Approaching Systemic Transformation – Learnings from applying Net Positive Principles -

The case of beverage carton recycling

Outcomes of a case study within the Net Positive Project

2021

Contents

1. Introduction

Following UN's Sustainable Development Goals program the Decade of Action has just begun. This calls for governments, civil society and businesses to take ownership of achieving the 17 Sustainable Development Goals and accelerate transformation. Consumers and consumer goods industries are in particular addressed within SDG 12, which focuses on Sustainable Consumption and Production – in itself linked to the other SDGs by causal relationships to areas of concern like ecosystems health or climate change.

In order to achieve the Sustainable Development Goals solutions, responses are needed that do not only focus on incremental change or product innovation in isolation, but rather on systemic and transformative change that facilitates long-lasting change towards more sustainable development. The need for systemic and transformative change is also part of the four principles as articulated by the Net Positive Project (NPP)[1], bringing together an authoritative and ambitious coalition of cross-sector partners to develop a credible and aligned net positive approach, supported by a common set of principles and best practices.

Within one workstream of the NPP SIG Combibloc and Stora Enso have engaged jointly since 2019 to explore how to translate and adapt to the Net Positive Principles and apply these to make progress towards establishing a net positive food and drink packaging system. Building on a joint agenda along the most material areas for joint action, a pilot case study was established to explore the end-of-life of used packaging, its wider role in a circular economy, and potential routes for systemic and transformative change. This paper reveals the learnings arising from this "expedition" in providing a show case on net positivity from a circular economy and recycling point of view for a value chain delivering food and drinks to consumers with a wood-fibre based packaging system.

2. Net positive strategies: Systemic and transformative change

"Net positive" has been coined in recent years to express the need to move beyond zero-impact strategies to "give more back than we take". Where applied to business, this paradigm has helped companies to broaden the avenue of action to also address, focus, and achieve positive outcomes, and consider wider systemic impacts (positive or negative) beyond their own operations and value chains. While standards and protocols to manage, measure, and minimize corporate and product footprints exist, a consistent framework to transfer this to positive outcomes also in a wider system context is not well advanced and partly contentious. Providing guidance for a credible, transparent, and effective NP approach has been established within the Net Positive Project.

[1] https://www.netpositiveproject.org

2.1. Net positive and Net Positive Project

Within the Net Positive Project, companies together with NGOs have created a set of principles and a maturity model to enable companies to drive change towards net positivity in their value chains. These elements are summarized in the NPP user guide[2]. In addition to focusing on the reduction of negative impacts only – often called footprints – this net positive approach is looking into positive outcomes for society and the environment in addition – often called handprints. The core idea is, as laid down in the user guide, to include potential positive outcomes as a focus for maximization next to a comprehensive footprint reduction.

The approach builds upon four guiding principles: material, systematic, regenerative, and transparent. In short, the principles guide companies to focus on impacts that matter the most, to influence positive change across entire systems by creating long-term impacts, and while doing all this, being transparent about progress and actions. To avoid trade-offs and ensuring net positive impacts over the value chain and beyond, having a holistic, systemic approach is essential.

In practice, net positivity entails that negative and positive impacts are shared by the actors of the value chain or system in order to look at the overall societal impact rather than partitioning contributions of the actors of the value chain. The goal of the net positive approach is to increase the sustainability ambition level of companies and by doing so, whole "ecosystems" will transform, having greater positive impacts on society and the environment.

The user guide that has been developed within the project, provides examples and introduces a maturity model to allow a broader uptake of the principles of a broad variety of actors at various stages along their transformational journey. By providing the framework to focus on positive outcomes for the environment and society, the principles add implicitly a scale to the change that is needed as positive outcomes shall exceed negative impacts. Even if this is still a relative reference, it already makes clear that change (whether systemic, transformative, or neither) needs to matter. This requires measuring performance alongside a NP pursuit tailored to the material areas in such a way that also trade-offs are captured and no harm occurs by increasing positive outcomes. This also adds essential value where other design approaches for change are followed like the "Bio-Economy" or "Circular-Economy".

2.2. Circularity as systemic and transformational paradigm

As a paradigm for designing sustainable resource flows, circularity has been coined by Ellen Mac Arthur Foundation (EMF) and since then found broader acceptance in policy making and business. It contains the vision of a steady state model to meet people's needs without living on the resources that are to be used by future generations. A key is the shift from a linear economy that consumes resources, makes use of them and disposes of them after they are no longer useful. Circular economy, on the contrary, preserves resources by closing material loops.

Numerous positive outcomes of a more circular system design have been identified, such as reduced pressure to finite resources, reduced littering, emissions savings, and job and welfare creation. Accordingly, circularity is one of the key means to help companies and society achieve

[2] https://toolkit.netpositiveproject.org/

broader Sustainable Development Goals. Because of the imperative for change, circularity has clear systemic and transformative elements; however, the “controls” are rather implicit as it remains not proven nor measured if establishing a circular economy delivers a “safe and just space for humanity” within the pace and scale needed.

In order to determine the right pace and scale of circular transformation, the net positive principles offer meaningful controls to ensure lasting changes and positive outcomes.

3. Targeting positive outcomes for transformation and systemic change

As laid out by the Sustainable Development Goals and the core principles of net positivity, systems need to change as a fundamental paradigm of sustainable development. Transformation and transformative change relate to “changes that last” so that there is a change from business as usual into a new baseline.

Driving systemic change towards net positivity is a complex space. System change addresses the system as a whole and not changes of a single entity within a system. Linked to human interaction and change, systems are predominantly understood as delivering essential human needs (food, shelter, mobility, etc.). This is then linked to sub-systems which can be further specified, e.g. food and beverages system.

In order to get started and start accumulating know-how in a specific case, the first step is to scope out the systems being scrutinized.

Figure 1 shows a nested system view on a packed liquid food system as part of a food distribution system which in itself is only one system to provide essential services for human needs.

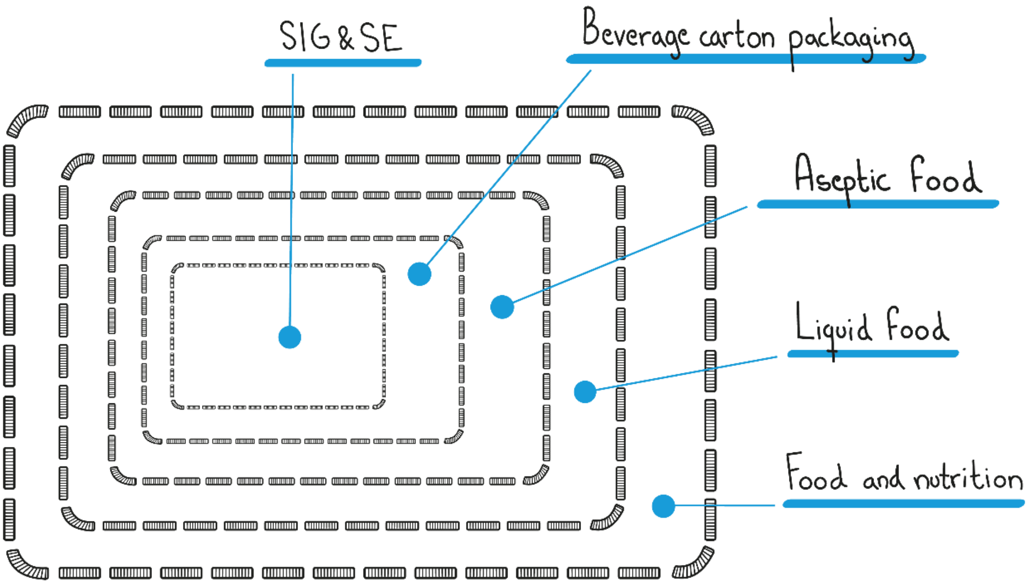

Figure 1 The beverage carton system by a single manufacturer is part of the aseptic food system within a wider food supply system. Essentially all these nested systems service human needs.

Addressing positive outcomes does not only relate to the system under study but may, or even shall address intersects with other systems – where resources are sourced or delivered at end of life. Targeting true transformative change means that all aspects of the systems need to be looked at another way. It is important that striving to perform better might not be enough: we need to move away from system optimization to system transformation. It becomes obvious that the system definition - or better - specification is an essential step in considering systemic and transformative change.

3.1. Mapping the system and your role

Building on the purpose or function of the system, a system needs to be defined and specified prior to ideate change. This typically involves simplified "modelling" and mapping to identify system components.

Different approaches are frequently used to develop a system boundary to separate "what's in and what's out":

- Life cycle approaches, such as Life Cycle Assessment (LCA) following ISO 14040, using (environmental) relevance to define cut-offs along a product life cycle.
- Accounting, e.g. of GHG emissions that include materiality assessments of contributions of a set catalogue of system components.

- CR reporting standards, such as the Global Reporting Initiative (GRI), use the concept of materiality to determine the appropriate reporting approach distinguishing between operational control and upstream/downstream similar to life cycle approaches.
- Apart from potential impacts, also material flow cost accounting can deliver e.g. material value as a criterion to set boundaries.

The key is to draw the boundary on relevance. In practice, systems modelling approaches begin with resource extraction and are clearly defined in terms of the conversion of natural resources into commodities. The end-of-life as termination of a system typically ends at the first recycling stage when a product feeds new raw material into the subsequent life cycle (see figure 2).

Depending on the modelling purpose (goal and scope), end-of-life processes are either allocated to the product system (as an artificial boundary between systems) or the subsequent system. System expansion can also be used to model, map, or reconcile products and their life cycles.

Figure 2 Simplified beverage carton life cycle as joint life cycle from Stora Enso (supplying liquid packaging board) and SIG Combibloc (beverage carton converter and filling system supplier). Both are providing the beverage carton packaging system.

The previous shows that system modelling involves a purpose (goal and scope) and is an iterative approach – as relevance and materiality can only be used as criteria if sufficient knowledge about the processes at the system boundary is available. Thus, an appropriate model cannot be built if relevant impacts are not known – on the other side impacts cannot be determined if the system is not known. The concept of footprints and materiality within NP builds on the idea that a system boundary can be drawn e.g. for an operator which is embedded in a wider economic system.

3.2. Understanding impacts and physical cause and effect relationships

Impacts – either with a negative or a positive outcome - are closely connected to systems as they are predominantly investigated, measured, and managed at the system boundary. Cause and effect relationships are used to aggregate and simplify impacts in such a way that they can be modelled e.g. as a footprint or handprint with a clear allocation to the system under study.

3.2.1. Techniques useful to identify impacts

Materiality is an essential NP principle and relates to the identification of impacts that are relevant to trigger systemic change (positive or negative). This is similar to the Life-Cycle principle of "relevant aspects". Identification of material issues or relevant aspects shall guide system modelling, data collection, impact assessment, and interpretation. It shall also prevent a miss-placed focus and needs to be sufficiently complete.

A materiality assessment, according to GRI, includes sustainability risks as seen by businesses and stakeholders and requires the identification of topics with a significant impact.

Within LCA, relevance is typically determined as an iterative approach of setting goal and scope, collecting data, assessing potential impacts and interpretation. Figure 3 shows a collection of material issues that are identified for the beverage carton packaging system.

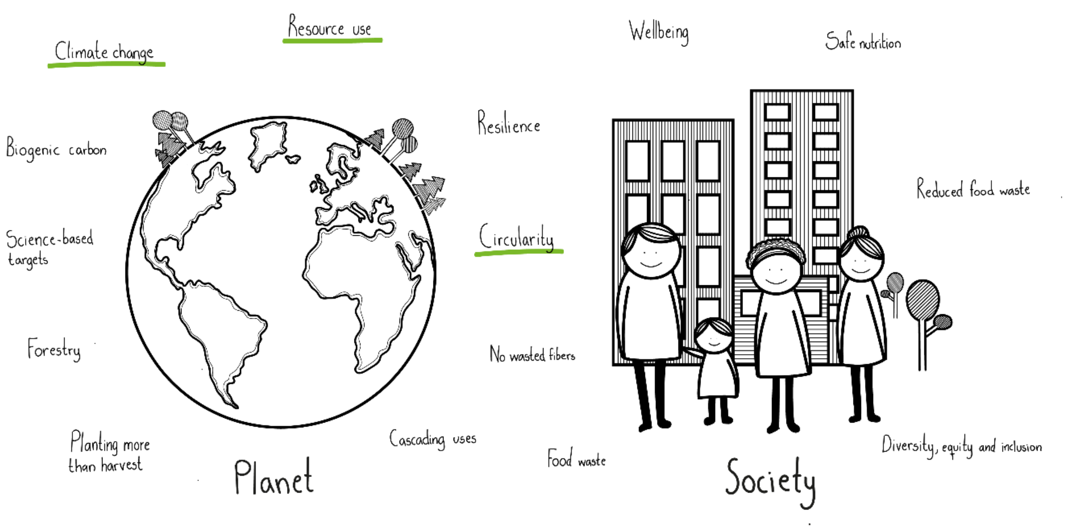

Figure 3. Mapping of material issues and aspects for the beverage carton system covering environmental and societal impacts. Circularity as material issue is clearly linked to both realms. Climate change and resource use relate rather to physical impacts.

3.2.2. Techniques useful to quantify Impacts

Given that we now have a system – and have iteratively fixed the system boundary based on materiality and relevance, we can determine impacts (potential impacts) or footprints that typically relate to activities (processes) in this system. Impact pathways build a relation between inputs to a system and potential impacts.

LCA information, such as Life Cycle Inventories, typically provide inputs and outputs (including resource use and emissions) for unit processes that can be further arranged to a product life cycle i.e. a product system. Where science allows, these flows can be aggregated based on the impact they potentially cause (like methane and carbon dioxide can be added to a global warming potential based on the contribution to an increase in radiative forcing). In addition to numeric data, qualitative data and attributes are relevant information to understand and measure system performance.

While LCA builds around unit processes as the smallest entity lined up in a life cycle, this may also be of use in a broader understanding of causal relationships as typically explored in an impact pathway analysis (see figure 4).

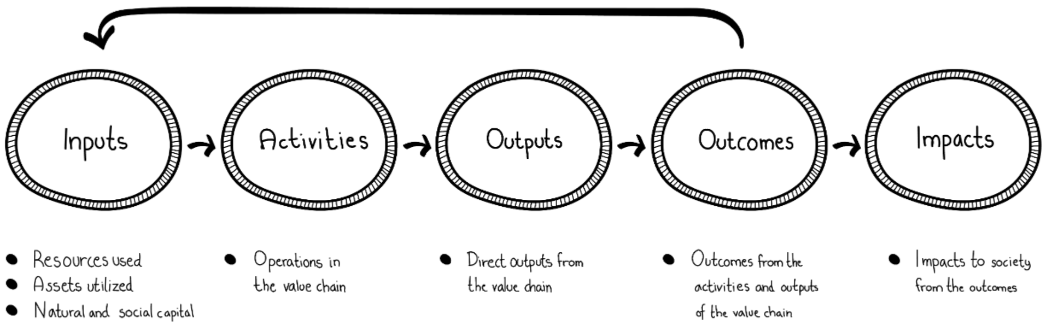

Figure 4. The impact pathway framework[3] is an excellent tool for mapping the physical cause-effect chains in the system.

Typically, systems are not straight forward or linear e.g. from a resource use perspective. On the contrary, they are looped as secondary raw materials that might be used within the system under study or in other connected systems for other purposes. Therefore, boundaries are needed in system modelling to define what happens to impacts on either side of the boundary.

System expansion can be used to broaden the purpose of the system e.g. by including secondary products that are derived from the primary product. This increases complexity, and in particular, at the end of life, system expansion includes an increasing number of processes that are distant to the system operator or the product under focus.

[3] Natural Capital Coalition. 2016. Natural Capital Protocol. https://naturalcapitalcoalition.org/wp-content/uploads/2018/05/NCC_Protocol_WEB_2016-07-12-1.pdf

An alternative to using a wider boundary is allocation that defines the proportion of how much of a subsequent system still belongs to the system under study. Allocation methods allocate a proportion of impacts to the system that makes use out of the used products e.g. by recycling. In LCA modelling, impacts of the recycling are typically allocated either by cut-off when all impacts are allocated to the subsequent system, or by sharing impacts from the recycling with the product system under study and the subsequent system.

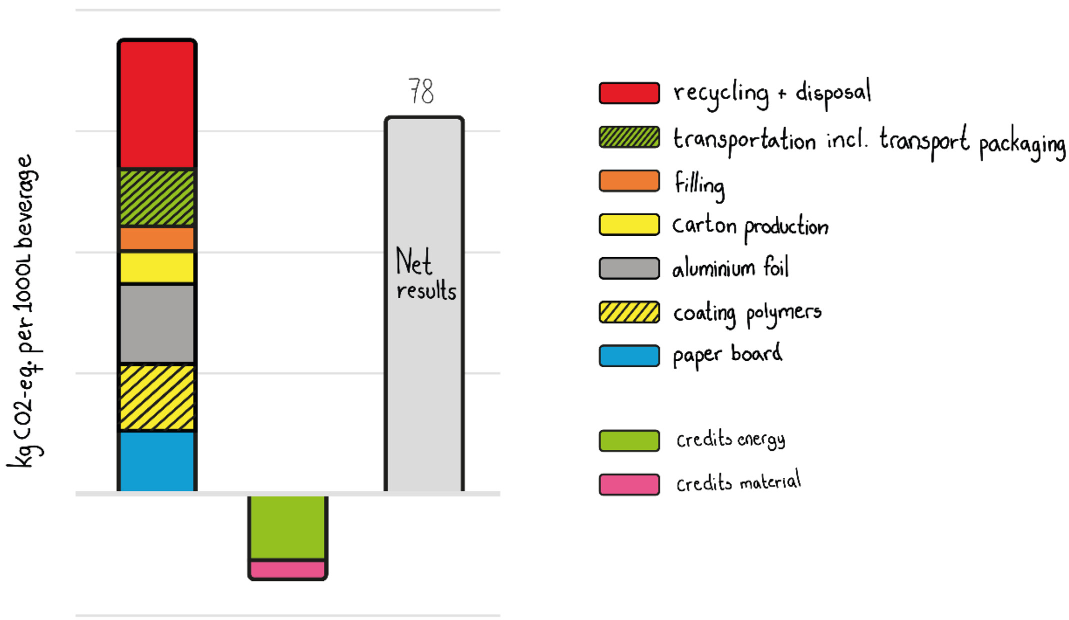

Figure 5: Global Warming Potential (GWP, in CO2-eq) as determined in an LCA study for delivering 1000 litres of liquid food and beverages. Different life cycle stages contribute with GHG emissions which are aggregated to GWP. Negative flows occur from recycling at end-of-life as primary raw materials and fossil energy carriers are replaced.

Building on various routes to understand impacts i.e. footprints that relate to a system (as a subsystem of a bigger system), Net Positive suggests delivering positive outcomes relative to the negative impacts by initiating systemic and transformative change.

This change

- shall second (and not outweigh) activities to reduce systems impacts (no netting off)
- shall not create negative trade-offs within the system under study or in the wider system.

To understand inter-system interaction and to enable positive change, knock-on effects, ripples and rebound effects need to be identified.

3.3. Understanding wider impacts, ripples, and butterflies

Building on footprints that are predominantly allocated to a subsystem (e.g. a product system), the net positive principles invite for a wider scope to include a broader range of impacts in a systemic perspective. It has already been clarified that any relevant or material impact in the wider system would need to be considered in footprinting if it can be linked to a product or organization. This is contrasted by an increasing and unmanageable complexity if all systems identified during impact pathway analysis are looked at.

Nevertheless, management decisions based on footprints limited to a narrow scope alone might overlook small but relevant impacts in the wider system. For example, an innovation that has a footprint increases competition and hence accelerates change in the supplying commodity sector and thus overall impacts might be positive regardless of the footprint in one product system.

In addition, understanding change in this “wider system” might help to inform more effective ways to trigger change than by focussing on the foreground system in isolation.

For end-of-life processes, materials feeding into different systems might trigger substitution of primary raw materials which can have positive outcomes. This aspect is essential information wherever decisions are taken in the product system – it also could identify levers to maximize positive outcomes from end-of-life systems.

Impact pathway analysis is a tool for understanding wider impacts and causalities in the system. In this case, it can be used to not only map and understand the impacts of and within the studied system (intra-system) but also to study implications in other systems (inter-system). This is also echoed by net positive approaches which typically set the impacts of an actor’s system as a baseline to identify opportunities for positive change.

The raw material flow models and system maps can now be used to understand and map the wider system. (figure 6)

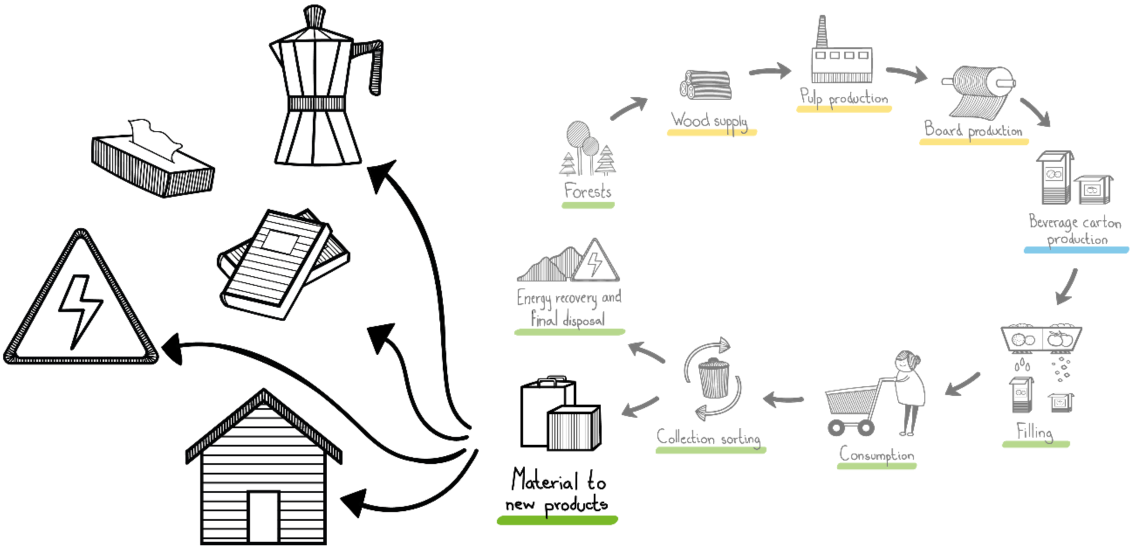

Figure 6. Beverage cartons are based mainly on virgin fibers and the fiber used in a beverage carton can have many subsequent lives in other fiber-based products when recycled. When fibers are not used as material anymore, fibers can be incinerated, generating bioenergy. Polymers and aluminium foil used are predominantly separated from fibres during recycling and can be recycled too.

It becomes obvious that in theory an infinite number of processes and outcomes would need to be looked at in order to understand the footprint of this "wider system". In addition, only by assuming linearity one could argue that attributable impacts get smaller and smaller the more distant the system interaction gets. Related to end-of-life systems one would then assume that impacts get smaller as a function of the materials "vanishing" with every recycling loop (by becoming elementary flows in LCA).

However, in practice, there is no evidence for this linear decline and modelling often shows "butterfly effects" that are understood in science to express that a small change in one state of a deterministic nonlinear system can result in large differences in a later state (a wing-flap of a butterfly might co-cause a hurricane). The same holds true for modelling relationships for wider economic systems.

Merging the idea of an almost infinite system with the understanding that impacts could be non-linear invites the idea that the right initial impulse might propagate into larger changes - like ripples in water. Creating or causing positive "ripple effects" in the "wider systems" by taking action is an important opportunity to facilitate systemic and transformative change. This invites to consider a wider range of actors who might play a role in propagation.

3.4. Mapping actors and their opportunities

Building on a deepened understanding of systems and impacts, a third element is essential for systemic and transformative change: the actors. Value chain naturally connects actors – they are either connected by a product or service flow. All these actors have a different role in the system and some actors probably have clear opportunities to drive for positive change.

For commodity producers and manufacturers, it is easier to understand the characteristics of the actors that operate at the beginning of the supply chain as the supplier landscape is typically on their radar and strong bonds are established. Also, a decent understanding of customers is typically very mature. Compared to these direct contacts, actors that operate at the end-of-life of products are comparably distant and potential mechanisms for change are less clear to companies at the beginning of a value chain.

"Upstream" is usually part of the core competencies of producing companies and efficiency processes, depending of course of the industry. However, cascading recycling loops involve sometimes completely different industries and sectors. Complex systems comprised of different operators and a huge variety of possibilities make it difficult to estimate negative and positive impacts caused by different actors.

Mapping a nested set of actors and product systems helps to connect the dots between actors and systems and eases estimating negative and positive impacts created in complex systems, which further enables to identify positive impacts beyond impact pathways. Actors engaged in ambitious sustainability targets within the value chain accelerate change by creating a ripple effect to other interconnected systems (see figure 7).

Figure 7. Mapping actors in the beverage carton value chain helps to understand what kind of impacts activities of each actor have on footprints and how these actors are connected to other systems. When having circularity in focus, especially waste management companies, recyclers and users of the recycled materials are relevant actors for driving positive change.

3.5. Understanding the system in which actors operate

Impact pathway and actor analysis take companies far on their journey of understanding their opportunities for positive impacts and cover a great deal of enablers for a systemic change. However, extending the scope beyond the actors and value chain to a wider industrial ecosystem is essential when driving transformative change. The actors (within the system) take action within a web of influence that needs to be understood to effectively trigger change (see figure 8).

One way to gain a better understanding of this web of influence is to look at a company's day-to-day business environment (e.g. other companies and associations), expanding to megatrends and policy frameworks (e.g. circular economy, European Green Deal) and finally to the margins of the mainstream (research, innovation). Four entities can be identified as influencers for change: policy making, research and development (R&D), industry associations and non-governmental organizations (NGOs).

- Policy as an influential entity: Policies are developed at a fast pace; a wide range of new policies are coming into force in the near future, directing societies and companies towards a more sustainable future. Policies are strong accelerators of change, and vice versa, change is a strong accelerator in policy making.

- Research and Development (R&D) as an influential entity: Research and innovation topics that are relevant for the company's operations enable companies to identify ways for improvements and positive impacts.
- Associations as influential entities: associations, forums, and value chain collaboration are essential when striving for maximising the impacts. Afterall, a common goal in a complex system is the best way to influence change.
- Non-governmental organizations (NGOs) as influential entities: many NGOs are strong accelerators of change by actively pursuing positive changes in humanitarian, environmental, and social systems.

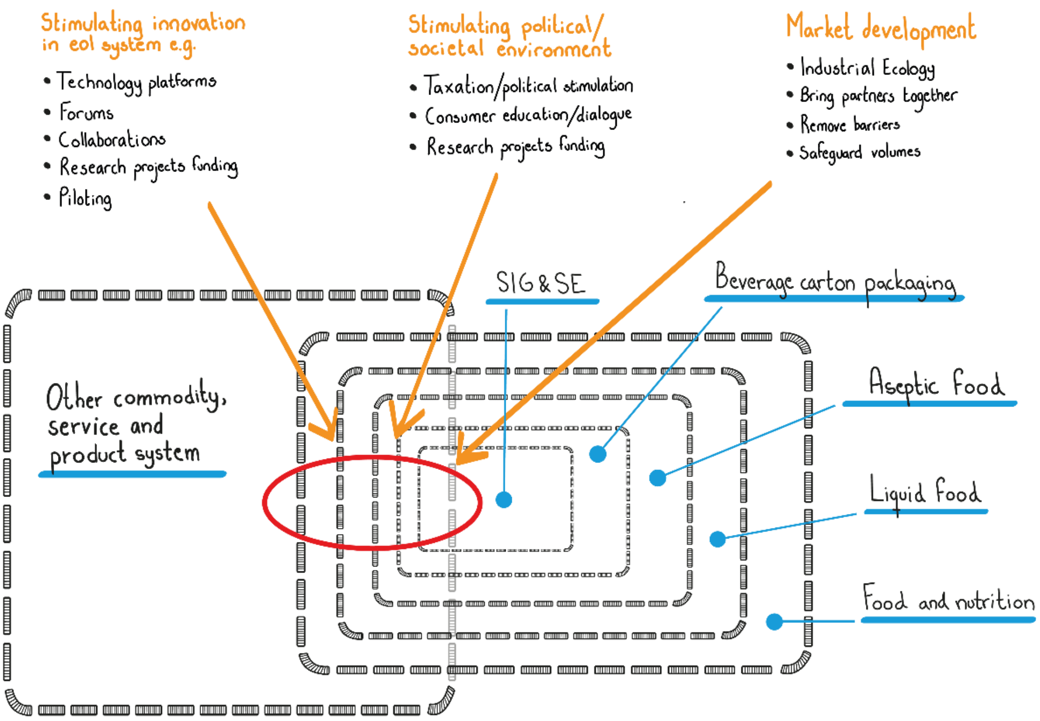

Figure 8. Mapping the wider system helps to understand possibilities for driving transformative change in the system. Regardless of whether we look at the beverage carton, food packaging or recycling systems, we can map different system characteristics for innovation, policy, society, and market development. Understanding the role of each of these characteristics and operators in the system enables us to understand how best to steer the whole system towards transformative change.

Understanding of actors, their "environment" and their opportunities deliver ideas for going beyond footprint reduction.

This includes the need for new metrics and ways of measuring to distinguish value chain-related footprint reduction from maximizing positive outcomes from triggered changes in the wider system.

3.6. Handprints

Exploring positive impacts in operations, value chain, and in the wider system supports decision-making in companies and steer their operations towards a more sustainable way of producing goods and services. Also, empowering change in complex systems requires a common goal that actors in the system are pursuing. Taking this thinking further, reducing footprints and maximising positive impacts wherever possible would drive systems towards more holistic change and a more sustainable future.

Handprinting can be used as a method to address these positive impacts and e.g. measure positive outcomes. So far, the concept of handprint has not achieved international consensus such as footprints. Handprints conceptually relate to positive impacts that typically occur outside the scope of the footprint system. As shown for footprints above, the scope of a handprint is also modelling choice and like the footprint, needs to include materiality and relevance.

Like footprints, handprints are no system property but rather performance indicators that shall be able to support decision-making. Decision-making can mean to compare e.g. two product systems and assess the difference, or it can be related to annual accounting and progress tracking. In both cases, a handprint needs to identify either the better alternative or progress if comparing different handprint measurements. To guide systemic and transformative change, handprints could serve as a key performance indicator (KPI) that inform decision-making for interventions that target positive outcomes in the wider system. In particular, for nested and complex systems, such as product end-of-life, handprints could be used to measure the positive outcomes of recycling materials in various applications.

Apart from being used in decision support, handprints – like footprints – can be used in communication. In this case it is important to provide all relevant information in a transparent way to avoid biased views to footprint reduction or handprint increase.

Opportunities for the creation of handprints can be mapped along extended value chains and raw material flows given that creation relates to both the positive action and an appropriate measurement to set positive outcomes in context. Depending on the system, illustrating handprint opportunities e.g. in a Sankey diagram both shows where the opportunities lie in the system and indicates the magnitude of the handprint potential. However, sometimes small streams can also lead to great handprint opportunities and big volumes to relatively low handprints – therefore it is important to map the whole system and have a holistic look into its handprint opportunities (see figure 9).

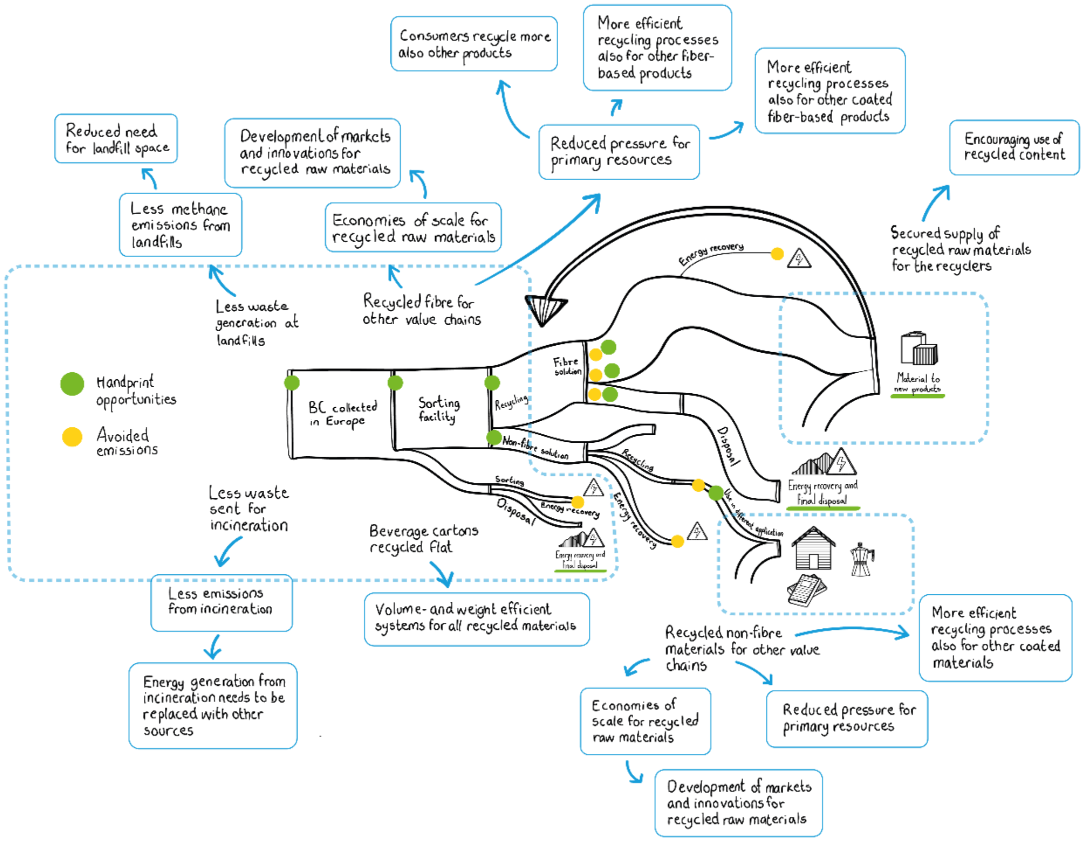

Figure 9. Handprint opportunities are mapped on the Sankey diagram that illustrates material streams after beverage cartons are collected for recycling. Both avoided emissions and handprint opportunities are mapped in the figure. Once all opportunities are mapped together with the wider system, it is easier to look more into details of individual opportunities and what is their role in the systemic change.

4. Initiating transformative change

Initiating transformative change that is regenerative and delivers positive outcomes needs to include systemic elements. As discussed in this paper, to accelerate change in the system, it is essential to understand the system, its impacts, actors and their roles, operating environment, and influencers. The transformation from a business-as-usual to a truly sustainable and circular system can only happen when all actors in the system are actively pursuing change. The following conclusions and recommendations summarize the learnings from this paper and the case study, and can be used as an inspiration in targeting net positive change:

1. Systemic transformation is needed to achieve a more sustainable development i.e. the SDGs. The Net positive principles add value to shape systems for companies by introducing materiality for setting priorities, regeneration as a core objective, and handprint creation as an amendment to footprint reduction approaches.
2. Testing these principles to identify opportunities for positive change within a complex and nested end-of-life product system delivered valuable insights to inform practitioners and support the identifications of actions beyond e.g. closing the loop/circularity approaches.
3. In order to achieve/approach positive outcomes system models need to be built based on materiality and relevance. Transparency is needed to map system boundaries both between

the subsystem under study (e.g. packaging) and the bigger system (e.g. food supply) (intra-system boundaries), and between the value chain and connected value chains (e.g. recycling system) (inter-system boundary).

4. Building on such model actors and potential and desirable action can be identified for the actors along the value chain and their “influential environment” but also adjacent sectors.
5. Ideating handprints as new metrics to measure and maximize positive outcomes (including value) is a promising route to enable decision support for transformative interventions.
6. More practical examples and showcases are needed to enable a broader range of actors to move beyond footprint reduction into “regenerative change action” minimizing footprints while maximizing positive outcomes i.e. handprints.

5. Acknowledgement

SIG Combibloc[4] and Stora Enso[5] joined forces in the Net Positive Project, using an action learning technique within Workstream 3 of the NPP during 2020 to develop an approach for evaluating the systemic net positive impacts. The action learning process started with the selection of the focus areas and mapping the operating system and value chain. An approach with three different routes was identified during the action learning process. Part of the action learning was a periodic exchange with the three hosts of the NP project: BSR, Forum for the Future, and SHINE.

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The views shared in this paper are not official views by the companies.

[4] SIG Combibloc is a leading systems and solutions provider for aseptic packaging. We work in partnership with our customers to bring food and beverage products to consumers around the world in a safe, sustainable and affordable way. Our unique technology and outstanding innovation capacity enable us to provide our customers with end-to-end solutions for differentiated products, smarter factories and connected packs, all to address the ever-changing needs of consumers. For more information, visit www.sig.biz

[5] Stora Enso is a leading global provider of renewable solutions in packaging, biomaterials, wooden construction and paper. Stora Enso is a global leader in the circular economy with premium renewable and recyclable packaging materials for food and drink, pharmaceutical and transport packaging, based on both virgin and recycled fibers. For more information, visit www.storaenso.com