain and stakeholders' analysis and examples.

#### Business support organizations

Embracing new circular value chains and helping businesses to become more circular.

#### Other relevant stakeholders

Familiarizing the circular strategy through the circular value chain and real examples.

## Training plan

Introduction (Slides 1-2)	Main part (Slides 3-11)	Conclusion (Slides 12-18)
<p>Introducing the presentation's purpose and addressing current issues or challenges relevant to the topic.</p> <p><i>Presentation, discussion.</i></p>	<p>In the main segment, the presentation navigates from abstract theoretical frameworks to practical real-life applications, elucidating various focused theories along the way. The exercise is designed to identify the practical benefits of the circular economy, the challenges involved and the first circular economy solutions that can be implemented.</p> <p><i>Presentation, discussion.</i></p>	<p>Final discussion about examples for CE and integrated learning approach is used for check-up.</p> <p><i>Presentation, discussion.</i></p>
<p><b>Total duration for the Topic 3: approx. 2 h</b></p>		

## Training modes

In person	Online	Hybrid
<p>10 minutes reception + 90 minutes class</p>	<p>90 minutes + 10 minutes for questions</p>	<p>90 minutes class + 10 minutes for questions</p>

## Notes for the trainer

Required previous experience and theoretical knowledge	Ethical aspects of carrying trainings	Training tools and resources
<p>Understanding of Linear and Circular Economy, business models, stakeholders.</p>	<p>An evident eagerness for knowledge acquisition and an inquisitive exploration of creative design methods, accompanied by a keen understanding of the nuanced demands of present-day societal dynamics.</p>	<p><i>For trainer:</i> computer, projector or any other screen (used for presentation)</p> <p><i>For trainee:</i> notebook, computer or smartphone (used for case studies' research)</p>

# Concepts of value chains

Circular economy model involves sharing, leasing, reusing, repairing, refurbishing, and recycling to extend product life cycles. The main goal is to minimize waste by keeping materials within the economy through recycling and creating further value. When departing from linear economic model, traditional Take-make-dispose pattern is replaced.

## Discussion



Discover value chain in linear economy and find out which parts of value chain must be influenced at first in order to make changes to circularity.

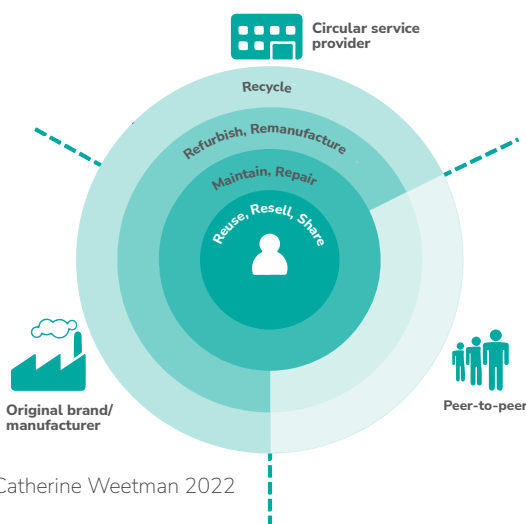


Suggested reading: Weenk, E., & Henzen, R. (2021). *Mastering the Circular Economy*. Kogan Page, 5-34 pages.

The basic idea of value chain changes in order to close the loop or maintain everything in chain as in circle. This slide introduces the idea of service providers as main players instead of manufacturers. It also increases part of society's role – sharing economy.

## Most products flow through four typical loops:

- ✓ Reuse, resell, and share – ways to keep the original product in use, such as reselling it, returning it after its use for someone else to use it, or sharing it, so more people can use it.
- ✓ Maintain and repair, to keep the product working efficiently and effectively for a longer time.
- ✓ Refurbish and remanufacture, which needs deeper levels of intervention. Refurbishing involves cleaning, surface-level repairs, and maintenance, perhaps repainting and polishing the product or equipment.
- ✓ Recycling is the outermost and least effective loop. Recycling requires lots of energy and may need expensive labour or equipment to sort and separate different materials. There are different 'levels' of recycling too. Ideally, we want to recycle materials to use them again in the same kind of application; and avoid 'downcycling' them into a lower-grade, lower-value material with inferior functional specifications.



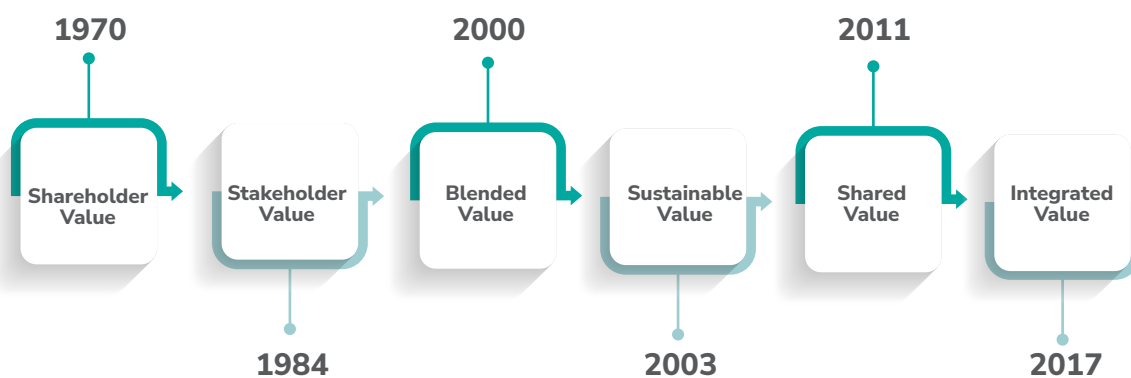
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More reading: Weetman, Catherine. *A Circular Economy Handbook*. Available from: VitalSource Bookshelf, (2nd Edition). Kogan Page, 2020, 13-44 pages

**There are currently five leading value creation concepts that reconceive business's value to society.**

1. Stakeholder Value. Central to this concept is how stakeholders (e.g. customers, suppliers, employees, financiers, communities, and management) work cooperatively to create value. This means that business is a 'set of value-creating relationships among groups that have a legitimate interest in the activities and outcomes of the business and upon whom the business depends to achieve its objectives' (Phillips et al, 2019).
2. Blended Value. In this conceptual framework – also known as mission-related investing, impact investing, aligned capital, and social investments – businesses, investments, and non-profit organizations are evaluated based on their ability to generate a blend of social, environmental, and financial value (Emerson, 2000). This holistic approach is sometimes used interchangeably with the triple bottom line people, planet, and profit.
3. Shared Value. Creating Shared Value already has an acronym, CSV, and it's a framework in which a business's success and social progress are interdependent. It enhances the competitiveness of a business while 'simultaneously advancing the economic and social conditions in the communities in which it operates. Shared Value creation focuses on identifying and expanding the connections between societal and economic progress' (Porter and Kramer, 2011).
4. Sustainable Value. The framework views global sustainability challenges through the business lens, which helps to identify the right strategies and practices that contribute to a more sustainable world while simultaneously driving shareholder value. This win-win approach is defined as the creation of sustainable value (Hart and Milstein, 2003).
5. Integrated Value. Creating integrated value is the simultaneous building of multiple 'non-financial' capitals (such as human, ecological, social, technological, and infrastructural capital) through synergistic innovation across the nexus economy (including the circular, well-being, access, exponential, and resilience economies) that result in net-positive effects, thus making our world more satisfying, sustainable, shared, smart and secure (Visser, 2017a).

Suggested reading: Weenk, E., & Henzen, R. (2021). *Mastering the Circular Economy*. Kogan Page, 34-91 pages



Weenk, E., & Henzen, R. (2021). *Mastering the Circular Economy*.



# Stakeholders & CE strategies

The picture below illustrates that all identified stakeholders have the possibility to affect the value chain by different strategies.

	Waste management	Waste Biochemical experts/Labs	Waste Renewable material products	Users	Service providers	Product manufacturers	Part manufacturers	Recycling Facilities
Maintain & Prolong								
Reuse & Redistribute								
Recycle								
Cascades								
Biochemical extraction								
Return to biosphere								



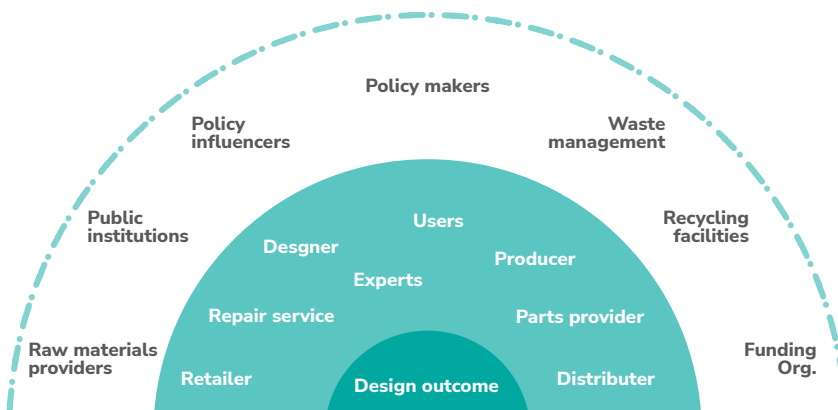
## Discussion



Each organization involved in the value chain should be considered in terms of its power or influence on the collaborative product. The above matrix can be used as an example when examining own company / organization by identifying and defining intervention points.

Suggested reading: G2: Stakeholders and collaboration, <https://upcommons.upc.edu/bitstream/handle/2117/179149/Handbook-in-IDfSpdf;jsessionid=F6DFB47D850447FD5C055455F65484EB?sequence=1>

Stakeholders in circular economy can be both direct and indirect. Picture below illustrates the variety of such stakeholders for particular product outcome.



## Discussion



Discuss why stakeholders in the circular economy are separated into direct and indirect ones. Examine each stakeholder, their role and importance in the specific product development process.

Suggested reading: G2: Stakeholders and collaboration, <https://upcommons.upc.edu/bitstream/handle/2117/179149/Handbook-in-IDfSpdf;jsessionid=F6DFB47D850447FD5C055455F65484EB?sequence=1>

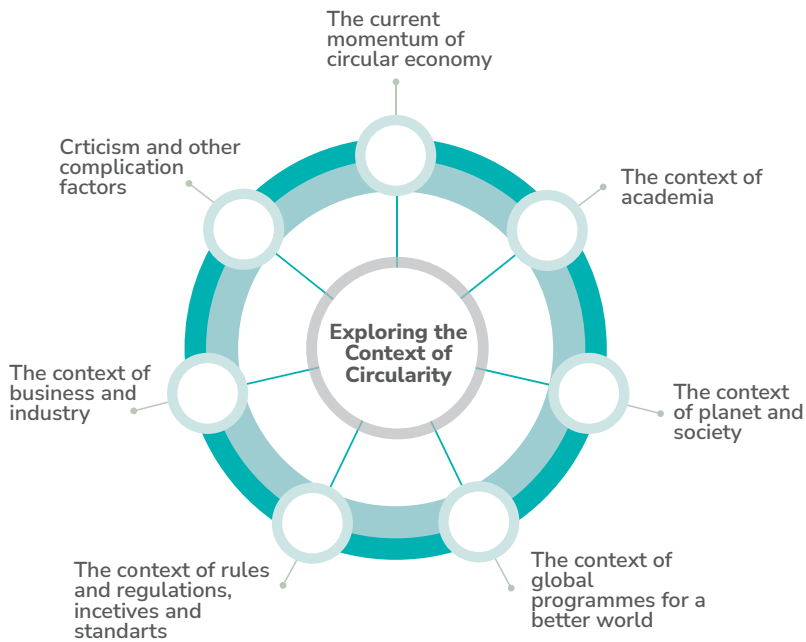
# Implementing circular economy

## Discussion



Investigate the scheme below and discuss its components as well as relations. Explain different aspects or views on circular economy and its development stage.

Suggested reading: Weenk, E., & Henzen, R. (2021). Mastering the Circular Economy. Kogan Page, 5-34 pages



## Discussion



Instructions for trainees	Instructions for trainers
<p><b>Discuss in groups answers to the following questions:</b></p> <ol style="list-style-type: none"> <li>1. What are the benefits of being circular for (1) entrepreneurs, (2) local government, (3) citizens</li> <li>2. What are the problems to become circular faced by (1) entrepreneurs, (2) local government, (3) citizens?</li> <li>3. Where would you start to act more circular in your closest surrounding? Please, mention 3-5 examples.</li> </ol>	<p>The biggest group can be divided into three smaller groups – entrepreneurs, local government and citizens. Each group should find answers to these three questions.</p> <p>Groups can also be formed from the representatives of different stakeholders who can work on these three questions.</p> <p>Exercise all together takes 40 min: 15-20 min for discussing answers and other 15-20 min for presentations; additional 5-10 min for trainer summary.</p>

European Union planning documents has set circular economy implementation milestones, which must be followed by all stakeholders. They are:

- ✓ Established legal framework
- ✓ Administrative support and conditions
- ✓ Economic and financial instruments
- ✓ Educated and involved society

Barriers to circular economy, based on the research by Ritzén S. et al. (2017):

Theoretical		Research findings
<b>Financial</b>	Measuring financial benefits of circular economy	1. Attitude and knowledge 2. Integration between functions 3. Value chain structure 4. Values and finances 5. Technology
	Financial profitability	
<b>Structural</b>	Missing exchange of information	
	Unclear responsibility distribution	
<b>Operational</b>	Infrastructure/Supply chain management	
<b>Attitudinal</b>	Perception of sustainability	
	Risk aversion	
<b>Technological</b>	Product design	
	Integration into production processes	

### Discussion



Discuss the results of barrier analysis. Compare and agree on the key aspects of successful circular economy implementation, based on information provided above.

Additional reading: Ritzén S. et al. (2017) Barriers to the Circular Economy – integration of perspectives and domains, Elsevier, Procedia CIRP 64

# Ecosystems

**Drivers of ecosystem change:** habitat destruction, invasive species, pollution, population, overexploitation, climate change.

**Conservation and restoration:** disturbance, structural complexity, connectivity, resilience.

**Living together (reconciliation ecology):** yards and parks, birds, bats, green roofs, cemeteries, military sites, golf courses, agricultural lands, public lands, utility corridors, roads and wildlife crossings.

## Discussion



Investigate and comment on drivers of ecosystem change by using one of mentioned aspects – e.g. invasive species. Then conservation and restoration aspects should be discussed, again from one of mentioned aspects – e.g. disturbance. The third ecosystem aspect is reconciliation – how all mentioned aspects can live together – e.g. expanding military sites.

Suggested reading: Robertson M. (2021) Sustainability Principles and Practice, 3rd Edition. Routledge, 137-169 pp.

# Examples of circularity

Title	Description	Pictures
<b>Business: Hotels</b>	This is a real, existing hotel in global environment, which presents solution, how to co-exist with nature.	
<b>Business: Packaging</b>	Different examples of packaging, which can be more sustainable and eco-friendlier.	 <p data-bbox="1262 1200 1437 1227">www.pixabay.com</p>
<b>Society: Energy efficiency</b>	Examples of how society as a whole can change its everyday life by saving energy, water. Small discussion about examples.	 <p data-bbox="1262 1435 1437 1462">www.pixabay.com</p>
<b>Society: Re-using</b>	Examples of how society in general can change its everyday life by giving a new life to second-hand objects - a second, third life. Small discussion about the examples in the pictures.	
<b>Urban communes, society: Kitchen garden</b>	Urban gardening, small-scale gardening is a good example of how citizens can reuse their bio-waste.	



## Makerspaces example: DARE and local families

Makerspace DARE has already been setting up great examples of circularity in the past by promoting more environmentally friendly decision-making through workshops. There have been various activities for adults and families with children. For example, creating interior elements from used glass bottles (such as vases, glasses and light objects), upcycled lamps with new design elements from different scrap materials. Another form of workshop is using scrap material left from printing stickers and creating new designs with these colourful pieces on fabric.



# Change management

An integrated learning approach should always be taken into account when engaging with stakeholders and trying to change their attitudes.

## Integrated learning approach

Meaningful & relevant	Need to appeal to learner's perspective: business, society, citizenship
For now & the future	Not only the basics, but link to future changes & challenges
'Feel' the complexity!	Everything looks simple, until you're in the driving seat
Knowledge & skills	Not only ' <i>know the concepts</i> ', but also ' <i>able to decide</i> ' (trade-offs)
Individual & team activities	Individual view versus team & cross-functional alignment
Engaging & fun	Motivate: through the <i>content</i> , but also through the <i>methodology</i> ('gamification')

## Discussion



Discuss different aspects of integrated learning approach and define next steps to be taken.

Suggested reading: Weenk, E., & Henzen, R. (2021). *Mastering the Circular Economy*. Kogan Page, Preface, 286 pages

# Used references and additional resources

- ✔ Ritzén S. et al. (2017) Barriers to the Circular Economy – integration of perspectives and domains, Elsevier, Procedia CIRP 64
- ✔ Robertson M. (2021) Sustainability Principles and Practice, 3rd Edition. Routledge, 137-169 pp.
- ✔ Weenk, E., & Henzen, R. (2021). Mastering the Circular Economy. Kogan Page, 5-34 pages
- ✔ Weetman, Catherine. A Circular Economy Handbook. Available from: VitalSource Bookshelf, (2nd Edition). Kogan Page, 2020, 13-44 pages
- ✔ Teaching circular design: <https://upcommons.upc.edu/bitstream/handle/2117/179149/Handbook-in-IDfS.pdf;jsessionid=F6DFB47D850447FD5C055455F65484EB?sequence=1>
- ✔ Hotels: planet-friendly ideas for lowering your carbon footprint: <https://www.dawnvale.com/news/hotels-planet-friendly-ideas-for-lowering-your-carbon-footprint/>
- ✔ 25 ways to reuse common household items: <https://maximizeminimalism.com/25-ways-to-reuse-common-household-items/>
- ✔ How To Start A Permaculture Garden: <https://grocycle.com/how-to-start-a-permaculture-garden/>