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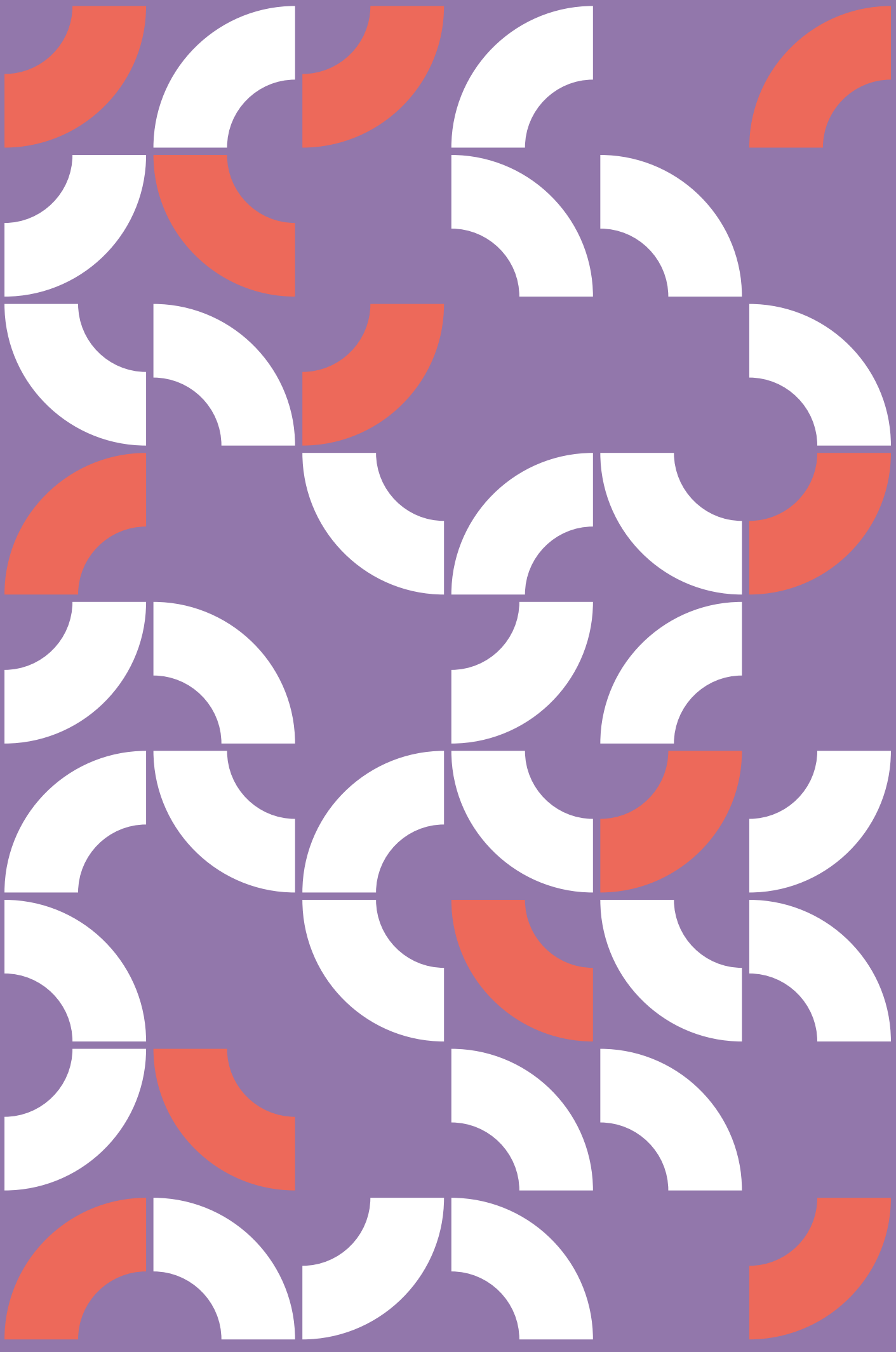
Towards a Circular Life Sciences Sector in Basel

Strategic Ecosystem Insights and Implementation Roadmap

June 2025



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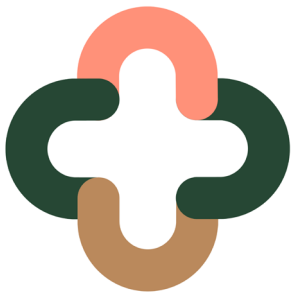

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1. Executive summary

In May 2024, the Canton of Basel-Stadt and the Eckenstein-Geigy Foundation launched **BaselCircular**, an innovation promotion program aimed at building a strong and networked innovation ecosystem for the circular economy. As part of its mission to accelerate circular transformation in strategically important industries, BaselCircular commissioned this study, carried out by the **Go Circular in Life Science (GCiLS)** association. GCiLS brings together stakeholders from across the life sciences sector to build a community dedicated to advancing circular economy practices through collaboration, knowledge exchange, and practical case studies.

This report emphasizes the importance of a holistic perspective for circular economy in life science (Figure 1) and applies the 10-R strategies, which include Refuse, Rethink, Reduce, Reuse, Repair, Refurbish, Remanufacture, Repurpose, Recycle, and Recover.

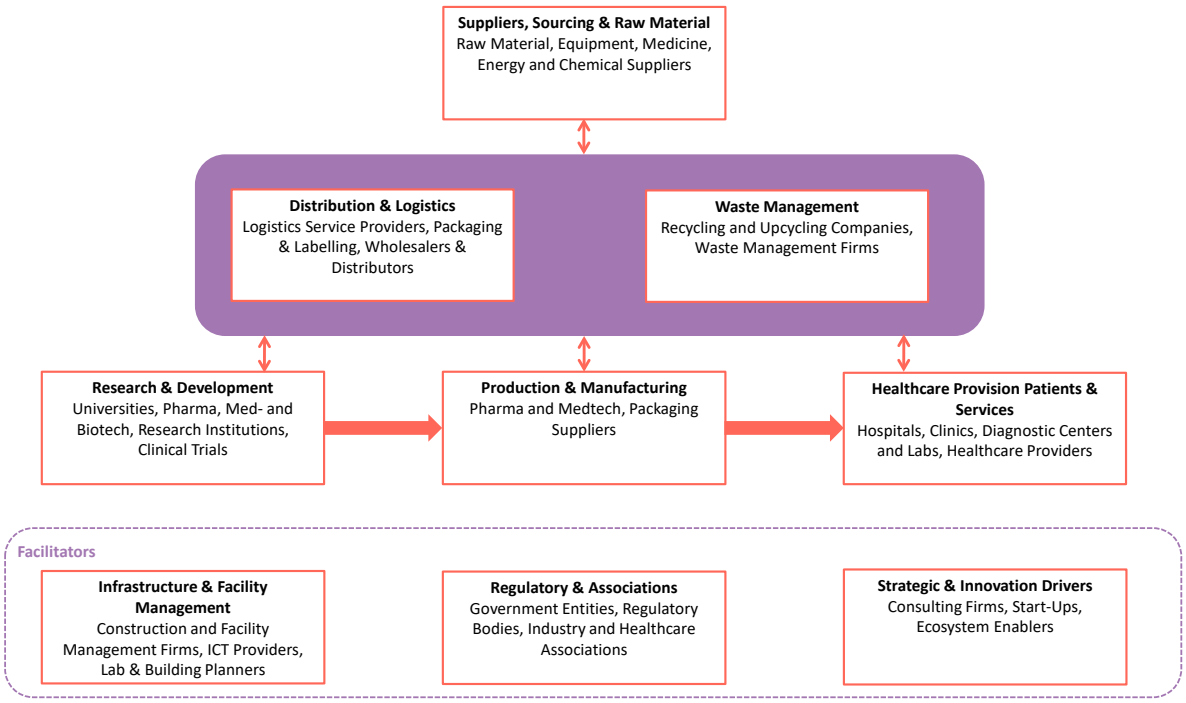


Figure 1: Interplay of stakeholders along life science value chain

A thorough analysis of the current status, specific opportunities, and challenges within Basel's pharma, MedTech, and healthcare industries was conducted. Key measures identified include fostering collaboration platforms, sharing best practices, and developing policies to support circular economy practices. Additionally, the report outlines identified fields of action where targeted efforts can yield significant impacts (Figure 2)

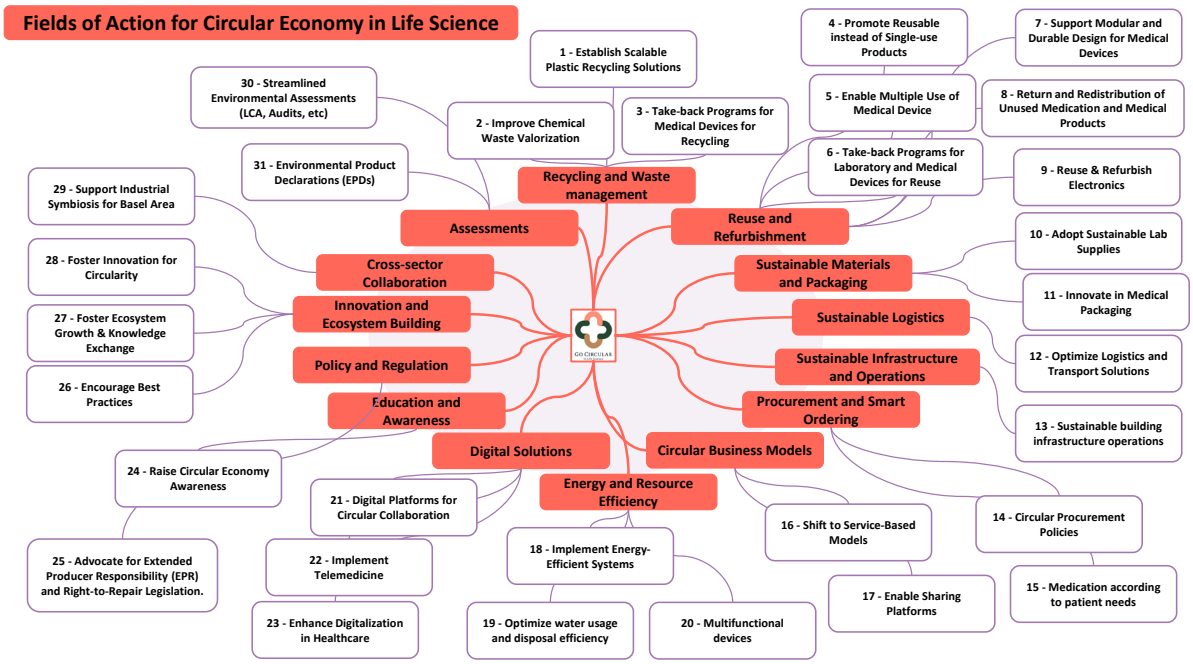


Figure 2: Mind map of the list of identified project ideas (Link)

Those fields of action were prioritized during several workshops and expert ratings into following workstreams: raise circular economy awareness, foster ecosystem growth and knowledge exchange, support industrial symbiosis in the Basel area, reuse & repair, sustainable lab consumables and circular procurement policies, establish scalable plastic recycling solutions and take-back programs for medical devices for recycling, as well as foster innovation for circularity.

Based on this analysis, a comprehensive strategy and a concrete action plan are being developed (Figure 3). These initiatives highlight the importance of collaboration platforms like „Go Circular in Life Science“ for fostering innovation and driving the adoption of circular economy principles within the life sciences sector. Collaboration with academic institutions and industry leaders is necessary to drive research and development in these areas.

Recommendations and next steps in the report emphasize the need for continued investment, stakeholder engagement, and the establishment of clear metrics and benchmarks to measure progress. Ongoing dissemination of knowledge and successful case studies is crucial to inspire broader adoption of circular economy practices.

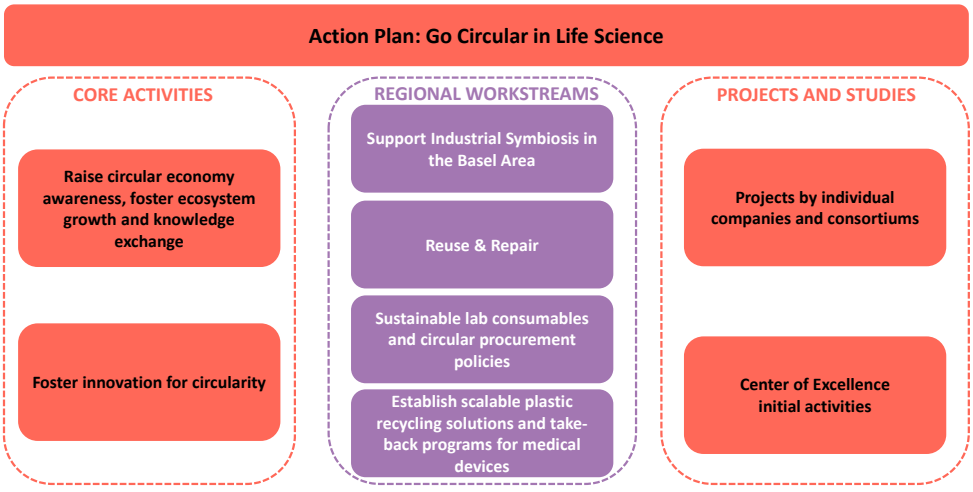


Figure 3: Action plan to foster CE in Life Science in Basel region

2. Background and objectives of the analysis

2.1. The initiator: BaselCircular

In May 2024, the Canton of Basel-Stadt and the Eckenstein-Geigy Foundation jointly launched BaselCircular, a public-private partnership aimed at fostering the transition to a circular economy. BaselCircular's mission is to develop and strengthen an innovation ecosystem that promotes sustainable economic practices. By supporting startups and SMEs in implementing circular economy projects, the initiative seeks to drive systemic change and position Basel as a leading hub for circular innovation.

2.2. The implementation partner: Go Circular in Life Science association

In early 2022, Impact Hub Basel hosted an Innosuisse-funded open innovation challenge organised by the NTN Innovation Booster Applied Circular Sustainability. Participants from companies, research institutions, and other organisations came together to co-develop circular economy solutions for the pharma and MedTech industries. One of the teams proposed the creation of a Swiss collaboration platform dedicated to circular economy in the life sciences. This idea won the challenge and secured funding to organise two well-attended networking and co-creation events at Impact Hub Basel, attracting over 50 participants from large pharmaceutical companies, suppliers, MedTech firms, hospitals, startups, research institutions, and service providers.

As a result, the non-profit association **Go Circular in Life Science (GCiLS)** was founded on 18 October 2022. GCiLS serves as an independent platform that brings together stakeholders and companies committed to advancing circular economy in the life sciences industry. By fostering collaboration, enabling knowledge exchange, and supporting practical case studies, GCiLS helps identify and implement circular solutions across the value chain.

2.3. The motivation and strategic intent behind the analysis

BaselCircular is committed to supporting the transition towards a circular economy. One of its key objectives is to strengthen innovation ecosystems and bring relevant actors together to unlock circular economy opportunities—especially in industries that are of strategic importance to the Basel region, such as the life sciences sector. This sector plays a vital role in the regional economy and holds great potential to advance sustainable business models and secure resilient jobs through innovative circular solutions.

Go Circular in Life Science (GCiLS), as an established platform and community dedicated to fostering circular economy in the life sciences, is a natural partner to collaborate on this analysis. With its network, expertise and active stakeholder base, GCiLS not only contributes to the success of this analysis but also represents an important player to continue supporting and advancing selected activities and the resulting action plan beyond the scope of this project.

To build a solid foundation for future action, this analysis assesses the current status, identifies specific opportunities and challenges, and highlights potential circular economy strategies for Basel's pharma, MedTech and healthcare industries. The results provide valuable input for both BaselCircular and GCiLS to guide their future activities, and serve as a valuable resource for the local ecosystem and key industry stakeholders to advance circular economy implementation. In this way, the analysis supports positioning the Basel region as a leading hub for circular economy innovation in the life sciences sector.

2.4. Scope of the analysis

- Holistic understanding of the status quo and the potential for the CE in life sciences (Pharma, MedTech and Healthcare)
- Concrete, implementation-oriented measures and project ideas along the value chain
- Strengthening awareness and expertise for the CE among the stakeholders involved
- Establishment of a CE network for life sciences in the region
- Strengthening Basel's position as a leading location for sustainable innovations in the life sciences industry

2.5. Scope of the analysis

Phase 1: Ecosystem analysis of Basel's life science industry and its circular economy opportunities

- Identification and mapping of the relevant players
- Survey of the status quo regarding CE through interviews, surveys, desk research
- Analysis of challenges, barriers and potential for the implementation of the CE
- Identify fields of action and priorities

Phase 2: Development of action plan

- Derivation of fields of action and priorities based on the analysis result
- Co-creation workshops with experts and stakeholders to develop concrete solutions
- Shortlisting of the fields of action and concrete projects ideas based on implementation potential and interest of the stakeholders in the region.
- Development of a mid-term action plan to foster circular economy in the life science industry in the Basel region

3. Selected references and key concepts

In this study, we mostly focused on analyzing the Basel life science ecosystem and identifying tangible project ideas. We reviewed several references, but do not provide an extensive literature review in this report, as concepts are well known and high-level. We believe it adds up more value to focus on applying those concepts to the specific case of life science ecosystem in Basel rather than writing an academic literature review. However, selected key frameworks and reference documents were essential in shaping the analytical approach and project proposals. The following subchapters highlight those that are particularly relevant to our scope, while other complementary publications are briefly mentioned in chapter 3.6.

3.1. Ellen MacArthur Foundation

The Ellen MacArthur Foundation is a globally recognized reference on CE. Its widely used *Butterfly Diagram* visualizes both biological and technical material cycles, making it a cornerstone for CE understanding and communication (Figure 4). Much information can be found on the website: How to Build a Circular Economy | Ellen MacArthur Foundation.

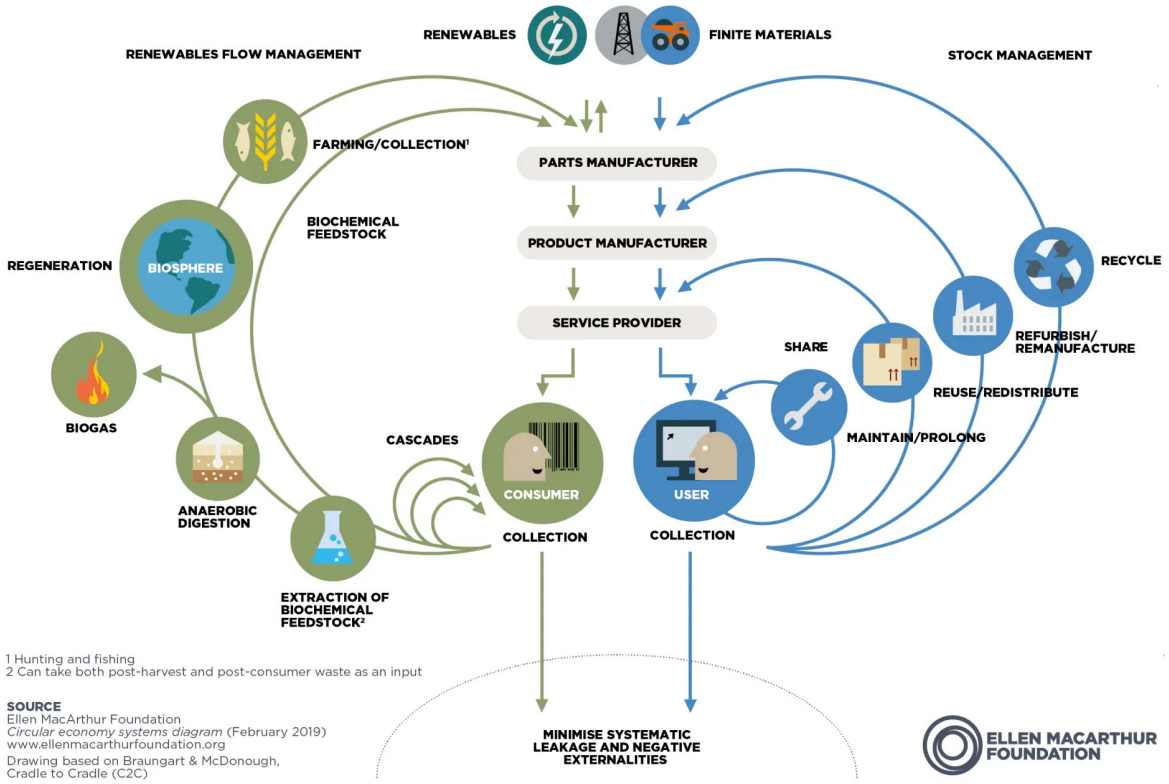


Figure 4: Circular economy systems diagram (MacArthur Foundation, 2019).

3.2. Circularity Gap Report

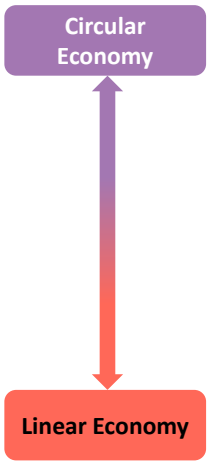
The Circularity Gap Report aimed to examine the current state of the CE in Switzerland, focusing on how materials are used and in what quantities. The results show that Switzerland's Circularity Metric is 6.9% with the potential to increase to 12.1% if all suggested interventions are implemented. The report also indicates that healthcare represents 27.6 million tons, or 16% of national material consumption. This underscores the untapped potential for CE interventions, reinforcing the urgency of regional action in sectors like life sciences (Circularity Gap Report, Circle Economy, 2023).

3.3. The R-Strategies for a Circular Economy

The R-Strategies, explained in R-Strategies for a Circular Economy, form the core analytical framework for this report's ecosystem analysis in chapter 5. They offer a structured approach to optimizing resource efficiency and minimizing waste in a CE. Organized in a hierarchy, they emphasize progressively longer loops of resource use, with shorter loops being more sustainable and circular. The strategies are grouped into three categories:

Table 1:

The different stages that R-Strategies can be implemented (adapted from Malooly, Daphne, 2023).



R-Strategies	The different stages where R-Strategies can be implemented	
R0 Refuse R1 Rethink R2 Reduce	**Short Loops**: These aim to optimize the design and use of products, minimizing the need for resources from the start:	• Design phase • Most sustainable, adds value • Responsible use and manufacturing
R3 Reuse R4 Repair R5 Refurbish R6 Remanufacture R7 Repurpose	**Medium Loops**: These focus on extending the lifespan of products through maintenance, repair, and upgrading:	• Consumption phase • Optimal use • Preserve and extend life of products
R8 Recycle R9 Recover	**Long Loops**: These involve transforming materials at the end of a product's life	• End-of-life or return phase • Capture and retain value • Use waste as a resource
Discard		• Loss of resources • Value lost • Environmental pollution

Short loops: These aim to optimize the design and use of products, minimizing the need for resources from the start:

- R0 Refuse: Avoid unnecessary resource use altogether.
- R1 Rethink: Use products more efficiently or share them to maximize utility.
- R2 Reduce: Lower material and energy use during production and consumption.

Medium loops: These focus on extending the lifespan of products through maintenance, repair, and upgrading:

- R3 Reuse: Continue using products or components in their current form.
- R4 Repair: Fix defects to restore functionality.
- R5 Refurbish: Update or refresh products to extend their life.
- R6 Remanufacture: Use parts of discarded products to create new ones.
- R7 Repurpose: Adapt products or components for new use without significant modification.

Long loops: These involve transforming materials at the end of a product's life:

- R8 Recycle: Process materials to make new products, retaining less original functionality.
- R9 Recover: Extract energy or materials as a last resort.

The ladder visualizes a shift from prevention and efficiency to resource recovery, guiding circular practices towards minimizing waste and maximizing value retention at every stage of the product lifecycle.

3.4. EFPIA White paper on circular economy

The EFPIA White paper on circular economy (2024) is highly aligned with the objectives of this project, providing a detailed, sector-specific framework for circular practices in the pharmaceutical industry. The document also features numerous case studies and practical examples, several of which have informed the identification of circular strategies within this report. Key opportunities are summarized in Table 2 and Figure 5. The full publication is available on the European Federation of Pharmaceutical Industries and Associations (EFPIA) website: White paper on circular economy (efpia.eu).

Figure 5 & Table 2: Indicative circular economy opportunities available to the pharmaceutical industry (adapted from EFPIA White paper on circular economy, 2024)

	RAW MATERIALS	DRUG PRODUCT	DEVICES	PACKAGING
1. Raw material	Non-Hazardous Materials	Non-Hazardous Materials	Avoid the use of substances within the device that negatively affect the reuse and recycling of the materials Certified, Renewable or Recycled Materials	Avoid the use of substances within the packaging that negatively affect the reuse and recycling of the materials Certified, Renewable or Recycled Materials

	RAW MATERIALS	DRUG PRODUCT	DEVICES	PACKAGING
2. Design	Biodegradable Green Chemistry Principles Use approved schemes e.g., Palm Oil	Biodegradable Green Chemistry Principles Dosage optimization Maximize Shelf Life	Reusable or refillable Use less different materials Maximize life of the device Build LCA/DfE into Design Process	Optimize Packaging Size Use less different materials Design to minimize secondary & tertiary packaging Design for recyclability
3. Production	Green energy at production facilities Minimize carbon footprint of production Maximize mass production efficiency. Secondary raw materials	Green energy at production facilities Minimize carbon footprint of production Maximize API vs raw material efficiency. Minimize API emissions	Suppliers to meet sustainability criteria Minimize environmental footprint of production Local sourcing of parts	Suppliers to meet sustainability criteria Minimize environmental footprint of production Local sources of packaging materials
4. Distribution	Apply Green Logistics Minimize carbon footprint of distributor(s) Manufacture at point of use	Apply Green Logistics Minimize carbon footprint of distributor(s) Manufacture at point of use	Apply Green Logistics Minimize carbon footprint of distributor(s)	Local Sourcing Apply Green Logistics Carbon footprint of distributor(s) Reduce use of passive shipper boxes for cold chain
5. Consumption, use, reuse, repair	Recirculation of solvents Reuse of catalysts	Dosage & Pack size optimization 'Personalized' medicines Promote Patient Compliance (particularly for Chronic conditions)	Offer repair options Minimize waste generated over treatment period	Maximize efficiency on packaging lines Reuse transport packaging
6. Collection	Incineration of Drug product waste Education of Patient	Incineration of Drug product waste Take Back Schemes Education of Patient	Segregate waste at source to optimize recycling Take Back Schemes	Segregate waste at source to optimize recycling Consider Take Back Schemes
7. Recycling	Solvent reuse Re-use of water for primary rinses Re-use of bi-products and waste streams for other purposes Recycling of metals (e.g. PGMs)	Develop certified unused drug recycling programs	Clear recyclability signs on packaging Recycle device materials	Clear recyclability labelling on packaging Recycle packaging materials

3.5. Eco-industrial parks

The Eco-industrial parks (EIP's) concept is about creating more resource-efficient and cost-effective industrial parks which are more competitive, attractive for investment and risk resilient. The Basel region—with its strong life sciences concentration, shared infrastructure, and waste-energy synergies—is well-positioned to explore urban-industrial symbiosis.

Successful international models, such as Kalundborg and Rheinfelden in Germany (Figure 6), offer inspiration for how Basel can evolve toward coordinated material loops and shared circular infrastructure. For example, energy recovered from non-hazardous and hazardous waste incineration is used for district heating in the city and the water from the Rhine is used for cooling purposes. Furthermore, the new wastewater treatment plant ProRheno is treating both communal and industrial wastewater, including micropollutants removal. There are also numerous service providers involved for supply or waste management, including solvent recycling. It is inspiring to apply the concept of eco-industrial park to the region and to identify potential for more resource efficiency.

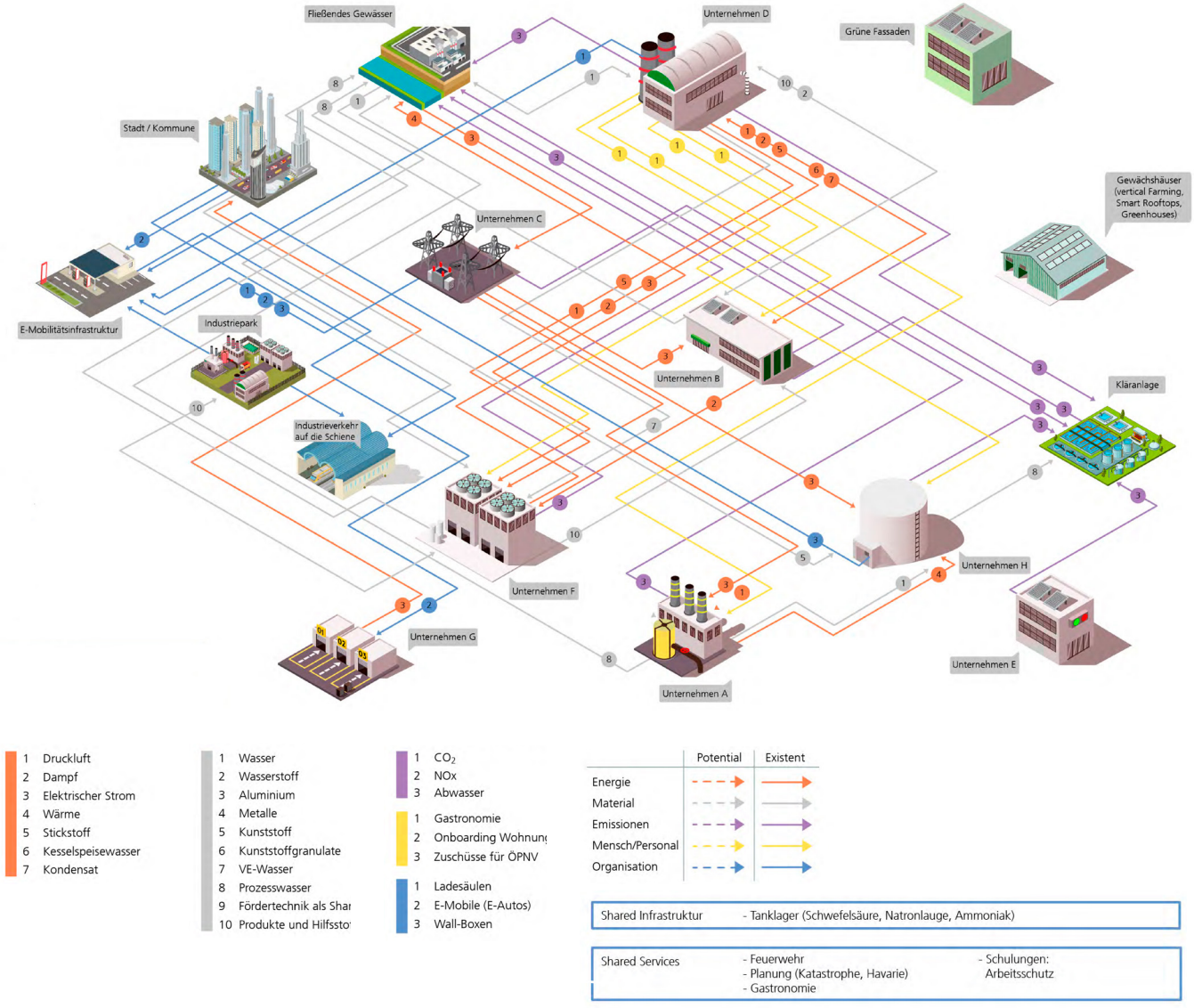


Figure 6: Rheinfelden eco-industrial park (Miehe et al. (2020), „Ultraeffizienzfabrik – Symbiotisch-verlustfreie Produktion im urbanen Umfeld", Fraunhofer IPA)

3.6. Selected recent publications

Additional publications informed the study and helped validate observations in specific subdomains of CE. While not central to the report's structure, they offer valuable insights and support further exploration by interested stakeholders:

Sustainability in Intensive and Emergency Medicine (Kochanek, M et al., 2023)
This paper highlights the high resource use in critical care and proposes reducing single-use materials, improving energy efficiency, and optimizing procurement to promote CE principles in hospitals.

Green Lab Position Paper; Circular Economy in the Lab (Jens Feddern et al., 2024)
Focusing on lab sustainability, this report recommends reusable lab materials, improved recycling, and energy-efficient equipment while advocating for regulatory support and behavioural changes in lab operations.

Green Surgery Report; Reducing the environmental impact of surgical care (Mahmood Bhutta et al., 2023)
This study examines surgical waste reduction, highlighting reusable surgical gowns, optimized anaesthesia gases, and energy-efficient sterilization, while advocating for sustainability in procurement and medical training.

Reducing the Carbon Footprint of a German University Hospital (Claudia Quitmann et al., 2023)
This paper outlines emission-reduction strategies in hospitals, including energy-efficient infrastructure, improved recycling, and low-emission medical transport to integrate CE principles.

The White Dot 2024: MedTech Circular Economy Feasibility Study (Michael Leitl et al., 2024)
Focusing on MedTech, this report promotes product-as-a-service models, modular device design, and regulatory changes to enable refurbishing and reduce medical waste.

4. Methodology

This study is based on reviews of literature, expert knowledge, previous studies, interviews and workshops conducted. Especially following activities were conducted:

- **Desk research** on circular economy practices and analysis of relevant studies.
- **Collaboration with FHNW and ZHAW students**, who conducted targeted research, supported stakeholder mapping, and helped drafting project ideas.
- **Interviews with field experts** to validate separate parts of the analysis
- **Stakeholder input:** Representatives from across the life sciences value chain, based in Basel and other parts of Switzerland, contributed their perspectives on barriers, opportunities, priority fields of action, and potential project solutions through workshops and a survey.

The study adhered to best scientific practices and ensured confidentiality and compliance with anti-trust regulations in all interactions with companies and stakeholders throughout its execution. Expert knowledge was also gathered along the way to ensure that the results of the study are aligned with expectations of the potential actors involved in follow-up projects and to maximize the chances to initiate successful follow-up projects and activities.

5. Ecosystem analysis: circular economy in life science

5.1. Visualizing the life science sector from a circular economy perspective

This study encompasses the entire life sciences sector, with a focus on pharmaceutical companies, MedTech companies, healthcare facilities, patients, logistics and all stakeholders directly or indirectly involved. This holistic approach requires a structured visualization to classify and identify opportunities within silos and across actors in a transdisciplinary manner. For this purpose, Figure 7 proposes a structured visualization that is used across this report.

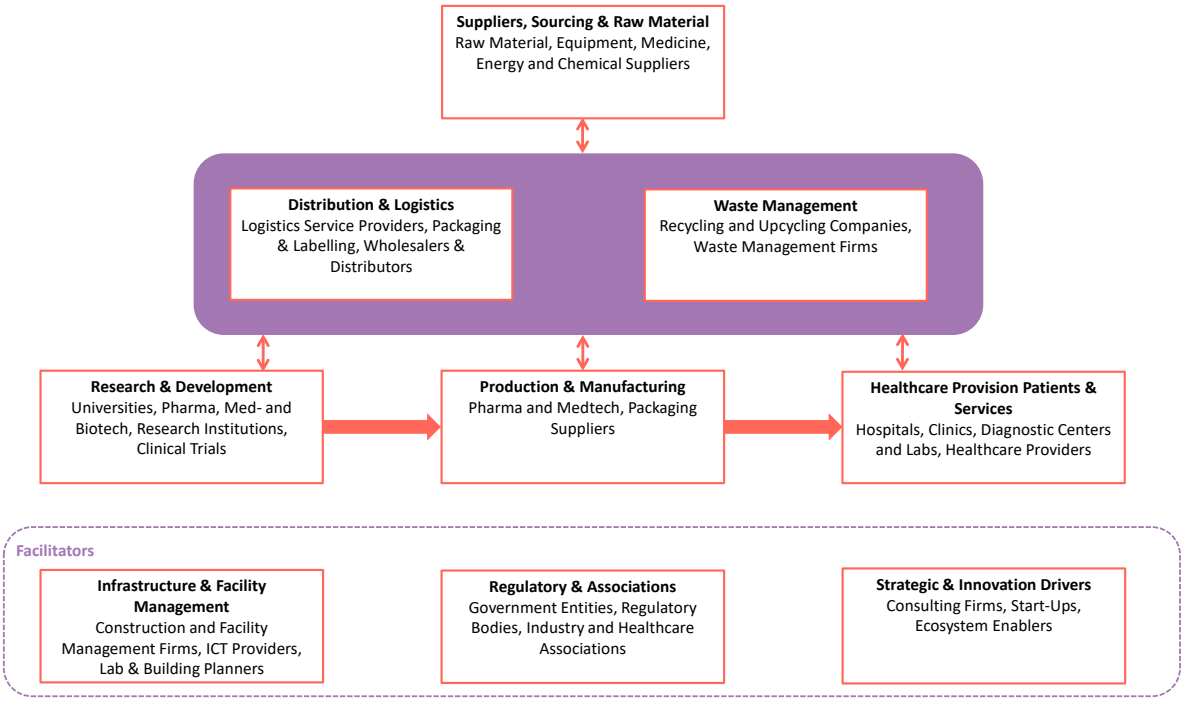


Figure 7: Interplay of stakeholders along life science value chain

Figure 7 shows the most relevant stakeholder groups categorized by type and their relationships with one another. Suppliers, sourcing & raw materials occupy the earliest phase, ensuring that upstream resources enter the system. Research and Development drives Production and Manufacturing, transforming innovations and material inputs into healthcare products. These products are then delivered to Healthcare Provision and Services, where they are utilized in patient care.

On the periphery are Facilitators – such as governmental bodies, industry associations, insurers, regulatory agencies etc. – whose influence spans the entire chain, providing oversight, financing mechanisms, and strategic direction. Waste Management entities anchor the cycle by capturing and recycling outputs from all segments, regenerating materials for re-entry into production loops. The interplay between Distribution & Logistics and Waste Management is critical: While Distribution & Logistics ensures the precise and timely circulation of materials and products, Waste Management closes the loop by converting end-of-life products into reusable resources. Potential for circularity emerges where stakeholders collaborate across boundaries, innovating product designs for refurbishment, integrating recycled materials into manufacturing, optimizing logistics to reduce resource intensities, and engaging facilitators to align incentives and set standards. Through the lens of this visualization, each stakeholder's role and impact on circularity become clearer, guiding targeted engagement strategies and paving the way toward more sustainable, resource-efficient healthcare operations.

5.2. Key stakeholders for the Basel region

According to the chamber of commerce both Basel (HKBB), over 800 lifescience companies are active in the Basel region. An interactive map can be found online and a screenshot is shown in Figure 8: Unternehmen, Institutionen und Hochschulen | Life Sciences Cluster Basel (lifesciencesbasel.com)

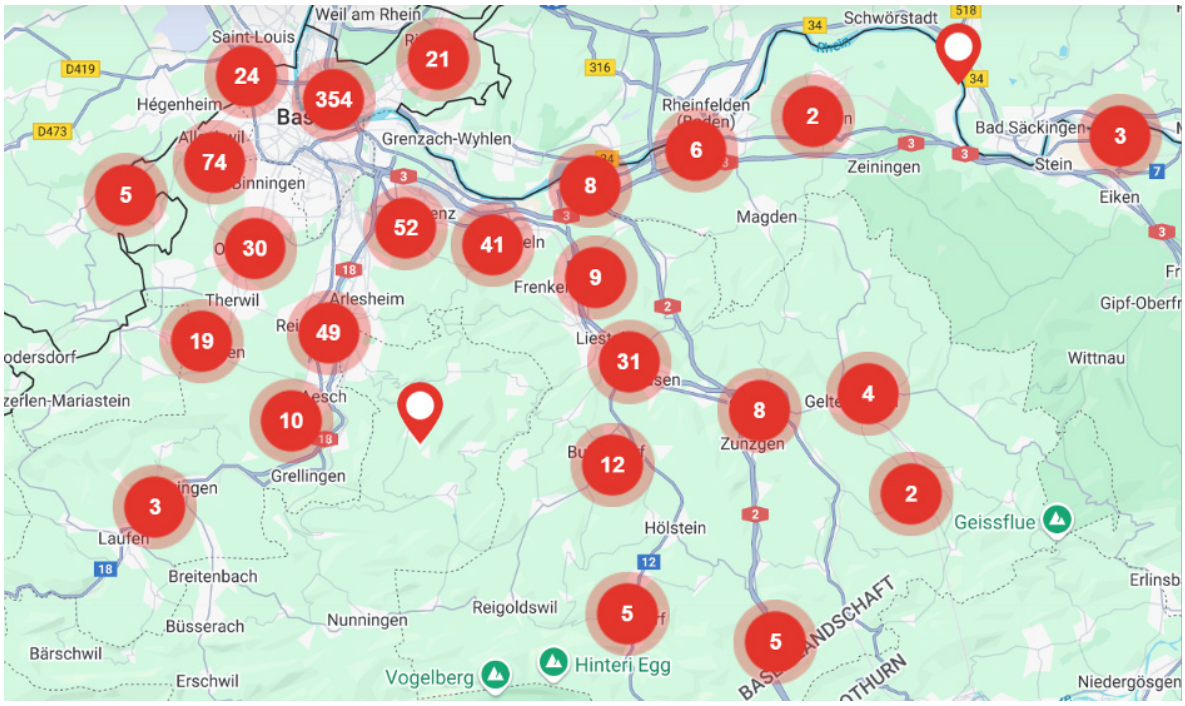


Figure 8: The life sciences industry in the region covers the entire value chain (HKBB Life Science Cluster)

In addition to pure play life science companies, there are several additional stakeholders involved directly or indirectly in the value chain. The Swiss Biotech association also references over 1'500 companies and stakeholders: The Swiss Biotech Directory – Swiss Biotech.

5.3. Circular economy potential across the life sciences value chain in Basel region

This analysis examines the nine previously identified and interconnected stakeholder groups within the life sciences industry, highlighting opportunities to integrate CE principles. Each group is analysed using a general structure based on the circular economy's 10 R-Strategies. These strategies prioritize actions to Refuse, Rethink, Reduce, Reuse, Repair, Refurbish, Remanufacture, Repurpose, Recycle, and Recover resources, ensuring sustainability is addressed comprehensively.

The identified opportunities and potential actions for each stakeholder group stem from a variety of sources, including literature reviews, workshops, stakeholder interviews, and student research. They serve as some potential ideas or suggestions—either as existing practices worth scaling or as solutions to identified challenges.

A key overarching recommendation for all stakeholders is the need for accountability measures to drive progress in the CE. Setting measurable targets and standardized metrics is critical to assessing CE performance across the sector. Transparent reporting and monitoring systems allow stakeholders to track progress, identify opportunities for improvement, and foster continuous innovation.

5.3.1. Suppliers, sourcing & raw materials in Basel's life science

The life sciences sector, particularly in healthcare, including pharmaceuticals, MedTech, and hospitals depends on a complex and interconnected network of suppliers to ensure the reliable availability of raw materials, energy, equipment, and consumables. Many of these critical materials, such as chemicals and single-use components, are sourced globally, making the supply chain vulnerable to disruptions, resource scarcity, and environmental impacts. In the Basel region's healthcare industry, this interdependence is evident, with local companies providing essential equipment, such as reactors, microscopes, and analytical instruments, while MedTech and pharmaceutical firms supply hospitals with machines, tools, and medications. For instance, Roche alone sources from 56,000 suppliers worldwide, encompassing logistics, packaging, and IT services (Roche 2, 2024). These supply chains contribute to over 50% of healthcare emissions, including those from R&D and patient care (SMI, 2022).

Basel's position as a leading hub for life sciences also presents an opportunity to drive the adoption of CE principles. By reducing reliance on single-use products, promoting local sourcing, and investing in innovative recycling systems, the region can address key supply chain vulnerabilities while enhancing sustainability and resilience. However, local or regional sourcing is not always possible, as some essential equipment or raw materials are only produced or available in specific regions, such as specific metals. Furthermore, transitioning to circular approaches requires collaboration across the supply chain, infrastructure development, and a shift in cultural and operational practices among stakeholders.

The following key factors of influence in Table 3 are organized by their importance to the CE and presented as some possible actionable steps. By addressing these factors, the life sciences sector can create a more sustainable and resilient supply chain, aligning operations with CE principles while minimizing environmental impact and resource dependencies.

Table 3: Key factors of influence for suppliers, sourcing and raw materials

R0 Refuse	**Cultural shift toward circularity:** Encourage suppliers to eliminate unnecessary resource use by phasing out single-use materials and promoting waste-free alternatives. Establish strict procurement guidelines that prioritize waste reduction at the source, such as banning non-essential packaging and enforcing sustainable sourcing criteria.
R1 Rethink	**Collaboration:** Build partnerships and platforms that facilitate material sharing, innovation, and joint problem-solving among stakeholders. **Digital innovation:** Leverage digital tools for supply chain transparency, material tracking, and waste optimization to improve efficiency and lower resource consumption.
R2 Reduce	**Resource efficiency:** Optimize the use of materials and energy across supply chains to minimize waste and reduce environmental impact.
R3 Reuse	**Sustainable alternatives:** Develop and promote reusable materials and components as replacements for single-use products. **Design for reuse:** Prioritize product designs that enable repeated use without compromising quality or performance.
R4 – R6 Repair Refurbish Remanufacture	**Modular design:** Collaborate with suppliers to implement modular product designs, making repairs and remanufacturing easier and extending product lifecycles. **Refurbishment initiatives:** Establish programs to refurbish high-value items like lab instruments and manufacturing equipment to prolong usability, ensuring quality and compliance.
R7 Repurpose	**Creative innovation:** Identify alternative uses for surplus materials, components, or by-products within the supply chain.
R8 Recycle	**Recycling infrastructure:** Invest in systems that facilitate the recovery and high-quality reprocessing of raw materials.
R9 Recover	**Energy and material recovery:** Implement systems to extract energy or materials from waste generated in the supply chain, avoiding overall resource loss.

5.3.2. Distribution & logistics in Basel's life science

The distribution and logistics sector in life sciences encompasses companies specializing in the transportation and handling of chemicals, medications, and laboratory equipment. Key features include stringent safety regulations, adoption of cutting-edge technologies, and a growing emphasis on sustainability.

Basel serves as a critical logistics axis due to its strategic location at the crossroads of Switzerland, Germany, and France, supported by robust infrastructure, including the Rhine River, international rail networks, and the Basel-Mulhouse Airport. Thousands of employees in Basel's life sciences and chemical industries manage global supply chains, with significant environmental impacts stemming from centralized production and international shipping.

The sector's main challenges in adopting CE practices include the need to reduce transport emissions, optimize supply chains, and implement sustainable packaging solutions. Opportunities lie in regional production hubs, reusable packaging and the electrification of transport fleets.

This prioritized to-do list in Table 4 emphasizes some possible actionable key strategies for integrating CE principles into distribution and logistics, ensuring efficiency, sustainability, and reduced environmental impact.

Table 4: Key factors of influence for distribution and logistics

R0 Refuse	**Avoid unnecessary transportation:** Eliminate inefficient transport by localizing production and distribution centres.
R1 Rethink	**Integrated logistics models:** Promote combined transport solutions that leverage multiple modes (e.g., rail and road) for efficiency. **Fleet electrification:** Replace traditional vehicles with electric or hybrid alternatives to minimize fuel consumption and emissions.
R2 Reduce	**Energy efficiency in warehousing:** Design energy-efficient warehouses with sustainable materials, solar energy systems, and LED lighting.
R3 Reuse	**Reusable packaging:** Introduce reusable containers and packaging to replace single-use plastics in logistics operations.
R4–R6 Repair Refurbish Remanufacture	**Regional maintenance hubs:** Establish local production and repair hubs to centralize equipment storage, maintenance, and repairs, reducing downtime and transportation needs.
R7 Repurpose	**Creative packaging repurposing:** Repurpose surplus or discarded packaging materials for alternative uses in logistics processes.
R8 Recycle	**Recyclable packaging materials:** Use bioplastics or recycled paper for packaging, emphasizing materials designed for easy recycling.
R9 Recover	**Energy recovery in warehousing:** Utilize waste heat recovery and renewable energy sources, such as solar panels, in logistics facilities.

5.3.3. Research & development in Basel's life science

The Basel region is a global center for life sciences R&D, accounting for 49% pharmaceutical and 29% MedTech activities (Vogel, 2021) and 42% of companies identifying it as a core activity (Vogel, Schneider-Sliwa, 2020). Companies like Novartis and Roche drive innovation, with Novartis alone investing CHF 4.6 billion in Swiss R&D in 2023 (Novartis, 2024). Nationally, Switzerland's pharmaceutical industry invests CHF 7 billion annually in R&D (Interpharma, 2022). Additionally, the MedTech sector employs over 8,500 specialists in fields like robotics and material processing, supported by over 1,000 researchers in scientific groups (BaselArea 1, 2024).

Despite its innovative edge, the sector faces significant challenges in adopting CE practices. Developing new compounds remains resource-intensive, with only 1–2 out of 10,000 compounds reaching the market after 12–13 years of research (EFPIA, 2022). Traditional linear processes generate substantial waste, such as solvents and disposable lap supplies, while stringent safety regulations limit the adoption of alternative practices. The majority of laboratory waste is made up of single-use plastic, which is frequently deemed dangerous because of contamination and needs to be burned. Moreover, the lack of infrastructure for recycling specialized materials exacerbates resource inefficiencies.

However, Basel's concentration of expertise and resources offers immense potential for integrating CE principles. Innovations in material use, process optimization, and collaboration between academia and industry can drive sustainability. Adopting circular practices in R&D can reduce waste, optimize resource use, and strengthen resilience against global disruptions.

A CE in life sciences R&D is essential for improving resource efficiency, reducing waste, and strengthening resilience. To address these needs, the following to-do list in Table 5 gives an example of key actions organized by CE priorities.

Table 5: Key factors of influence for research and development

R0 Refuse	**Promote cultural adaptation:** Foster a collaborative culture in R&D environments that prioritizes resource sharing and sustainability. Engage R&D staff through training and workshops to embed sustainable practices, such as minimizing single-use materials, into daily workflows.
R1 Rethink	**Enhance process efficiency:** Integrate shared lab resources and green chemistry principles to rethink traditional experimental setups, prioritizing resource efficiency and minimizing waste.
R2 Reduce	**Advance material innovation:** Develop biodegradable, recyclable, and resource-efficient materials to reduce dependency on critical raw materials and global supply chains. **Optimize resource use:** Adopt high-throughput screening and predictive modeling to streamline experiments, reducing material and energy consumption (e.g. downtime) in laboratory workflows.
R3 Reuse	**Adopt reusable lab items:** Transition from single-use to reusable lab items (e.g., gloves, pipettes) with effective cleaning and sterilization systems.
R4–R6 Repair Refurbish Remanufacture	**Enable specialized equipment repair:** Develop programs for the regular maintenance, repair, and refurbishment of high-value lab equipment such as spectrometers, centrifuges, and imaging devices.
R7 Repurpose	**Creative repurposing of lab components:** Repurpose unused lab equipment for training purposes or donate to educational institutions.
R8 Recycle	**Establish recycling for lab materials:** Create recycling streams for non-contaminated lab plastics and glassware. Partner with recycling firms, educate staff on segregation practices, and provide labelled bins. Conduct audits to improve recycling rates.
R9 Recover	**Implement comprehensive recovery systems:** Develop systems to recover resources such as energy from lab devices and Heating, Ventilation and Air Conditioning (HVAC) systems, water from cleaning and cooling processes, solvents through distillation, and precious metals from instruments and catalysts.

5.3.4. Production & manufacturing in Basel's life science

Production in the Basel life sciences sector is defined by its complexity and global reach. For pharmaceuticals, this involves multiple stages, including active ingredient synthesis, formulation into dosage forms like tablets or ointments, and final packaging. Every step adheres to strict regulatory and quality standards to ensure safety and efficacy. Switzerland's pharmaceutical exports total over CHF 100 billion annually, representing 50% of the country's export value, with the majority destined for the EU (FDFA, 2023). In Basel, companies like Roche, Novartis, and Lonza focus on active ingredient development, while final production stages often occur at distributed sites worldwide. Packaging materials and inserts are sourced from various regions, resulting in resource-intensive and emission-heavy transport chains.

This sector's challenges include high energy and water consumption, inefficient supply chains, and waste from packaging and production residues. For example, pharmaceutical packaging waste often ends up incinerated due to the lack of specialized recycling systems.

The potential for CE practices lies in enhancing resource efficiency, localizing production processes, and adopting sustainable packaging materials. Circular strategies can reduce energy consumption, streamline logistics, and minimize material waste, while maintaining compliance with strict quality and regulatory standards.

The following key factors of influence in Table 6 are organized by their importance to the CE and presented as some possible actionable steps.

Table 6: Key factors of influence for production and manufacturing

R0 Refuse	**Avoid unnecessary resource use:** Conduct audits to identify and phase out single-use materials, collaborating with suppliers to ensure sustainable alternatives are available and maintained for extended lifecycles.
R1 Rethink	**Process optimization:** Redesign manufacturing processes to minimize waste, energy use, and emissions while maintaining quality standards. **Localization of production:** Explore opportunities to localize certain production stages, minimizing complex transport chains, CO_2 emissions, and supply chain vulnerabilities.
R2 Reduce	**Energy and material efficiency:** Improve production efficiency through advanced technologies that reduce raw material input, energy consumption, and emissions. **Eco-design for packaging:** Streamline packaging designs to using biodegradable materials, optimizing packaging size, reducing plastic content.
R3 Reuse	**Reusable production components:** Implement reusable moulds, containers, and tools within manufacturing processes to reduce single-use items. **Closed-loop water systems:** Adopt water recovery systems to reuse process water, minimizing freshwater consumption in production facilities.
R4-R6 Repair Refurbish Remanufacture	**Refurbish equipment:** Extend the lifespan of manufacturing equipment through regular maintenance and refurbishment, avoiding the need for new machinery. **Modular equipment design:** Collaborate with equipment manufacturers to integrate modular components that allow for easier repair and system upgrades.
R7 Repurpose	**Innovative material repurposing:** Explore opportunities to repurpose production by-products or waste streams for alternative uses within or outside the industry.
R8 Recycle	**Recycling infrastructure for manufacturing waste:** Invest in systems to recycle production scrap, residual chemicals, and unused materials back into the supply chain.
R9 Recover	**Energy recovery systems:** Integrate waste-to-energy technologies to recover energy from production waste streams, minimizing overall energy demand. **Material recovery processes:** Develop solutions to recover and reprocess valuable materials from production waste, particularly in active ingredient synthesis.

5.3.5. Healthcare provision, patients & services in Basel's life science

Healthcare provision in Basel encompasses 13 hospitals, 33 care homes, over 1,000 medical practices, and a wide network of pharmacies (Comparis, 2024; BS, 2023; Heiminfo, 2024). The University Hospital Basel alone employs over 13,000 staff and treats 38,000 inpatients and 800,000 outpatients annually (IQVIA, 2024). Despite its scale and sophistication, the sector faces significant inefficiencies and environmental impacts.

Switzerland discards 4,800 tons of medications annually, worth an estimated CHF 4 billion, often due to oversized packaging and unused prescriptions. Despite potential solutions like partial dispensing and repackaging (blistering), regulatory and financial barriers hinder widespread implementation (Yolanda Guzmán, 2024). Strict hygiene regulations often limit the potential for reusing and recycling materials, particularly in high-risk environments like intensive care units. Additionally, hospitals are major consumers of energy and resources, driven by sterilization processes, Heating, Ventilation and Air Conditioning (HVAC) systems, and the widespread use of single-use medical supplies. These factors contribute to substantial waste and emissions, highlighting the need for more sustainable practices.

Integrating CE principles can help address these challenges by reducing medication waste, transitioning to reusable medical textiles & devices, and implementing energy-efficient systems. Basel's healthcare infrastructure offers an opportunity to pilot and scale these innovations, creating a model for sustainability in healthcare.

The following key factors of influence in Table 7 are organized by their importance to the CE and presented as some possible actionable steps.

Table 7: Key factors of influence for healthcare provision, patients and services

R0 Refuse	**Avoid unnecessary resource use:** Eliminate single-use medical supplies where alternatives exist, such as surgery equipment. **Cultural shift toward efficiency:** Raise awareness and train healthcare staff to identify and avoid unnecessary resource consumption in day-to-day operations while still following hygienic safety requirements.
R1 Rethink	**Telemedicine:** Expand telemedicine programs to reduce patient and staff travel, significantly lowering the carbon footprint associated with healthcare delivery. **Digital platforms for resource management:** Implement digital tools to optimize material flows and enable better tracking of resource use in medical care centres.
R2 Reduce	**Minimize waste in food services:** Streamline food logistics to reduce food waste in hospital cafeterias and patient meal services.
R3 Reuse	**Reusable medical textiles:** Replace single-use surgical gowns, linens, and lab coats with durable, reusable alternatives supported by proper sterilization systems.
R4–R6 Repair Refurbish Remanufacture	**Refurbish high-value equipment:** Extend the lifespan of imaging devices and other high-cost medical technologies through regular refurbishment. **Maintain hospital infrastructure:** Focus on repairing and upgrading existing infrastructure (e.g. surgical lasers, X-ray machines and wheelchairs) to delay replacements and minimize resource consumption.
R7 Repurpose	**Repurpose surplus medical equipment:** Redirect outdated or surplus equipment to educational institutions or low-resource healthcare settings. **Repurpose food waste:** Convert food waste into energy or compost to support sustainable waste management practices.
R8 Recycle	**Systematic recycling programs:** Establish robust recycling systems for medical-grade plastics, metals, and textiles used in healthcare settings. **Medication take-back systems:** Establish systems for the collection and proper recycling of expired or unused medications.
R9 Recover	**Water recovery systems:** Install systems to recover water used in cleaning, sterilization, and other hospital processes.

5.3.6. Waste management in Basel's life science

Basel produces significant and complex waste streams due to its high concentration of pharmaceutical, biotech, and MedTech companies. With over 700 life sciences firms and 400 biotech companies operating in the region (BaselArea 2, 2024), waste generation is a critical challenge. For instance, Roche alone produced 29'179 tons of non-hazardous waste in 2024, of which 68.5% (19'981 tons) was recycled. The company aims to increase this rate to 80% by 2025 (Roche 1, 2025), highlighting the pressing need for more effective waste management strategies.

In a CE, waste can either be reintegrated through material recovery—where waste is recycled into new products—or thermal recovery, where waste is incinerated to generate energy. Waste management in the life sciences sector involves both internal and external streams that determine how materials are handled and where improvements can be made.

Internal waste streams: Many life sciences companies manage waste internally, using dedicated waste management divisions to minimize waste at the source, improve separation, and implement circular strategies such as reducing single-use materials and increasing recycling rates. However, these efforts face barriers, including strict safety regulations, low prioritization of waste reduction, and insufficient recycling infrastructure for hazardous materials.

External waste streams: Once waste exits company facilities, external waste management firms, including recycling companies and waste disposal services, take over. Their role is to sort and process waste, transferring it to incineration plants or recycling facilities where possible. However, financial incentives linked to waste-to-energy incineration—where intermediaries profit from selling waste to energy recovery plants—can undermine waste prevention efforts. In some cases, waste is sold at low prices, making disposal more attractive than circular alternatives, further challenging the transition toward sustainable waste management.

Addressing these challenges requires stronger collaboration between waste-generating life sciences companies and external waste management providers. By prioritizing waste prevention, enhancing material recovery, and optimizing recycling infrastructure, the sector can accelerate the shift toward a CE.

The following prioritized to-do list in Table 8 outlines some actionable CE strategies to reduce environmental impact while maintaining safety and operational efficiency in Basel's life sciences waste management system.

Table 8: Key factors of influence for waste management

R0 Refuse	**Waste prevention:** Support hospitals, laboratories, and pharmaceutical companies in implementing waste prevention strategies by optimizing procurement practices, avoiding single-use items, and promoting reusable alternatives. **Collaborative initiatives:** Establish collaborative initiatives with manufacturers to design products with longer lifespans, minimal packaging, and non-hazardous materials, avoiding the need for disposal altogether.
R1 Rethink	**Advanced sorting systems:** Invest in automated sorting technologies for separating recyclable components from hazardous waste streams.
R2 Reduce	**Decrease plastic waste:** Collaborate with manufacturers to reduce single-use plastics in laboratory and medical environments. **Streamline waste streams:** Implement practices to minimize mixed waste, enhancing recyclability and reducing residual waste volumes.
R3 Reuse	**Reusable waste containers:** Introduce reusable containers for medical and laboratory non-Hazardous waste collection to minimize packaging waste.
R4–R6 Repair Refurbish Remanufacture	**Establish refurbishment programs for medical and lab equipment:** Collaborate with manufacturers and healthcare providers to collect, repair, and refurbish discarded medical devices and lab equipment. Create specialized refurbishment centres to safely recondition tools and machinery, ensuring compliance with regulatory standards.
R7 Repurpose	**Energy composting:** Convert non-hazardous organic waste into compost or energy resources like biogas.
R8 Recycle	**Build specialized recycling facilities:** Develop recycling plants tailored to handle medical-grade plastics, contaminated paper, and specific hazardous materials instead of immediate incineration.
R9 Recover	**Enhance waste-to-energy technologies:** Upgrade incineration plants with energy recovery systems to maximize efficiency and minimize emissions. **Chemical recovery:** Develop/Implement systems to extract and recover chemicals from hazardous waste streams.

5.3.7. Infrastructure & facility management in Basel's life science

Infrastructure in the Basel life sciences sector, including laboratories, hospitals, and research facilities, is highly energy- and resource-intensive. Basel hosts over 1000 medical practices (Comparis, 2024) including 13 hospitals (BS, 2023). Laboratories consume significantly more energy than standard office buildings, with specialized equipment like clean benches requiring up to 1,000 kWh annually per device. Optimizing usage through standby modes and shutdowns during inactivity can reduce their energy consumption by up to a third, highlighting opportunities for improved sustainability in life sciences infrastructure (Wolfgang Richter, 2024).

Laboratory planners and building designers play a pivotal role in integrating sustainability into infrastructure, with significant potential to reduce energy consumption through automated energy management systems, renewable energy sources like solar power, and efficient planning of water and waste systems.

The main challenges include high energy consumption for HVAC and lab equipment, limited recycling facilities for lab-generated waste, and the ecological footprint of construction materials such as concrete and steel. Addressing these challenges requires collaboration between building planners, facility managers, and regulatory bodies to embed CE principles into infrastructure from the outset.

The prioritized to-do list in Table 9 outlines some possible strategies for laboratory and building planners to align infrastructure development with CE goals, ensuring energy efficiency, material recovery, and waste reduction in life sciences facilities.

Table 9: Key factors of influence for infrastructure and facility management

R0 Refuse	**Avoid overuse of non-sustainable materials:** Avoid the use of high-impact materials like concrete and steel in favour of greener alternatives.
R1 Rethink	**Design for circularity:** Integrate renewable energy sources, such as solar power, into building designs to minimize CO_2 emissions. **Design for deconstruction/disassembly (DfD):** Use this holistic approach, that aims to facilitate the deconstruction of buildings or into individual modules, elements, components or materials so that they can be reused, reassembled or recycled.
R2 Reduce	**Energy-efficient HVAC systems:** Invest in advanced heating, cooling, and ventilation systems to decrease energy use in labs and healthcare facilities. **Reduce construction waste:** Use modular construction and prefabricated components to minimize material waste during building projects.
R3 Reuse	**Reuse construction materials:** Reuse materials like mineral wool and steel from building renovations or demolitions.
R4-R6 Repair Refurbish Remanufacture	**Retrofit existing buildings:** Upgrade older buildings with energy-efficient systems and sustainable materials instead of demolishing and rebuilding.
R7 Repurpose	**Utilize surplus construction materials:** Redirect surplus or offcut materials from construction projects for other building needs.
R8 Recycle	**Enhance recycling infrastructure:** Develop systems to recycle materials like mineral wool despite its energy-intensive recycling process.
R9 Recover	**Energy recovery from waste:** Incorporate waste-to-energy systems in building operations to recover energy from unavoidable waste.

5.3.8. Regulatory & associations in Basel's life science

The regulatory systems and industry associations in the Basel region are key enablers of CE practices in the life sciences sector. By setting safety, waste management, and environmental standards, federal (FOEN) and cantonal authorities can drive sustainability, while industry associations like ScienceIndustries, BaselCircular, or Swiss MedTech can advocate for CE initiatives, bridge gaps between stakeholders, and foster collaboration across the value chain.

These systems and associations influence critical areas such as waste disposal, resource efficiency, and the integration of CE principles into operations, infrastructure, and supply chains. They have the potential to incentivize green innovation, encourage local sourcing, and promote inter-industry collaboration, addressing the systemic challenges of sustainability. Their influence is vital because regulations often impact not only life sciences but also other sectors, creating opportunities for broad-scale alignment and shared benefits.

However, significant challenges must be addressed. Regulatory frameworks, often designed for multiple industries, can limit flexibility for sector-specific CE adaptations. Strict safety requirements may hinder material recovery and recycling efforts, while administrative burdens can slow the adoption of sustainable practices. Authorities on federal and cantonal levels cannot enforce CE measures in private organizations, creating a reliance on voluntary compliance. Aligning stakeholders across diverse sectors, government levels, and associations requires coordinated efforts and shared vision.

The prioritized to-do list in Table 10 highlights some possible actionable steps for regulatory systems to foster CE practices in life sciences, ensuring compliance while driving sustainability and innovation across the sector.

Table 10: Key factors of influence for regulatory and associations

R0 Refuse	**Strengthen enforcement of existing regulations:** Enhance the enforcement of regulations limiting single-use plastics and non-recyclable materials in laboratories and healthcare. At the federal level, ensure alignment with hygiene requirements to avoid conflicts and promote practical compliance. **Encourage sustainable procurement:** Encourage public health and research institutions to self-commit and use eco-certified and circular products.
R1 Rethink	**Redesign regulatory frameworks:** Update safety standards to accommodate innovative recycling methods and material recovery without compromising compliance.
R2 Reduce	**Support energy efficiency:** Ensure existing energy efficiency guidelines are current and enforced, emphasizing renewable energy use in healthcare, labs, and manufacturing. Collaborate with stakeholders to support implementation and compliance. **Reduce emissions in supply chains:** Provide incentives for companies to localize supply chains and reduce transport-related emissions, e.g. in the form of location facilitation
R3 Reuse	**Reuse waste streams:** Define framework conditions for the reuse of non-hazardous materials, such as plastics and glass, in secondary applications.
R4–R6 Repair Refurbish Remanufacture	**Promote refurbishment programs:** Provide site relief or consulting for companies that refurbish medical and laboratory equipment to extend product life. **Promote repair over replacement:** Promote prioritizing cost-effective repairs over replacements for high-value devices, including provisions such as extending warranties by an additional year after a successful repair.
R7 Repurpose	**Support industrial symbiosis:** Facilitate collaboration between companies to repurpose waste streams, such as using biopharma waste for energy production or other industrial applications.
R8 Recycle	**Expand recycling mandates:** Establish stricter recycling requirements for hazardous and non-hazardous materials across healthcare and life sciences sectors, including audits and advisory services to guide stakeholders toward compliance and improved recycling practices. **Support and monitor recycling standards:** Assist the life sciences industry in developing medical-grade plastic recycling standards by providing guidance and conducting audits to ensure their effective implementation, focusing on quality and safety compliance.
R9 Recover	**Promote waste-to-energy projects:** Promote projects for waste-to-energy technologies that process life sciences waste sustainably. **Encourage material recovery incentives:** Encourage the recovery of valuable materials like metals and chemicals from waste streams by providing targeted incentives, such as site facilitation for shared hubs that enable collaboration among multiple companies.

5.3.9. Strategic and innovation drivers in Basel's life science (consultancies & startups)

Consultancies and startups in the life sciences sector, particularly in the Basel region, play a vital role in driving innovation and sustainability. These entities provide expertise in areas such as sustainability strategy, operational efficiency, and the adoption of CE principles. Startups act as innovation hubs, introducing disruptive technologies and new business models, while consultancies help established organizations implement these solutions effectively.

The Basel region hosts numerous consultancies and startups focused on pharmaceutical, biotech, and healthcare sectors. These players are uniquely positioned to bridge gaps

between regulatory frameworks, industry practices, and cutting-edge technologies. They can guide companies in conducting lifecycle assessments, optimizing supply chains, and adopting CE strategies such as resource recovery and waste reduction.

In addition to traditional consultancies, startups are transforming the life sciences landscape with innovations like AI-driven drug development, digital health platforms, and 3D bioprinting, while also developing sustainable materials and embedding circularity into their business models from the outset. By offering scalable solutions and fostering cross-sector collaboration, they are fast-tracking the adoption of CE practices.

Challenges include aligning diverse stakeholders on CE goals, securing funding for scalable CE initiatives, and navigating the complex regulatory landscape. However, consultancies and startups have significant potential to influence systemic change through data-driven decision-making, stakeholder engagement, and innovation.

The prioritized to-do list in Table 11 outlines how consultancies and startups can act as catalysts for embedding CE principles into the life sciences industry, fostering innovation, collaboration, and sustainability.

Table 11: Key factors of influence for strategic and innovation drivers

R0 Refuse	**Promote sustainable procurement:** Help businesses adopt procurement strategies prioritizing circular products and services, minimizing waste upstream. **Digitalization for resource optimization:** Implement digital tools, such as AI-driven resource management systems, to identify and avoid inefficiencies.
R1 Rethink	**Innovative business models:** Develop and implement circular business models such as product-as-a-service, shared resource platforms, and digital marketplaces for material exchanges. **Strategic ecosystem building:** Facilitate collaborations across industries to create circular ecosystems, integrating supply chains and waste streams.
R2 Reduce	**Lifecycle assessments (LCAs):** Conduct LCAs to identify opportunities for reducing environmental footprints across product lifecycles. **Optimize packaging design:** Develop innovative packaging solutions that reduce material use while ensuring product integrity, leveraging biodegradable, recyclable, or reusable materials.
R3 Reuse	**Collaborate on reuse strategies:** Foster partnerships between companies to share reusable resources, such as advanced lab equipment, transportation containers, or packaging.
R4-R6 Repair/Refurbish/ Remanufacture	**Modular design consulting:** Work with manufacturers to incorporate modularity into product designs, enabling easier repair and upgrades.
R7 Repurpose	**Industrial symbiosis facilitation:** Connect companies to create symbiotic relationships where one's waste becomes another's resource. **Exploration of new markets:** Encourage startups to explore novel applications for by-products, such as materials for green construction or sustainable textiles.
R8 Recycle	**Recycling infrastructure guidance:** Support the development of recycling systems tailored to the needs of the life sciences sector, such as medical-grade plastic or chemical waste recycling. **AI-driven recycling solutions:** Collaborate with startups using AI to optimize waste sorting and material recovery in recycling processes.
R9 Recover	**Energy recovery systems:** Advise organizations on waste-to-energy technologies that recover value from unavoidable waste. **Material recovery optimization:** Develop strategies for recovering valuable resources, such as rare metals and active pharmaceutical ingredients (APIs), from waste streams.

6. Identification and prioritization of the fields of action for CE in Basel's life science

6.1. Identification of the fields of action for CE in Basel's LS

Building on the sector-specific analysis conducted in chapter 5, which examined circular economy (CE) opportunities along the life sciences value chain, we were able to identify and assess specific project ideas from a functional and value-creating perspective. This foundational work provided key insights and supported the final structuring and clustering of all identified ideas into a more practical and action-oriented framework.

With input from FHNW and ZHAW students, industry professionals, and various research publications, a comprehensive list of CE project ideas for the life sciences sector was developed across multiple industry categories. To enhance clarity and usability, these ideas were systematically grouped into broad clusters based on CE principles, then further refined into specific fields of action, each with short description.

Figure 9 provides a mind map overview, while the complete list is available in Appendix 1.

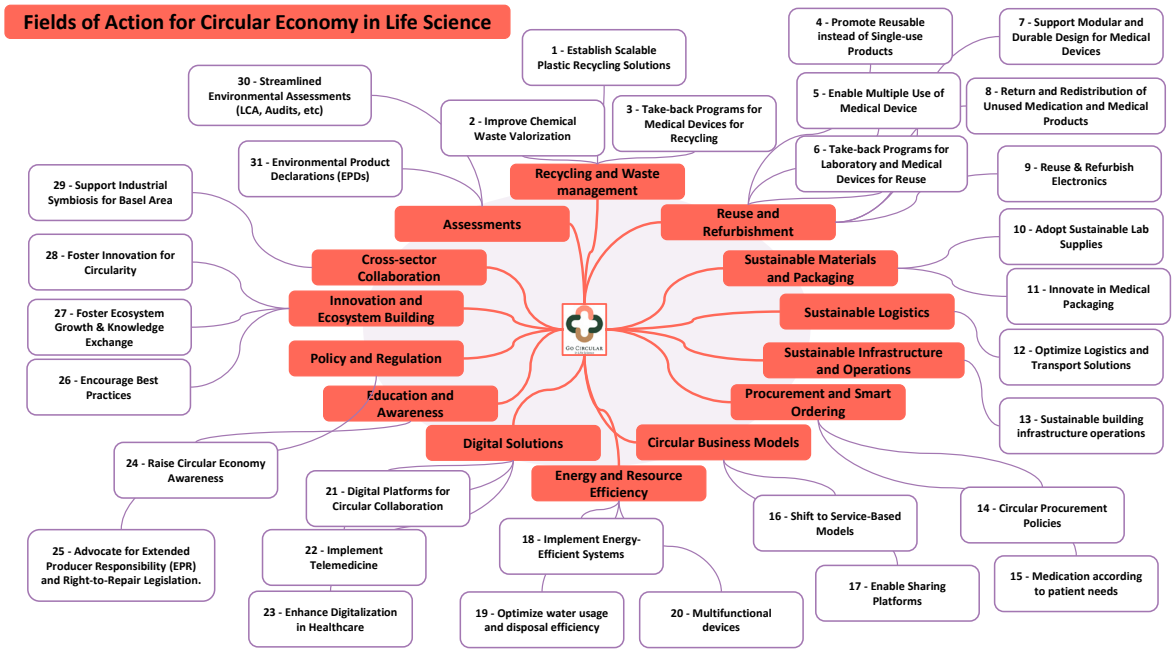


Figure 9: Mind map of the list of identified project ideas

6.2. Prioritization of the fields of action by the key stakeholders

Phase 1: Workshop 30. January 2025

The objective of phase one of this study was to identify and prioritize several most relevant and feasible fields of action including project ideas for the Basel life sciences industry from the mind map shown in Figure 9. To achieve this, a workshop was held on 30th of January 2025 with 51 industry professionals representing the entire value chain outlined in the eco-system analysis in Figure 7. This diverse participation ensured a well-rounded feedback from the industry. During the workshop, participants rated the identified fields of action based on two key criteria: Potential & Feasibility and Need & Interest for their respective companies, providing valuable insights into the most impactful and actionable opportunities. The results of this rating are shown in Table 12.

Figure 10: Picture of workshop held on 30 of January 2025 with 51 industry professionals

Following the rating process, the 10 highest-rated fields of action were discussed in greater depth through break-out sessions during the workshop. Participants were divided into smaller groups, where they reviewed the existing project ideas for each field and provided feedback. The goal was to refine these ideas, identify potential challenges, and generate additional project concepts, ensuring a more comprehensive and well-rounded approach to CE initiatives in the life sciences sector. These inputs were incorporated into the Excel spreadsheet with the list of the fields of action and project ideas (Appendix 1).

High-level Cluster	Fields of Action	Potential & Feasability	Need & Interest	Weighted Score
Education and Awareness	Raise circular economy awareness	4.2	3.9	**4.0**
Innovation and Ecosystem Building	Foster ecosystem growth & knowledge exchange	4.1	4.0	**4.0**
Cross-sector Collaboration	Support industrial symbiosis for Basel area	4.1	3.9	**3.9**
Innovation and Ecosystem Building	Encourage best practices	3.9	3.9	**3.9**
Policy and Regulation	Advocate for extended producer responsibility (EPR) and right-to-repair legislation.	3.8	3.9	**3.8**
Procurement and Smart Ordering	Circular procurement policies	3.8	3.8	**3.8**
Energy and Resource Efficiency	Implement energy-efficient systems	4.2	3.6	**3.8**
Sustainable Infrastructure & Operations	Sustainable building infrastructure operations	3.6	3.9	**3.8**
Reuse and Refurbishment	Take-back and collection programs for laboratory and medical devices for reuse	3.7	3.8	**3.8**
Sustainable Materials and Packaging	Optimize logistics packaging and transport solutions	3.8	3.7	**3.8**
Recycling and Waste Management	Take-back and collection programs for medical devices for recycling	3.75	3.775	**3.765**
Sustainable Materials and Packaging	Adopt sustainable lab supplies	3.5	3.8	**3.7**
Recycling and Waste Management	Establish scalable plastic recycling solutions	3.625	3.675	**3.655**
Innovation and Ecosystem Building	Foster innovation for circularity	3.9	3.5	**3.6**
Reuse and Refurbishment	Reuse & refurbish electronics	3.8	3.5	**3.6**
Reuse and Refurbishment	Promote reusable instead of single-use products	3.4	3.8	**3.6**
Circular Business Models	Enable sharing platforms	3.8	3.4	**3.6**
Digital Solutions	Enhance digitalization in healthcare	3.8	3.4	**3.6**
Sustainable Materials and Packaging	Innovate in medical packaging	3.6	3.5	**3.5**
Digital Solutions	Digital platforms for circular collaboration	3.6	3.5	**3.5**
Reuse and Refurbishment	Return and redistribution of unused medication and medical Products	3.7	3.4	**3.5**

High-level Cluster	Fields of Action	Potential & Feasability	Need & Interest	Weighted Score
Recycling and Waste Management	Improve chemical waste valorization	3.67	3.38	**3.49**
Reuse and Refurbishment	Support modular and durable design for medical devices	3.6	3.4	**3.5**
Assessments	Streamlined environmental assessments (LCA, Audits, etc.)	3.5	3.5	**3.5**
Energy and Resource Efficiency	Optimize water usage and disposal efficiency	3.4	3.5	**3.5**
Circular Business Models	Shift to service-based models	3.6	3.3	**3.4**
Reuse and Refurbishment	Enable multiple use of medical device	3.4	3.3	**3.3**
Assessments	Environmental product declarations (EPDs)	3.4	3.3	**3.3**
Procurement and Smart Ordering	Medication according to patient needs	3.5	2.8	**3.1**
Energy and Resource Efficiency	Multifunctional devices	3.0	3.0	**3.0**
Digital Solutions	Implement telemedicine	3.3	2.7	**2.9**

Table 12: Results from online rating in Workshop held on 30 of January 2025

Phase 2: Shortlisting by the GCiLS board, follow-up workshops with stakeholders

Following the initial workshop in phase two of this study, the GCiLS board analysed the results and leveraged their expertise to derive the top fields of action with the highest implementation feasibility and regional impact. These priority areas will guide the association's efforts in the coming years. To further refine these areas and develop concrete project ideas, a series of follow-up workshops with relevant stakeholders is planned. These workshops will build on the insights gained during the initial workshop, allowing for deeper exploration and targeted project development.

Additionally, on April 28, 2025, a workshop was held at FHNW as part of the event *Transformation of the Life Sciences Industry – New Ways to Make Life Sciences More Circular.* During this session, the prioritized fields of action were presented to participants and used as the basis for discussions. This event provided an opportunity to validate the study's findings, and identify potential partners for upcoming projects.

Figure 11: Photo of workshop held on 28th of April 2025 at FHNW's Transformation of the Life Sciences Industry – New Ways to Make Life Sciences More Circular event

7. Suggested action plan to foster CE in LS in Basel region

Building on the findings of this study and the insights gathered during the stakeholder workshop, the following key fields of action have been identified as priorities for advancing CE initiatives within Basel's life sciences ecosystem.

The prioritisation of these fields was based on the following criteria:

- **Tangible outcomes:** Initiatives that can lead to concrete projects within the next four years.
- **Stakeholder involvement:** Willingness of key actors (industry, research institutions, suppliers, hospitals, etc.) to collaborate on the proposed topics and potentially contribute in-kind or financially.
- **Collaboration potential:** The ability to engage multiple cross-sector stakeholders.
- **Regulatory feasibility:** No major legal obstacles preventing implementation.
- **Financial viability:** A realistic potential for funding through BaselCircular, external sources, or cost-sharing among partnering companies.
- **Scalability:** The potential to expand successful initiatives beyond the Basel region.

Incentives to engage with circular economy topics vary widely across stakeholders and depend on the specific field of action. While some common drivers exist—such as evolving legislation, economic viability, supply chain resilience, cost-saving potential, and reputational or regulatory risk—specific motivations often depend on the company's position in the value chain, internal priorities, and exposure to material or operational risks. For this reason, incentive structures were not used as a standalone criterion in the prioritization process. However, the action plan focuses on areas where stakeholders clearly signaled a willingness to collaborate and where concrete, scalable progress seems achievable within the next four years. Field- and project-specific incentives will be further clarified as GCiLS works with stakeholders and company partners to jointly develop concrete initiatives.

Some of the fields of action that were highly rated by stakeholders (Table 12) have been strategically merged with complementary fields to leverage natural synergies. For example:

- *Foster ecosystem growth & knowledge exchange* has been combined with *Encourage best practices.*
- *Take-back and collection programmes for laboratory and medical devices for reuse* has been merged with *Advocate for extended producer responsibility (EPR) and right-to-repair legislation and Promote reusable instead of single-use products.*
- *Adopt sustainable lab suppliers* has been integrated with *Circular procurement policies*.

On the other hand, some highly ranked fields, such as *Implement energy-efficient systems* and *Sustainable building infrastructure operations*, are not included in this list. We believe that these areas should primarily be addressed by individual companies. Additionally, certain complementary activities related to these fields, such as knowledge sharing, may be covered under other prioritized initiatives.

We are also adding two additional fields to the list that were not highly ranked by stakeholders in the survey: *Establish scalable plastic recycling solutions and Take-back and collection programs for medical devices for recycling.* While these fields may have a relatively lower impact potential (something that still requires further analysis through material flow and life-cycle assessment), they remain a significant topic of discussion among stakeholders and hold promise for a collaborative local solution.

7.1. WORKSTREAM 1: Raise circular economy awareness, foster ecosystem growth and knowledge exchange

The transition to a circular economy (CE) in life sciences cannot be achieved by individual actors alone. It demands a shared mindset, cultural transformation, and coordinated action across sectors and stakeholders. This field of action merges three originally distinct but strongly interconnected areas *(Raise circular economy awareness, Foster ecosystem growth and knowledge exchange, and encourage best practice),* as they collectively form the foundation of meaningful circular transformation.

This combination also reflects stakeholder sentiment: these fields are among the highest ranked in the stakeholder survey, underscoring an urgent need for cross-sector knowledge exchange, inspiration, and actionable insights. CE in life sciences is still evolving, and creating an environment where actors can connect, learn, and co-create is essential for turning ambition into implementation. A **neutral platform such as Go Circular in Life Science (GCiLS) is crucial in enabling this process.** As a trusted coordinator, GCiLS can facilitate collaboration, lower competitive barriers, and help build the shared knowledge base and practices needed to drive systemic change.

Opportunities and possible ongoing activities of GCiLS within this workstream
To unlock the full potential of CE in life sciences, this field of action should focus on:

- **Organize symposiums and events:** Regular symposiums, events, and collaborative workshops bring stakeholders together to share insights, build networks, and spark joint initiatives.
- **Showcase best practices and case studies:** Use Go Circular in Life Science as a central hub to collect, elevate, and give visibility to practical CE examples, while potentially providing the additional resources needed to scale and share them.
- **Enable peer-to-peer learning:** Facilitate connections between companies starting CE initiatives and those with prior experience to exchange practical know-how, avoid pitfalls, and improve implementation success.
- **Initiate road show tours:** Organize educational tours for employees to see best practices in action (e.g., visiting demonstration buildings like K116, NEST Empa).

- **Build multi-actor partnerships:** Form topical intercompany working groups with key suppliers and stakeholders to co-develop scalable CE solutions.
- **Offer tailored CE training for life sciences:** Provide company-specific, hands-on training led by independent experts to support employees, teams, and suppliers in applying circular practices.
- **Promote sector-wide CE qualifications:** Collaborate with universities to establish accredited programs like a CAS in Circular Economy for Life Sciences, building long-term expertise across the sector.

Challenges to address

- **Cultural and mindset barriers:** A successful CE transition requires a significant cultural shift. Overcoming entrenched silo structures between departments and stakeholders is essential to unlock synergies and integrate circular practices across entire organizations and industries.
- **Limited understanding of CE's broader scope:** Many people still associate CE only with recycling or waste management, missing out on upstream opportunities like reducing, rethinking, or refusing. This lack of understanding weakens engagement and narrows potential impact.
- **Fragmented understanding across roles:** Different levels of CE awareness and practical experience between top-level management and operational teams can create disconnects and slow progress.
- **Misalignment of incentives:** Staff, suppliers, and customers may not perceive clear benefits—financial, operational, or reputational—for engaging with CE initiatives, making behavioral change less likely.
- **Lack of support and proven models:** Getting internal approval or funding for CE initiatives is often difficult without proven case studies or internal champions. The absence of well-documented best practices leads to hesitation and inaction.
- **Inexperience and uncertainty:** Even when a project is approved, implementation can feel like navigating uncharted territory. There is often little internal experience with CE projects, making it unclear where to start, how to assess risks, or what steps to follow.
- **Visibility and documentation costs:** Collecting, documenting, and making best practices accessible requires resources, and such efforts are often not prioritized within organizations.
- **Bottom-up bias:** Existing best practices tend to emerge from grassroots efforts rather than strategic leadership, limiting their reach and systemic impact.
- **Knowledge silos and confidentiality:** Competitive pressures and confidentiality can inhibit open sharing of lessons learned. Some companies are reluctant to share findings due to perceived loss of competitive advantage.

Potential projects

- **Develop a stakeholder database** to track key industry contacts, their roles, and ongoing CE initiatives.
- **CE Award in LS:** launch a competition to showcase and reward outstanding circular economy initiatives within companies.

7.2. WORKSTREAM 2 – Support industrial symbiosis in the Basel area

Industrial symbiosis plays a key role in advancing CE goals by enabling resource sharing and collaboration between companies. The Basel area, with its high concentration of life science industries and supporting infrastructure, offers a strategic opportunity to establish a model region for industrial symbiosis. By aligning industrial actors around shared material flows, waste reduction, and resource optimization, Basel can lead the way in building eco-industrial networks that generate economic, environmental, and social value. Stakeholders emphasized the relevance of this field of action due to its strong potential for long-term sustainability, regional resilience, and innovation. Integrating industrial symbiosis into the life science sector can improve supply chain independence, reduce CO_2 emissions, and create qualified jobs—while also connecting Basel to international CE efforts.

Opportunities and potential

- **Regional leadership:** Basel can position itself as a pioneer in industrial symbiosis, setting standards and showcasing scalable models.
- **Resource resilience:** Symbiotic networks enhance local resource availability and reduce supply chain vulnerabilities.
- **Economic and job benefits:** Industrial symbiosis can lower costs, create new revenue streams, and foster green job creation.
- **Cross-sector expansion:** Lessons from the life sciences can be extended to other sectors, such as construction and packaging.
- **International alignment:** Participation in EU networks on CO_2 and hydrogen utilization can strengthen Basel's integration into European sustainability frameworks.

Challenges to address

- **Lack of feasibility studies:** A detailed analysis is needed to identify and prioritize symbiosis opportunities based on material flows, infrastructure, and regulatory feasibility.
- **Limited data transparency:** Companies may hesitate to share resource and waste flow data due to confidentiality concerns.
- **Value chain complexity:** Introducing new intermediaries, ensuring scalability, and aligning economic incentives across companies remains challenging.
- **Market acceptance and business models:** Products and processes derived from industrial symbiosis may face uncertain demand. Clear revenue models are required.

Potential projects

- **Conduct an in-depth material flow and lifecycle assessment** for the regional healthcare and life science sector to identify high-impact circular opportunities. As part of this analysis, identify projects and initiatives related to industrial symbiosis, carbon utilization, and recycling in the region.
- Based on the analysis, **initiate working groups with relevant stakeholders on board** to define an action plan and first collaborative projects to develop eco-industrial parks in the Basel area.

  i.e. Launching a pilot project focused on a specific material stream, such as carbon. The "Keep Carbon in the Loop" program aims to capture, reuse, and optimize carbon flows through cross-sector partnerships and infrastructure enhancements.

7.3. WORKSTREAM 3 – Reuse & repair

This workstream combines three strongly related field of action: *Take-back and collection programs for reuse, Promoting reusable products over single-use items*, and *Advocating for extended producer responsibility (EPR)* and *right-to-repair Legislatio*n. These fields naturally reinforce each other—reuse requires circular-friendly design and extended service models; take-back programs enable second-life pathways; and EPR regulations ensure producers share responsibility for equipment beyond its first use.

Medical and laboratory equipment is frequently discarded long before reaching the end of its functional life. Whether due to internal policies, lack of reuse infrastructure, or regulatory barriers, many devices are underutilized and generate unnecessary waste. According to recent ecosystem analyses, thousands of reusable devices are disposed of prematurely each year in the Basel region alone. For example, it is estimated that up to 90% of single-use surgical instruments used in Swiss hospitals could be substituted with reusable alternatives (Mahmood Bhutta et al., 2023).

Basel has the potential to pioneer scalable reuse systems that reduce environmental impact and foster resource efficiency. With over 700 life sciences firms and 400 biotech companies in the region (BaselArea 2, 2024)—and global players like Roche sourcing from more than 56,000 suppliers (Roche 2, 2024)—there is a substantial volume of medical and laboratory devices in circulation. These supply chains account for more than 50% of total healthcare emissions (SMI, 2022). Meanwhile, packaging materials and single-use instruments, including blister packs and plastic labware, are major contributors to healthcare waste, with only a fraction currently being recycled or reused.

As EPR regulations evolve, particularly in the EU and UK, they are expected to shift from basic compliance costs toward more nuanced responsibilities—modulated fees based on environmental impact and possibly service requirements. Basel's life science sector can lead by shaping business models and infrastructure that go beyond minimum compliance, strengthening competitive positioning and regional sustainability. Combined, these strategies encourage systemic change and align economic incentives with environmental outcomes.

Communicate and promote

- Promote the environmental and financial benefits of reuse programs through awareness campaigns targeted at procurement teams, technicians, and sustainability officers.
- Share case studies and success stories from companies that have implemented device-as-a-service (DaaS) or reuse models.
- Raise awareness of the risks of unregulated donation or resale—emphasizing that responsible reuse must include serviceability, spare parts availability, and ethical considerations.
- Highlight how shared ownership, inventory platforms, and lifecycle planning reduce costs and increase operational efficiency.
- Advocate for shared warranties, liability frameworks, and regional servicing capabilities to support multi-use ownership models.
- Require manufacturers to manage the entire lifecycle of their products, including recycling and disposal.

- Advocate for policies requiring manufacturers to provide repair options for medical devices, including access to replacement parts and manuals.

Challenges to address

- **Lack of market offer for leasing models despite user interest:** In direct stakeholder discussions, companies expressed interest in leasing or product-as-a-service models for lab and medical equipment. However, no such offers currently exist. At the same time, producers may hesitate to propose such models without clear market demand. This creates a chicken-and-egg problem. A dialogue between producers and users must be initiated to explore pilot projects and develop viable business cases.
- **Unclear EPR implementation pathways:** The structure of future EPR systems is uncertain. If obligations only take the form of taxes without physical take-back requirements, this may lead to higher product costs rather than improved reuse or recycling.
- **Logistics and coordination gaps:** Returning equipment to its original point of manufacture is not feasible in most cases. New logistics schemes are required to consolidate return flows and manage them regionally.
- **Lack of shared responsibility frameworks:** Circular solutions must include shared responsibility across producers, suppliers, and end users. EPR design should reflect this to avoid unfair cost burdens.
- **Internal policies and compliance constraints:** Some companies have strict rules against donating or reselling equipment, even if still functional. Legal, compliance, and liability concerns create resistance to reuse.
- **Warranty and liability questions:** Unclear ownership and responsibility between original producers, buyers, and secondary users complicate reselling or donating devices.
- **Lack of reuse business models:** Current market structures rarely support multi-user ownership or resale. New ecosystems and shared inventory models are needed.
- **Maintenance and servicing abroad:** Equipment sent to other regions may lack access to spare parts or service providers, making reuse cost-prohibitive or non-compliant.
- **Regulatory challenges:** Even working equipment may no longer meet updated technical standards, limiting options for resale or donation across borders.
- **End-of-life responsibility:** Once devices can no longer be reused, clear frameworks are required to ensure proper recycling and avoid disposal.

Potential projects and analyses

- **Conduct analysis that will support the implementation of reuse programs:**
  - Analyze and consolidate existing reuse and take-back solutions, inform companies about available options, and initiate regional dialogue to determine the most scalable, efficient, and collaborative platform.
  - Conduct a material “pain point” study to identify problematic components such as blister packaging and develop targeted circular solutions.
  - Conduct a business case analysis for device-as-a-service models in the life science sector.
  - Map the process of reselling or donating equipment across multiple institutions to identify enablers and barriers.
  - Launch a pilot project identifying specific devices with high reuse potential and develop leasing or refurbishment partnerships with suppliers.
  - Map full equipment lifecycle from procurement to disposal and assess points of intervention to extend lifespan and improve circularity.
  - Categorize devices by technological complexity to determine best-fit reuse, resale, or recycling strategies.

- **Shifting from single use to reuse in hospitals and labs:**
  - Shift to reusable surgical gowns in hospitals.
  - Shift from single-use to reusable lab coats for laboratory visitors.
  - Shift from single-use to reusable laboratory consumables (e.g. glass instead of plastic).
  - Promote plastic-free screening tests.
  - Promote reusable medical devices/equipment (e.g. inflation devices for cardiology).
  - Create training modules and procurement guidelines that promote reusable alternatives to common single-use items.
- **Develop in-house or regional inventory and reuse platforms** to track, share, and repurpose laboratory and medical equipment across departments and sites, enabling equipment exchanges within and between companies.
- **Create cross-industry working groups** to coordinate EPR and reuse strategies, including local partnerships with recyclers and logistics providers.
- **Develop EPR pilot schemes** that test shared-cost and shared-responsibility models across the value chain.
- **Launch a modular design program** to support producers in creating dismantle-friendly and repairable medical equipment.
- **Expand procurement criteria to include full product lifecycle costs,** including maintenance, service, and end-of-life treatment.
- **Develop a stakeholder partnership pool** to support donation programs, ensuring serviceability, traceability, and shared costs.
- **Create training modules and procurement guidelines** that promote reusable alternatives to common single-use items (e.g. lab coats, surgical gowns, glass labware).

7.4. WORKSTREAM 4 – Sustainable lab consumables and circular procurement policies

Laboratories, production facilities, and hospitals are resource-intensive environments, consuming large volumes of energy, water, and materials—particularly single-use plastics. Embedding CE principles into procurement processes is key to reducing their environmental impact and improving the long-term sustainability of purchasing decisions.

Stakeholder workshops revealed a clear consensus: the life science sector urgently needs better access to sustainable alternatives, more credible assessment tools, and centralized procurement guidance. Time and again, participants voiced the need for a digital solution—such as a searchable database of sustainable lab consumables and suppliers—to support better, faster decision-making. Procurement teams, especially in large institutions like university hospitals, face fragmented systems and inconsistent ordering practices, leading to duplication, waste, and inefficiency.

Moreover, integrating circularity into procurement policies helps address Scope 3 emissions and the broader environmental footprint of value chains. By shifting to leasing models (Product-as-a-Service), prioritizing lifecycle assessments (LCAs), and standardizing data sharing, procurement can evolve into a powerful lever for sustainability.

To ensure transparency and credibility, there is also a need to develop trustworthy scoring systems—similar to a "nutriscore" for life sciences—that aggregate environmental and social performance of products and suppliers. Such tools would significantly reduce the administrative burden of product evaluations, especially for SMEs, and allow for informed comparisons within existing procurement platforms.

Challenges to address

- **Lack of digital solutions to navigate sustainable lab purchasing:** The need for a centralized, credible, and user-friendly database of sustainable lab consumables was mentioned repeatedly in stakeholder discussions. Procurement professionals are currently overwhelmed by scattered, unverified options and lack time or expertise to vet them effectively.
- **Higher cost and performance uncertainty:** Bio-based or recycled consumables are often more expensive and raise concerns about quality, reliability, and regulatory compliance.
- **No supplier-side offer for leasing models:** Although customers express interest in product-as-a-service solutions, suppliers are hesitant without visible demand, creating a chicken-and-egg dynamic.
- **Lack of standardization and data sharing:** Suppliers face a flood of differing requests for sustainability information. The absence of unified standards and databases makes procurement inefficient and inconsistent.
- **Fragmented ordering systems and surplus:** In large institutions, uncoordinated procurement systems cause unnecessary duplication, excess inventory, and avoidable waste.
- **Tension between environmental and social criteria:** Procurement decisions must increasingly navigate trade-offs—e.g., recycled materials that are harder to certify as conflict-free.
- **Resistance to change:** Without clear proof of performance and compliance, labs are hesitant to trial sustainable alternatives.

Potential projects

- **Initiate a lab-focused assessment project for sustainability tools:** Conduct a landscape analysis of existing tools, platforms, and labels for lab consumables. Share insights through the *Go Circular in Life Science* platform to support more informed and aligned decision-making.
- **Explore funding opportunities for lab-specific data-driven solutions:** Reach out to initiatives like the Sustainable Markets Initiative (SMI) to fund the development or evaluation of credible LCA-based lab procurement tools.
- **Develop a digital database of sustainable lab products and suppliers:** Create or contribute to a centralized platform listing certified sustainable consumables, equipment, and packaging, complete with LCA data.
- **Build a smart procurement platform integrating a sustainability scoring system:** Design a product evaluation framework (e.g. "nutriscore" for life sciences) that combines product-level and company-level data into one comparable score.
- **Launch a cross-stakeholder working group to map procurement challenges:** Include hospitals, producers, SMEs, and regulators to co-create a framework that meets both supplier and buyer needs.
- **Design a standardized data-sharing protocol:** Take inspiration from the automotive sector to create templates that ease supplier burden and improve transparency.

- **Develop a smart-ordering and inventory system:** Track expiry dates, reduce duplication, and align department-level procurement practices in large institutions like university hospitals.
- **Support centralized procurement hubs and services:** Promote bulk purchasing and shared-use services (e.g. media kitchens) to reduce packaging and transport emissions.
- **Establish strict procurement guidelines:** Set internal rules to eliminate non-essential packaging and prioritize vendors with certified sustainable sourcing.

7.5. WORKSTREAM 5 – Establish scalable plastic recycling solutions and take-back programs for medical devices for recycling

While these fields of action (*Establish scalable plastic recycling solutions* and *Take-back and collection programs for medical devices for recycling*) were not ranked among the top priorities in the stakeholder survey, they consistently emerged as major discussion points during workshops. Stakeholders frequently highlighted the challenge of growing plastic waste streams and the absence of practical, scalable recycling solutions. Despite the complexity, this is a challenge that can be tackled at the regional level, offering potential for collaborative local initiatives involving shared infrastructure, regulatory support, and advanced recycling technologies, especially in the context of medical devices where plastic and metal recovery remains underutilized.

Circular redesign of medical devices, aligned with take-back and recycling strategies, could help close the loop. These strategies should be co-developed with manufacturers, regulators, and users and waste management companies ensuring compliance and quality, while addressing the need for shared responsibility and viable financial models.

Challenges to address

- **No shared take-back or collection infrastructure:** There is currently no consistent system to collect used medical devices or sort single-use plastics at scale across facilities.
- **Lack of data and transparency:** Without clear data on material flows, device volumes, and waste composition, it is difficult to design viable recovery and recycling programs.
- **Regulatory and compliance barriers:** Many medical plastics are classified as hazardous waste by default, limiting recycling options unless proper assessment, decontamination or redesign is achieved.
- **Limited economic incentives:** Take-back schemes are often financially unviable without subsidies or shared-cost models, especially in low-volume contexts.
- **Redesign requirements and IP (Ingress protection) barriers:** Enabling recycling often requires design changes, including simplified or mono-material products—yet redesign can be costly and complicated by existing patents.

Potential projects

- **Map and assess current take-back and recycling programs in Switzerland:** Conduct a baseline analysis of what types of medical devices and plastics are currently collected, how they are treated, and where gaps exist.

- **Pilot a regional sorting and decontamination facility:** Test scalable technologies such as optical sorting, mechanical separation, or chemical cleaning for non-contaminated and hazardous plastics.
- **Develop collaborative take-back schemes for medical devices for recycling:** Focus on single-use injection systems and complex on-body injectors. These schemes should be co-designed with industry and regulators to enable disassembly, material separation, and the safe redirection of plastics and metals into certified recycling streams, in compliance with regulatory requirements.
- **Build business cases and shared responsibility models:** Identify financial incentives, cost-sharing mechanisms, and potential policy support for collection and recycling.
- **Promote redesign for recyclability:** Host workshops and co-creation sprints with manufacturers to explore device designs that allow easier disassembly, material recovery, and less material mixing.
- **Collect and recycle valuable materials from hospitals:** Set up targeted programs to capture high-value materials like titanium from healthcare facilities for reuse through advanced manufacturing.
- **Explore partnerships for pyrolysis or chemical recycling:** Analyse opportunities to collect non-contaminated plastics regionally and feed them into FDA/EMA (Food and Drug Administration/European Medicines Agency)-compliant pyrolysis oil production.
- **Update safety and recycling standards:** Work with regulatory bodies to allow for safe recycling pathways without compromising compliance.

7.6. WORKSTREAM 6 – Foster innovation for circularity

While this field of action was not ranked among the top priorities by stakeholders, *Go Circular in Life Science* sees fostering innovation for circularity as a core part of its mission. Startups, SMEs, and intrapreneurs are vital drivers of change and experimentation in the CE. Supporting these players helps introduce new business models, technologies, and infrastructure that can be scaled across the life sciences sector. For this reason, we believe it is important to initiate at least one targeted project in this field in the mid-term.

Startups, SMEs, and intrapreneurs within large organizations are key drivers of innovation in CE solutions. Their agility, creativity, and willingness to test new models position them as crucial players in transforming the life sciences sector. However, these actors face significant barriers to bringing circular ideas to scale—particularly in a highly regulated and risk-averse industry.

During stakeholder workshops, participants emphasized the importance of targeted support to foster innovation. This includes not only funding but also structured opportunities for visibility, validation, and connection with established industry players. Collaborative experimentation spaces and circular demonstration projects were also identified as crucial mechanisms to accelerate adoption.

Circular innovation also requires infrastructure and shared learning environments where new solutions can be tested and refined. In this context, Basel has the potential to become a leading testbed for circular life science infrastructure—offering scalable, real-world insights for the broader industry.

Challenges to address

- **Lack of dedicated funding for circular innovation in life sciences:** Most available funds focus on digital health or biotech, leaving circular infrastructure, reuse models, and sustainable design under-supported.
- **Regulatory and compliance barriers:** Startups must navigate complex standards early on, increasing development time and cost.
- **Limited visibility and integration with industry:** Smaller actors often face challenges in accessing procurement systems, forming partnerships with larger companies, or participating in pilot projects.
- **High initial cost and risk for pilot infrastructure:** There is little support for testing circular building designs or shared reuse services in real-world settings.

Potential projects

- **Organize a circular innovation competition:** Celebrate impactful intrapreneurship and startup-led CE solutions through a high-profile event, fostering visibility, recognition, and investor interest.
- **Design and build a fully circular, resource-efficient lab prototype:** Apply GreenLab principles to co-create a modular, flexible laboratory space in Basel with multi-stakeholder input. Use it as a demonstrator and learning hub for future projects.
- **Launch a dedicated innovation fund for circular solutions in life sciences:** Provide seed funding for startups and SMEs developing CE-related products, services, or infrastructure.
- **Establish an incubator or accelerator program focused on CE in life sciences:** Offer mentorship, infrastructure access, and regulatory support tailored to circular innovators.
- **Create a matchmaking platform for startups and industry:** Facilitate partnerships, pilot projects, and procurement opportunities between small innovators and large healthcare or pharma actors.

8. Conclusion and invitation to collaborate

This analysis highlights six priority workstreams with strong potential to advance the circular economy in Basel's life sciences sector. These workstreams offer practical entry points for companies, research institutions, healthcare providers, and other stakeholders to jointly address environmental, economic, and social challenges.

1. The six priority workstreams

1. **Raise circular economy awareness, foster ecosystem growth and knowledge exchange**
   Building the knowledge, skills, and cross-sector connections needed to accelerate circular transformation across the industry.

2. **Support industrial symbiosis in the Basel region**
   Enabling resource-sharing and collaboration between companies to improve efficiency, strengthen resilience, and reduce environmental impact.

3. **Enable reuse and repair of medical and laboratory equipment**
   Reducing waste by extending product lifecycles through take-back systems, service models, and reusable alternatives to single-use products.

4. **Promote sustainable lab consumables and circular procurement policies**
   Supporting better purchasing decisions by improving access to sustainable products, data transparency, and circular procurement practices.

5. **Establish scalable plastic recycling solutions and take-back programs for medical devices for recycling**
   Developing collaborative systems to address the growing challenge of medical and laboratory plastic waste.

6. **Foster innovation for circularity**
   Supporting startups, SMEs, and intrapreneurs to develop, test, and scale new circular business models, technologies, and infrastructure.

2. Moving forward together

Realising the potential of these workstreams requires joint action. No single organisation or company can achieve the transition to a circular economy alone. It calls for collaboration across industry boundaries, bringing together diverse expertise and perspectives to co-develop and implement practical solutions.

Both BaselCircular and Go Circular in Life Science (GCiLS) can play an important role in enabling this collaboration environment, by supporting ecosystem development, facilitating partnerships, and fostering the practical implementation of circular economy in the Basel region. BaselCircular, with its mission to strengthen the innovation ecosystem for circular economy, and GCiLS, as a neutral platform and community builder for the life sciences sector, together provide the foundation needed to move from intention to action.

Importantly, this analysis not only identifies priority workstreams but also presents a concrete list of suggested projects and activities for each field of action. These project ideas—developed with and validated by stakeholders—serve as a solid starting point for practical collaboration in all six workstreams.

Continued investment and long-term funding will be essential to maintain momentum, build capacity, and move from strategy to implementation. Strengthening the ecosystem and achieving real impact requires reliable support for coordination, stakeholder engagement, and the development of collaborative projects.

3. Action plan for Go Circular in Life Science

Based on the findings of this analysis, GCiLS has developed an action plan (Figure 13) that reflects its mission and capabilities.

The action plan distinguishes three levels of engagement:

- **Core activities:**
  The first and sixth workstreams—*raising awareness, fostering knowledge exchange* and *ecosystem growth and supporting innovation for circularity*—are natural core activities of GCiLS. These activities strengthen the ecosystem and lay the groundwork for collaboration across all other priority areas.

- **Thematic fields of action:**
  GCiLS is well positioned to facilitate and coordinate collaboration in the other four workstreams. This includes building and guiding multi-stakeholder working groups, supporting co-creation processes, and helping develop practical projects with partners from industry, research, and healthcare.

- **Projects and studies:**
  In addition to ecosystem-level activities, GCiLS offers to work directly with individual companies or consortia to design and implement specific circular economy projects. GCiLS can also commission targeted analyses and research studies to generate insights and create a knowledge base that supports further project development and implementation in the identified priority areas.

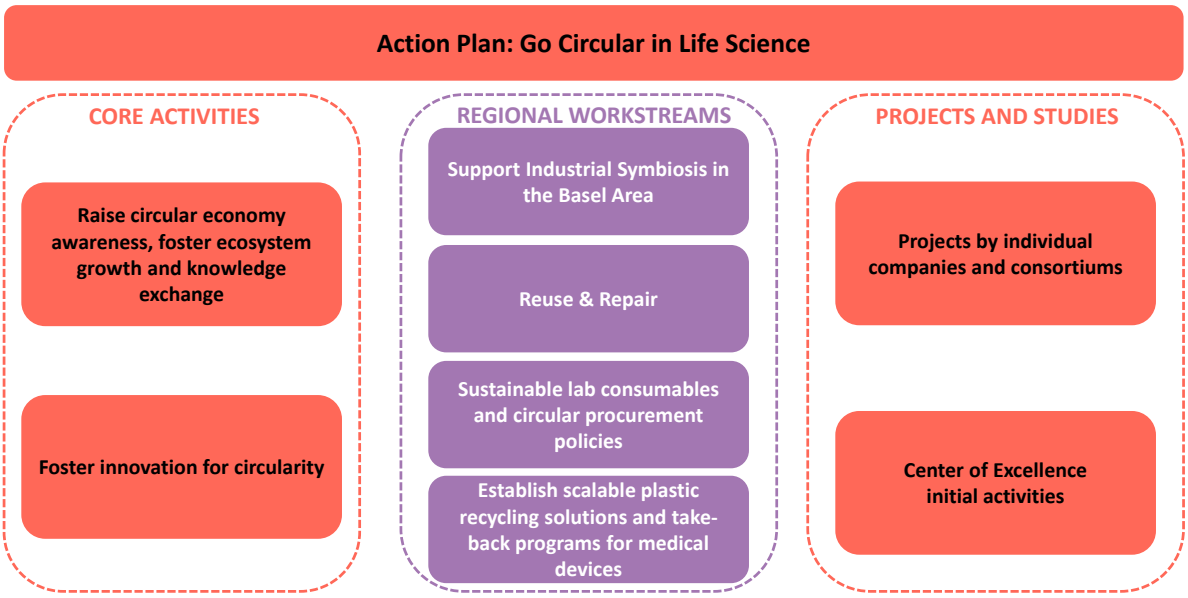


Figure 12: Action plan to foster CE in Life Science in Basel region

4. Join us in shaping the next steps

We invite all interested stakeholders—including industry leaders, suppliers, healthcare providers, researchers, policymakers, and solution providers—to join us in shaping and advancing the circular economy in the life sciences sector. Whether through collaboration in working groups, joint projects, or research partnerships, your engagement is key to turning these opportunities into real impact.

9. List of acronyms

Acronym	Description
API emissions	Active Pharmaceutical Ingredient emissions
CE	Circular Economy
DfD	Design for Deconstruction/Disassembly
DfE	Design for the Environment
EFPIA	European Federation of Pharmaceutical Industries and Associations
EIP	Eco-industrial parks
EMA	European Medicines Agency
EU	European Union
FDA	Food and Drug Administration
FHNW	Fachhochschule Nordwestschweiz
FOEN	Federal Office for the Environment
GCiLS	Go Circular in Life Science
HKBB	Handelskammer beider Basel
HVAC	Heating, Ventilation and Air Conditioning
IP	Ingress protection
LCA	Lifecycle Assessment
MFA	Material Flow Analysis
MedTech	Medical Technology
PGMs	Platinum Group Metals
R&D	Research & Development
SMEs	Small and Medium Enterprises
ZHAW	Zürcher Hochschule für Angewandte Wissenschaften

10. List of figures

11. List of tables

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13. Appendix 1 – List of identified clusters, fields of actionand project ideas

High-level Cluster	#	Fields of Action	Description	Concrete project ideas
Recycling and Waste Management	1	Establish scalable plastic recycling solutions	Develop regional solutions for scalable collection of plastics, including pyrolysis and advanced recycling technologies.	Build an automatic (optical, mechanical, chemical) plastic sorting machine in the region.
				Develop solutions for pyrolytic treatment of plastic waste (Non-hazardous).
				Develop solutions to decontaminate hazardous plastic waste to enable recycling.
				Develop products designed for recycling.
				Analyse the potential for scalable collection system for single-use plastic waste, intended for pyrolysis (or similar chemical recycling methods) across different companies in the region, which may offers several advantages: cost efficiency; resource optimisation; regulatory compliance: e.g. have one company which offers a scalable solution for producing FDA/EMA-compliant pyrolysis oil while the regional or federal authorities can help with location facilitation.
				Collect non-contaminated plastics from laboratories and healthcare facilities for recycling instead of incineration, using sorting and decontamination technologies.
Recycling and Waste Management	2	Improve chemical waste valorization	Recycle and reuse chemicals and solvents via methods like distillation and filtration to minimize waste and reduce costs.	Develop solutions for solvent valorization from laboratories (especially for mixed, low-values fractions) instead of incineration. For example, distillation, filtration, removal of water fraction for use as alternative fuel or application for another use (downcycling).
				Develop solutions to collect/extract, recycle or repurpose specific chemicals or by-products from (hazardous) waste streams.
				Reuse of catalysts.
				Develop/Implement systems to extract and recover chemicals from hazardous waste streams for reuse in industrial processes.

High-level Cluster	#	Fields of Action	Description	Concrete project ideas
Recycling and Waste Management	3	Take-back and collection programs for medical devices for recycling	Organise collaborative take-back schemes or collection programs for medical systems and devices to ensure recycle and reuse of materials.	Develop solutions integrating take-back schemes, disassembly and recycling for single-use injection systems (i.e. injection pens, complex on-body injectors).
				Develop solutions integrating take-back schemes, disassembly and recycling of medical devices.
				Update safety standards to accommodate innovative recycling methods and material recovery without compromising compliance.
				Convert non-hazardous organic waste into compost or energy resources like biogas.
				Mapping and assessment of already existing collection systems in CH for different types of medical devices.
				Inclusion of more stakeholders in design discussions; Education on redesign to simplify material collection/separation.
				Development of shared responsibility financial models – who pays? Equity model?
				Collect metals like titanium from medical practices and hospitals for reuse through advanced manufacturing techniques.
Reuse and Refurbishment	4	Promote reusable instead of single-use products	Change paradigm from single-use products to multiple-use solutions in laboratory, production and healthcare settings.	Shift to reusable surgical gowns in hospitals.
				Shift from single-use to reusable lab coats for laboratory visitors.
				Shift from single-use to reusable laboratory consumables (e.g. glass instead of plastic).
				Plastic free screening tests.
				Reusable medical devices/ equipment (e.g. inflation device for cardiology).
Reuse and Refurbishment	5	Enable multiple use of medical device	Develop schemes for reusing various medical devices such as surgical instruments (i.e. metal scissors) and endoscopy equipment.	Implement in-house or service-based systems to replace single-use medical devices with reusable alternatives, including robotic surgery instruments, metal scissors, endoscopy tools, and interventional catheters. This shift requires addressing sterilization protocols, regulatory approvals for reprocessing single-use devices, logistical capacity, and certification requirements. Developing efficient sterilization and washing solutions will be key to enabling a broader adoption of reusable medical instruments.
				Refurbish used medical devices to be reused in other countries or for new purposes.

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Reuse and Refurbishment	6	Take-back and collection programs for laboratory and medical devices for reuse	Valorize various used lab equipment and medical devices through refurbishment programs, selling/ donating them externally to other companies or universities.	Develop in-house or regional solutions for laboratory equipment exchanges within the company.
				Collect, recondition and resell used laboratory equipment in good conditions through marketplaces platforms such as Equipnet, labexchange, etc.
				Assess the feasibility of leasing instead of purchasing medical devices by collaborating with suppliers. Map the resale/donation process across multiple entities to identify barriers and enablers for efficient equipment transfers.
				Develop solutions integrating take-back schemes for medical devices (i.e. surgical staplers).
				Establish intra-company inventory and reuse platforms to track, share, and repurpose purchased equipment across departments.
Reuse and Refurbishment	7	Support modular and durable design for medical devices	Encourage the development of durable modular and recyclable MedTech devices to facilitate maintenance, repair and component replacement, reuse and disassembly (for labs, hospitals).	Focus on repairing and upgrading existing infrastructure (e.g. surgical lasers, X-ray machines and wheelchairs) to delay replacements and minimize resource consumption.
Reuse and Refurbishment	8	Return and redistribution of unused medication and medical products	Develop structured take-back programs for unused medications and medical supplies to prevent unnecessary waste.	Collect non-expired medication from hospitals and pharmacies to redistribute.
				Develop solutions to test medication and extend expiration dates.
				Reuse medical kits for clinical trials.
Reuse and Refurbishment	9	Reuse & refurbish electronics	Promote the second life and refurbishment of equipment, including IT and electronic waste.	Promote prioritizing cost-effective repairs over replacements for high-value devices, including provisions such as extending warranties by an additional year after a successful repair.
Sustainable Materials and Packaging	10	Adopt sustainable lab supplies	Transition to bio-based and more sustainable materials for lab equipment, emphasizing reusable options.	Develop low-cost bio-based or recycled material based consumables and equipments.

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Sustainable Materials and Packaging	11	Innovate in medical packaging	Develop bio-based or recycled-based secondary packaging for medicines, replacing paper inserts with digital solutions like QR codes.	Use alternative material for packaging (e.g., certified renewable and recycled materials).
				Reduce the amount of packaging required, optimize packaging size.
				Replace paper inserts with QR codes.
				Standardisation of packaging by collaboration between Pharma companies and big logistic players, fair collaboration.
				Bio-based or alternative materials for secondary and tertiary packaging.
				Design packaging for recyclability (e.g., use less different materials).
Sustainable Logistics	12	Optimize logistics and transport solutions	Improve the footprint of transportation from suppliers to laboratories or hospitals, waste logistics, as well as pharma products to hospitals.	Reusable Shipping boxes: Collaborate with suppliers and customers to implement compatible, reusable shipping boxes for laboratory supplies to reduce waste and to promote sustainability across the supply chain for different temperatures (e.g., Softbox).
				Introduce reusable containers for medical and laboratory waste collection.
				Algorithm to optimize the transport, storage and bulk ordering across multiple users.
				Manufacture at point of use where possible.
				Promote combined transport solutions that leverage multiple modes (e.g., rail and road) for efficiency.
				Replace traditional vehicles with electric or hybrid alternatives to reduce fuel consumption and emissions.
				Educating the customers, hospitals e.g. to share warehouses.
				Green Logistics: Optimisation towards net-zero transport from production place to consumer (including plane, packaging, etc.).

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Sustainable Infrastructure & Operations	13	Sustainable building infrastructure operations	Adopt sustainable and modular construction and retrofitting techniques for laboratories and hospitals, incorporating energy-efficient layouts, sustainable materials, and infrastructure for recycling and waste reduction. Promote green principles by reusing and refurbishing equipment, designing dynamic modular spaces for evolving needs, and ostering shared workplaces and labs.	Upgrade older buildings with energy-efficient systems and sustainable materials instead of demolishing and rebuilding.
				Implementing effective waste management practices in hospitals.
				Reuse materials like mineral wool and steel from building renovations or demolitions.
				Use modular construction and prefabricated components to minimize material waste during building projects.
				Plan infrastructure to enable user-friendly use of reusable solutions (e.g., washing & sterilisation installation, storage).
				Design for Deconstruction/Disassembly (DfD): Use this holistic approach, that aims to facilitate the deconstruction of buildings or into individual modules, elements, components or materials so that they can be reused, reassembled or recycled.
				Establish clear, industry-recognized guidelines for implementing circular building infrastructure; Align with existing or emerging international standards like ISO TC 336.
				Provide structured insights and recommendations to influence decision-making and policy development by drafting position papers addressing key topics.
				Consider lifecycle calculation for buildings, not only investment but also maintenance, repairs, energy.
				Ensure that key decision-makers (buyers, procurement teams, facility managers) understand and implement circular building principles.
				Create buildings that create more energy than they use over time.
				Create a regional platform for discussion, collaboration, and problem-solving on circular infrastructure; Ensure broad stakeholder involvement and exchange best practices, resolve conflicts, and push for common standards.
				Avoid the use of high-impact materials for lab constructions, like concrete and steel, in favour of greener alternatives.

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Procurement and Smart Ordering	14	Circular procurement policies	Integrate circular economy principles into procurement for laboratories, production facilities, and hospitals by emphasizing sustainability, longevity, end-of-life management, and smart ordering standards informed by LCA and a "nutriscore" for life science products.	Develop a sustainability label to compare products for their sustainability aspects and facilitate procurement.
				Integrate the waste management cost to the procurement.
				Establish strict procurement guidelines that prioritize waste reduction at the source, such as banning non-essential packaging and enforcing sustainable sourcing criteria.
				As the first step, get a 360° view of all stakeholder challenges to ideally design a framework that addresses both customer and supplier needs.
				Design a standard for data sharing (look at the automotive industry for inspiration).
				A software that compares products with a 'score' (based on both product and company level data) that works into already existing procurement processes.
				Develop a unified system to track expiration dates and streamline ordering processes. Implement smart-ordering solutions to reduce waste and duplication, ensuring alignment across departments, as seen in hospitals like Unispital.
				Promote solutions such as bulk ordering and media kitchen.
				Integrate green chemistry principles to rethink traditional experimental setups, prioritizing resource efficiency and minimizing waste.
				Streamline food logistics to reduce food waste in hospital cafeterias and patient meal services.
Procurement and Smart Ordering	15	Medication according to patient needs	Adapt medication distribution through pharmacies to only distribute the required amount (not a whole box if only two tablets are required).	Sell only required doses at pharmacies.
				Bulk ordering of medicine and dispensing it to patients according to their needs in reusable boxes.
				Develop an app to manage home pharmacy inventory, similarly to wine cellars.
				Prescribing medicines in specific quantities and frequencies, which can smooth out the demand for specific medications.
				Develop reusable packaging to distribute only required doses by pharmacies.

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Circular Business Models	16	Shift to service-based models	Promote leasing and renting equipment with included maintenance to extend product life cycles and reduce ownership costs.	Equipment as-a-service.
				Laboratory equipment and supply as-a-service.
				Chemical Leasing.
Circular Business Models	17	Enable sharing platforms	Develop platforms to facilitate the sharing, renting, or exchange of underutilized medical and laboratory equipment, as well as chemical inventories, across facilities and companies.	Develop a regional marketplace for common goods among multiple stakeholders.
				Internal solutions to enable exchange within companies and institutions, coupled with procurement platforms.
Energy and Resource Efficiency	18	Implement energy-efficient systems	Upgrade hospital and lab infrastructure with LED lighting, thermal insulation, and renewable energy sources to reduce energy consumption.	Implement smart systems to shut down inactive devices and reduce standby energy consumption/downtime.
				Optimize air-change rates and fume hoods to minimal requirements.
				Optimize waste heat recovery.
				Redesign workflows in hospitals to reduce waste and energy use, particularly in operating rooms and intensive care units.
				Integrate renewable energy sources, such as solar power, into building designs/ infrastructure to minimize CO_2 emissions.
				Every project with higher investment should go through an energy challenge; establish Energy Savings Teams with members of all departments.
				Develop systems to recover energy from lab devices and HVAC systems.
Energy and Resource Efficiency	19	Optimize water usage and disposal efficiency	Optimize water usage through multiple loops, water reuse schemes or consider wastewater treatments as alternatives to incineration of water.	Recover and recycle water from pharmaceutical production processes to reduce freshwater usage.
				Disposal of surgical liquid waste rather to canalisation than to incineration.
				Develop solutions for separation of the water fraction prior to incineration of contaminated low hazardous streams.
Energy and Resource Efficiency	20	Multifunctional devices	Avoid the use of certain devices by replacing them with more sustainable alternatives or multifunctional devices	Centralise devices as an internal service in a dedicated location.

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Digital Solutions	21	Digital platforms for circular collaboration	Use technologies like AI, blockchain and RFID to enable interorganizational ecosystems for waste tracking, resource sharing, and transparency.	Adopt high-throughput screening and predictive modelling to streamline experiments, reducing material and energy consumption in laboratory workflows.
Digital Solutions	22	Implement telemedicine	Implement telemedicine offers to reduce energy consumption and resource use in healthcare settings	
Digital Solutions	23	Enhance digitalization in healthcare	Implement digital tools to track material use, optimize supply chains to reduce environmental impact.	Use AI-driven analytics to predict demand and automate orders, ensuring just-in-time supply while minimizing excess.
Education and Awareness	24	Raise circular economy awareness	Engage healthcare staff, patients, and suppliers in sustainability initiatives to drive cultural shifts toward circular practices.	Provide training/ workshops for adopting circular practices (10 R-strategies) in day-to-day operations, including waste segregation, sustainable procurement, and equipment maintenance for all employees.
				Encourage suppliers to eliminate unnecessary resource use by phasing out single-use materials and promoting waste-free alternatives.
				Encourage public health and research institutions to self-commit and use eco-certified and circular products.
				Encourage the recovery of valuable materials like metals and chemicals from waste streams by providing targeted incentives.
				Develop a practical guide/guidelines to help small businesses integrate circular economy practices, providing support for those without dedicated sustainability teams or consultancy budgets.
				Give tools and KPIs to measure circularity.
				Establish an independent workforce of CE experts in Life Sciences to provide tailored training and workshops for employees, key teams, and suppliers. Focus on industry-specific, in-depth expertise rather than generic sustainability concepts.

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Policy and Regulation	25	Advocate for extended producer responsibility (EPR) and right-to-repair legislation.	Require manufacturers to manage the entire lifecycle of their products, and extend useful life of its products.	Ensuring proper disposal of medications to prevent environmental contamination.
				Require manufacturers to manage the entire lifecycle of their products, including recycling and disposal.
				Advocates for policies requiring manufacturers to provide repair options for medical devices, including access to replacement parts and manuals.
				Assist the life sciences industry in developing medical-grade plastic recycling standards by providing guidance and conducting audits to ensure their effective implementation, focusing on quality and safety compliance.
				Make a study to identify pain points or rather "Pain materials" – then develop specific circular solutions for those materials.
				Producers need to design by thinking about the end-of-life. Important to designing and making equipment easy to dismantle.
				Establish EPR frameworks where costs and technical solutions for circularity are shared among producers, healthcare providers, and waste management entities.
				Introduce a funding mechanism similar to Switzerland's PET bottle recycling system, where a surcharge covers the costs of collection, refurbishment, and sustainable disposal of medical devices and laboratory equipment.
Innovation and Ecosystem Building	26	Encourage best practices	Explore and communicate successful case studies and best practices to identify scalable circular models and frameworks.	Promote procurement strategies that go beyond capital expenditure (CAPEX) to include operational costs (OPEX) and end-of-life management, ensuring sustainable purchasing decisions.
				(GCiLS as) a platform to collect and leverage best practices and maybe even give the extra resources needed to increase accessibility and visibility of practical cases.
				Establish inter-company working groups and partnerships to share best practices, white papers, and real-world CE solutions from Switzerland and abroad. Ensure accessibility of proven strategies, highlighting economic, ecological, and social benefits.
Innovation and Ecosystem Building	27	Foster ecosystem growth & knowledge exchange	Organize symposiums, events and collaborative workshops to share insights and build collaborative networks.	Playing the rules of the market, selling the finest best practices to consulting firms or other organizations who require them for their clients, and making a business case out of it (because the biggest obstacle is a lack of competition).

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				Foster partnerships across the healthcare value chain to enhance resource use, recycling, and circular innovation.
				Idea for a company level: Mentoring 4 one month": a professional(s) from a company guides a group of students working on a CE project.
Innovation and Ecosystem Building	28	Foster innovation for circularity	Organize startup challenges and call for projects to find and fund innovative circular solutions.	Competitions including a great event to celebrate the winning cases of intrapreneurship in CE in Life Sciences.
				Design, build, and test a fully circular, adaptable, and resource-efficient laboratory, applying GreenLab principles and involving different stakeholder groups. Serves as Real-world insights into implementing circular lab infrastructure, scaling best practices, reference model for future circular life science buildings in Basel and beyond.
Cross-sector Collaboration	29	Support industrial symbiosis for Basel area	Analyse opportunities for industrial symbiosis in the region, leveraging waste and energy streams between life science companies and other industries.	Conduct an in-depth material flow analysis for healthcare and life science sector in the region, including lifecycle assessment in order to identify potential options with maximal environmental impact.
				Develop an interactive stakeholder mapping of involved players in the region and their interaction.
				Apply concepts of Eco-industrial parks to the Basel Area as a whole (Industrial Symbiosis, flows between players, etc).
				Explore opportunities to localize certain production stages, minimizing complex transport chains, CO_2 emissions, and supply chain vulnerabilities.
				Collaborate with manufacturers and healthcare providers to collect, repair, and refurbish discarded medical devices and lab equipment. Create specialized refurbishment centres to safely recondition tools and machinery, ensuring compliance with regulatory standards.
				Apply the "Swircular" Model to the Life Science Sector; "Swircular" is a circular economy platform used in the construction sector. Adapt its methodology to industrial symbiosis in life sciences.
				Map current projects in carbon utilization, recycling, and industrial symbiosis.

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Assessments	30	Streamlined Environmental assessments (LCA, Audits, etc)	Provide a streamlined community of practice for environmental assessments of the sector.	Create a concept for Basel that includes centralized hazardous waste collection and sorting, recycling, oxyfuel-based incineration of non-recyclables, carbon capture, hydrogen production (with oxygen repurposed for oxyfuel), and sterilization processes.
				Create a joint platform for streamlined lifecycle and material flow analysis to standardize assessments, reuse data models, and improve efficiency across the industry.
				Conducting waste audits to identify and reduce waste.
				Develop a “nutriscore” for life science and healthcare products to support the evaluation of products on the market, linked with procurement.
Assessments	31	Environmental product declarations (EPDs)	Proposes regulations for mandatory EPDs, requiring manufacturers to disclose the environmental impact of their products through lifecycle analysis.	Develop and implement a circularity index of the sector to quantify critical flows and identify options with maximized potential impact.

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