Synthesis note of the LACE project n°5

Towards a circular economy for glass bottles

Reusing glass bottles reduces their environmental impact. However, today's Swiss market is largely dominated by one-way glass bottles. Even if the current legal framework does not set an explicit obstacle to reuse, it does not promote it and several key players in the sector are seeking to maintain the status quo. Different measures could be implemented by public authorities to lower the barriers to glass bottles reuse. These measures could help turning words into action, implementing circular economy principles in practice.

Original paper references:

Brunner, D. (2020). Vers une économie circulaire des emballages de boissons en verre en Suisse - limites et apports du cadre réglementaire. Partie I : État des lieux. *DEP (droit de l'environnement en pratique)*, 2020(4) pp. 367-396. https://serval.unil.ch/en/notice/serval:BIB_BAE17A266531

Brunner, D. (2020). Vers une économie circulaire des emballages de boissons en verre en Suisse - limites et apports du cadre réglementaire. Partie II : Perspectives. *DEP (droit de l'environnement en pratique)*, 2020(7) pp. 685-718. https://serval.unil.ch/en/notice/serval:BIB_99FF1E89EA66

Reuse of glass bottles: why is it important?

The Swiss Federal Council has set itself a climate target to achieves net zero emissions by 2050. This means that by 2050, greenhouse gas emissions must be balanced: the amount of gas emitted into the atmosphere must be equal to the amount absorbed. In parallel, Switzerland has set targets for reducing energy consumption as part of its 2050 energy strategy. To achieve these goals, both a more efficient use of resources and a transition to sustainable production and consumption patterns are necessary. These objectives are at the heart of Switzerland's sustainable development strategy (Agenda 2030).

With 704 kg in 2020, Switzerland has, in international comparison, one of the highest volumes of municipal waste produced annually per capita. Of this waste, 379'886 tonnes of glass were recovered from households and businesses for recycling in 2020, making glass the third most important flow of waste in terms of volume. Of this flow, 83% is glass beverage containers (the rest is non-beverage containers, e.g., jam jars and sorting errors). **Of the total glass collected, only about 1% is currently reused without further processing.**

Reuse requires fewer primary resources and is much more energy-efficient than glass recycling. Therefore, the meager proportion of reuse does not match with the logic of transitioning towards sustainable consumption and production, being far from contributing to the political goals mentioned above.

The challenge of reuse, the obstacles to its implementation and its contribution to Swiss sustainability goals were explored by Dunia Brunner at the Graduate Institute of Public Administration (IDHEAP) of the University of Lausanne, within the framework of the National Research Program "Sustainable Economy" (NRP 73) and the research project "Laboratory for Applied Circular Economy" (LACE). The main findings of this research are summarized in this transfer note.

Current snapshot of material flows for production and consumption of glass bottles in Switzerland

Does the current Swiss regulatory framework hinder the reuse of glass bottles?

Through which laws and ordinances are glass reusable bottles regulated?

- Federal Act on the Protection of the Environment (EPA)
- Ordinance on the Avoidance and the Disposal of Waste (ADWO)
- Ordinance on Beverage Containers (BCO)
- Ordinance on the amount of the prepaid disposal fee for glass beverage containers

The management of household waste (garbage, glass, paper, packaging, plastics, food waste, etc.) is regulated by the EPA and the ADWO. These regulations impose a general recovery obligation. However, no clear definition of "recovery" is provided, leaving it open to describe different activities. Swiss law also provides specific legislation for beverage containers through the BCO. This ordinance sets out recycling obligations and threatens more stringent state intervention if minimum recycling rates are not achieved. The same ordinance also addresses the reuse of glass bottles and does not create explicit barriers to it.

The collection system of glass bottles is financed through the revenues of the prepaid disposal fee (hereafter, "fee") imposed on all glass bottles placed on the Swiss market. The BCO states that the revenue from the fee should be used, among other activities, to finance the cleaning and sorting of intact glass bottles and the campaigns to promote reuse. In practice, however, most of the revenue is currently used to finance the recycling of glass bottles.

Without explicit legal barriers to reuse, one might assume that reuse and recycling are treated equally. However, the same ordinance requires importers, manufacturers and traders who work with reusable bottles to charge a deposit on them. This provision is accompanied by an obligation to mark the reusable bottles and to take them back against reimbursement of the deposit. In contrast, there is no obligation on the distribution and collection of single-use bottles, which are paid for by the society through the revenues of the fee. Once the fee is paid, producers and importers of single-use bottles abandon their responsibility on the end-of-life stages of the packaging.

The difference in legal treatment between reusable and single-use bottles creates an imbalance between the two systems: **actors who choose reuse face additional tasks and costs** (charge and reimbursement of the deposit, organization of reverse logistics, storage and washing of bottles) compared to those who remain in the status quo.

The current legal framework therefore applies an "end-of-pipe" waste management perspective, with recycling as the preferred scenario. The BCO aims at a minimum recycling rate rather than limiting the quantity of bottles on the market or promoting their reuse by instituting, for example, a minimum reuse rate.

What is the role of the different actors in the transition towards more reuse?

The recycling rate

In Switzerland, there is an obligation to recycle. The recycling rate must be 75% for glass, PET and aluminum packaging taken separately. The Swiss recycling rate for glass varies between 94% and 96%, thus easily fulfilling its obligation.
How is it then possible that of all the glass collected in 2020, around 64% is exported while only 24% is actually recycled?
De facto, the recycling rate does not give any indication of how the collected glass will be treated. Its name is misleading, as it actually refers to a collection rate, i.e., the quantity of glass recovered compared to the quantity of glass put on the market. A redefinition of this rate could provide a more accurate material flows' picture.

The life cycle of glass bottles involves many actors: producers and importers of empty glass bottles and of beverages, supermarkets and retailers, consumers, municipalities and public authorities, recyclers, etc.

Most of the actors involved in the life cycle of glass bottles have an interest in maintaining the status quo:

- **Consumers** are used to the simplicity of ready-to-use and throw away, whereas reuse often involves returning or storing the bottles, which is more demanding than only discarding them.

- **Swiss municipalities** are currently responsible for the collection of used glass: they manage the collection points and organize the logistics (pickup and transport). The role of the municipalities is to provide the infrastructure for glass collection, while ensuring that the process is cost-effective. It is therefore important for them to pay off the investments in their infrastructure over time, and this amortization is linked to the revenues of the fee, which depend on the volume of glass collected.

- **Producers of glass bottles or those who use the shards as a secondary raw material** also depend on the status quo. These actors have an interest in maintaining the recycling system to ensure the availability of the raw material in sufficient quantities and at a good price.

- Similarly, **recyclers** also have an interest in maintaining a system based on single-use glass in order to make their economic activity profitable.

- Finally, **retailers, manufacturers, and importers of beverages in single-use bottles** are not subject to the legal obligation to mark them before sale and to collect the deposit. The single-use bottles system saves them the costs involved in these activities and the effort deriving from the organization of reverse logistics, the washing of bottles and the provision of storage space for these

bottles. They therefore rely mostly on the collection and disposal system for single-use bottles funded by the revenues of the fee.

Lock-in and path dependency: why isn't the transition happening?

Since the 1980s, the positioning of actors in favor of the recycling of glass bottles has strengthened to the point of imposing the current system. The configuration of actors, the technologies and infrastructures mobilized, and the current rules and practices can be described by the studies on transition as forming the socio-technical regime of bottles recycling.

This regime is inherently relatively stable and insulated from radical innovations that could fundamentally change the system. Such radical innovations develop in niches but have difficulty gaining broader acceptance because of the stable regime.

This situation is often described as **lock-in**, a situation in which the status quo is maintained for technological, economic, social, and cognitive, or institutional and political reasons. Lock-in situations allow only marginal or small, incrementally implemented innovations. So-called "lock-in mechanisms" prevent fundamental change. Examples of lock-in mechanisms are the need to amortize existing infrastructures, cognitive routines, and the difficulty to reorganize complex systems with interconnected elements.

These mechanisms thus generate **path dependency**, a notion that expresses the fact that current events are highly dependent on past decisions. A given practice, in this case glass recycling alone without reuse, continues to be favored despite more efficient alternatives. This institutionalized practice will continue to be privileged as long as a socio-technical transition around radical innovations does not succeed in imposing itself as a new and more sustainable regime.

It is only when the setting changes dramatically that radical innovations have a chance to emerge from their niche and develop on a large scale. A new, more sustainable regime can then impose itself around the radical innovation. Such "windows of opportunity" usually arise due to exogenous events and trends such as crises, wars, macroeconomic trends, political developments, demographic shifts, climate change, and profound changes in cultural and social values and norms.

The benefits of reuse

Despite the obstacles to the development of reuse in Switzerland, there are many arguments that are likely to lead actors to transition away from the status quo. These arguments are based on the three spheres of sustainable development and therefore concern ecological, economic, and social benefits.

On the **ecological** level, a multitude of scientific studies have shown that the reuse of glass bottles reduces environmental impacts (e.g., in terms of resource and energy consumption, as well as the production of greenhouse gas emissions) compared to systems that implement recycling only, or to materials other than glass. These benefits are, of course, even greater when there is more reuse and in systems that are local or regional in scale, which limit transport distances. Reuse can therefore help companies to achieve their environmental objectives, while improving their image with consumers.

Economically, reuse in Switzerland currently involves additional logistical costs and may also require an initial investment to develop the necessary washing infrastructure. However, the prepaid deposit fee only applies when glass bottles are first placed on the market, which makes reuse profitable if multiple cycles are considered. The acquisition of reusable packaging also eliminates the need to purchase bottles for each refill and provides producers with significant savings in operating costs. The current global crises are increasing raw material shortages and supply chain disruptions. Reusing bottles reduces foreign dependence and exposure to price fluctuations, thus building system resilience. Glass bottles reuse channels can also support the creation of new markets and jobs, stimulating the regional or local economy.

Adopting circular business models and implementing reuse can therefore be seen as a risk reduction strategy for

economic actors. This is especially true in the context of the climate emergency, which is pushing the development of more stringent legislations on products (instead than on waste).
Packaging reuse and circular business models, combined with innovation and the use of new technologies (e.g., for packaging tracking or logistics automation) are therefore key strategies for companies to anticipate and adapt to the future developments of the system.

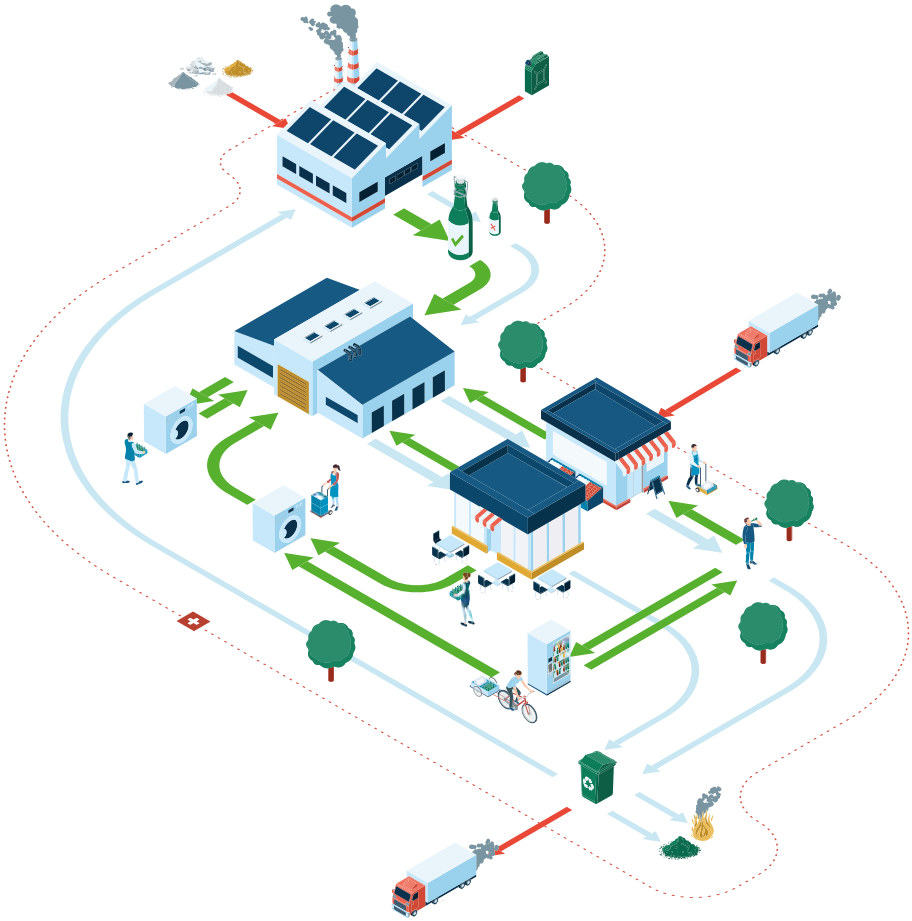
From a **social** perspective, the benefits are not only in terms of the potential for local jobs creation, but also when it comes to health. Glass performs better than other materials when reused since it is less susceptible to decomposition (i.e., does not emit particles or chemicals) and is easier to clean.

Different measures could help overcome the barriers to glass bottle reuse

A shift towards more reuse requires a systemic change, with measures that target the different stages of glass bottles life cycle. Some examples are mentioned below:

1 **Production and distribution**

a. Set a maximum amount, through quotas or percentages, of single-use glass bottles that can be put on the Swiss market or ban them completely.
b. Standardize glass bottles to facilitate the implementation of a generalized reuse system. This standardization can be done with or without regulatory intervention.
c. Increase taxes on single-use glass bottles or, alternatively, create financial incentives for reusable glass bottles.
d. Develop bulk sales of food and beverage products that avoid unnecessary packaging.



Material flows of production and use of glass bottles in Switzerland: potential situation with more reuse

2 **Use and Collection**

a. Introduce a mandatory deposit applied to all glass bottles, whether disposable or reusable.
b. Impose a minimum reuse rate instead of the recycling rate.

3 **Recovery**

a. Better define recovery by distinguishing between recycling and reuse activities and favoring the better option in terms of environmental impacts.
b. Move from an "end of pipe" system based on waste management to a "life cycle" approach that makes producers responsible for the entire life cycle of their products. An extended producer responsibility system with eco-modulation, as well as requirements to the market introduction of products, would allow this shift.

The right mix of public policies remains to be established. To do so, it may be useful to compare them in terms of their relevance and proportionality. Measures that might be considered extreme at first glance may nevertheless become proportional in the near future, given the changing environmental situation. Expressed in terms of transition studies, it is a matter of designing the process of innovation and transition from the current socio-technical regime to a more sustainable one.

Conclusions

The reuse of glass bottles is the best practice from an environmental point of view, as it allows energy and material savings. It brings major ecological benefits compared to recycling when all the variables of the system are equal. However, there are a number of factors that prevent this practice from becoming widespread.

While current Swiss legislation does not explicitly prevent the reuse of glass bottles, it does not encourage it either. There is a legal difference (deposit obligation, marking obligation) between the management of single-use and reusable glass bottles, which translates into a practical difference: the additional costs and tasks make reuse systems less attractive from an economic point of view. Therefore, a stakeholder who wants to get involved in the reuse of glass bottles often cannot afford to do so, even if he does not mind the extra effort. In addition, many actors benefit from the current glass bottles management system and therefore block the transition to more reuse. The institution of the single-use bottles recycling system was the result of a negotiation between these stakeholders and the state. This situation must now change to achieve sustainable and responsible production and consumption patterns, and to reap the full benefits of reuse.

To overcome the barriers to reuse, several measures exist, which target the different stages of bottles' life cycle - production, distribution, use, collection, and recovery. These measures must be combined to achieve a coherent system.

To avoid a transfer of environmental impacts to other products or materials, framework conditions should preferably target a function or need, rather than a specific sector or product. Targeting the need "drinking" or the function "packaging" rather than changing regulations specifically for glass bottles implies rethinking the entire beverage production and consumption system and reorganizing the ecosystems of actors involved. **The development of clear general principles, e.g., distinguishing between recovery options and prioritizing the best of these options, and the implementation of coherent framework conditions and ambitious targets, should enable the development of innovative reuse systems.** On the contrary, maintaining the status quo will signal that Switzerland is not committed to the transition to a sustainable circular economy and is not putting in place the strategies to achieve its sustainability goals.

For this reason, sanu durabilitas has developed the project "*Au REverre*", directly inspired by the analyses conducted by Dunia Brunner in her publications. This project aims to better understand the current context of glass bottle reuse in Switzerland. It documents good practices and success stories, raises awareness of the topic of glass bottle reuse, and does a knowledge transfer from scientific knowledge to concrete implementation. The project also aims to test the scientific results in practice by forming reuse ecosystems through two pilot projects.

About the NRP 73

This research project is part of the National Research Programme "Sustainable Economy: resource-friendly, future-oriented, innovative" (NRP 73) of the Swiss National Science Foundation (SNSF).

NRP 73 aims to generate scientific knowledge about a sustainable economy that uses natural resources sparingly, creates welfare and increases the competitiveness of the Swiss economy. NRP 73 takes account of the environment, the economy and society as well as all natural resources and stages of the value chain.

73 NRP **Sustainable Economy**
National Research Programme

Further information on the National Research programme can be found at:
www.nfp73.ch

About the LACE

The Laboratory for Applied Circular Economy (LACE) is an inter- and trans-disciplinary project that gathers researchers from three Swiss higher-education institutions, and from various disciplines: environmental and material sciences, business administration, as well as law and political sciences. The LACE project is working together with seven well-known partner companies in order to show how the resource-efficient patterns of the circular economy and related business models can be introduced into the value chains of the participating companies. The aim of this project is to demonstrate that the principles of circular economy can be ecologically beneficial and profitable for Swiss companies. The sanu durabilitas foundation is knowledge-transfer partner of the LACE project.

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Further information on the Laboratory for Applied Circular Economy can be found at:
www.nrp73.ch/en/projects/circular-economy/laboratory-for-circular-economy

About sanu durabilitas

The sanu durabilitas foundation is an independent Think and Do Tank based in Biel/Bienne. Its aim is to develop new practice-oriented and effective solutions for the transition towards a sustainable Switzerland which are being applied in economy, policy and public administration, and also to improve the institutional framework conditions for sustainability. In collaboration with partners from research, business, politics, administration and civil society, sanu durabilitas identifies promising solutions, develops them further, tests their application in the field, draws up recommendations, and brings them to the attention of decision-makers and the general public. The current focus areas of sanu durabilitas are circular economy, sustainable use of soils, and social cohesion in a changing society.

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