

The circular economy

An economic and environmental opportunity
for Switzerland?



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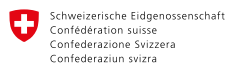
S A T O M



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Education and Research EAER
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for Switzerland?

ABOUT THIS PUBLICATION

This special report was produced by CleantechAlps in close collaboration with Sofies.
Rytec Circular has also contributed to this document.

The authors

CLEANTECHALPS

CleantechAlps is Western Switzerland's cleantech cluster. Its mission is to foster collaborative innovation, bringing together players who are contributing to ways of using our natural resources sustainably and developing new forms of renewable energy. As the pre-eminent exponent of the innovation ecosystem, CleantechAlps is Switzerland's cleantech enabler. Created by the cantons of Western Switzerland, this inter-industry platform facilitates interaction, stepping up and accelerating the capacity for innovation and the digital transition of Swiss enterprise. CleantechAlps increases the visibility of the region's cleantech businesses, positioning Western Switzerland as a centre of excellence at international level.

www.cleantech-alps.com

SOFIES

A pioneer of the circular economy for more than 10 years, with offices in Geneva, Zurich, London and Bangalore, Sofies specialises in consulting and project management to serve the cause of sustainable economic growth. A more rational consumption of resources lies at the heart of the issues we tackle head on with our clients in both the public and private sectors. Combining a participatory ethos with a systematic approach to every issue, our expertise is founded on the ability of our people to help our clients deliver sustainable operational strategies and projects.

www.sofiesgroup.com

RYTEC

In preparing this report, Sofies and CleantechAlps draw on the expertise of Rytec Circular, a division of Rytec AG. Rytec Circular helps develop ecological innovations in waste management from source to recycling or processing, and supports both public and private organisations in identifying circular economy opportunities and applying them to their business in practical ways.

www.rytec-circular.ch

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The circular economy: unparalleled societal growth



OLIVIER FERRARI

CEO – CONINCO Explorers in finance
Senior Executive, ONE CREATION Cooperative

Planet Earth is a finite resource. For nearly two and a half centuries, we have been building an 'unnatural' world, consuming this resource with no thought to its protection and preservation for the future. In the first quarter of the 21st century, we find ourselves at a crossroads with unprecedented potential for growth. We must renew, reconstruct and continue to build a world that will provide a safe home for existing and future generations.

To take up the opportunities that present themselves to humanity, we must commit to an unfaltering transition to a sustainable economy. This radical change requires us to find the answers to issues of many kinds: political, industrial, environmental and social. And if we are to succeed in this evolution, we must change our perception and our mindset too.

Our impact on the development of human society does not end with the last link in the production/consumption chain; it goes back to the origin of every component of this chain and throughout the transformation it undergoes. Now that we know our space is finite, we are all too aware of the inescapable necessity of thinking in terms of a circular economy. The raw materials that we start with, both in terms of the finished products they make and the manufacturing residue and end-of-life waste they generate, demand a fresh approach, reallocating them to repeated cycles of transformation and consumption.

The circular economy leads to a reduction in waste, inefficiency, built-in obsolescence and the depletion of resources. It creates new jobs and fosters the development of new industries while protecting the environment. It offers us as yet unexplored horizons with a positive impact on society that we must encourage at all costs.

The lifeblood of success is finance. It is imperative that it is allowed to return to the natural pace of the real economy. It is essential that we offer investors ad hoc investment vehicles.

«This will be a small, closed, limited, planetary society, almost certainly dependent on solar energy for its input or power, and it will have to recycle virtually all its materials into a circular economy, in which the dumps become the mines¹ .

It was with this sentence that the British-born American economist Kenneth E. Boulding put forward

the concept of the circular economy in 1972, comparing Planet Earth to a spaceship with limited resources. Today, the circular economy presents itself as a sustainable alternative to the linear economy, the sole economic model in place since the Industrial Revolution of the 19th century. Kenneth E. Boulding's pioneering vision lies at the heart of numerous organisations such as the Ellen MacArthur Foundation and World Economic Forum, organisations that are promoting the circular economy and the potential for economic growth that it represents.

The aim of this special report is to show how the circular economy can benefit the key sectors of the economy. Switzerland may not be a circular economy pioneer, but a multitude of circular economy good practices exist and thrive here. It is our responsibility to share and pass on these good practices and to develop the framework conditions that will enable us to meet the current and future challenges we face in consuming our natural resources.

In 2020, the health emergency caused by the Covid-19 pandemic and the resulting unprecedented worldwide economic crisis have pushed the circular economy into the limelight. Numerous studies all over the world indicate that a closed-circuit economy reduces the risks and negative impacts of health or environmental crises. This is because a circular economy improves security of supply of raw materials and considerably reduces dependence on imported goods.

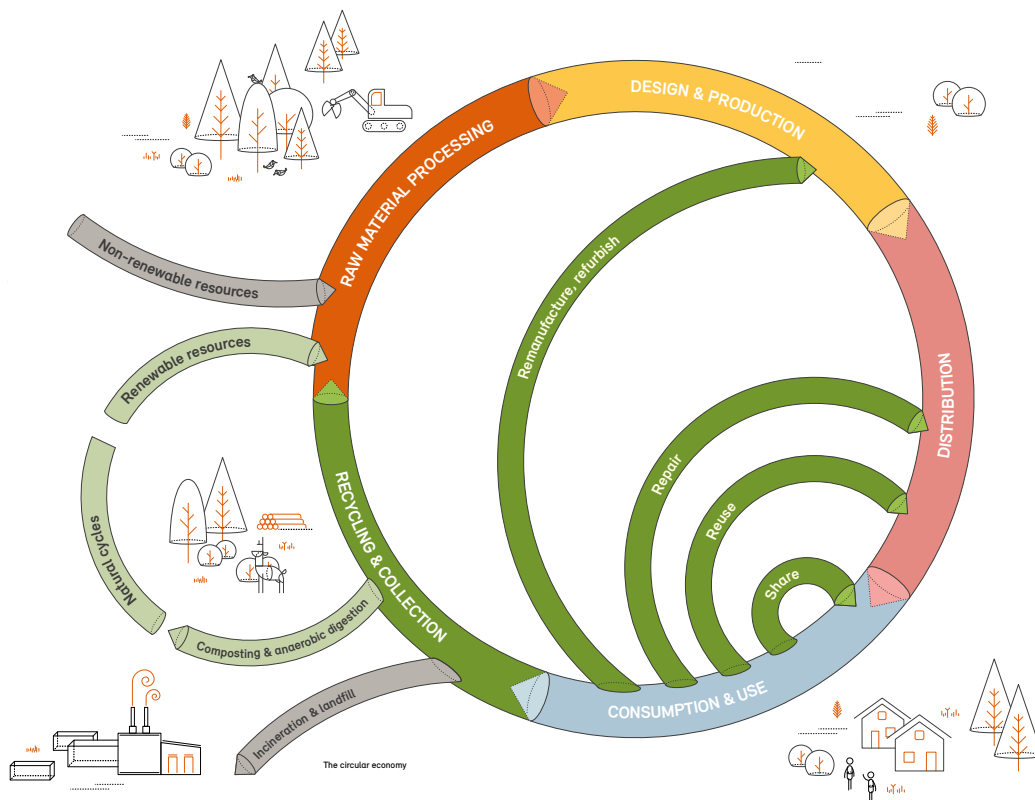
The first part of this report, which provides an overview of the circular economy concept, its advantages and its limits, is followed by a second chapter describing the current political and economic climate in Switzerland. The main part then focuses on seven sectors of the Swiss economy: food production, construction, consumer goods, the machinery industry, luxury goods and watchmaking, finance and tourism. While more progress has been made in some sectors than in others, innovative examples are to be found in each of them. There is still a long way to go, but the way ahead is clear. In developing and fostering good practices, Switzerland can draw inspiration from those already in motion at home and around the world.

Introduction

DEFINITIONS

This chapter provides an overview of the circular economy and describes how it relates to the current economic system. It provides the reader with more information about the concept of the circular economy, explaining that it is about much more than simply recycling, and outlining the practical operational options it entails.





◀ **Figure 1**
 A schematic diagram of the circular economy. In this paper, the term 'business model' refers to all of the steps shown in the outer circle and the term 'strategies' refers to the steps shown by the inner arrows. Source: Swiss Federal Office for the Environment (FOEN)

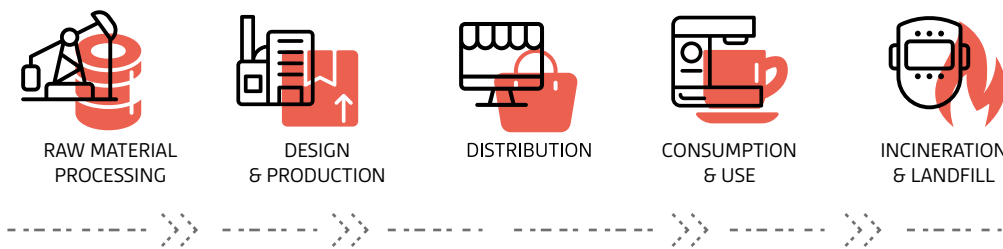
WHAT IS THE CIRCULAR ECONOMY?

The circular economy is an economic system of production, trade and consumption that, from the design of a product through to its end of life, is designed to optimise the use of resources and reduce the impact of economic activity on the environment. Figure 1 is a schematic representation of the circular economy. It is not exhaustive, but illustrates the basic principle: the circularity of resources and the extension of the use phase. The circular economy offers a set of strategies and business models designed to limit the consumption and wastage of raw materials, water and energy (see page 10). This innovative system represents a paradigm shift that accommodates the concept of sustainable development and offers an alternative to the current – linear – economic system.

WHY THE CIRCULAR ECONOMY?

The current economic system, the linear economy, is a model in which growth goes hand in hand with (over) consumption and therefore with the extraction of natural resources. This is an 'extract, manufacture, consume and throw away' system in which resources are extracted, processed, transformed into products, consumed and then, in the majority of cases, incinerated or sent to landfill (Figure 2). While landfilling is still commonplace in Europe and around the world, in Switzerland it applies only to special-category materials such as some types of deconstruction waste. These are materials that cannot be incinerated or that it may be possible to reprocess and re-use in the future (for example the phosphorus in sewage sludge).

If everyone in the world had the lifestyle of the average Swiss person, we would need the resources of three planets Earth. Every year, the NGO [Global Footprint Network](#) calculates Earth Overshoot Day. This is the date in the year by which humanity has consumed all of the resources that our planet's ecosystems can produce in one year. Figure 3 shows some of the dates calculated for 2020, including the date for Switzerland: the 8th of May. This clearly illustrates the limits of the linear economy and the fact that, although it is not a panacea, the circular economy represents a worthwhile alternative and a more responsible, sustainable way to create societal (economic and social) value. The circular economy is designed to continue to generate growth, but by using fewer primary raw materials than we do currently. This is called decoupling economic growth from the consumption of raw materials.



◀ **Figure 2**
Diagram of the linear economy. Source: Swiss Federal Office for the Environment (FOEN)



Figure 3 ▲
 Overshoot Days in 2020. Not all countries are shown in this diagram. More details are available [here](#).
 Source: Global Footprint Network²

MARLOES FISCHER
 General Manager, Madaster



Circularity means that we have to plan ahead and use buildings as raw materials warehouses so that we can re-use resources as efficiently as possible.

HOW DO WE IMPLEMENT THE CIRCULAR ECONOMY?

How do we switch from a linear economic model to a circular model by doing more than just recycling? The circular economy is made up of a set of strategies designed to create socioeconomic value while preserving resources. These different strategies are summarised below.

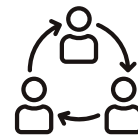


Ecodesign: this strategy is implemented at the product planning or design stage. Its purpose is to minimise the use of resources, use modular systems than can be disassembled, extend the product's useful life by making repair easier, and facilitating the separation of the materials at the end of the product's life to simplify recycling. Ecodesign significantly reduces the environmental impact of a product's life cycle.

Ecodesign is essential to every way of implementing the circular economy described below. For example, it is much easier to recondition a product if this option has been taken into account at the design stage. Prevention is better than cure, as they say!

Examples:

- ▶ [Franke](#) has reworked the design and manufacturing method of one of its flagship models of domestic sink to reduce its environmental impact. Instead of three pieces of stainless steel, this sink now consists of only one. This ecodesign saves 75% of the energy and 48% of the stainless steel used in the manufacturing process and also reduces the installation time.
- ▶ The Swiss reusable packaging solution [reCIRCLE](#), designed for the take-away food industry, has created a reusable product to limit the environmental impact of single-use packaging.



Sharing / leasing / dematerialisation: these strategies, which use an innovative contractual system, are designed to optimise the use of a product over time, encouraging the manufacture of efficient, sustainable products because – in the case of leasing and the dematerialisation of sales – the manufacturer remains the owner of the product, marketing only the use of the product or its function(s). This is known as the economy of functionality. It is a set of business models that are very effective in increasing the added value produced from each unit of resource consumed. Like ecodesign, they are essential to minimising the amount of resources consumed throughout the life cycle of a product and to extending its use phase. These business models are therefore fundamental to the deployment of a sustainable circular economy.

Examples:

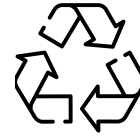
- ▶ Sharing products between users: the cars provided by [Mobility](#), and the tool library [La Manivelle](#).
- ▶ Leasing and product hire are also a form of sharing. This is a familiar concept for cars, but is catching on in other areas and is starting to be used in the fashionwear industry (leasing of jeans – [MUD Jeans](#)), for and certain items of equipment (tool hire – [Hilti](#)), and also for baby clothes ([Oioioi](#)).
- ▶ The idea behind dematerialisation or economy of functionality is to sell the use of the goods rather than the goods themselves. [Michelin](#) has introduced this strategy for truck tyres, selling usage on the basis of distance travelled and encouraging fuel saving by offering high-quality products and advanced user training. The Geneva-based company [Devillard](#) has changed its printer sales model to a hire-based system that includes a maintenance service.

The advantage? By retaining ownership of the product, the manufacturer can manage its life cycle more appropriately. In this business model, ecodesign, repair and reconditioning during the use phase are profitable for the manufacturer because each additional day of use means more revenue. When the product reaches the end of its use phase, it is generally dismantled and recycled to generate new components or secondary raw materials. In this way, the manufacturer also avoids some of the effects of volatility in the price of primary raw materials. It also frees the business from the linear model, which is dominated by its reverence for private property.



Re-use, reconditioning, repair and maintenance: a set of strategies that all have the same desired outcome: to increase the lifetime of a product and optimise the use of primary raw materials.

- › **Re-use:** products that are still functional but no longer used are passed on to new users (through [second-hand markets](#) for example), thereby extending their lifetime. In fashion retail, the second-hand market is a good illustration of this phenomenon, which also exists in the food industry, with smartphone apps like [Too Good To Go](#) designed to avoid food waste. Even telecoms operators such as [Swisscom](#) are starting to sell second-hand smartphones.
- › **Reconditioning/reprocessing:** products that are faulty or at the end of their life are reconditioned by replacing or upgrading components in a processing plant. [Liebherr](#) carries out remanufacturing, recovering certain used components from construction site machinery and vehicles to recondition them and re-market them without having to manufacture them from scratch. In doing so, it uses fewer primary raw materials.
- › **Repair:** faulty products are repaired, extending their lifetime. This is a familiar practice carried out by outlets like the bicycle repair workshop [péclot13](#) in Geneva and the [arche Brockenhaus](#) domestic appliance and electronic device repair workshop in Zurich. Some brands are also starting to offer repair services like the one available for [Felco](#) secateurs, marketed as repairable for life.
- › **Maintenance:** products are regularly maintained to prevent premature failure and prolong their useful life.



Recycling and re-use of material: these strategies, which are connected, are a way of reintroducing into the value chain 'secondary' raw materials recovered from recycling. Recycling is quite a common practice in Switzerland, but using recycled materials in consumer products and goods is a strategy that has considerable development potential³.

Exemples:

- › By 2025, [Nestlé](#) plans to use only recyclable or re-usable packaging.
- › By introducing innovative procedures, the [SORTERA](#) platform has developed a multiflow sorting process for bulky harmless industrial waste, urban waste generated by businesses, construction waste and other kinds of waste to maximise material sorting and re-use.
- › [Eberhard](#), winner of the 2020 'Umweltpreis der Wirtschaft' environmental award, [the gravel pit operator GCM](#) and [BOWA Recycling AG](#) all recycle construction and deconstruction waste, using it to make concrete for use in new constructions.
- › Recycling and re-use can potentially be incorporated into all kinds of consumer goods, as demonstrated by [EcoLogistic](#), which recycles printer ink cartridges and computers.
- › The [Swissrecycling](#) platform is actively developing recycling projects and conducting research to improve recycling rates and re-use solutions in Switzerland.

Some of the most advanced Energy-from-Waste plants, such as the SATOM plant in Monthey (Valais), are able to recover materials right through to the end of the processing cycle, reclaiming metals from the ash. These metals are then fed back into the economy.



Recyclable, biodegradable or compostable?

A product is recyclable if, following its initial use, it can be reintroduced into the manufacturing chain of another product.

A product is biodegradable if it can be broken down naturally by living organisms and is not harmful to the environment. According to European standard EN 12432, **a product is compostable** if 90% of its initial dry mass can be broken down naturally in less than three months.

THE ADVANTAGES AND LIMITS OF THE CIRCULAR ECONOMY

The circular economy is a promising approach to limiting the overexploitation of natural resources. It has some considerable advantages and can benefit from the ever-increasing digitalisation of our economy and instant access to information on a massive scale. Today, digital tools can be used to trace materials and separate them on the basis of their location or state (for example, raw, processed or waste), which makes it easier to identify opportunities to re-use or recycle them for example. Despite this, and without expressly limiting its development, the legislative framework of society in general and the current economic system are not always conducive to the growth of the circular economy.

Advantages

- ▶ It encourages sustainable business models that address the issues affecting society.
- ▶ It creates a stronger and more lasting relationship with consumers, who are more attached to the service and company than the product itself.
- ▶ It drives technological innovation through ongoing efforts to develop new ways of substituting and using primary raw materials.
- ▶ It encourages and motivates employees, through the values that the circular economy brings to their work and daily lives.
- ▶ It drives growth in the repair, reconditioning and recycling of goods, creating new jobs and localising added value. The types of manual jobs that this growth supports are currently in decline in our societies.
- ▶ It creates value chains that are more local and more secure, enabling local businesses to be more resilient.

Limits

- ▶ Recycled materials are less competitive: the price of primary raw materials does not include the negative externalities and is therefore very often more competitive than the price of secondary raw materials.
- ▶ The high level of outsourcing and subcontracting inherent in circular strategies: product reconditioning and re-use of raw materials are not always carried out locally.
- ▶ Consumers are used to the very competitive prices possible thanks to cheap labour and inferior-quality products.
- ▶ The potential rebound effect among consumers who think of the circular economy as THE solution for protecting the environment or stopping climate change and who therefore do not limit their consumption.
- ▶ The investment required not only to incorporate circular principles (industrial processes and qualified workforce), but also to transform the business model and strategy of businesses (organisation, risk taking).
- ▶ The lack of regulatory provision to promote the circular economy, while other regulations may hamper it (waste status, health and safety standards, etc.).



Negative externality

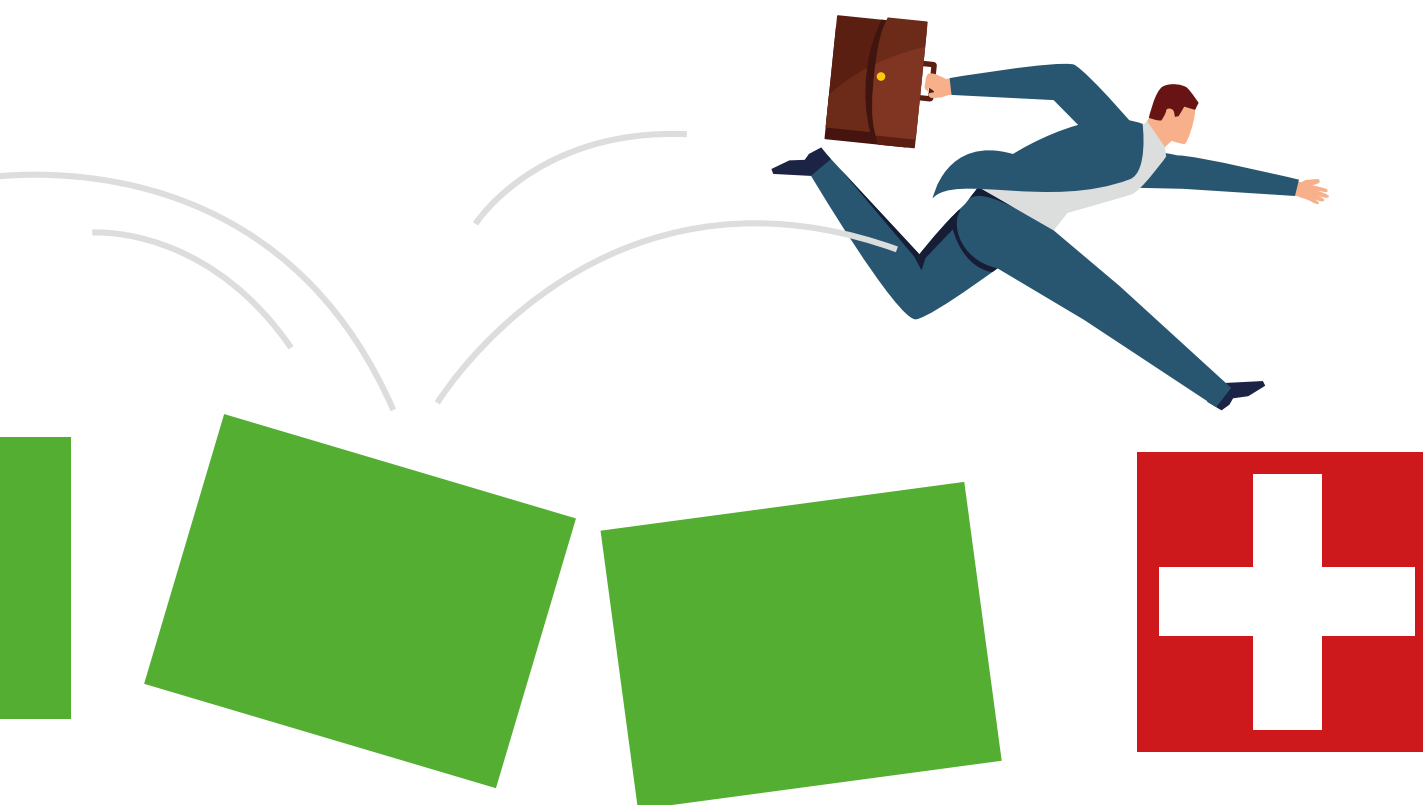
In environmental terms, a **negative externality** is an undesirable side effect of a production or consumption activity. For example, a 'standard' T-shirt made from cotton consumes pesticides, fuel for transport and around 2,500 litres of water. The cost of these impacts on the environment is almost never incorporated into the price of the T-shirt and is instead borne by society in general.



The situation in Switzerland

The circular economy is the subject of growing interest around the world and in particular in Europe, where in March 2020 the European Union adopted a [Circular Economy Action Plan](#) setting out a number of measures for different sectors of industry. Other countries have also adopted legal bases that pave the way to a circular economy, such as France's anti-waste law. However, to date there are no standard indicators to quantify or qualify the circular economy, and this makes it difficult to assess and compare different businesses or countries. Despite this, and although it is not at the forefront alongside France, Germany, the Netherlands and Denmark, Switzerland is working towards a transition to a circular economy.

The canton of Geneva is a trailblazer in the field, having set up a dedicated portal to create and oversee a new circular economy community.





Genie.ch, a collaborative platform

Developed in Geneva by the general directorate for the environment (Direction générale de l'environnement, DGE), the cantonal office for energy (Office cantonal de l'énergie, OCEN), the foundation for industrial land in Geneva (Fondation pour les terrains industriels de Genève, FTI), the utility company Services industriels de Genève (SIG) and the Office for the Promotion of Industries and Technologies (OPI), Genie.ch is an informational and promotional tool for industrial ecology projects. It supports businesses looking to develop more environmentally friendly circular strategies that will remain economically competitive. Genie.ch connects with a number of international collaborative platforms, benefiting from the feedback provided by more than 1,000 circular economy endeavours.

POLITICAL CONTEXT AND ISSUES REGARDING THE INSTRUMENTS USED TO ROLL OUT CIRCULARITY

In Switzerland, the circular economy was recently given a boost at federal level when Parliament opted to put in place framework conditions to encourage its development. In recent years, various political initiatives have been launched to promote efficient use of resources, recycling, waste management and producer responsibility and tackle food waste. However, these initiatives are still in discussion, and there is as yet no formal institutional framework for the circular economy⁴. The climate fund provided for in Switzerland's CO₂ Act may help things along and could potentially include a dedicated circular economy instrument for projects that have an impact on greenhouse gas emissions.

Recent changes in legal frameworks apply mainly to the waste processing and consumer goods sectors⁴:

- ▶ [Change to the Environmental Protection Act](#)⁵: The Federal Council can now prohibit the marketing of raw materials if their cultivation or extraction is severely damaging to the environment or compromises the sustainable use of natural resources.

- ▶ [Change to legislation on public procurement](#)^{6,7}: from January 2021, public procurement contracts awarded by the Confederation and its attached institutions must not simply be agreed on the basis of the lowest price; they must also incorporate the concept of sustainability.

In general terms, with draft legislation in the works, the encouraging signals being sent out by changes to the institutional framework will pave the way to the circular economy in Switzerland. Nevertheless, it will take some years for the different initiatives to result in formal changes to Switzerland's legislative framework. With this in mind, Circular Economy Switzerland is working to educate about good practice and align the debate with a view to introducing a consistent change in society.



Circular Economy Switzerland (CES)

is a Swiss movement launched in 2018. CES functions as a kind of project incubator, regarding itself as a platform for coordination and discussion among circular economy players. It provides participants (SMEs, start-ups, public bodies, etc.) with a knowledge base and good-practice resource to help them develop circular solutions. In doing so, CES is striving to contribute to the evolution of the market towards the circular economy.

ECONOMIC CONTEXT AND CIRCULARITY ISSUES REGARDING RESOURCES – KEY FIGURES

How established is the circular economy in Switzerland? What share of the country's resources is re-used? How significant are the second-hand and repair markets? A clearer understanding of the circular market in Switzerland would be helpful, but so far, data has been in short supply. However, the Federal Statistical Office recently published a study that provides an initial picture of the circular economy in Switzerland⁸.

Today, the most telling unit of measurement of circularity is based on the ratio between the quantities of materials recovered and the total amount of materials consumed: **the circular material use rate** (also known as the circularity rate).



13%

CIRCULAR MATERIAL
IN SWITZERLAND IN 2018

13% of what the Swiss
consumed was made from
recycled materials



Switzerland's circularity rate has been rising steadily since 2000 and is higher than the European rate (11%).

109 million tonnes per year :
total consumption of materials



94 million tonnes
extracted on Swiss territory
or imported



15 million tonnes
of recovered materials

IN 2018, THE TOTAL
AMOUNT OF WASTE
PROCESSED WAS

around **2.7**
tonnes per person

THE MOST WIDELY RECYCLED MATERIALS IN SWITZERLAND



METALS

metals can be repeatedly fed back into the economic circuit with little loss of material⁷



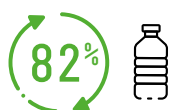
MINERALS

these are mainly materials collected from the recovery of construction site waste, which can be used for instance in place of some of the sand required to make concrete⁷



BIOMASS

collected mainly from the recovery of paper and natural textiles, along with biomass from biogenic waste (compost, sewage sludge)⁷



PET PLASTIC

82% of the PET bottles in circulation were recycled in 2018⁹



GLASS

94% of the glass in circulation was recycled in 2018¹⁰

MATERIAL FLOWS IN TONNES PER PERSON, 2018

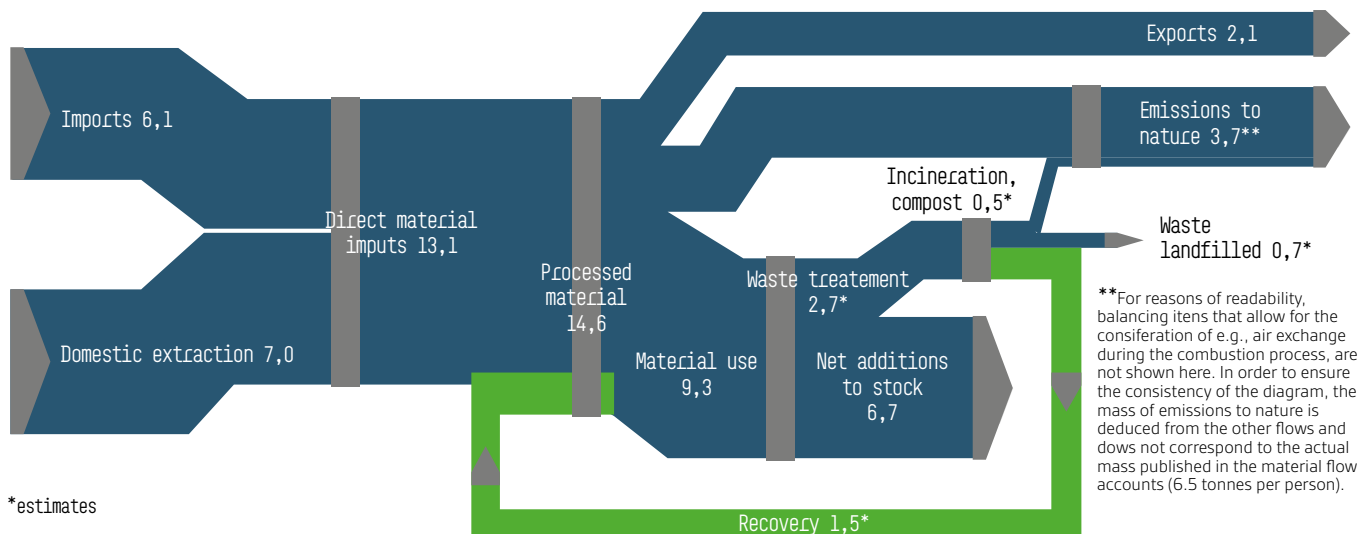


Figure 4 ▲
Main materials flows through the Swiss economy and Swiss society. Source: [FSO](#)

What this diagram shows is that as things stand, even if all of the waste processed (2.7 tonnes/person) could be re-used, it would cover no more than one fifth of the materials requirements of the Swiss economy (13.1 tonnes/person). Flows of secondary materials (produced by recycling) are a circular economy lever, but additional strategies other than recycling and recovery – such as the reduction of mass consumption – must be introduced across the country to reduce our impact on the environment.

To evaluate the environmental impact of a product, Switzerland has devised the ecological saturation method (Figure 5), which is expressed in environmental load units, or ELUs. By taking a broad spectrum of ways in which a product affects the environment and comparing them to international and national environmental objectives to which Switzerland has signed up, this method can be used to put an ELU figure on the impact of a product.

For example, wasting one kilogram of fruit and vegetables has an estimated impact of between 1,000 and 3,000 ELUs, wasting one kilogram of cheese represents 10,000 ELUs, and wasting one kilogram of coffee represents 50,000 ELUs¹¹. On a different scale, a 3,000km car journey represents one million ELUs¹².

Did you know?

- ▶ Switzerland's recovery rate for paper is 80%.
- ▶ Two-thirds of the environmental impact can be attributed to food and agriculture, housing and construction, and mobility.
- ▶ Half of Switzerland's ecological footprint is a result of its imports¹³



Figure 5 ▲
Schematic representation of the ecological saturation method

MARC EHRLICH
CEO, Groupe VIPA

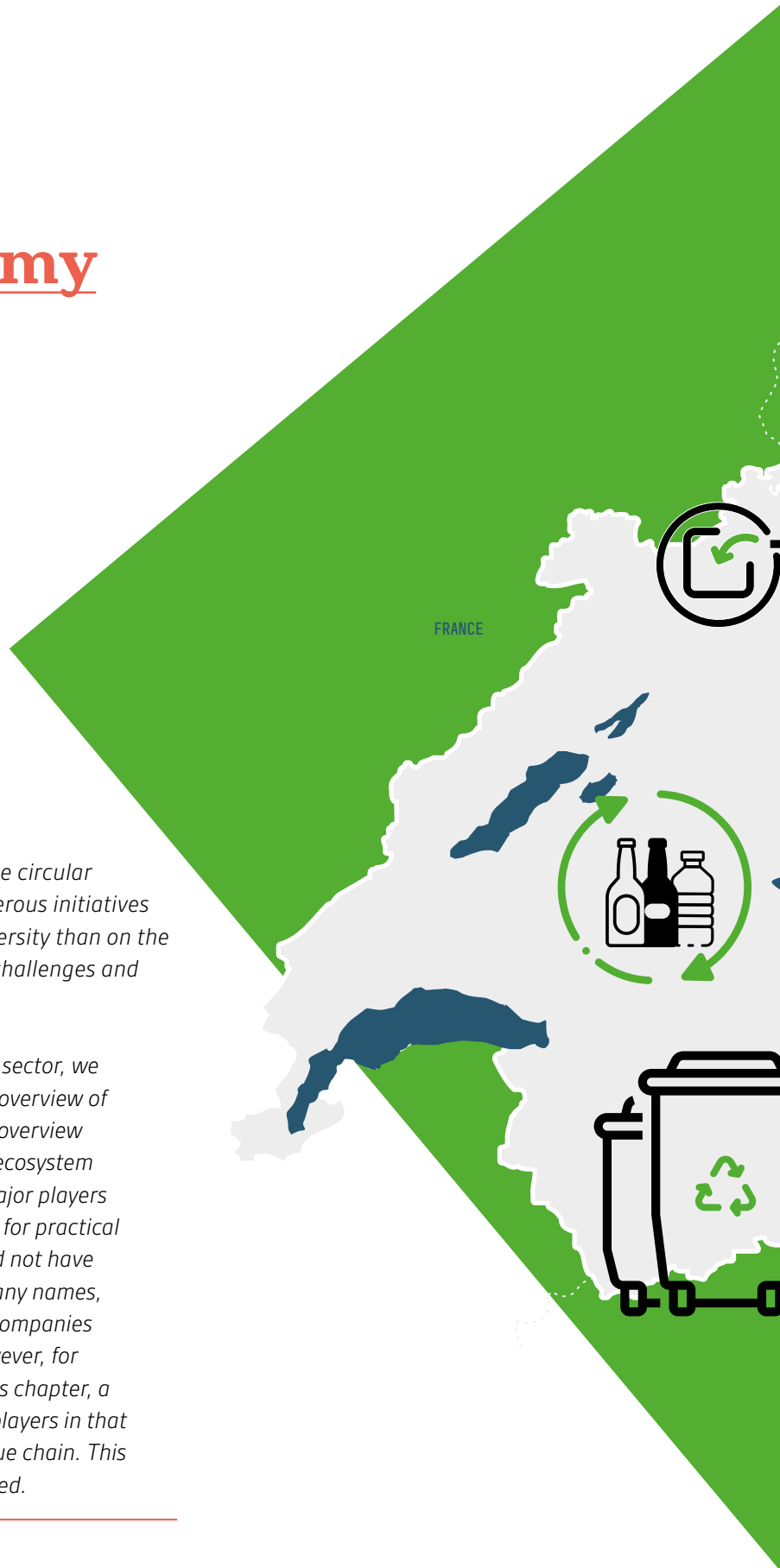


Circular economy is a "business" expression to explain that we live in an enclosed space that we call planet Earth!

Switzerland's circular economy ecosystem

This chapter seeks to explain the specifics of the circular economy in Switzerland and to show that numerous initiatives are under way. It concentrates more on the diversity than on the quantity of the players involved, outlining the challenges and opportunities facing seven industry sectors.

To focus on the initiatives and structuring of the sector, we propose to begin this chapter with a systematic overview of Switzerland's circular economy ecosystem. This overview covers the categories of players making up this ecosystem and the industries in which they operate. The major players in each category are explicitly mentioned, but – for practical reasons – individual businesses are not. It would not have been relevant to publish an endless list of company names, and this is also problematic in a context where companies potentially belong to more than one sector. However, for each of the major industry sectors covered in this chapter, a summarising description of the business of the players in that sector is provided for each of the links in the value chain. This makes it easy to identify the businesses concerned.



ACADEMIC INSTITUTIONS

- › EPFL / ETHZ
- › Universities
- › Universities of Applied Sciences
- › EMPA
- › PSI
- › Agroscope

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- › PICC – Plastic Innovation Competence Center
- › Circular Economy Switzerland (CES)
- › Swiss Food Research
- › Laboratory for Applied Circular Economy (LACE)
- › NEST

COLLABORATIVE PLATFORMS AND NETWORKS

- › NTN Applied Circular Sustainability
- › NTN Living-Labs for Decarbonisation
- › Genie.ch
- › 1PEC
- › Circular Hub
- › Madaster
- › CleantechAlps
- › Regiosuisse.ch

CONFEDERATION

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INDUSTRY

- › SMEs
- › Start-ups
- › Large companies
- › Architecture firms
- › Engineering firms
- › Design consultants

MAJOR INDUSTRIES

- › Food production
- › Construction
- › Consumer goods and devices
- › Machinery industry

EMERGING INDUSTRIES

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- › AGRIDEA
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- › sanu durabilitas
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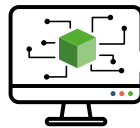
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FOOD PRODUCTION

INDUSTRY CONTEXT

The food production industry plays an important economic role in Switzerland. It accounts for around 15%¹⁴ of GDP and employs a workforce of more than 500,000, concentrated mainly in catering and agriculture¹⁵.

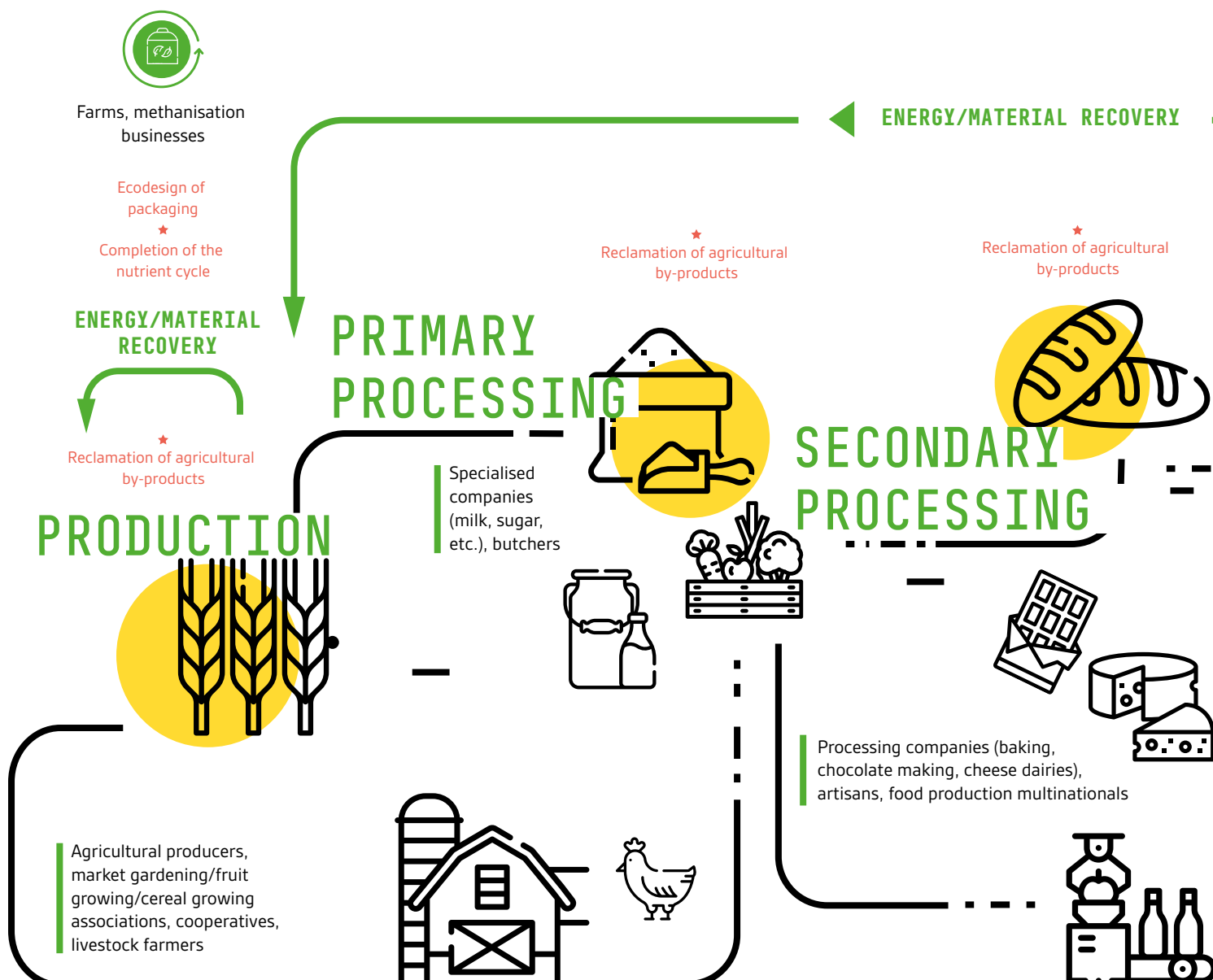
The industry as a whole is responsible for 30% of Switzerland's total environmental impact¹⁶.

Proportionately, Switzerland is a major producer of foodstuffs, producing around 60% of the food it consumes¹⁷, and the production phase is responsible for most of the industry's environmental impact. This impact is caused mainly by cattle farming and cereal cultivation. The extraction of agricultural raw materials is responsible for 59% of the

Swiss agricultural sector's greenhouse gas emissions, with 34% being generated by upstream suppliers, in other words suppliers of intermediate products such as oils and various materials and packaging. The production phase also has a major impact on biodiversity and water consumption.

Conversely, the environmental impact of the transformation phase is minimal. Nevertheless, production plants, which consume large amounts of energy, water and plastic, do emit greenhouse gases. The impact of distribution is also limited, due to the short distances covered in Switzerland. Distribution could even be optimised, by applying the principle of reverse logistics for example.

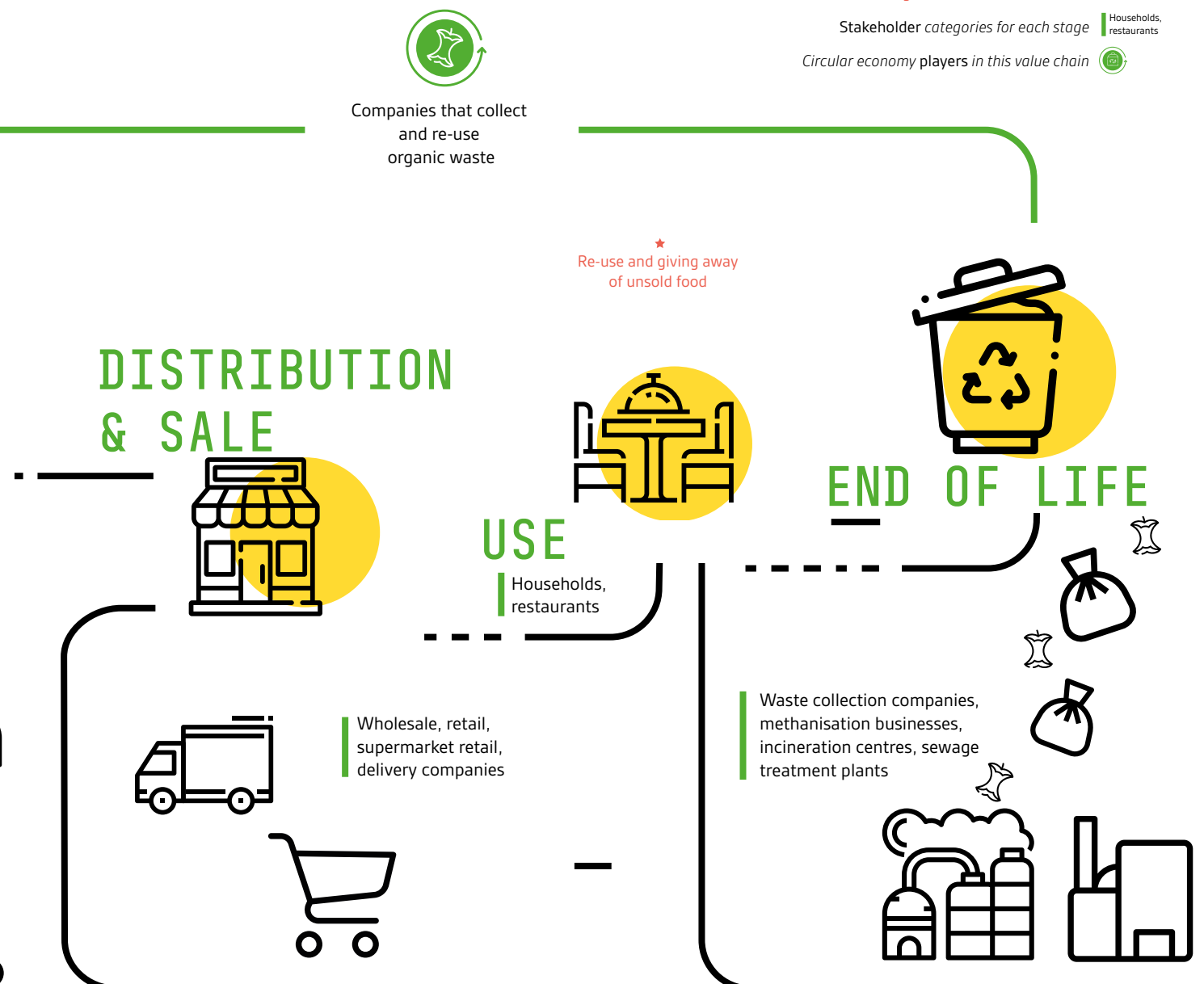
One important challenge for the industry is wastage of organic material all along the value chain. Consumption of foodstuffs in Switzerland generates 2.8 million tonnes¹⁸ of avoidable waste around the country and abroad. Half of



Switzerland's agricultural land is used to grow food that is ultimately discarded. One-third of this waste occurs at the end of the chain, as a result of food wastage by the end consumer¹⁹. Organic material is essential to the development of good-quality soil. Soil with a low organic-material content becomes depleted. This has a number of consequences, including loss of fertility.

Figure 6 ▾
Value chain of the food production industry

Legend:
Value chain in green and yellow 🗑️
Strategies to make it more circular ★
Stakeholder categories for each stage | Households, restaurants
Circular economy players in this value chain 🔄



GOOD PRACTICE IN SWITZERLAND

The connection between agriculture and circularity is easy to make: a piece of fruit (organic material) falls from a tree, rests on the ground and is slowly broken down into nutrients by microorganisms, and these nutrients (including nitrogen, phosphorus, potassium) enrich the soil. This completes the biological cycle and provides the tree with the nutrients it requires to begin a new fruit production cycle. One might therefore be tempted to think that the circular economy does not need to be applied to agriculture because agriculture, by its very nature, is circular. However, a number of circular opportunities and strategies have an important role to play in agriculture and more broadly throughout the food production industry.

When applied to the food production industry, the circular economy is a way both of reconnecting with this naturally circular essence (for example, not incinerating food waste because this doesn't return the nutrients they contain to the soil), and of using different strategies to make the most of the potential offered by organic matter (for example, the cascading use of resources in a bioeconomy). The main circular economy opportunities that present themselves for the food production industry are discussed below.

Applying ecodesign at the agricultural production stage

At individual farm level, the natural nutrient life cycle process explained above has the beneficial effect of fertilising the soil and making it for example more resistant to different weather conditions (drought or heavy rain). The latter effect can be limited by mechanised agricultural practices and/or breaking the nutrient cycle through practices such as extraction without the later return of nutrients to the soil and the intensive use of herbicides. The main purpose of the ecodesign principle is to manage resources as effectively as possible and extend the useful life of a product or material. It implies reorienting agricultural production methods towards practices that are more favourable to soil regeneration and the return of organic matter to the soil.

Healthy soil is soil with a high organic matter content, and this factor is the key to agricultural ecodesign. Examples of agricultural practices that improve the soil's organic matter content are crop rotation, planting cover crops, reducing the extent to which the soil is worked, and recycling crop residues through techniques such as composting and biogas production. Different types of agriculture such as agroecology, pasture rotation, agroforestry, conservation farming

and permaculture are also practices designed to extend the life of organic matter by returning agricultural waste to the soil and minimising the use of resources.

The food production industry has cottoned on to these different issues and is slowly becoming interested in circular agricultural production systems. [Nespresso](#) has turned to agroforestry to preserve coffee cultivation ecosystems and increase their resilience²⁰. This practice is also starting to be adopted at cantonal level in Switzerland: the association [AGRIDEA](#) is helping 140 farms in the cantons of Geneva, Jura, Neuchâtel and Vaud to develop agroforestry.



Did you know...

...why is organic matter so important? The organic matter in soil – essentially the organic carbon that makes up most of its mass – plays a fundamental role in the overall behaviour of soil and the agroecosystems it supports. The organic matter present in soil is subject to biological transformations that result in it becoming mineralised, releasing mineral elements such as nitrogen, phosphorus, sulphur, potassium and oligoelements and making them available to plants. Organic matter acts as a 'larder' for the plants and organisms living in the soil. The amount of organic matter present in the soil can also have significant repercussions on the water supply available to crops and the regulation of pollutants. The organic matter in soil also improves its structure and stability. Organic matter can make land less susceptible to erosion through a number of mechanisms: reducing the susceptibility of loamy soils to crusting, increasing cohesion in sandy soils and providing a litter of largely intact crop residue.

Re-using agricultural by-products throughout the value chain

Organic matter can be returned to the soil at every stage of the food production value chain. The journey from field to fork results in losses of organic matter, some of which are more commonly referred to as agricultural by-products. In the production phase, this means the produce that stays in the fields. In the transformation phase, it means the different materials that result from the preparation of a product, such as pulp, peelings and bones. In the use phase, the by-products are the leftovers on the plate or the food that goes off in the refrigerator. Re-using these by-products tends to increase the lifespan of this organic matter and lessen the environmental impact of the different processes.

ergy companies [Biogaz Mandement](#), Martin Biogaz, [Duchli Ranch](#) and [Biogas Ticino](#). This kind of recycling constitutes a circular strategy that can be appended to a company's business model. It can, however, also be a business model in itself, which is the case for [Centravo](#), which collects and recycles abattoir and butchery by-products. The same is true of companies that process soil and compost products, such as [Ricoter](#).



Did you know?

Consumers are responsible for one-third of organic matter losses. In Switzerland, each consumer throws away up to 100 kg of food worth CHF 2,000 every year.

[Schweizer Zucker](#) sells the pulp generated by its sugar beet processing method as animal feed. [L'Union Maraichère Genevoise](#) creates processed food products from unsold local agricultural produce. Around a hundred Swiss farmers have adopted biomethanisation technology that enables them to use agricultural waste to generate energy and produce fertiliser, employing the same process as the en-

Re-using and giving away unsold food

In the food production sector, the circular economy can act as a 'buffer' solution to reduce food wastage by for example re-using unsold food still fit for human consumption, as the company [Too Good To Go](#) does, and even giving away unsold food, which is the case of foodbanks such as [Partage](#) in Geneva and [Tables du Rhône](#) in Valais. Other options are repurposing unsold food as animal feed or to generate energy.

Here, the circular economy is a 'buffer' solution that helps prevent waste. However, one of the main challenges here is striving to eliminate or reduce as far as possible avoidable food waste, using the principle of the adapted waste management pyramid below:



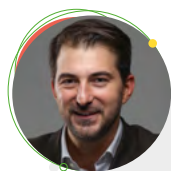
Figure 7 ▲
Order of priority of actions undertaken to limit the amount of unsold food

Applying ecodesign to packaging to increase its useful life and limit the extraction of primary natural resources

Packaging is a significant component of the food production sector, and the circular economy offers innovative strategies to reduce its impact. Firstly, ecodesign can be used to create packaging solutions with a low environmental impact. The supermarket chain Migros claims to be totally committed to this approach, employing dedicated staff to redesign containers, find alternatives to plastic, reduce the quantity of materials used and simplify the composition of its packaging²¹. A Federal Council Motion in support of this trend recently proposed the introduction by 2025 of a tax on disposable plastic products with less than 25% recycled plastic packaging²². Lastly, Nestlé has just invested two billion Swiss francs in research on alternatives to plastic, announcing that it intends to use only fully recyclable or re-usable packaging by 2025. Research in this field is therefore very active, with the [Plastics Innovation Competence Center in Fribourg](#), for example, currently working on an innovative thermoplastic made from chicken feathers.

A brief outline of solutions currently on the market:

- ▶ Ecodesign secondary packaging: [Coop](#) is switching from plastic produce nets to biodegradable cellulose ones for its organic onions, oranges and lemons.
- ▶ Re-usable packaging: [reCIRCLE](#) produces re-usable boxes for take-away services from restaurants, cafeterias, etc.
- ▶ [BioApply](#) makes biodegradable and compostable plant-based bags and packaging.



JONATHAN NORMAND
Founder and Executive Director, B Lab Switzerland

The transition to a circular economy is an excellent opportunity for Switzerland to use innovation to reinvent itself – there is so much potential!

OUTLOOK

As it stands, the circular economy thus offers a range of reasonably varied strategies. Applying the circular economy is a way to extend the life of our natural resources. Nevertheless, projects outside Switzerland show that by combining the principles of the circular economy with those of the bioeconomy, it is possible to take the sustainable re-use of by-products of the food production industry further.

Creating more added value through optimal re-use of by-products

Making better use of by-products is the same thing as making cascading use of resources, which involves using the same organic 'waste' as a secondary material, and then to generate energy, and then as a soil conditioner.

[GRAP'SUD](#), a French union of cooperative distilleries which specialises in the production and sale of grape-derived products, processes large volumes of grapes to extract most of their value (cascading use):

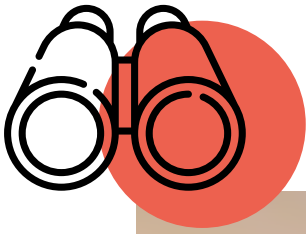
1. Recycling of the grape pomace recovered after pressing.
2. Extraction of polyphenols from the pomace for re-use in various applications: cosmetics, food additives, animal feed.
3. Re-use of the remaining material to generate energy and as soil conditioner.

The grapes are thus re-used optimally both from an economic and an environmental point of view (providing the nutrient cycles are taken into account and the constituents are extracted sustainably). The European research project [No Agro Waste](#) is researching alternatives to fossil plastics. One of its potential solutions is to extract components of unavoidable waste from different food production sectors and use them to make biosourced, biodegradable plastics. Applications targeted in the medium term include the mulch films used in agriculture. The vast majority of the plastic films currently in use are non-biodegradable and are an end-of-life management headache for market gardening companies.

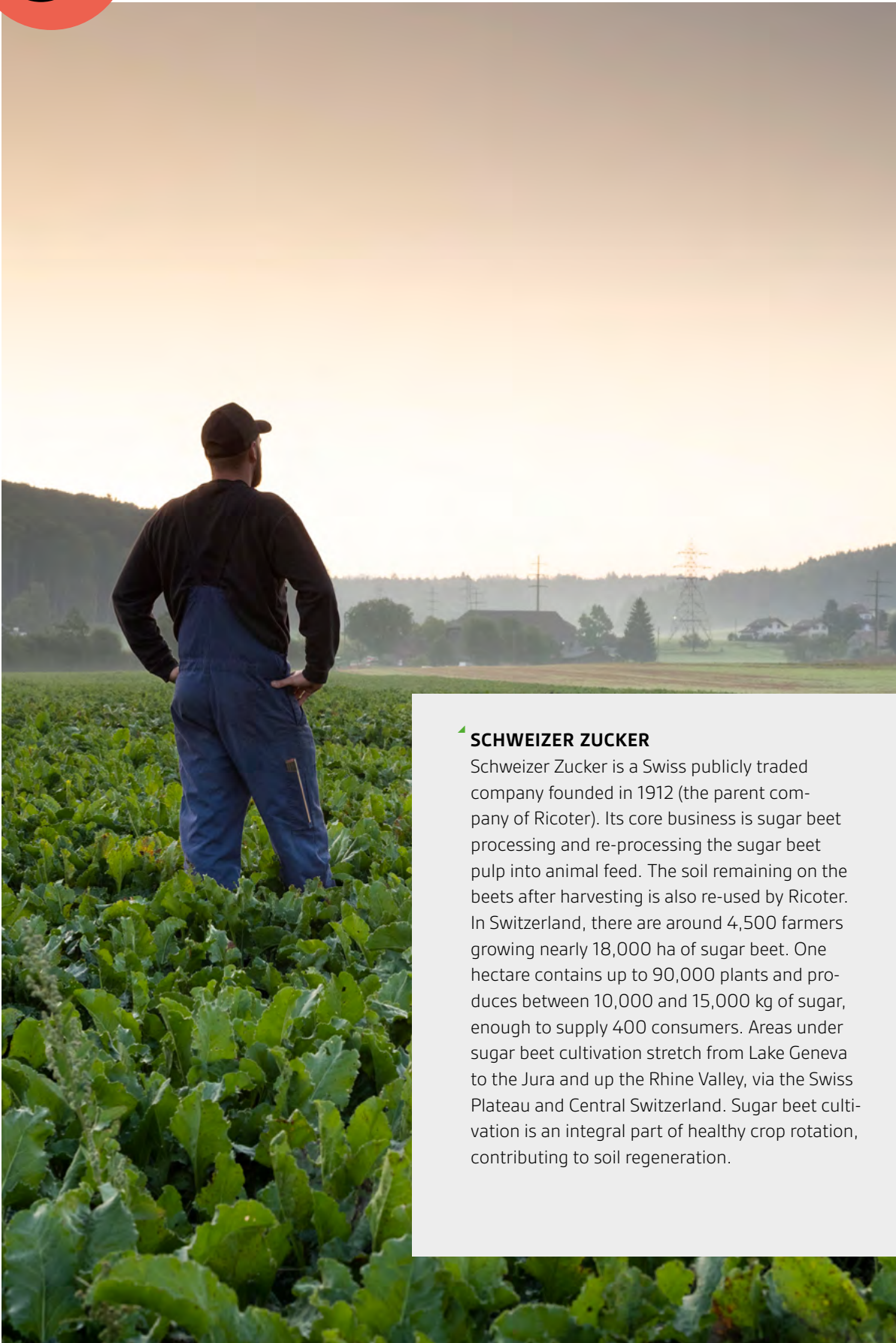


The bioeconomy

The bioeconomy is the name given to all economic activities based directly on the moderate use of biological resources. One principle of the bioeconomy is to maximise the use of renewable bioresources while taking into account the limits of agroecosystems. What this means in practice is applying circular organisation to agricultural production (re-using co-products, recycling waste and optimising energy flows).

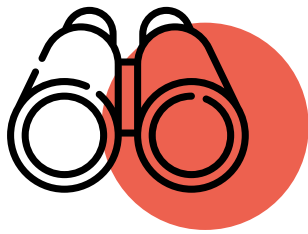


Spotlight on ...



▲ **SCHWEIZER ZUCKER**

Schweizer Zucker is a Swiss publicly traded company founded in 1912 (the parent company of Ricoter). Its core business is sugar beet processing and re-processing the sugar beet pulp into animal feed. The soil remaining on the beets after harvesting is also re-used by Ricoter. In Switzerland, there are around 4,500 farmers growing nearly 18,000 ha of sugar beet. One hectare contains up to 90,000 plants and produces between 10,000 and 15,000 kg of sugar, enough to supply 400 consumers. Areas under sugar beet cultivation stretch from Lake Geneva to the Jura and up the Rhine Valley, via the Swiss Plateau and Central Switzerland. Sugar beet cultivation is an integral part of healthy crop rotation, contributing to soil regeneration.



Spotlight on ...



RICOTER

Ricoter is a Swiss publicly traded company headquartered in Bern. Established in 1981, Ricoter is a subsidiary of Schweizer Zucker and the pioneer of Swiss-made compost (produced at its plants in Frauenfeld and Aarberg). The way it operates is a good illustration of the principle of nutrient cycle completion: the company produces compost out of organic waste generated by farms, the forestry industry, horticulture and the Swiss food industry. It makes garden and potting compost for retail to consumers. Ricoter also produces a peat-free compost which does not rely on the exploitation of these natural ecosystems that form carbon sinks. (The company also makes a compost with a low peat content.) In addition, Ricoter uses Jura limestone to produce lime, which can then be used on farms to improve soil aeration and permeability.

CONSTRUCTION

INDUSTRY CONTEXT

With a workforce of more than 500,000 and accounting for 10% of Switzerland's GDP, the construction industry is a heavyweight of the Swiss economy. Every day, an area equivalent to the size of 6,400 car parking spaces is concreted over in Switzerland²³. This industry is also the country's leading source of waste, accounting for more than 80% of the total waste generated annually (8.7 tonnes per inhabitant²⁴): 57 million tonnes of excavation waste and 17 million tonnes of demolition waste²⁵.

Figure 8 shows the different stages of the construction industry and the strategies to make it more circular.

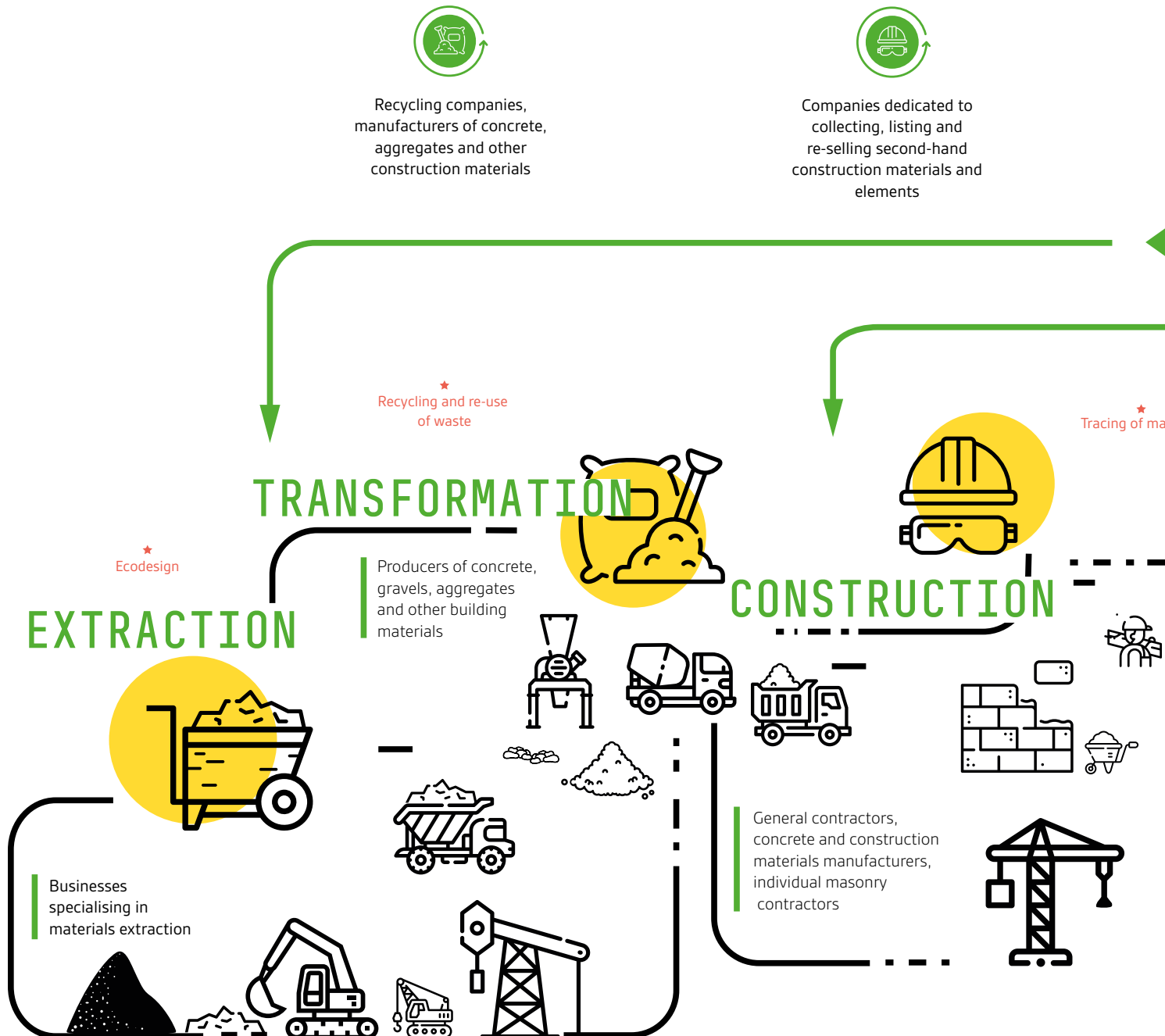




Figure 8 ▼
Value chain of the construction industry and its circularity strategy

Legend:

Value chain in **green** and yellow 

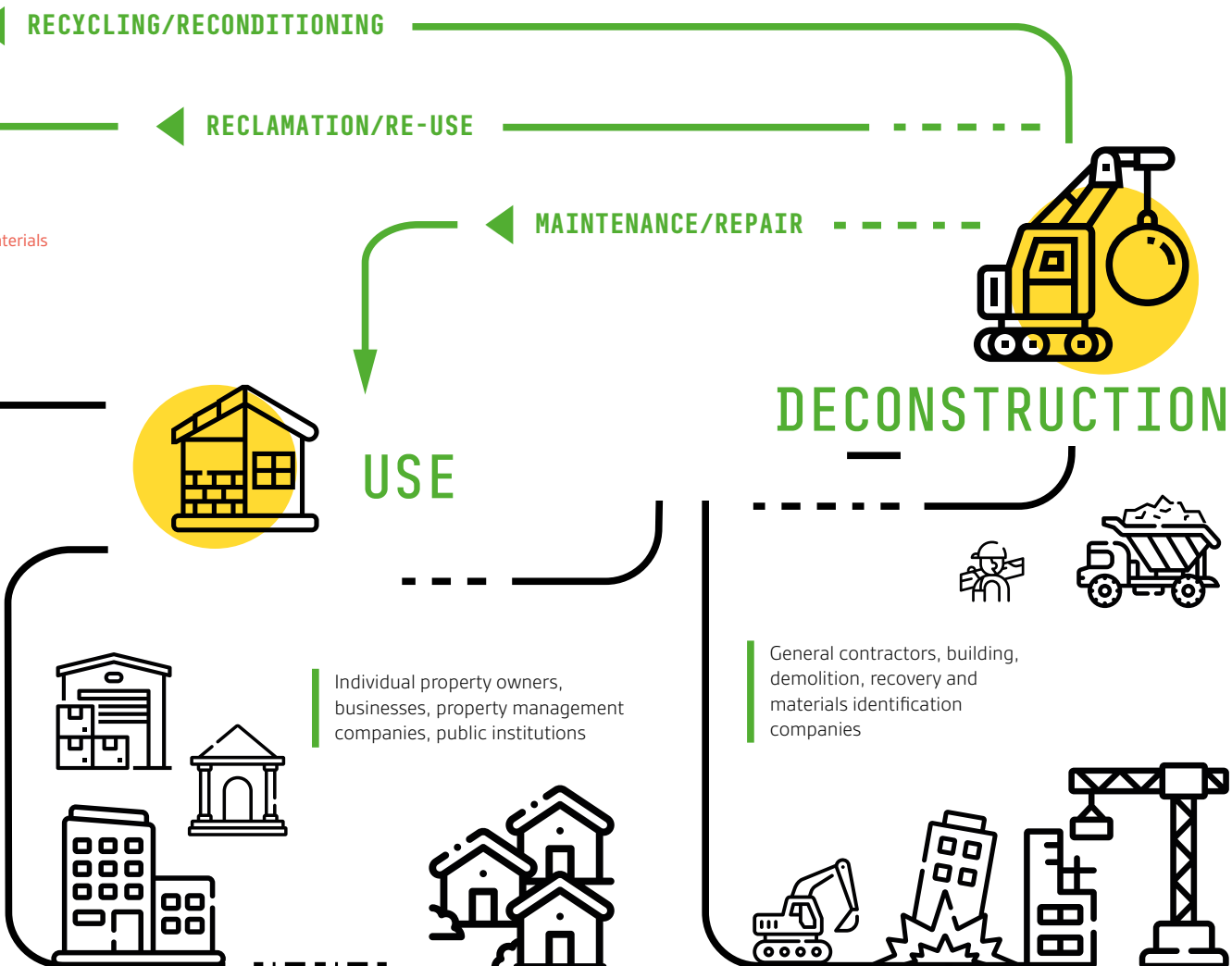
Strategies to make it more circular 

Stakeholder categories for each stage  Businesses specialising in materials extraction

Circular economy players in this value chain 



Businesses operating in all the finishing trades



Roughly two-thirds of the construction industry's overall environmental impact occurs during the use phase of a building. Heating and wastewater treatment²⁶ are the main culprits. For decades, the industry has been applying demanding quality standards to reduce and optimise the consumption of water and heating, through initiatives such as the [Minergie](#) quality labels and the [GEAK tool](#). Greater investment at the planning stage of urban developments and individual buildings would reduce the environmental cost in the long term. Despite this, in a [study](#) published in December 2019²⁷, the Swiss Federal Office of Energy found that investment decisions relating to energy efficiency tend to be short-termist. It would appear that the industry is due a wake-up call and in need of a paradigm shift.

Upstream, the extraction and supply of materials also impact the environment, and with resources becoming progressively depleted, the amount of energy required to extract them is increasing significantly. This impact is felt mainly outside Switzerland. And despite the fact that the level of construction waste recycling is quite high in Switzerland (70% for mineral deconstruction materials and around 75% for excavation materials), their reclamation and re-use is far from optimal. The current trend is for 'decycling', in other words, a process of cascading re-use in which materials are recycled for uses requiring a lower quality, such as backfill materials. The complexity of recycling, its cost and above all the reluctance of industry players to use recycled materials are all contributing to this situation.

A paradigm shift and the central role of the public authorities

With an average of between 3,000 and 4,000 deconstruction permits issued annually in Switzerland²⁸ and the growing difficulty of opening up new extraction sites on Swiss territory^{29,30}, the recycling, reclamation and re-use of

materials are important issues for the industry. The circular economy in the construction industry must be accompanied by a change in mindset of what the built environment should be. It must now be looked upon as a stock of materials, an 'urban mine'.

The situation is changing and public authorities like the Vaud cantonal council now require all new constructions owned by the Canton of Vaud (or in which it has a majority financial stake) to comply with the [Minergie-P-ECO](#) standard or demonstrate equivalent performance (at least 50% recycled concrete). Similarly, Zurich is the only canton to prohibit the landfilling of concrete and require polluted waste to be processed³¹ for re-use. Both of these initiatives are helping to encourage the use of recycled materials. The Federal Office for the Environment is also looking into incorporating reclamation and re-use into construction standards and specific certifications designed to speed up the adoption of these practices³².



KILIAN JORNET

Professional athlete and President of the Kilian Jornet Foundation

It's about living life at a slower pace to speed up our response to the climate challenge.

GOOD PRACTICE IN SWITZERLAND

Companies in the Swiss private sector too are actively developing innovative circular economy strategies to limit their impact on the environment throughout the construction industry's value chain.

Incorporating ecodesign to reduce environmental impact and maintenance and deconstruction costs

It is during the ecodesign – or ecoconstruction – process that decisions are taken to limit the use of materials, use recycled materials, re-use or reclaim materials from other buildings and anticipate the end of the building's useful life (planned deconstruction). The architectural firm [in situ](#) is one of Switzerland's re-use pioneers. For its [Halle 118](#) project in Winterthur, in situ began by identifying reusable elements and materials on deconstruction sites around the region, before drawing up the plans for the renovation work and raising the superstructure. Ecodesign is more than just an ideal. The construction of a [NEST](#) (Next Evolution in Sustainable Building Technologies) module on the Empa site in Dübendorf³³, built entirely of separated, reusable, recyclable and compostable materials, is proof of that. NEST is a student residence building that functions like a modular laboratory in which construction research and tests are carried out in real-life conditions.

Tracing materials to meet demand for recycled materials

To support re-use, companies such as [Salza](#) publish online in real time a list of re-usable elements that become available on demolition sites. This is also the approach adopted in 2017 by [Madaster](#), a Dutch not-for-profit foundation which opened a Swiss office in Zurich in October 2018. Madaster does more than draw up an inventory of materials available for re-use; its aim is to provide each of the construction materials with an identity profile. The objective of this approach is to facilitate future renovation work by providing contractors with all the details of the materials of origin, reduce demolition waste and also promote re-use and reclamation by making the elements available online. The tool also provides an estimate of the circularity of the materials and their current market value.

Recycling construction site waste and reintegrating it into the circuit as construction materials

In support of this trend, businesses operating mainly in materials processing and construction have come up with innovative ways of using construction site waste. As eastern Switzerland's leading building waste recycler since 1983, [Eberhard AG](#) collects deconstruction waste, produces recycled materials such as gravel and concrete, and constructs buildings with these materials. Other players have emerged too: [Ronchi SA](#) in Gland, [Sotrag SA](#) in Etoy and [Kästli Bau AG](#) in Rubigen to name but a few. These companies recover and re-use mineral waste from construction sites by sorting, crushing and sifting concrete waste and asphalt materials. Similarly, [BOWA Recycling AG](#), in Susten owns one of the industry's most modern soil washing installations. The company cleans, processes, recycles and reintroduces decontaminated construction materials. In Geneva, the innovative Terrabloc project, winner of the Geneva canton sustainable development grant (Bourse Cantonale du Développement Durable) in 2011 and the SUD sustainable start-up prize in 2019, gave rise to the company of the same name. [Terrabloc](#) recovers spoil from ground excavations and turns it into compressed earth blocks for use as an alternative to bricks and concrete in various applications. Other industry players are looking for ways to 'circularise materials flows'. [Neustark GmbH](#) in Bern, for example, has come up with a way of storing CO₂ by injecting it into demolition waste which is then re-used in the form of aggregates and gravel to produce new concrete.

Wrecking balls and columns of trucks filing into landfill sites will soon be a thing of the past; planned deconstruction is fast becoming a key stage in the construction industry value chain, involving every player in the industry and providing a plentiful source of recyclable and re-usable materials.

OUTLOOK

In response to the issues discussed above and to meet more ambitious circularity objectives, other countries have developed innovative, accessible initiatives.

Modular buildings designed to encourage repurposing, reconditioning and re-use

To reduce the quantity of raw materials used to construct a building and limit the waste generated by future renovations of that building, more and more research is focusing on building reversibility^{34,35}. A reversible building must ensure that future renovations generate little or no waste and must be easy to convert to another use, for example from commercial to residential. This practice also involves giving preference to re-usable materials wherever possible. Several reversible buildings have been constructed in recent years. In Brussels, a timber building built in 2018 for use as offices was dismantled and rebuilt in 2019 to serve as commercial premises, and it is due to be transformed into an acoustics laboratory in the near future³⁶. Another building, a seven-storey office block in the Confluence district of Lyon, France, was designed from the start to be easily transformable into a residential block in the future. The size of the windows, the balconies and even the height of the storeys were designed with both types of use in mind, and the project took into account the planned reclassification of the nearby motorway as an urban boulevard³⁷. At a bigger scale, [Park 20|20](#) in Amsterdam is a circular economy business district in which the buildings are reversible and quickly and easily able to accommodate different business requirements (offices, hotels, restaurants, etc.). The buildings have been designed to be dismantlable, with each different material used logged for easy identification. Park 20|20 is currently home to the international headquarters of several major corporations, and has received a large number of enquiries about opening shops there.

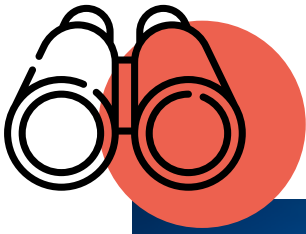
Conceiving the circular economy at district level

In 2015, Amsterdam was the first city in the world to evaluate the quantitative potential of the circular economy. Since then, several projects have seen the light of day, including the [circular economy district of Schoonschip](#), completed in 2019. Located in a family-friendly residential quarter in the north of the city, close to the full range of amenities, the district is made up of floating homes built of timber and other recycled materials. Heat pumps use the water in the canal for domestic heating, and water is also heated by solar collectors and photovoltaic panels that generate electricity which is stored in batteries, with the surplus being fed into the urban grid. The water treatment system is also innovative: the grey water is channelled into the conventional system, while the sewage waste is recycled into fertiliser and used to generate biogas. Most of the dwellings also have a vegetable garden on the roof. From the start, this has been designed as a circular economy district, from construction to the end of its useful life.

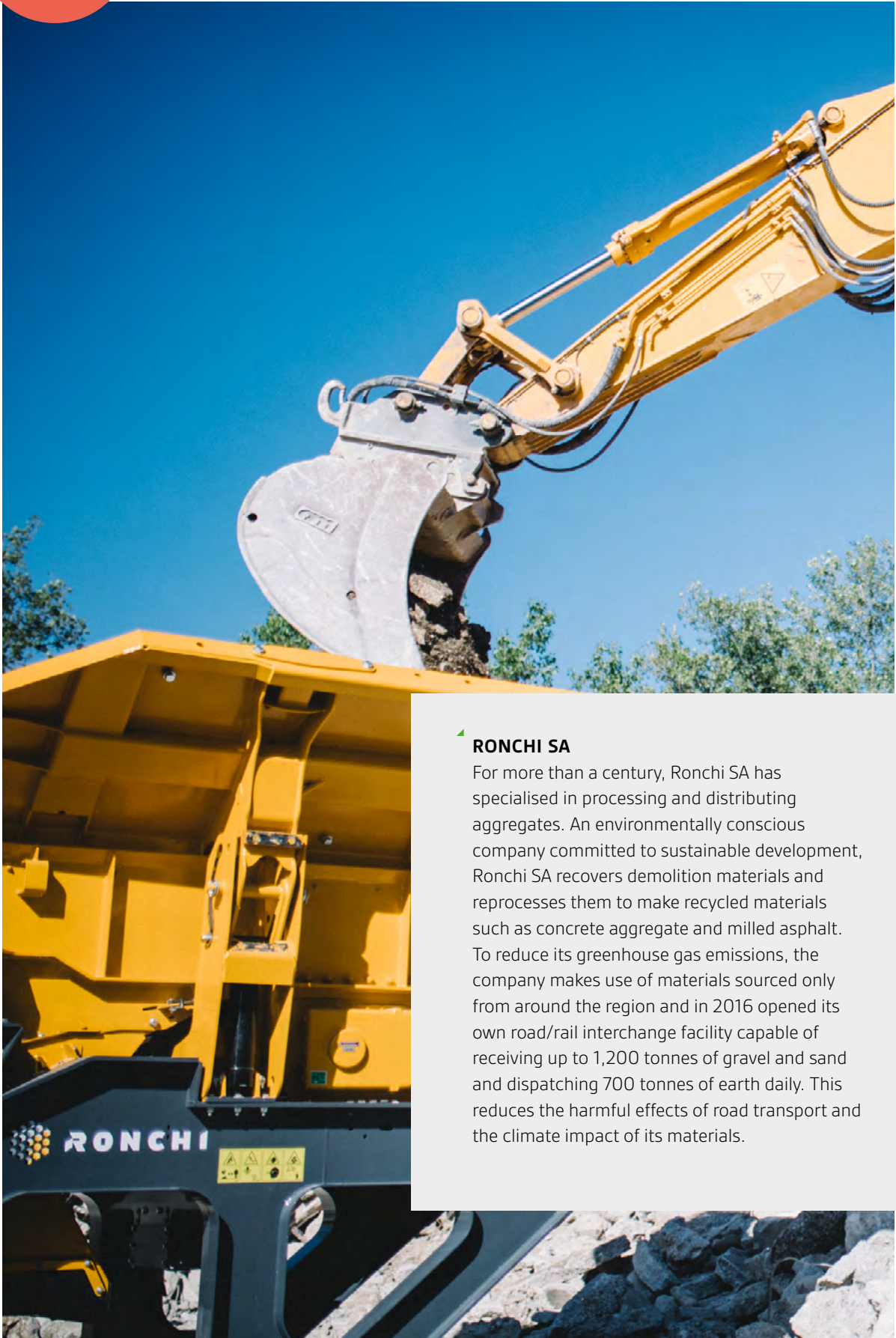


IGOR USTINOV
Co-founder of UHCS

Like in nature, imagine and learn to regenerate our activities to better adapt the world to the impacts of our unavoidable necessities.

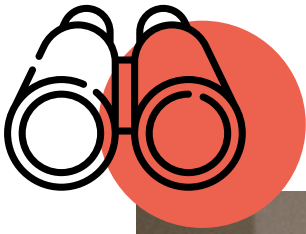


Spotlight on ...



RONCHI SA

For more than a century, Ronchi SA has specialised in processing and distributing aggregates. An environmentally conscious company committed to sustainable development, Ronchi SA recovers demolition materials and reprocesses them to make recycled materials such as concrete aggregate and milled asphalt. To reduce its greenhouse gas emissions, the company makes use of materials sourced only from around the region and in 2016 opened its own road/rail interchange facility capable of receiving up to 1,200 tonnes of gravel and sand and dispatching 700 tonnes of earth daily. This reduces the harmful effects of road transport and the climate impact of its materials.



Spotlight on ...



▲ **TERRABLOC**

This Geneva-based company has brought back into fashion the age-old technology of making bricks out of earth. The blocks Terrabloc makes are not only environmentally friendly, they also improve the building's interior comfort by naturally regulating humidity. One to watch... see the Terrabloc company profile in the second part of this report.



What about timber constructions?

Every year, Switzerland uses around ten million cubic metres of timber³⁸, the equivalent volume of 4,000 Olympic-sized swimming pools. Since 2015, the use of timber has been permitted in every type of construction³⁹ and in 2019 it accounted for approximately 14% of the market⁴⁰. However, Switzerland's forests are underexploited for construction materials because production costs are too high. As a result, timber is often imported from Germany or Austria⁴¹.

But in terms of developing the circular economy and reducing the construction industry's environmental impact, timber is the ideal solution. It's a natural material that stores CO₂, is renewable and can be recycled at every transformation stage. Today, building with timber makes it possible to build more quickly, increase the net floor area of a given building footprint by 8%, naturally regulate the building's humidity levels, reduce heat loss by 30% by limiting thermal bridges, and store – naturally – CO₂ (1 m³ of timber equates to 1 tonne of stored CO₂^{42,43}). Building with timber also avoids using concrete of course, and concrete production consumes primary raw materials and emits large quantities of CO₂⁴⁴. And despite what the naysayers claim, timber buildings can stand the test of time. The oldest timber house in Europe is in... Switzerland! Built in 1176 in what is now the village of Steinen (canton of Schwytz), it was dismantled in 2017 to make way for an apartment block and rebuilt in Sattel (canton of Schwytz). And timber has lofty ambitions too: the [Mjøstårnet tower](#), built in 2019 in Brumunddal, Norway, entirely of timber, is 85.4 metres high, making it the highest timber building in the world to date⁴⁵.

Timber therefore has a big future and – who knows? – could become the go-to building material in the 21st century, as concrete was in the 20th century.

DAVID CRETENAND

Director, RedElec Technologie SA and founder of the 1PEC initiative



The circular economy encourages us to collaborate and requires skillsharing so that each partner is able to capture value from it.

CONSUMER GOODS/DEVICES

INDUSTRY CONTEXT

Consumer goods consist of two categories: consumer durables (furniture, clothing, electronic goods and tools) and non-durable consumer goods (cosmetics, cleaning products, food and drink). Our analysis will focus on consumer durables, for which circular strategies already exist in Switzerland. Their value chain is illustrated in Figure 9.

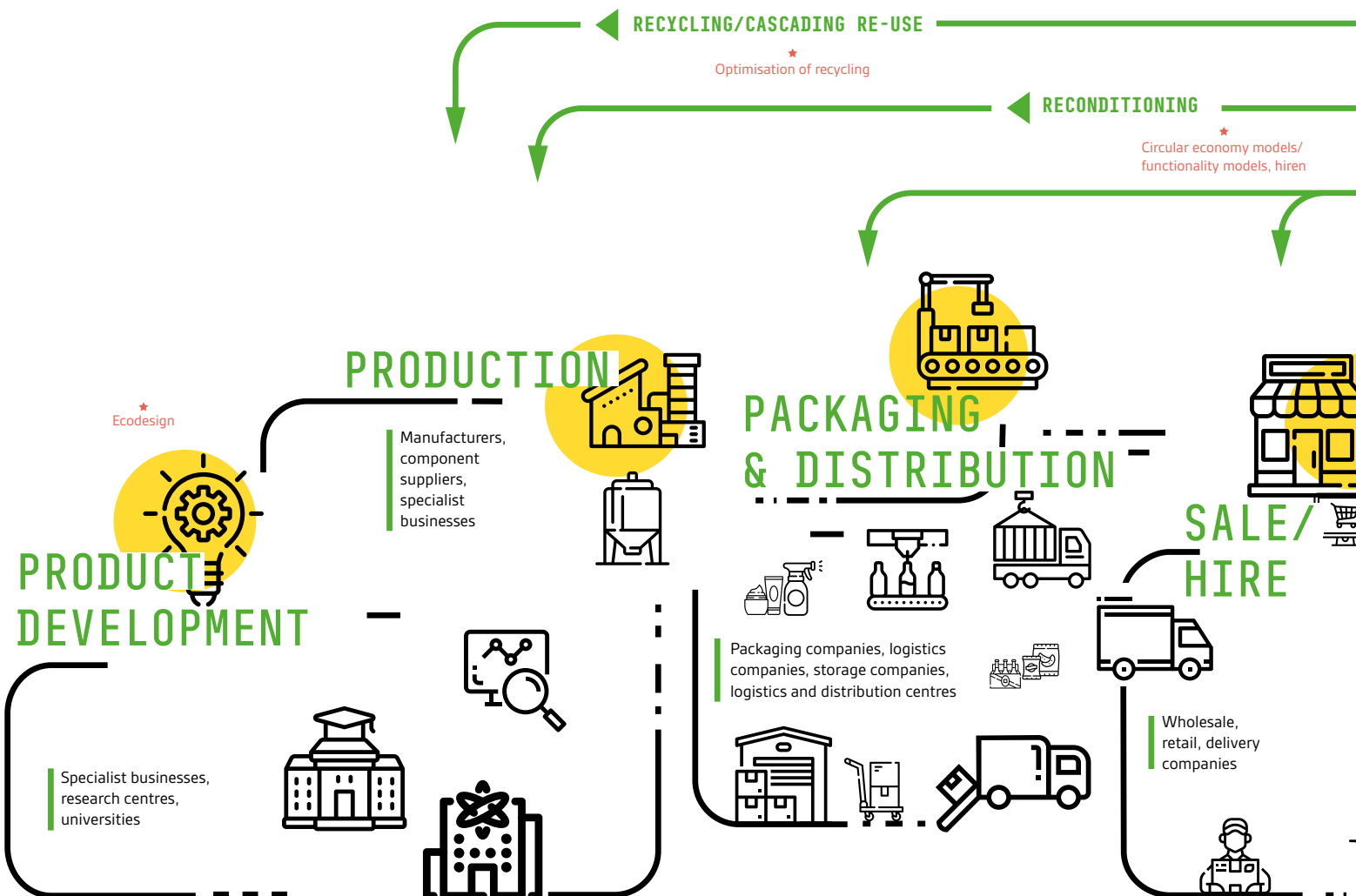
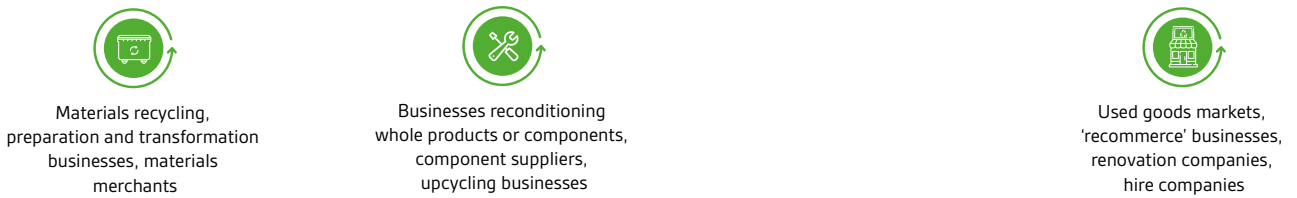





Figure 9 ▾
Value chain of the consumer goods industry

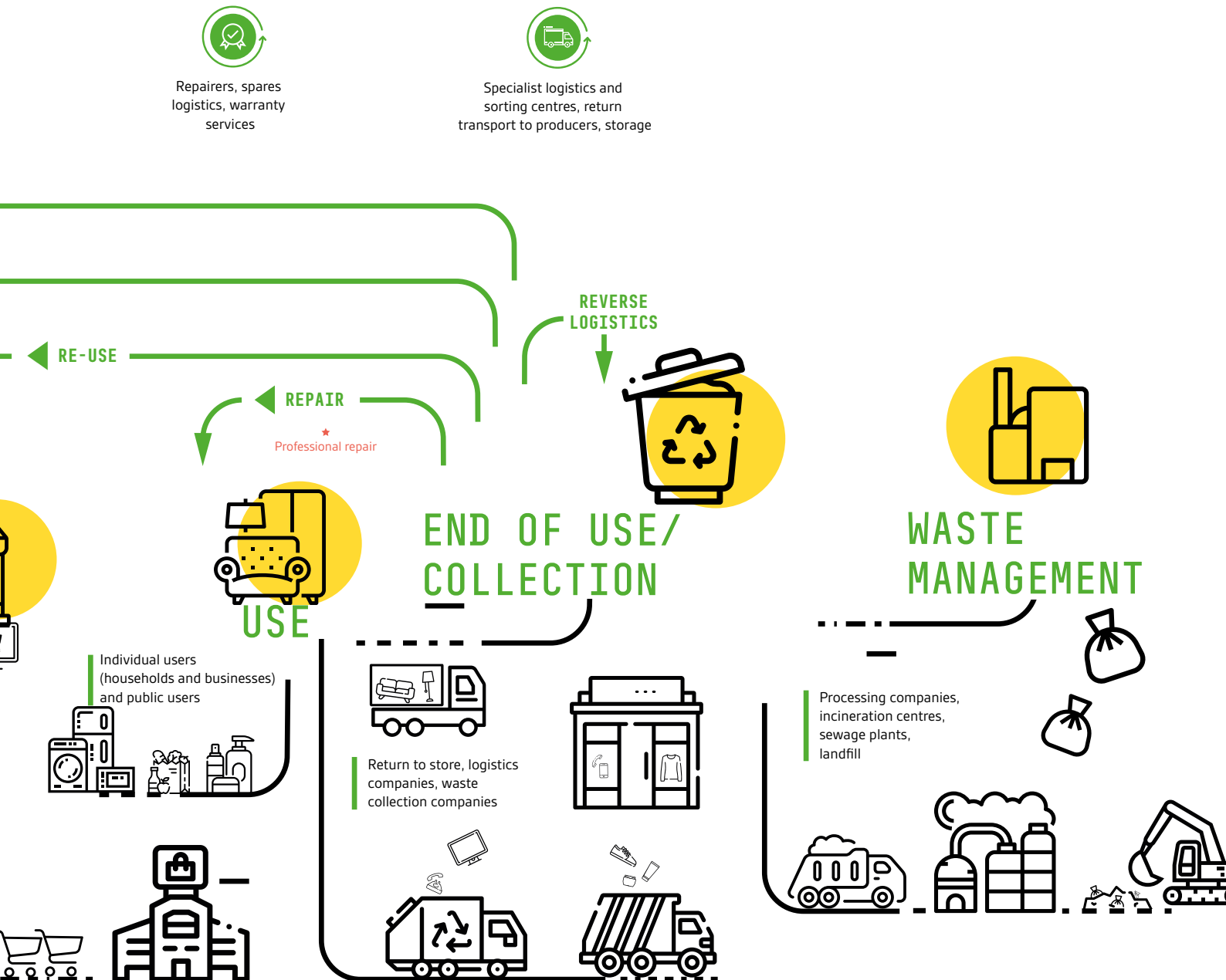
Legend:

Value chain in **green** and yellow 

Strategies to make it more circular 

Stakeholder categories for each stage  Specialist businesses, research centres, universities

Circular economy players in this value chain 



Electrical appliances and electronic devices

Electrical appliances and electronic devices can be divided into four groups:

1. Consumer electronics
2. Electronic office and ICT equipment
3. Domestic appliances
4. Tools (excluding heavy industrial machinery)

For 2020, Swiss sales in the consumer electronics segment are estimated to be approximately CHF 2.2 million⁴⁶ and CHF 1.2 million for domestic appliances. No reliable figures are available for the household tools category.

In 2017, 129,000 tonnes of electrical and electronic devices were recycled in Switzerland, 62% of which were domestic appliances and light bulbs ([SENS eRecycling](#)) and 38% ICT and telecommunications equipment and consumer electronics ([Swico Recycling](#))⁴⁷. The recycling rate of these devices in Switzerland is 95%, compared to around 35% in the European Union⁴⁸.

Swiss manufacturers and importers contribute to the current recycling system, giving Switzerland a very dense network of collection centres compared to the rest of Europe, which makes collection and recycling easier. The devices recovered amount to a valuable stock of materials; nearly 60% of their total mass is made up of metals such as iron, copper and aluminium. There are currently nearly 120 businesses in Switzerland manually dismantling these devices.

Furnishings

Furniture sales in Switzerland have declined slightly in recent years and are currently worth around CHF 3.8 billion per year. On the Swiss furnishings market, around 7% of furniture and furnishings sales are generated through e-commerce – and this trend is growing.

In furnishings, we can identify three key issues that are slowing the growth of the circular economy. At the design and material-selection stage, there is a gradual shift away from solid wood and metal towards cheaper, lesser-quality materials, which inevitably limits their potential for re-use. Many furnishing products are made from mixed materials without the purchaser being aware of the fact, and this makes recycling, disassembly and re-assembly difficult.

A lever effect can also be generated by consumer choice. Consumers are rarely given advice on how to maintain and repair furniture to extend its useful life. Furthermore, a lack of availability of replacement parts encourages the purchase of new furniture, and a lack of information about sustainable furniture for domestic and commercial use acts as a brake on circular economy business models.

A third aspect is to do with the existing infrastructures for collecting, remanufacturing and re-using furnishing products and reverse logistics systems, which are not sufficiently well organised or funded at national level. Products reaching the end of their use phase are therefore often recycled or incinerated before they can enjoy a second life⁴⁹.



Reverse logistics

Reverse logistics is the catch-all term for all the operations connected with the re-use of products and materials. It applies to the process of moving goods from their place of final delivery to derive additional value from them or eliminate them in an appropriate way. Repair and re-marketing activities can also be included in the definition of reverse logistics.

Clothing, footwear and textiles

In recent years, the production of clothing, footwear and textiles in Switzerland has declined, amounting to around CHF 8.8 billion in 2017. The clothing products segment accounts for around three-quarters of sales, followed by footwear and accessories. For the most part, these products are produced by small fashion brands employing fewer than 10 people. Every year, more than CHF 10.5 billions' worth of clothing products are imported into Switzerland, while CHF 4.2 billions' worth are exported. The Swiss clothing retail sector comprises nearly 3,000 businesses. Currently, Swiss fashion retail sales are facing the challenge of growing competition from online retailers. The e-commerce share of fashion sales is currently around 16%, but this is expected to rise to more than 27% by 2022⁵⁰.

There are three key issues in the clothing, footwear and textiles industry. On the design and supply side, applying circular economy design criteria optimises the choice of materials, helps reduce the use of toxic substances, and has an impact on the products' ecological footprint, longevity and recyclability (example: the non-recyclability of mixed fibres, which represents an opportunity to develop this kind of technology). During the manufacturing process, it is important to take into account processing (which uses a lot of energy), the use of chemicals and water in dyeing textiles and the generation of waste fibres and fabrics. At the end of the use phase, reducing the premature disposal of clothing⁵¹ is an issue that must urgently be addressed. Introducing circular economy practices can help to reduce the quantity of clothes thrown away prematurely every year (approximately 92 million tonnes)⁵².

Cosmetics and bodycare products, detergents and cleaning agents

In 2019, sales of cosmetics and toiletries in Switzerland were worth around CHF 1.9 billion, more than 16% of which was spent on decorative cosmetic products^{53,54}. The value of the market for detergents and care and cleaning products in Switzerland was approximately CHF 690 million in 2019^{55,56}.

From the point of view of the circular economy, the market for detergents and cleaning agents is similar to that for cosmetics and bodycare products. Packaging design plays an important role in that the product packaging accounts for a significant proportion of the mass of the finished product. The complex composition of packaging makes it difficult to recycle or re-use, and this leads to decycling. The formulation of the product itself, with the use of microplastics in shower gels, lipsticks and skin scrubs for example, could be optimised at the design stage to reduce the use of raw materials that are harmful to the environment^{57,58}. The formulation of these products, with particular emphasis on non-toxicity, lies at the heart of circular economy thinking in this area. Companies that are now replacing synthetic chemicals in their products include [EFP Biotek](#) (alternatives to silicones and lanolin), [Genomatica](#) (biosourced glycols), [Method](#) (Cradle to Cradle Certified™) and [BASF](#) (The Rambutan Program).

ADÈLE THORENS GOUMAZ
Member of the Council of States



The circular economy is an opportunity for our businesses to rethink their business model so that they can disconnect profit-making from the overconsumption of resources.

GOOD PRACTICE IN SWITZERLAND

In the private sector, a number of circular economy strategies are being developed, enabling players in the consumer goods value chain to take up opportunities and offer their employees and customers new solutions.

Replacing linear economic models in the consumer goods sector to develop new opportunities

In the current sales model, the manufacturer transfers ownership of the product to the customer. If it invests in ecodesign, the manufacturer creates added value from which it cannot benefit directly because this added value is not generated until further down the value chain. If it uses recyclable materials, currently only the recycler will benefit from this; the user will enjoy a longer product life and the service technician will find it easier to repair. In the current sales model, the manufacturer benefits only indirectly from its investment in a circular design through the improvement to the product's properties, which may increase demand and sales. However, that in itself rarely justifies the required ecodesign investment. Besides the linear sales model, there are other business models that enable the producer to incorporate other parts of the value chain and therefore the added value of ecodesign in-house:

Hire and lease models

The Dutch company [Desso](#) (Tarkett group), which has a presence in Switzerland, uses circular economy materials in its carpets so that they can be entirely re-used to make a new carpet once the original one reaches the end of its use phase. It hires out and then recycles its carpets. Desso retains ownership of the carpet and therefore has a 'stock' of raw materials on its customers' premises. The value added by recycling and the added value in the materials used and savings made by the easy disassembly process benefit the company directly. Desso is also less dependent on price volatility in the raw materials market and therefore benefits from more predictable materials costs. Staying in the textiles industry, [CWS Boco](#) applies a circular economic model to its manufacture of workwear and hygiene solutions in Switzerland. The logistics (collection and delivery), product sorting, washing and drying, quality control and repair or replacement are all included in the company's hire service. In this model, CWS can invest in sustainable textiles and benefit directly from longer hire durations.

In the furnishings market, [Zesar](#) is innovating by carrying out the repair, disassembly, reprocessing and recycling of its products. The company recently developed a circular economic model for the hire of school furniture.

Service models that contribute to the economy of functionality

A manufacturer can benefit directly from the energy efficiency of its product if it offers it as a service. The lighting manufacturer [Signify](#), for example, offers 'light as a service'. The customer simply chooses the lighting level and how long they want to have the lighting. The costs of provision, installation and maintenance of the lighting, and also the electricity costs incurred, are covered by the service provider. Through optimum planning of the lighting, selecting an energy-efficient light source and installing proximity sensors, Signify can reduce energy consumption by up to 70%. Optimising energy efficiency and circuit design therefore directly increase Signify's profit margin. This makes the offer cheaper than if the customer had purchased and operated the product themselves (comparison of the overall cost).

The importance of ecodesign

[Pfister](#) has developed the first collection of biodegradable curtains in Switzerland. To achieve this, Pfister has used various circular economy design techniques, including a [Cradle to Cradle Certified™](#) process. Pfister products have been awarded Gold certification because their biological and technical cycles are fully optimised. After use, their curtains do not end up as waste but are bought back and fully reincorporated into the biological cycle. Pfister's strategic choice has been so successful economically, the company has extended the concept to other product ranges such as bed and bath linen.



Cradle to Cradle Certified™

This international certification scheme can be awarded to products whose composition, design and production method comply strictly with circular economy criteria. Certification is based on five criteria: the impact of the materials on human health and the environment, their potential for re-use, use of renewable energy and management of carbon emissions, water management, and social aspects. The product or process's achievement in each of these criteria is also rated at one of five levels: basic, bronze, silver, gold or platinum.

Optimising materials recycling systems

Some recycling and composting systems for consumer goods materials are already well established. These generally take the form of structured systems at regional level (such as the many systems specific to certain product categories in Switzerland, from batteries to packaging) or are specific to a particular company (such as the collection and recycling of used coffee capsules by Nespresso). In another innovative example, [Bauwerk](#) in the canton of St Gallen produces 'healthy-for-living' parquet flooring (certified FSC, Blue Angel, Sentinel Haus Institut, eco-INSTITUT and Cradle to Cradle Certified™). The company has removed from its products carcinogenic substances such as benzophenone, polyisocyanates and azo compounds, which are often found in other parquet lacquers and oils. Thanks to the special laying technique used, Bauwerk's parquets can be removed and re-laid up to three times, even in different locations. To this end, Bauwerk has set up a laid flooring returns system.

Solutions offered by companies or groups of companies require a level of materials separation that is suitable for high-quality recycling processes. Consequently, the market is generally growing through specialist players at regional level, with natural obstacles to growth beyond their initial area of coverage and a local labour supply.

Developing the professional repair and reconditioning of consumer goods

Contracting local professionals to repair goods could stimulate economic activity in Switzerland, even if the replacement parts required are not necessarily produced locally. Furthermore, in recent years the reconditioning sector has been booming in Switzerland, with several new initiatives emerging and increasing their market share.

[Girsberger](#), for example, specialises in repairing furniture that is worn out but does not necessarily need to be replaced. This strategy is sustainable (the existing furniture is retained, instead of being thrown away and new furniture purchased) and economical because it is profitable for the company to refurbish furniture on a large scale. In addition, offering repair gives Girsberger a better strategic position and visibility on the market, particularly with respect to the circular economy and sustainability.

OUTLOOK

Other innovations in consumer goods are being developed around Europe and finding their place in the Swiss economic environment.

Circular procurement in the public sector

Public procurement contracts in Switzerland amount to CHF 40 billion a year. Changes to the law in public procurement for 2021 have introduced stricter recycling requirements and more specific sustainability criteria to the tendering process. This volume of business is a useful lever for developing new offers and products, using more sustainable materials, making more efficient use of resources, and encouraging economic models with less negative impact on the environment and society. This is therefore where the circular economy really comes into its own. In the Netherlands, an office furniture procurement scheme incorporating the principles of the circular economy was trialled following a motion in parliament, which called on central government to make 10% of its procurement circular. The resulting report, 'The path towards a circular category – office furniture'⁵⁹, was produced to provide the public authorities with guidance in circular procurement. Re-using furniture internally has the potential to save the Netherlands' entire central government organisation around six to seven million euros per year⁶⁰. For suppliers, this contract worth 200 million euros⁶¹ over 10 years, which includes an option in the call for tenders to develop and improve circular offers at different stages, is not only an economic boon but also gives a real boost to their positioning on the circular furniture market.

Using disruptive technologies to accelerate the introduction of a more efficient circular model in the consumer goods sector

Disruptive technologies, also known as Fourth Industrial Revolution technologies, are a game changer for the circular economy because they allow businesses to disconnect production and growth from the use of natural resources⁶². There are three different kinds of disruptive technology:

1. **Digital:** technologies that make use of information technology, electronics and communication science, exploiting the growing volume of information and the connectivity of physical resources. Examples: artificial intelligence, the Internet of Things, and machine learning. The Dutch start-up [Circularise](#) was established to accelerate the transition to a circular economy and to

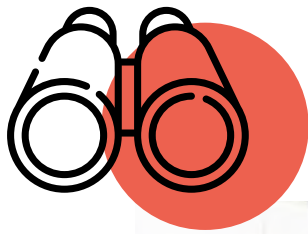
enable sustainable practices on a large scale by promoting reliable, standardised information about materials flows, the composition of materials, and components⁶³.

2. **Physical:** Technologies that make use of the fundamental properties of materials, energy, the forces of nature and the ways these interact. Examples: 3D printing, robots and materials science. [DSM-Niaga](#), an industrial design and engineering company, re-designs everyday products so that they can be recycled into the same single product. By using the minimum possible number of different ingredients and non-toxic materials, Niaga® products can be re-manufactured ad infinitum, closing the cycle of the materials they use. One example is the company's 100% recyclable carpets which can be recycled several times – to make new carpets.

3. **Biological:** technologies that make use of biology, including but not limited to biological systems and living organisms (or their derivatives), to manufacture products and create processes for specific uses. Examples: biosourced materials, DNA marking, and hydroponics and aeroponics. Another example is [gCycle](#), a company that makes 100% compostable nappies by replacing the petroleum-based plastic conventionally used with a biofilm made from non-GMO maize⁶⁴.

Disruptive technologies are a key element in circular economy business models because they are more effective, more innovative, incorporate greater transparency of information and reduce dependence on materials that use a lot of resources.

The circular economy requires innovations of this kind, and as one of the world's R&D centres, Switzerland is predestined to profit from these developments.

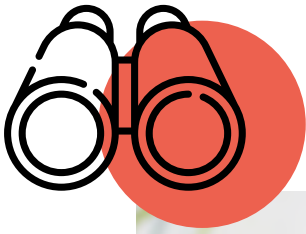


Spotlight on ...



ZESAR

[Zesar](#) was founded in 1926. Specialising in furniture for schools and industry since the 1950s, this company manufactures its furniture in Tavannes using the special expertise it has developed in processes such as steel cutting, welding, soldering and surface treatment. For some years now, Zesar has been developing a concerted circular economy strategy focused on the circular design, repair, dismantling, reprocessing and recycling of its products. All its furniture is repairable, with Zesar carrying out all of the repair work in-house. The company recovers products that are at the end of their life and gives them a second life as reconditioned products, while the separated unused materials are recycled. It also offers customers the option of hiring the furniture. Zesar recently decided to take things further by also offering school furniture hire⁶⁵, and continues its transition by offering the hire of fully equipped classrooms (in partnership with [AvescoRent](#)), and modular units (in partnership with [Baltensperger](#)).



Sportlight on ...



HILTI

Hilti⁶⁶ offers businesses a hire service for top-of-the-range construction tools and equipment for the duration of a building project while also optimising their customers' equipment expenditure planning. Hilti hires out a wide range of specialist tools and includes the repair of defective tools. The maximum hire duration is five years. Nevertheless, Hilti is aware of the economic opportunity afforded by extending the hire duration and recently stepped up its circular economy strategy to benefit from this. The company's circular economy department is currently developing a strategy that could enable a second or even a third use phase⁶⁷.

THE MACHINERY INDUSTRY

INDUSTRY CONTEXT

The Swiss machinery industry has a worldwide reputation for expertise and quality, employing a workforce of more than 70,000⁶⁸ nationwide in 2020. It exports nearly 80% of its production, which in 2019 amounted to around CHF 27 billion⁶⁹ (8.6% of Switzerland's total exports). The European Union is Switzerland's main customer, accounting for 60% of machinery industry exports. Swiss businesses operating in this industry handle the design, manufacture and distribution of their products locally (see Figure 10). Up to now, the circular economy has not been widespread in the machinery industry, but it is now on the agenda.

The environmental impact of this industry inside Switzerland is fairly limited, since much of this impact has to do with energy consumption when the machinery is used, and this mostly takes place outside the country. The extraction of primary raw materials such as metals and minerals and the manufacture of the materials required by the Swiss machinery industry (steel, metal rods, aluminium, etc.) also have a considerable impact on the environment. Overall, nearly 90% of the Swiss machinery industry's total environmental footprint is generated abroad⁷⁰.

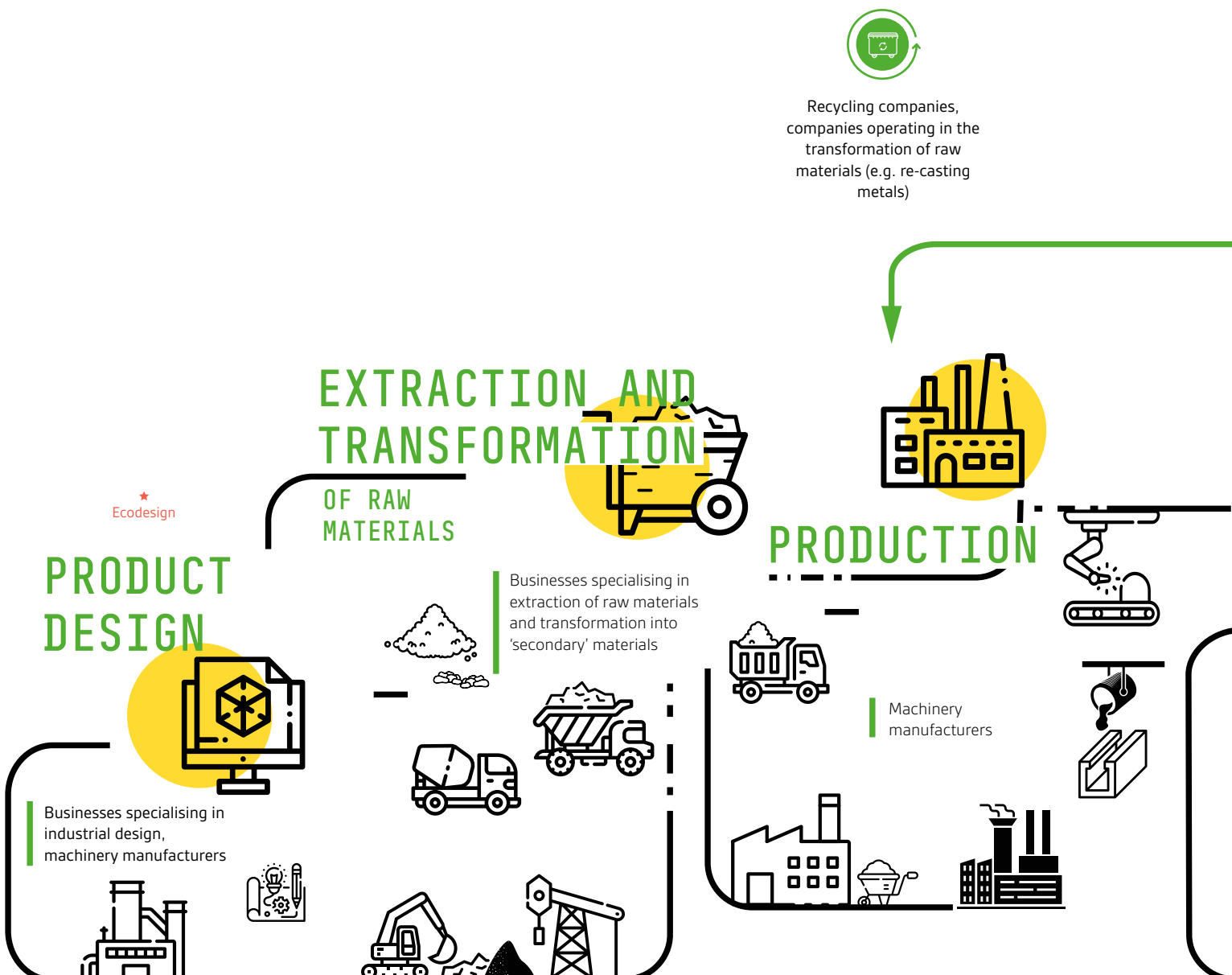





Figure 10 ▼
Value chain of the machinery industry

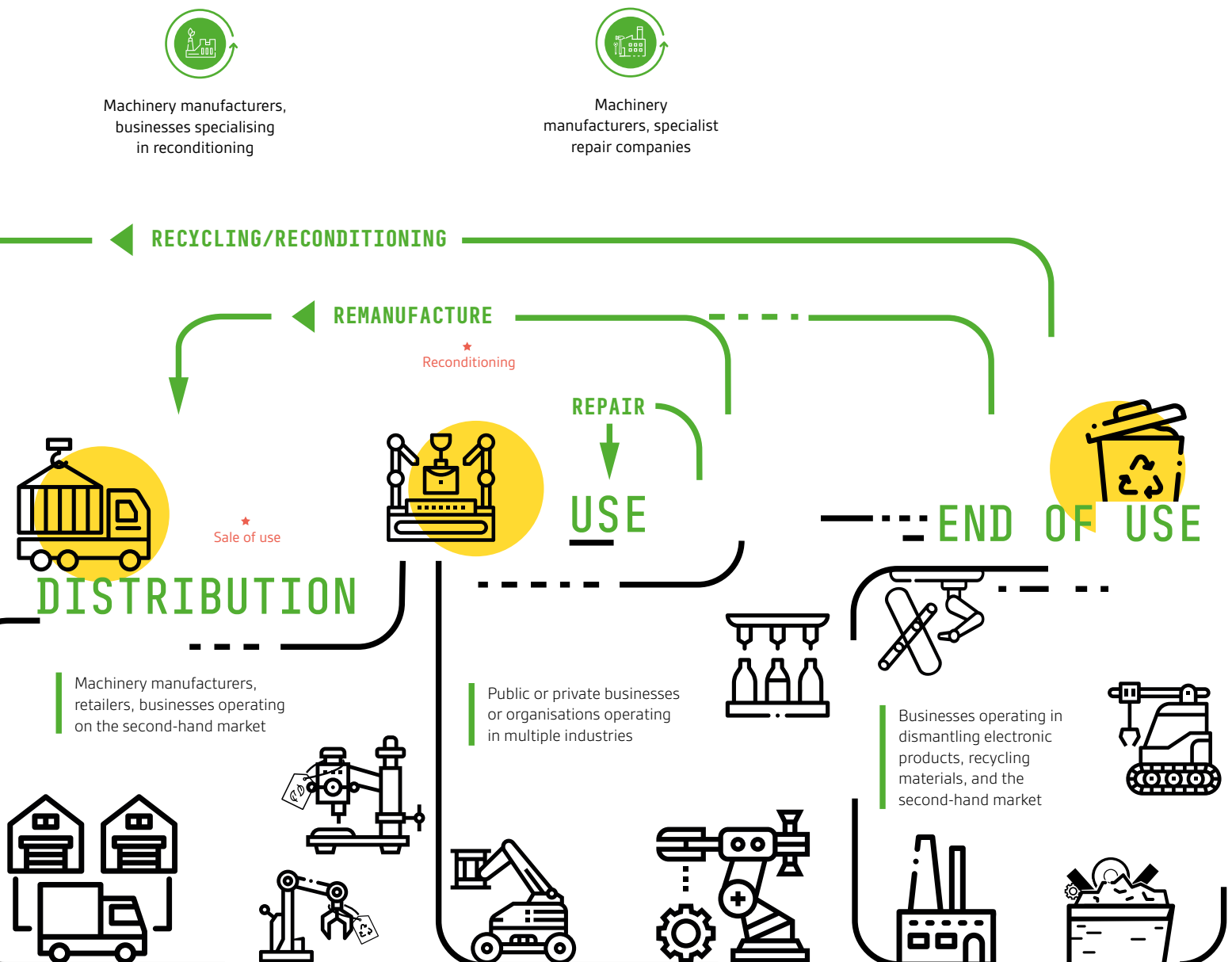
Legend:

Value chain in **green** and yellow 

Strategies to make it more circular 

Stakeholder categories for each stage  Specialist businesses, research centres, universities

Circular economy players in this value chain 



GOOD PRACTICE IN SWITZERLAND

In an increasingly competitive market, the Swiss machinery industry can no longer rely only on its 'Swiss made' reputation, and a circular economy trend is taking shape through efforts to optimise the use phase. The main aim is to reduce the long-term operational costs incurred by the purchaser of the machinery, and this objective also represents a circular economy opportunity for this industry.

Designing machinery that uses fewer raw materials

The environmental impact of the use phase may be felt outside Switzerland, but Swiss manufacturers are in a position to reduce it. They can design machines that use less energy and raw materials and that are ever more precise to limit the generation of waste. Having applied one of the ecodesign criteria in the food production industry, [Bühler](#) Group has achieved a technological feat by optimising the process used by its tortilla-making machine, resulting in a 91% saving in water and a 27% energy saving⁷¹. By using steam in the cooking process, [Bühler machines](#) save 1,365 litres of water for every tonne of maize used to make its tortillas⁷². While this does not in itself constitute a circular process, saving primary resources is one of the conditions for developing the circular economy.

Circular strategies for extending useful life

Competition on the machinery market is intense. To stand out, some Swiss companies are offering additional services designed to reduce the environmental impact of the use phase, albeit indirectly. By providing its customers with [in-depth training](#) in how to use its products, [BOBST](#), a manufacturer of machinery that makes packaging, folding boxes and corrugated board products, ensures its machines are used properly. This training results in a longer useful life, optimised energy consumption and a reduction in the waste generated all along the production line.

Building a machine requires raw materials. Therefore, the longer a machine's life cycle, the better use is made of the raw materials used to build it. Businesses operating in the machinery industry understand this, and an increasing number of them are including repair and reconditioning in their business portfolio. The Swiss group [Avesco AG](#), a partner of Caterpillar and one of the few companies outside the USA authorised to sell Caterpillar products, offers a full range of repair and reconditioning services for the brand's construction machinery. Inoperable Caterpillar machinery and faulty parts are sent to the Avesco workshops to be reconditioned and dispatched back to the customer

([Cat Reman](#)). Liebherr offers a similar service for some construction machinery and components (see 'Spotlight on...' below). Taking things a step further, machinery at the end of its life can be completely disassembled and each component serviced so that it can then be re-assembled and put back into use, through the [Cat Certified Rebuild](#) programme. This service drastically reduces the use of primary raw materials and the investment required to purchase new machinery.

Improving recycling potential

In eastern Switzerland, the train manufacturer [Stadler Rail AG](#), based in Thurgau, includes provision for [recycling right](#) from the design stage of its rolling stock. At the customer's request, the manufacturer can provide an identity card of the materials used and the recommended procedure for disassembling the individual parts. In this way, Stadler Rail encourages its customers to recycle and avoid disposal in landfill.

The Swiss machinery industry is moving towards the circular economy, and business models are changing. Just a few decades ago, the completion of a sale often signalled the end of the relationship between manufacturer and machine. Today, an after-sales service (training, maintenance, repairs, reconditioning, etc.) is an integral part of these companies' business portfolios and can even account for a significant proportion of their overall turnover. Nevertheless, Swiss businesses are still somewhat reluctant to take the circular economy concept on board. In practice, they are starting to incorporate more and more circular strategies, but there are still too few business models that include services such as hire and repair.

OUTLOOK

Digitalisation

Digitalisation has been very much in vogue in recent years and has not spared the machinery industry. Here, this term is understood to mean the increasing use of information technology and connected devices and components to enable the precise monitoring of processes on a production line. The Swedish company [Volvo Construction Equipment](#) has embraced digitalisation, integrating a host of sensors into its construction machinery to optimise fuel consumption and truck loading, but also so that it can continually monitor the overall condition of its machinery to prevent breakdowns and facilitate repairs when they become necessary. These innovations reduce part breakages and replacements and therefore consumption of primary raw materials. Digitalisation has huge development potential and can greatly benefit the circular economy, ensuring more efficient use of primary raw materials and a reduction in the quantities used.

Selling use rather than ownership

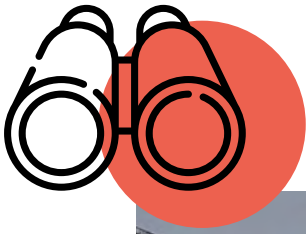
Today, many businesses are taking the plunge and changing their business model: selling the use instead of the ownership of their product. There is actually nothing new about this idea. As early as 1962, the British aircraft engine manufacturer Rolls-Royce launched its [Power by the hour](#) scheme, a comprehensive service based on flying hours that included the engine and replacement parts, charged at a set hourly fee. Today, Rolls-Royce is again offering this service, which has become the industry norm. This business model serves the interests of both parties, which is that the product functions correctly. It is in the manufacturer's interests that its product should work properly because this reduces its labour and materials costs, while the customer benefits from the fact that the product functions continuously.

CORINNE GRÄSSLE

Circular Economy Project Leader, Engagement Migros



The circular economy is a central element of a sustainable economy because it enables us to produce and consume intelligently while saving resources.

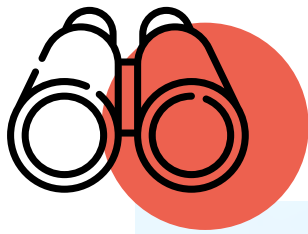


Spotlight on ...



LIEBHERR

Founded in 1949 with the tower crane as its flagship product, Liebherr is today a multinational company operating in a large number of sectors, including construction machinery. Manufacturing these products consumes a large quantity of raw materials, and Liebherr has introduced an innovative solution to extend the useful life of its machinery: [Liebherr Reman](#). This programme offers customers a remanufacturing (reconditioning) service for key components such as motors, travel drives, swivelling drives and axles, along with other eligible components. To ensure efficient customer service, Liebherr has plants around the world with the facilities to remanufacture these components. The resulting savings in energy and materials can be as much as 75%.



Spotlight on ...



STADLER RAIL

Based in Bussnang, eastern Switzerland, Stadler Rail AG is a manufacturer of railway rolling stock essentially active on the regional and suburban trains market. For some years, the company has placed the life cycle of its product at the heart of its strategy. Stadler Rail's engineers are given the job of designing train components that do not use mixed materials, to simplify the disassembly and recycling of its rolling stock when it reaches the end of its use phase. The resulting recycled materials can easily be re-used. In 2019, Stadler Rail published an [Environmental Product Declaration](#) for one of its products (the [KISS](#)), detailing its overall environmental impact throughout its life cycle and its recycling potential (97.9%).

LUXURY GOODS AND WATCHMAKING

The luxury goods industry, understood here to include fashion, jewellery and watchmaking, is made up mainly of large international groups such as LVMH, Kering, Richemont and Swatch Group, but also private groups such as Hermès, Rolex and Patek Philippe. Although the LVMH, Kering and Hermès groups are registered in France, a large part of their watchmaking and jewellery business is based in Switzerland.

The luxury goods industry has a major impact on the environment⁷³, largely due to the vast quantity of primary raw materials, precious metals and leather it consumes⁷⁴. WWF estimates that more than half of the gold extracted every year, more than 2,000 tonnes, is consumed by the jewellery and watchmaking industries⁷⁵. In addition to the product itself, in the luxury goods market, an important part of the customer experience is the packaging, which can account for a significant proportion of the industry's environmental impact⁷⁶.

Under growing pressure from millennials, the generation born between the early 1980s and the mid-1990s, the luxury goods industry is slowly moving towards circular economy practices. One study estimates that millennials will represent 50% of the customer base of luxury goods brands in 2025 (up from 32% in 2018) and will generate growth of 130% in the market between 2018 and 2025⁷⁷. To meet the new expectations of consumers, the luxury goods industry is innovating in the three specific areas outlined below.

Supply

World leader LVMH has launched a 'materials library', an in-house database for its designers that lists more than 300 environmentally friendly materials suitable for use in luxury goods⁷⁸. Several other jewellery and watch brands are looking into replacing 'standard' gold with 'sustainable' gold, which is extracted under conditions that are more environmentally friendly and ensure higher welfare standards for local workers. They are also considering using recycled gold, for which end customers are so far showing little enthusiasm.

Ecodesign

In 2018, the luxury watchmaker Baume et Mercier, owned by the Richemont group, launched the eco-friendly Baume brand, which uses no precious metals or materials of animal origin⁷⁹. Baume is the group's experimental brand, using recycled or easily recyclable materials such as aluminium and going down the repairability route, which includes choosing a Japanese movement over a Swiss one.

Limiting the volume of waste and introducing re-use

The leather goods manufacturer Hermès has taken a different approach with the creation in 2010 of its brand petit h, whose products are made from textile offcuts or materials that are not used or marketed by the prestigious Hermès brand.

The discreet world of luxury goods is making progress step by step (under duress?) and somewhat haphazardly, adopting targeted measures without having an overall vision for its value chain. The choices made by groups headquartered abroad will impact their Swiss subsidiaries and perhaps give Swiss decision-makers, who are lagging behind, a nudge towards adopting circular economy practices.

FINANCE

Many businesses are developing circular strategies and others are transforming their business model to incorporate the principles of the more environmentally friendly circular economy. To encourage development to reach the next level, businesses need to invest. This is where the financial sector comes in.

Support from the finance sector for the circular economy is a fairly new thing. The Ellen MacArthur Foundation recently published a [paper](#) in which it refers to the lack of financial instruments related to the circular economy. In 2020, three investment funds worldwide were dedicated solely to the circular economy (there were two in 2019 and one in 2018). To grow, the circular economy needs funding that supports businesses by enabling them to adapt their business model and put in place circular strategies all along their value chain.

This point is a critical one in the view of some experts, because risk analysis models are not always calibrated for the circular economy⁸⁰. For example, a company with a business model for selling washing machines then decides to sell the use of the machines rather than the machines themselves. As a result, it will have a different revenue collection model. Its revenue will be distributed over a longer time frame, and from the point of view of the credit organisation, this business model will be slower to make a profit and the necessary financing might be perceived to be higher risk.

Despite these challenges, investors are showing increasing interest and some of the banks are getting involved, developing innovative solutions to support the circular economy.

Investment funds that support the circular economy

In 2018, the Geneva-based finance industry pioneer [DECALIA Asset Management](#) launched DECALIA Circular Economy, an equity fund dedicated entirely to the circular economy⁸¹. The fund universe comprises almost 600 companies, mostly located in the United States, Europe and Japan and all of which have circular economy business models and/or strategies⁸². This type of instrument is helpful because it enables individual investors to invest and therefore support circular economy companies without having to seek them out and analyse them in detail, since the fund manager does that on their behalf.

Switzerland is keeping pace. In October 2020, Banque Cantonale Vaudoise teamed up with CONINCO Explorers in finance SA to launch a 'Certificat Tracker AMC EcoCircularity' investment certificate for the circular economy (see box opposite).

BCV – Certificat Tracker AMC EcoCircularity

The strategy of this investment certificate is based on the elements of ecodesign, the industrial ecology and the economy of functionality.

The circular economy model is relevant to companies that achieve value creation with a positive environmental and social impact, cost savings and better management of raw materials requirements.

The companies considered can continue to invest during a period of crisis and consequently maintain or even increase their market share with respect to their competitors.

Finance to support circular investment

Just like any other business, a business with a circular business model or circular strategies needs finance. A growing number of financial organisations are offering loans to support the circular economy. Banks like Intesa Sanpaolo (Italy) and publicly owned financial institutions such as the European Investment Bank (in partnerships with five of Europe's biggest banks) have made available lines of credit of a value of five and 10 billion euros respectively to finance projects related to the circular economy⁸³. In Switzerland, the Olten-based [Alternative Bank Switzerland](#) has a business model tailored to supporting alternative projects that foster the expansion of the circular economy⁸⁴.

TOURISM

Tourism is the biggest single industry on the planet, accounting for more than 10% of the world's GDP⁸⁵. In Switzerland, it generated 2.9% of the country's national wealth in 2019⁸⁶. The pressure that mass tourism exerts on the environment is growing along with the number of tourists; its consequences are damaging our ecosystems, biodiversity and air quality⁸⁷. Despite its importance to the economy and impact on the environment, we rarely hear talk of 'circular tourism', but more often of 'sustainable tourism'. According to the World Tourism Organization, sustainable tourism includes an environmental, economic and social dimension while addressing the needs of visitors, the industry, the environment and host communities⁸⁸.

Many tourists to Switzerland go there first and foremost for the scenery⁸⁹, and since 1966 the country has had a law that protects nature and the landscape⁹⁰. Nevertheless, the pressure on the environment is not easing and Switzerland's countryside is being used increasingly for leisure and tourism purposes⁹¹. This is often blamed on the number of tourists, but industry professionals bear some of the responsibility. An [unprecedented study](#) analysing the life cycle of the Accor group's hotels shows that more than 80% of their impact on water consumption is created by the kitchens and the water supply provided to customers^{92,93}.

All the industry players are concerned by the impact of tourism on the environment, and many of them are working to preserve the environment, like the [Swiss Alpine Club](#), whose [statutes](#) dating from 1907 refer explicitly to 'protecting beauty' and the 'struggle against the desecration of the high mountains', and whose communication is focused on the environment.

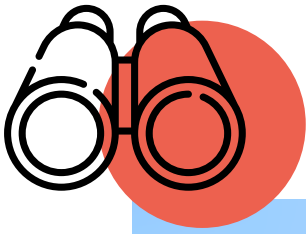
Tourists too are becoming increasingly aware of their impact on the environment and often look for more sustainable tourism options. To meet this growing demand, a [number of labels](#) have been created in recent years for the hospitality sector. Tourism concerns everyone, and Switzerland is at the forefront of sustainable tourism. Many initiatives are springing up, and tourists looking for somewhere to get away from it all and enjoy beautiful scenery are often receptive to new ideas.



DOMINIQUE GRUHL BEGIN

Head of Start-ups and Next-Generation Innovators Division

Businesses with sustainable strategies are more agile and resilient. They have adopted a future-proof business model which anticipates increasing demands from consumers and any new legislation.



Spotlight on ...



▲ **OONA CAVIAR AND TROPENHAUS FRUTIGEN**

In an original business model, the mixed commercial and tourism site [Tropenhaus Frutigen](#) in the canton of Bern was developed after the Lötschberg railway tunnel opened. Because it cuts through the mountain, this tunnel prevents water from percolating down through the rock. Fifty litres of water at a temperature of 18°C flow out of the tunnel every second. The water is too warm to be fed into the River Entschlige and cooling it would consume too much energy. It was decided to use the water to farm sturgeon to produce the Swiss caviar [Oona](#), and also to heat a hothouse for tropical plants. The water cools naturally as it goes through this process and is then fed into the river. The company has also developed a tourism attraction concept as part of the business, which is unique in Switzerland.



Experts views

As we have seen in the previous pages, the circular economy is a vast subject. To open up the debate and the range of possibilities even wider, we talked to five figures working in different industries and fields. They are all active in areas directly related to the circular economy, and here they give us their views on the subject.



3 questions for ...

► **DANIEL BAILLIFARD**

Chief executive
SATOM SA

For several years, SATOM has been running a number of projects as part of its circular economy approach. Where are you at the moment in this process?

SATOM SA's vision is to constantly innovate to recover materials, produce clean energy and preserve the environment. This vision is an integral part of the circular economy mindset that lies at the heart of everything we do at SATOM SA. We've secured a lot of investment, including the recent launch of the Ecotube project to build a steam pipeline between the Monthey chemicals site and SATOM SA and a pilot project to produce hydrogen from waste. But there is still masses of potential, and we're looking into lots of other projects. As a public service company owned by the public authorities, our role is to stay ahead of the game, identifying the right projects and spotting the changes in society and technology that will shape tomorrow's world.



Which sector of the waste industry is the hardest to integrate into a circular economy approach, and why?

Currently, incinerator residue, or slag, is impossible to exploit fully. In recent years, huge progress has been made in recovering the metals it contains (around 11%), but it is still very difficult, or even impossible, to recover the mineral fraction because of both the very stringent environmental requirements laid down by the law and the low market demand for this recycled material. In the Energy-from-Waste sector, the medium-term objective is to recycle all of this part of the waste, which on average accounts for 15% of the total weight of the heat-generating waste and which currently ends up as type D landfill.

Which cleantech technologies are the most promising for waste recovery?

CCS (carbon capture and storage) could be useful in the medium term in reducing or even eliminating the emissions that our Energy-from-Waste plants currently produce. The capture part of this technology is technically feasible, but CCS is not yet mature when it comes to the transport and permanent storage of the CO₂. For this, Switzerland still needs to make changes to the legal framework and negotiate international agreements.

The rapidly developing technologies that use AI to identify objects are also set to revolutionise the waste processing industry. Ultra-efficient automated waste sorting centres connected to our Energy-from-Waste plants will be capable of sorting all of the fractions that can be recovered both upstream and downstream of the processing chain, putting waste as a resource at the heart of a sustainable circular economy.

3 questions for...

The Canton of Geneva has been a circular economy pioneer in Switzerland, with the « Genie.ch » portal for example. What impact has this initiative had?

Genie.ch is the first business social media forum designed to develop industrial ecology and more broadly the circular economy. It's a collaborative platform that provides projects, ideas, workshops on different topics, daily news updates and examples of good practice that combine economic performance with respect for the environment. We launched it in 2015, and it now has a thousand members who deal with most of the issues affecting our local area. It's a recognised brand, which helps raise awareness and facilitate discussion. To enhance its impact even more and boost the network, it is now looking to step up its public-private partnerships with a view to helping Geneva businesses adapt to the circular economy and deal with challenges of the ecological transition.

The COVID crisis has demonstrated the importance of controlling the value chain and of short circuits. Does the circular economy provide an answer to these challenges?

Yes, of course it does. The circular economy is inspired by natural ecosystems in which nothing is wasted, nothing is created, and everything is transformed. To close materials cycles, slow them down, minimise the use of resources and non-renewable energy and reduce waste generation, it seeks to develop local trade networks and interactions between the players within a given territory. This makes it



▶ ALEXIA DUFOUR

Executive assistant with responsibility for cross-sector integration of environmental policy
Environmental protection office for the State of Geneva (OCEV)

a tremendous lever for relocalising economic flows, developing a more local and more sustainable economy and meeting the challenges of controlling the value chain and creating short circuits that have been thrown up by the current health emergency.

What instruments might enable the economy to move towards a more sustainable model?

The way to achieve this transition is through experimentation and innovative projects. To help the economic players with this kind of approach, we need to find ways of covering the risks inherent in any innovation, help them make the change and facilitate cross-sector approaches. Lastly, we need to do away with the 'niche' mindset, because this will enable us to accelerate and generalise the practical application of the circular approach. To that end, central government has a key role to play in setting the framework conditions, for example in terms of standards, tax incentives and even subsidies.

5 questions for...

▶ ANDRÉ HOFFMANN

Initiator of the Circular Economy
Switzerland movement and
President of MAVA Foundation

Who can take part in the Circular Economy Switzerland movement?

The original idea was to promote the circular economy among both small and large businesses in Switzerland, so in principle everyone is welcome. There's a brief tutorial a few pages long which gets shared around, and the people who embrace the ideas in this tutorial can help us progress the concept.

What about a business that hasn't yet incorporated circularity operationally? Can it also take part?

Absolutely! The idea is to bring about a real change of mindset in Swiss businesses and to try to introduce these circularity concepts right from the start. As you know better than me, the basic principle of the circular economy is to go beyond the primary uses of a product by incorporating its re-use as a next step.

This does of course require a change in thinking by businesses that will only work if it's addressed in advance. It's not about saying, 'oh dear, I produce waste, I must do something with it,' it's about making sure that the waste is re-usable at the project conception stage.

Bringing about a change of mindset in Swiss businesses and trying to introduce circularity concepts right from the start

With Switzerland having one of the highest per-capita GDPs in the world and a very high standard of living, the quantity of waste produced per person is huge. This being the case, how can we conceive a transition to a waste-free economy?

I think, in Switzerland, the way to make sure we can create a circular economy is by using more technology. With the incubator [The Ark] for example, in Valais we have the option of using more technology to make products that are better integrated within the circular economy, which may not be possible elsewhere. And I think that's an advantage we should use. We have a smaller, very efficient system that makes it possible to introduce this concept. So in my opinion, this initiative, supported by MAVA, is about trying to create a prototype system than can be replicated by other countries in Europe and around the world.

Do you think Switzerland is agile enough to succeed in a transition of this kind?

There are three things to bear in mind about Switzerland. Firstly, we have some excellent universities capable of developing technologies to facilitate this transition. Secondly, we have the fact that our economy is dependent on imported resources. In Switzerland, we

don't have any natural resources we can use, except for glacial meltwater perhaps. And that has encouraged us to develop more efficient production methods right from the start. That's something we should make more of. Thirdly, the majority of Swiss businesses have been making changes to reduce their ecological footprint. It seems that, in Switzerland, we have integrated these sustainable economy concepts in our practices more readily than in other countries. Switzerland, with its small volumes and high standards, is a very good place to undertake a transition of this kind.

How can we make this transition to the circular economy while remaining profitable?

There are two determining factors here: the time factor and the profitability factor. In my value generation equation, I have to look at which costs I can put off until later and which costs I take on today. You have to find the right balance of course, because a business that is not profitable becomes a problem. If you want to create a business that is sustainable in the long term, you must take into account not only what will happen in the following generations but also what is happening in terms of the use of resources now. In my opinion, running a business involves two essential tasks, backed up by a whole series of skills and areas of expertise: resource allocation

and risk management. Today, the risk that a business will fail based on the current model is greater than it has ever been. The pandemic has made that quite clear: we are weak, a giant with feet of clay. To make sure we can meet society's needs in the future, we have to think about how to manage that risk. In terms of resource allocation, this means not everything 'right now' but much of it over the long term.



Joint interview: the circular economy strategy and practices of Nespresso



To what extent is the circular economy a strategic element for Nespresso's economic growth?

- ▶ Christophe Boussemart (C.B.): The founding principles of the circular economy (see page 10) are strategic for Nespresso because we depend on resilient ecosystems for our coffee and on finite resources and we want to continue selling our products. It is therefore important, necessary and fundamental that Nespresso should contribute to the circular economy.
- ▶ Alban Bitz (A.B.): The coffee that forms the basis of Nespresso's product is an organic element, and therefore by its nature it can return to the earth in a virtuous circle. To a certain extent, the aluminium and cardboard used in its packaging – even though they are processed – can be re-used. This demands a circular approach as much from an environmental point of view as an economic one. As a result, circularity is a strategic element for Nespresso.

How do you apply this circular economy strategy throughout your value chain?

- ▶ C.B.: Firstly, by preserving the ecosystems in the regions where we buy the coffee by applying principles of sustainable cultivation (the principles defined with the NGO Rainforest Alliance) and the principles of agroforestry. Then, by using circular materials like aluminium, introducing capsule collection systems, recycling the aluminium and converting the coffee grounds into biogas. At Nespresso, we recently began using recycled aluminium to make our capsules. This has enabled us to complete the circular economy virtuous circle.

All of these actions contribute to the circularity of our current products, and it's now up to us to develop new products and new business models to distribute these products.

What advice would you give businesses about developing profitable circular business models?

- ▶ C.B.: The circular economy fundamentally changes your way of thinking and doing business. Since the dawn of time, we've always been 'linear' in the way we use resources. What businesses need to do now is acquire people whose mindset is focused on one single idea: the circularity of resources. It's also important for companies to develop and test new circular business models and accept that they're not always going to get them right first time.
- ▶ A. B.: I completely agree. You have to take the circular economy seriously, coming up with a strategic approach and working with competent, motivated people to develop these models. I would add that you also have to think of the circular economy as a unique opportunity to combine economic profitability with doing your bit to deal with the colossal challenges we are facing: the increasing scarcity of resources and climate change.

What is the consumer's role from a circular economy perspective?

- ▶ C.B.: The consumer's role is fundamental. It's the consumer who decides the future of the products he or she 'owns'. The consumer can, as it were, 'force' companies to develop circular products, and product recycling is partly a result of consumers boycotting products that are non-recyclable.
- ▶ A.B.: A very important role. Ultimately, it's the consumer who acts and who can change everything through the act of the purchase. Unfortunately, at the moment it's very difficult for consumers to know what's what and make informed choices.



◀ **CHRISTOPHE BOUSSEMART**
Sustainability Technology Manager
NESTLÉ NESPRESSO

Do you think that the market leaders have a particular responsibility to bring about a change of model more generally?

▲ C.B.: Of course. As the market leader, a brand must lead by example. A brand must use its financial resources to invest in developing circular business models, explaining them to the consumer and ensuring they are accepted by the consumer.

▲ A.B.: I agree. The market leaders have a huge responsibility. What's more, it's up to them to make this change all the way along their value chain. The worldwide economic fabric is made up mainly of SMEs and not multinationals, and these SMEs don't necessarily have the same weapons with which to face these challenges.

In your opinion, what are the main obstacles to or restraints on the circular economy?

▲ C.B.: Circular economy models have a tendency to generate revenue that is regular but lower and over a long period, unlike the linear economy, which generates higher revenue but all in one go. You have to cope with that accounting change and accept that you'll earn the same amount but over a longer time span. You also have to take the plunge and accept that you may not succeed on your first attempt

▲ A.B.: Short-term profit, because circular economy business models do not follow the standard procedures. You have to find the resources you need to be able to break out of the usual way to do things. In well-established organisations, that is often the biggest challenge.

In your view and experience, in what way(s) is it possible to take the circular economy further?

▲ C.B.: We have to start right now integrating the circular economy in new developments. In our case for example, our assets are currently mostly linear. What I mean by that is that we have invested a lot in linear infrastructures and models and we can't simply scrub our existing set-up and change our model. To take the circular economy further, we therefore need to integrate these circular economy principles, but without making them run counter to what we already have. Instead, we need to reconcile these two models so that, in the long run, circularity comes out on top in the business world.

▲ A.B.: In addition, I think there are three key elements that will accelerate the transition to a more circular economy. Firstly, it is often said that 80% of the impact occurs during the design stage of a product or service. So we have to ask ourselves the right questions at the right time, at the very start. Then, looking at the human aspect, it is very important to collaborate and build together. The circular economy makes it easier to create synergies. They might take place between two departments in the same business, or at regional level, to create ambitious projects involving multiple players, such as energy supply or turning one company's waste into another's resource. The third element is sharing good practice, and that isn't yet happening enough. Which is of course one of the aims of this report.

Summary

This special report clearly shows that the circular economy is of growing interest around the world and in particular in Europe. Switzerland has focused on recycling and waste management, becoming one of the leading global players in these areas. But the circular economy is not simply about recycling. Breaking out of the linear economy, transforming our business models and modes of consumption and keeping products and components in the economic system for as long as possible are the true challenges of the circular economy. And if we are to succeed, we have much work still to do and many improvements yet to make.

In the food production industry for example, the shift towards the circular economy has begun, but it remains too tentative. It has the opportunity to benefit from Swiss expertise in regenerative agriculture, agroforestry and recyclable/re-usable packaging. More can also be done in the sustainable re-use of by-products of the various food production sectors.

Switzerland's construction industry is already firmly rooted in the circular economy. It can also count on some promising innovations, including the reclamation of excavation and deconstruction materials, incorporating circularity in industry regulations and developing CO₂ storage in recycled concrete.

A number of circular economy strategies are also being developed in the consumer goods and devices industry. These are resulting in an increasing number of products that are biodegradable, compostable, re-usable, reconditioned, hired out or even bought back by the producer at the end of their life. Of course, in this area Switzerland could do better, perhaps by finding inspiration in what is happening elsewhere, such as circular public procurement and digital technology.

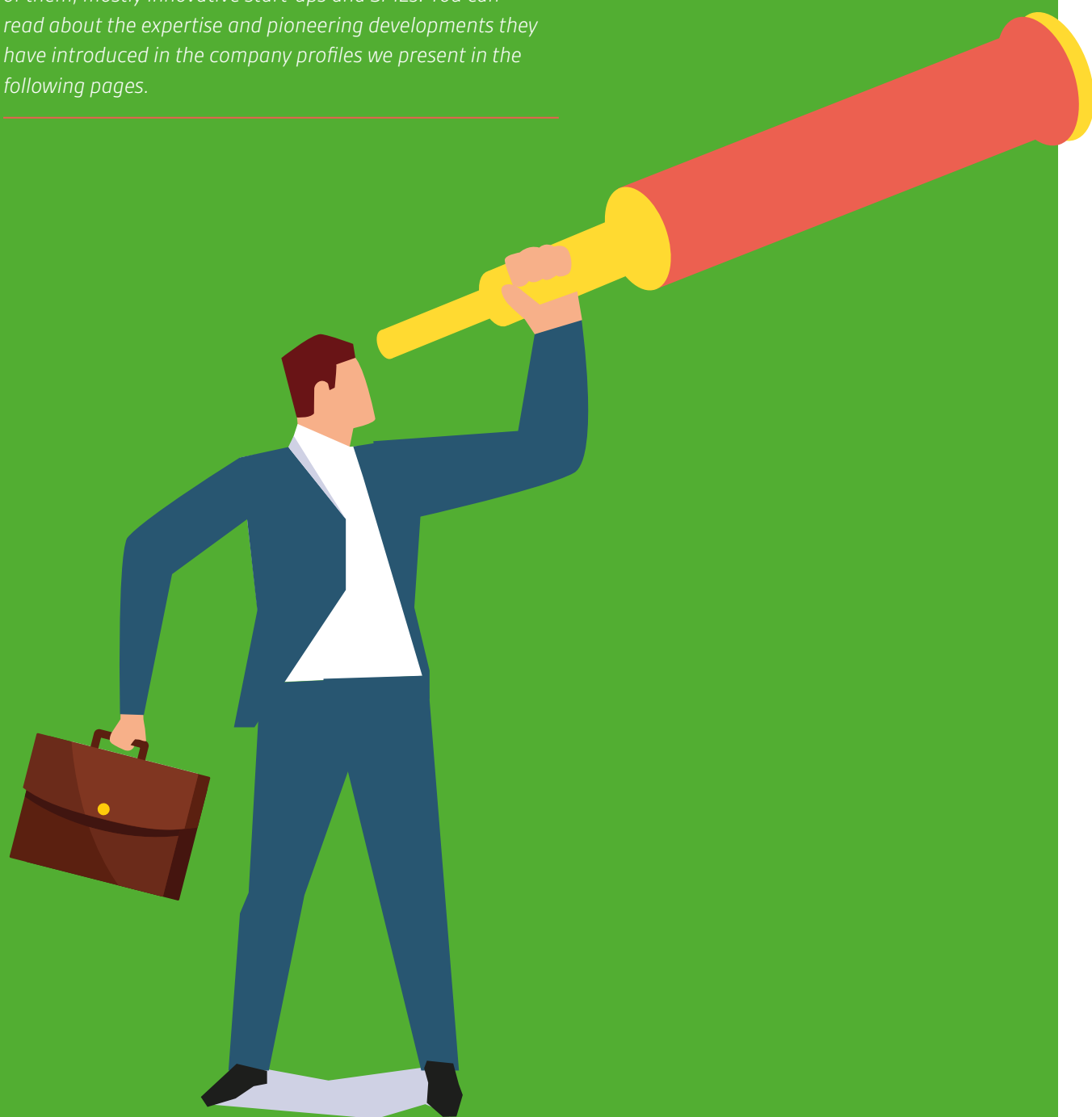
It is also gratifying to see that the Swiss machinery industry, too, is moving towards the circular economy. Consequently, its business models are evolving and starting to integrate circular strategies ever more closely. Business models based on hire, repair and repurposing are still few and far between, particularly in comparison to some other countries. France, Belgium, the Netherlands and Germany are all ahead in this respect.

Too few 'circular' solutions have been integrated in the luxury goods, watchmaking, finance and tourism sectors. Nevertheless, progress there has been slow but steady. This is undoubtedly because the circular economy is still quite new to these industries. But there is interest there, and that is an important first step.

This special report is a start, identifying the economic and environmental opportunities of the circular economy in Switzerland. Now it's time to take action. Many Swiss companies have already come up with practical solutions.

Company profiles

We thought it would be a good idea to shine a light on some of them, mostly innovative start-ups and SMEs. You can read about the expertise and pioneering developments they have introduced in the company profiles we present in the following pages.





Plastic pollution: an end in sight?

Fourteen million tonnes of microplastics are currently polluting the planet's ocean floors. If we are to stand any chance of ending this environmental catastrophe, we need new and innovative technologies to come to the rescue. DePoly, based in Sion, may just have come up with one of them.

It is one of the worst environmental disasters we face today. The scientific community even estimates that by 2050 there could be more plastic than fish in our oceans. The problem is an urgent one, but an extremely promising new technology may well play a key role in managing plastic waste in the future. This technology developed by DePoly uses a chemical reaction to break down PET in a process that recovers the components, making them fully recyclable.

And that's not all. This start-up offers an important economic advantage: its recycling process is more competitive than those used by its rivals, creating a saving of between 50 and 100 Swiss francs per recycled tonne. Another benefit of this technology is that the constituents it produces by recycling plastic waste are of the same quality as those manufactured by the oil industry.

A FUTURE WORLD LEADER IN CHEMICAL RECYCLING

Currently in the scaling-up phase of this technology, DePoly has had an operational demonstration plant up and running since the end of 2020. And thanks to the interest generated by its technology, the company is already maintaining and developing partnerships with a number of Swiss and international industry players,

including the central Valais waste treatment plant UTO and L'Oréal. «Our objective is to recycle on a vast scale in large recycling plants, becoming the world leader in chemical recycling», says company cofounder Samantha Anderson. «I think plastics are going to be around for a long time to come, chiefly because demand is continuing to grow, and so we need to find a more environmentally friendly way of living with them.»

With this process, DePoly has come up with a concrete circular-economy solution to deal with a thorny problem. The negotiations under way with some big names in the chemicals industry show that DePoly's approach has hit the mark. They are a product of the start-up's ability to forge solid links within the Swiss and European entrepreneurial and academic ecosystem, as evidenced by its collaborations with incubators and accelerators such as The Ark, Climate-KIC, Venture Kick and Venture Lab.

Using construction waste to build better



Construction waste is a precious resource. Why not recycle it to make concrete? An area that Eberhard has made a speciality.

In Switzerland, less than 10% of new buildings are built using recycled materials. But the potential is far higher: every year, Switzerland's demolition sites produce 7.5 million tonnes of construction waste. At the same time, some 26 million tonnes of sand and gravel are used in new constructions. As a pioneer in the field of urban mining, Eberhard is well aware of this crucial sustainability issue. In fact, the Kloten-based family business has been recycling building materials since 1983. With 40 years' experience, this SME with a 600-strong workforce produces recycled concrete of the same quality, or better, than most commonly used new concretes.

«Old habits die hard, and we often hear people saying that recycled concrete can't possibly be as good quality, which is absolutely not the case, especially given the knowledge and expertise we have today», bemoans Eberhard's communication director Astrid Gloor.

WHEN DECONTAMINATION AND RECYCLING GO HAND IN HAND

Eberhard steps in at the beginning of the process, when a structure is being demolished, and is involved right up to delivery of the recycled concrete to another construction site, bringing to bear its extensive stock of machinery and network of logistics centres where the materials are deposited, recycled and then re-dispatched. In addition, the company, which operates mainly in Switzerland, has worked at broadening its offering, also specialising in decontaminating polluted industrial sites and landfills. With the exception of certain highly polluted products that have to be stored in controlled landfills, it is able to treat the contaminated materials so that they can be re-used on building sites.

In 2020, Eberhard was awarded the Swiss 'Umwelt-preis der Wirtschaft' environmental award for its know-in and commitment to innovation in sustainability. A distinction that backs up its expertise and reputation among building industry players which, if they are strictly meeting the regulations in force in some Swiss cantons, should be using at least 20% recycled concrete in every new structure they build.

EBERHARD
www.eberhard.ch astrid.gloor@eberhard.ch

Turning plastic bottles into houses



Using PET to build affordable, quality houses for the masses: this is the ambition of UHCS (Ustinov Hoffmann Construction System) in Sion, which is all set to unveil its first house there.

These plastic houses – the brainchild of Igor Ustinov and André Hoffmann – may well revolutionise the housing sector. So, how does this construction system work? It consists of extruded profiles made of recycled and recyclable PET that fit together like Lego to build a complete structure that meets the most stringent Swiss (SIA) and international (ISO) construction standards. It is based on a modular cubic system that can be adapted to the culture and architectural traditions of each country. The project also creates a complete circular economy concept, from collecting the waste to manufacturing the profiles and right up to constructing energy-positive passive buildings.

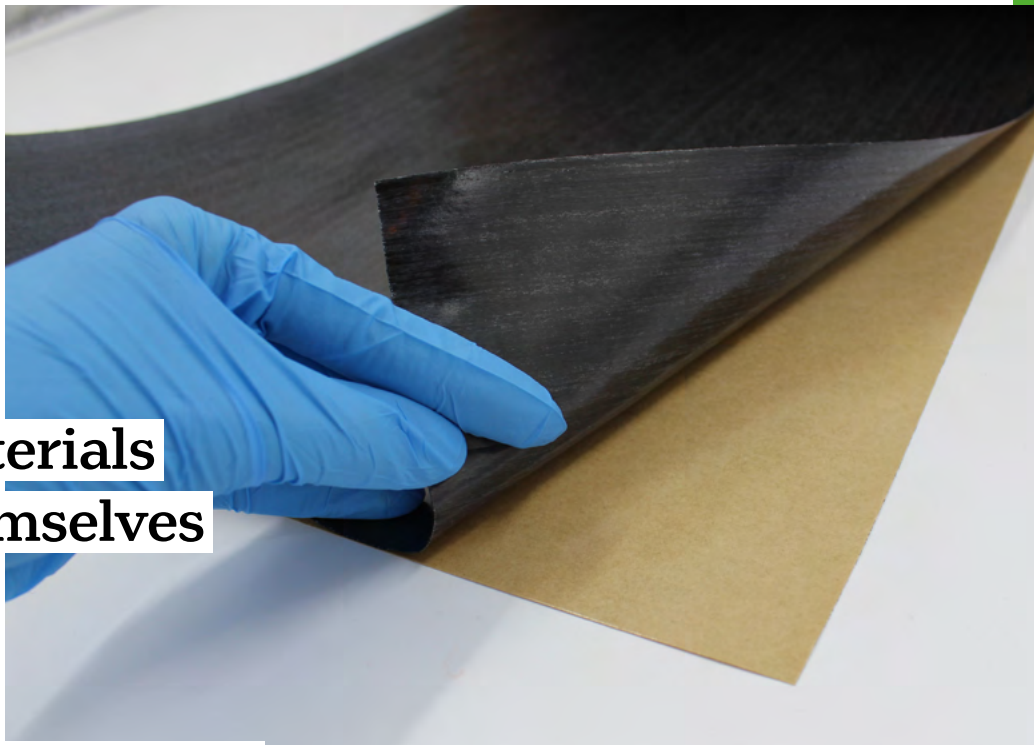
Using this technology, UHCS's ambition is to take the dormant plastic waste economy into profit, contributing to housing development without impacting the environment. «By putting this waste to good use, we could provide housing for billions of people,» says Igor Ustinov. «We can do all that without cutting down trees or extracting sand from rivers or the coast, and we'll save vast quantities of water that are essential to the cycle of life». The research institute Carbios estimates that the market lost by the failure to recycle the 360 million tonnes of plastic produced is 100 billion dollars a year. And when it comes to the quantity of used PET available in Kenya's waste sites, UHCS has done the sums: they think there is enough to build

100,000 60m2 homes. The company has also filed a PET collection patent: «If it is to be used to benefit as many people as possible, this material should not be allowed to become a speculative commodity.»

A MINIMAL CARBON FOOTPRINT

The manufacturing protocols have been perfected and are exportable, making it possible to distribute franchises to local partners all over the world. UHCS is targeting an average price well below that of a house built using conventional materials, but one that still allows for some innovative and surprising living comfort solutions. «And that's besides the advantage of its minimal carbon footprint and the fact that it also offers a solution to the costly waste problem, since waste can be repurposed locally.»

A prototype is currently on the drawing board in Valais. By building the first house in Switzerland, UHCS is making a statement that this project is very much Made in Switzerland. Because this construction system was not conceived solely for developing countries. It is the first to offer unrivalled innovative, recyclable comfort, paving the way for a new approach to living in harmony with the environment. The UHCS system was awarded the 'Efficient Solution' label by the Solar Impulse Foundation in 2020.



Composite materials that repair themselves

CompPair's pre-impregnated textiles are based on innovative chemistry. As their name, HealTech, implies, they lead to reduced maintenance costs and an increase in the useful life of composite structures.

While composite materials have the advantage of resilience and lower weight, they are susceptible to damage – if the structure is affected by cracks or tears, repairs can often take a long time, which means that users tend to replace the element rather than having it repaired. Such a choice is all the more regrettable in a world where the recycling of composite materials is costly and far from ecologically friendly. Repairs can also affect the original performance of the material.

Amaël Cohades, co-founder of CompPair and holder of a doctorate in self-repairing composite materials, was inspired by nature to develop a technology that looks set to revolutionise the field of composites. «Living organisms have the capacity to regenerate themselves, and we've developed a technology in line with that principle.» The company produces rolls of textiles (fibreglass or carbon fibre) pre-impregnated with a 'self-repair' resin, aimed at producers of rigid composite parts.

REPAIRS THAT DON'T COMPROMISE THE STRUCTURE'S PROPERTIES

CompPair's naturally inspired technology makes it possible to repair a crack in situ, within a minute. 'Healing the wound' is simply a matter of heating the material to a temperature of between 100 and 150°C.

This activates the repair, and the damaged element will self-repair while preserving its initial properties. There are many fields of application for this, including boating (repairing faults in the hull or the mast), energy (direct repair of impact damage to the blade of a wind turbine), storage (repairs to cracks in tanks and cisterns), transport (aerospace, road, rail), and sports (kayaks, bicycles, hockey).

The start-up is currently establishing its position on the market and seeking to raise capital. «Customers are already trialling our products on a small scale. The idea is to move forward with pilot implementation before starting series production during 2021.» At the same time, CompPair is continuing to develop new product families with a clear vision: that the circular economy should be applied to the composites industry. The business has been awarded the Solar Impulse Efficient Solution label.

Excavation waste that's worth its weight in gold

Using the mineral waste from excavation works to make concrete is the idea currently being perfected by Oxara. Founded by Gnanli Landrou and Thibault Demoulin after their doctorate at the Federal Institute of Technology, the spin-off is already attracting the interest of several industrial collaborators.



It is estimated that almost a third of all waste generated comes from construction and demolition works. Bulk waste that cannot be reused has a heavy toll on the ecological balance sheet, particularly since it is usually transported a long way from the place it originates. And what if it were possible to make concrete without the use of cement, by recovering this excavation waste? This is the idea that is currently being perfected by Oxara.

Cleancrete©. The name says it all with this new generation of concrete, produced on the basis of an innovative ecological additive developed by Oxara. Not only are there substantial environmental benefits – in particular because it avoids the use of cement, thus considerably reducing the quantity of CO₂ emissions while reutilising local resources more or less in situ – but there is also a real economic advantage, since the product costs 10 to 20% less than conventional concrete. Last but not least, Cleancrete© facilitates humidity control as well as improving indoor air quality.

Oxara's innovation could be used for structures up to three storeys high or non-structural elements within buildings, a profile that corresponds precisely to the Swiss architectural and urban landscape configuration.

REUSING 60 TO 70% OF LOCAL WASTE PRODUCTS

Together with various local industrial enterprises, in particular in the German-speaking countries (Germany, Austria and Switzerland), Oxara is currently working towards validating the pilot version of its product. «Waste generated by construction and demolition works is not only ecologically detrimental; it is also problematic from an economic point of view, because, apart from the fact that it is not reused, it is expensive to transport it to tipping sites,» says Gnanli Landrou. «Our procedure could enable between 60 and 70% of this waste to be reused, with the emphasis on short, local loops.»

Another argument in favour of this kind of recovery is that the restrictions on international exchanges due to the pandemic could make it increasingly difficult to import construction materials. With borders less open than before, making use of local resources could well become an essential aspect of the construction industry too.



Back down to earth

Terrabloc is reintroducing a material that had almost been forgotten: raw earth. The company has shown that the use of compressed-earth bricks for construction is anything but ancient history. Indeed, the possible applications for this abundant material are numerous.

Terrabloc's mission is to widen the scope of earth in the construction industry. «It has been completely forgotten in the western world, yet 40% of humanity still live within earth walls,» says Laurent de Wurstemberger, one of the company's co-founders. He adds that on Genevan soil alone, some 3 million cubic metres per annum are extracted during building site excavations – a real case of lost brick-making opportunities! Apart from this potential monetisation, earth also offers a number of other qualities: it has a high thermal inertia (the capacity to store and release heat), it regulates humidity and it provides effective sound insulation. Its potential applications are many and varied, both for building shells (load-bearing walls) and interior work (partitions, dividing walls).

ACADEMIC PARTNERSHIPS AND PUBLIC COMMISSIONS

Prior to founding Terrabloc, Laurent de Wurstemberger (architect) and Rodrigo Fernandez (materials engineer graduate of the Lausanne Federal Institute of Technology (EPFL)) already had a suitably 'down-to-earth' approach. Laurent de Wurstemberger was managing an architects' practice and was about to finish a construction project using pisé (raw earth), while Rodrigo Fernandez had explored earth bricks for his Master's degree and calcined clays for his PhD thesis. «We were well aware of the complexity of introducing

a new product, as well as the standards to be complied with.» Winning a sustainable development grant from the canton of Geneva in 2011 enabled them to buy a semi-automatic hydraulic press and undertake a series of tests. Their first physical project was in 2015 with the construction of a facing wall for an exhibition building for the Geneva utility company Services Industriels de Genève.

After five years of small-scale production, Terrabloc now aims to make raw earth more readily available to all. «We don't want it to be an elitist product, and an industrial approach means that we can reduce the production costs.» The blocks are now manufactured using machinery supplied by Cornaz, in the Swiss municipality of Allaman, a company that specialises in the production of concrete paving stones. Terrabloc has also established a number of academic partnerships (EPFL, the Geneva School of Engineering, Architecture and Landscape (HEPIA) and the School of Engineering and Architecture in Fribourg (HEIA-FR)) and has obtained a number of public service commissions. The most notable to date is the supply of 800 m², or 6400 units, of large-format 'Terrapad' earth blocks measuring 80 x 30 x 15cm, for the planned Environment Centre (Maison de l'Environnement) in Lausanne, a building that will house the 160 employees of the general environment directorate (DGE).



Modern-day alchemists

INNOmaterials' quest is not to find the philosophers' stone but to create new materials based on elastomers. Rubber holds no secrets for this Jura-based company, which develops and implements formulas that are as unexpected as they are varied.

Filomeno Corvasce, CEO of INNOmaterials, compares his team to a band of inspired chefs. «Our customers come to us when they want to develop a new elastomer-based material with a composition that must meet certain specifications. We then cook up a simple colour or a particular material for them.» For Corvasce, who holds a PhD in Materials Physics, there is no limit to possible formulations, thanks to the developments in nanotechnology that have appeared over the last twenty years. Metallised, pearly, glittery, transparent, phosphorescent, fluorescent, perfumed, hydrophobic, antistatic or antibacterial: there is a whole universe of possibilities. While INNOmaterials mainly works for clients in the watchmaking industry, it is also present in fields as diverse as agriculture, automotive, medical and aerospace with elaborate elastomer formulations (cut-resistant, anti-vibration, anti-magnetic, etc.).

Since 2019, INNOmaterials has been a partner of the Origin Group, a major player in the elastomer sector. The group has 14 companies in Europe, including Valiance, a firm that specialises in rubber moulding and overmoulding by vulcanisation. And when INNOmaterials takes on R&D projects to develop 'recipes', it can count on a worldwide network to test them.

NEW MATERIALS DERIVED FROM BIOLOGICAL MATERIALS

Designing ecomaterials, such as composite thermoplastics based on sugar cane fibres or elastomers that are biobased (i.e. derived from biological materials), is another field where INNOmaterials is active. «Plastic packaging can take a whole new route if polymers are used that are not derived from petrochemicals. We have developed elastomer formulas that can contain more than 75% biobased materials.»

Here, too, there are myriad applications: while the focus continues to be on watchmaking, ecological thermoplastics can also be used in the composition of patio flooring or wall claddings, bottles, and packaging for cosmetic products. Leather recycling is also being explored: the alchemists at INNOmaterials can turn scraps into large pieces of leather.

Tyres get a second lease on life



Tyre Recycling Solutions (TRS) has developed a novel process for recycling tyres, reducing them to a rubber powder that can be used for a variety of industrial purposes.

«Our aim is to reintegrate old tyres into a circular, unsubsidised and economically viable economy,» explains Staffan Ahlgren, CEO and co-founder of TRS. And the future looks bright for the Vaud-based company. After seven years in business and having raised more than 25 million francs, in November 2020 TRS began a collaboration with Trinseo*, one of the world's leading suppliers of materials solutions and producers of plastics, latex binders and synthetic rubber.

Wanting to transform the tyre recycling market, TRS has developed several innovations, including a machine that cuts tyres in three in just thirty seconds, halving shipping costs and tripling storage volumes. The company has also developed a high-pressure water jet (2500 bars) that transforms the treads on used tyres into a fine powder.

TESTING ON SWISS ROADS

The tyres' metal and synthetic fibre are separated from the rubber and resold on the market. The high-pressure water jet endows the powdered rubber, called TyreXol™, with new mechanical properties that improve its ability to mix with other materials. As a result, it can be used in new tyres, moulded car parts, roof insulation, industrial cables, gaskets, shoe soles and

asphalt. It can also be mixed with plastic packaging waste to produce floor coverings, truck loading ramps and other industrial applications.

More than 300 customers are currently testing the powder developed by the company, starting with the cantonal services responsible for road infrastructure in western Switzerland, which, in early July 2020, chose TyreXol™ to repair a section of cantonal road in the Jura. Testing is also under way in the cantons of Vaud and Valais. In addition, TRS is continuing its tests in its Prévèrenge research lab to find other opportunities with new applications. A turnkey demonstration plant has also been in operation in Yvonand since the start of 2020.

Rejuvenation for parquet floors



Bauwerk wants people to recycle their wooden parquet to limit the consumption of forest resources. Between Switzerland, Europe and Asia, the company based in the canton of St. Gallen promotes a virtuous economic cycle that also benefits its customers.

The average life cycle of a parquet floor is fifteen to twenty years. However, despite obvious signs of wear and tear after years of use, this robust floor covering can be reprocessed to last for three or even four more cycles. Recycling it in this way not only reduces the use of forest resources but also offers economic benefits for consumers. It is precisely in this niche in the circular economy that Bauwerk has specialised. The company has adopted a sustainable and innovative approach based on the use of a special glue that makes it easier to dismantle parquet floors once they have reached the end of their first life cycle. Once back in the manufacturing plant, the product is sandblasted to remove those signs of wear and tear before being finished in a different colour or pattern and finally reused.

The process offers customers some interesting benefits. In addition to the satisfaction of the product's environmental added value, they can also enjoy discounts on the purchase of another Bauwerk floor if they decide to give their first product back to the company. Customers also have the option of taking back their original parquet once it has been reprocessed by Bauwerk.

AN INTERNATIONAL VIRTUOUS CIRCLE

Bauwerk currently exports 75% of its production, mainly to the rest of Europe. In addition to its headquarters near Lake Constance, the company has production plants in Lithuania and Croatia, and branches all over the world.

One of Bauwerk's main challenges is to continue its efforts to raise consumer awareness. «Because today, while environmental awareness is clearly flourishing in many fields, such as in the automotive industry for example, efforts still need to be made in our sector», says Klaus Brammert, the company's CEO. The general public still opts all too often for materials derived from the oil industry, such as vinyl or PVC – products that have a higher carbon footprint and are not reusable.



Using electrochemistry to treat waste water

A Swiss electrochemical process developed originally to dissolve indigo dye is now being used in waste water treatment applications.

When David Crettenand, director of RedElec Technologie, began researching how to dye jeans made of denim (a cotton fabric with a very dense weave) more than 15 years ago, he was the only student at the Swiss Federal Institute of Technology in Zurich to tackle a problem that had been on the cards for a very long time. «To apply indigo dye – which is insoluble in water – to denim, you have to add a chemical reagent. Scientists have been looking for an alternative electrochemical solution for a century.» With the new electrochemical reactor patented by RedElec, this process is now sustainable and has been introduced in several production plants in China, Pakistan, Bangladesh and India. And this technology not only works in the denim industry, but also in energy storage and waste water treatment. The Valais-based company is today focusing on the latter.

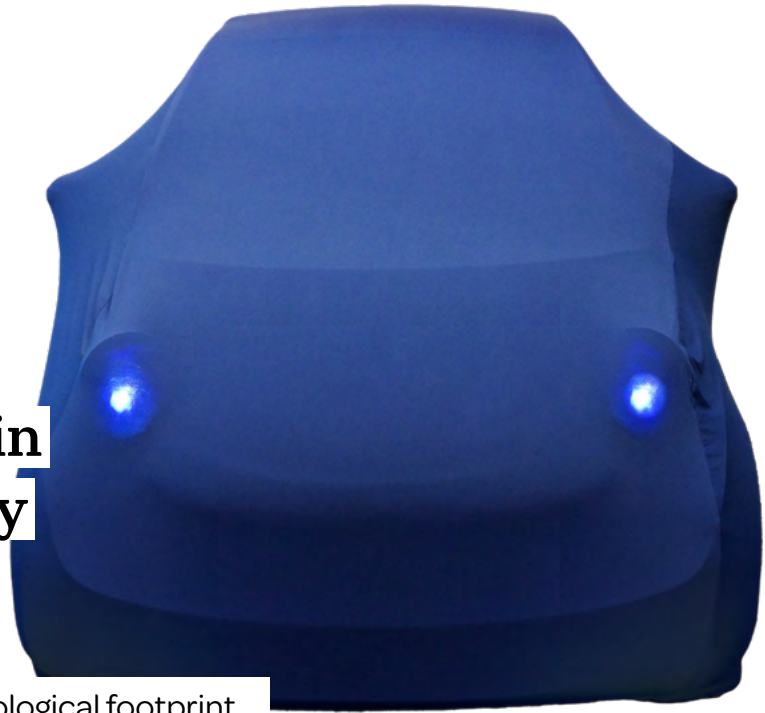
FROM BLUE JEANS TO WWTPS

RedElec now offers an effective way of treating aqueous industrial effluents to make them compatible with subsequent treatment in waste water treatment plants (WWTPs). The process also works well in recovering metals (copper, nickel, gold and silver) and removing micropollutants. «We come into play on

industrial sites, where the effluents are most concentrated, using bacteria which 'eat' the micropollutants, giving sewage works an easy job of cleaning up the rest.»

Businesses working in the chemicals, pharmaceuticals, agrochemicals and biotechnology industries have also tasked RedElec with developing an alternative electrochemical method of redox transformation. And the company thought carefully before focusing its R&D on the Valais canton. «Going by the experience we acquired when developing the process for the denim industry, we're better off building up our skills base locally before branching out internationally.» And for good reason: Valais boasts the perfect industrial and research environment for cutting-edge innovative businesses like RedElec.

A paradigm shift in the motor industry



An electric car with the lowest ecological footprint ever achieved: that is Softcar's declared objective. To make this happen, Softcar is relying chiefly on a manufacturing concept based on the decentralised cloud factory model. The Softcar is due to be launched in Switzerland in summer 2021.

The idea of a 'clean' electric vehicle took shape in Softcar director Jean-Luc Thuliez's mind as a result of his successive industry experiences. He was previously involved in developing the Swatchmobile, the brainchild of Nicolas Hayek, and the Total Car, the first vehicle to be made of a biopolymer (a material made from biomass). «But I've never felt so strongly that now is the right time», says an upbeat Jean-Luc Thuliez.

Whereas a conventional car running on petrol or diesel is made up of nearly 40,000 components, the Softcar has only 1,800 parts and is much lighter because it is made of biopolymers instead of steel, a dense metal that adds considerable weight to conventional cars. All of the Softcar's mechanical parts will be reusable, unlike in conventional vehicles, where worn parts have to be disposed of. And it will be possible to remould the Softcar's bodywork up to 10 times. Because the Fribourg-based company has set the bar high: it wants to take the motor car into the circular economy. What's more, every stage of each product's life cycle has been designed to reduce its CO₂ footprint. «We take into account the impact of production on water quality, air quality and soil quality, along with raw material and energy consumption», says Jean-Luc Thuliez.

DECENTRALISED PRODUCTION UNITS

On the production lines you won't find robots, cataphoretic immersion priming or electroplating, and there's no welding either, because no steel is involved. The four modules that make up the Softcar are set to be assembled in plants close to megacities. A business model that plans to do away with the long production lines on which vehicles are conventionally made before being shipped to the four corners of the planet. This is the 'cloud factory' principle, a one-of-a-kind, decentralised production model that makes use of small, modular assembly centres that can be easily replicated. This reduces both the financial investment involved and the amount of pollution generated by production.

Lastly, users will be able to choose which shape they want their car to have, but for now Softcar is keeping what that means in practice under the hood... until the Softcar launch, planned for 21 June 2021!



Using biomass to bring on circularity

In the race to decarbonise to create a more sustainable society, we urgently need to find alternatives to oil. Besides their use in energy generation and mobility, petrochemical processes are involved in the production of plastics, fragrances and flavourings. But now, a start-up has come up with a way of replacing the black gold with biomass.

Using trees and agricultural waste to produce fuels, plastics, perfumes and other molecules for the cosmetics and food industries: that's where the Marly-based start-up Bloom Biorenewables comes in. These products and molecules are currently produced by the petrochemicals industry, contributing to the increase in CO₂ emissions. Turning to biomass means using much shorter carbon cycles of 20 to 50 years, roughly the time it takes for a tree to grow. This is a way of simply 'borrowing' the carbon, before returning it to nature, over a human timescale. «Our idea is to offer an alternative that goes some way to tackling the urgent problem of global warming, a consequence of our use of hydrocarbons on a massive scale. We offer a unique solution that makes use of plants and agriculture», says CEO Remy Buser.

AN IMPACT ON THE FOOD PRODUCTION, CHEMICALS AND TRANSPORT INDUSTRIES

Currently in its pilot phase, within five years, the process that Bloom has developed should be able to produce these molecules in industrial quantities, replacing oil with biomass. This innovation has piqued the interest of industry giants keen to put into practice sustainable strategies in response to the climate

emergency. Initially, the technology will be used in the production of plastics, fragrances and flavourings, but the shipping industry is also in Bloom's sights.

The waste generated by Bloom's biomass process can be re-used to make marine fuel oil. This promising innovative approach is being masterminded by IDEALFUEL, an EU-funded project involving a dozen different partners, including the Winterthur-based company WinGD (known as the manufacturer of the Sulzer diesel engine).

«This area of our business involves rethinking from the ground up the design of a sustainable fuel to power the engines of merchant vessels», adds Remy Buser. An innovative approach for a sector that is being forced to reinvent itself to meet the new norms. And one that is urgently needed: the heavy fuel oil used by most cargo ships currently generates more pollution than the aviation industry.



This is how you clean soil sustainably!

The Valais-based company BOWA Recycling AG separates pollutants from contaminated soil. Managing Director Remo Schnyder explains more.

BOWA Recycling AG decontaminates, treats, and either reuses or disposes of 40,000 tons of contaminated soil a year. Since 2013, the company has run a soil treatment facility in Susten (Valais), where contaminants are separated by a variety of processes. One of the reasons for setting up the company was the mercury contamination in Valais soil, particularly in the Visp and Raron regions. «Cleaning up the land here called for more powerful technologies than a conventional soil washing plant can offer», says Schnyder. This is why the company has invested continuously in the facility. Today, BOWA's operation is one of the most modern in Europe. «We are in a very strong position compared to other market participants».

More recently, a second plant was opened in Steg. This means that thermal treatment can now be carried out alongside wet processing. In thermal treatment, the portions containing heavy metals such as mercury can be remediated too. «Previously, this material had to be transported abroad, where systems are generally not state of the art». It also means long journeys can be avoided. «It didn't make sense to transport thousands of tonnes of material by truck across half of Europe just to clean it». With its own thermal treatment plant, BOWA is attracting customers from beyond the cantonal borders.

NO FOSSIL FUELS USED

The thermal cleaning carried out in Steg has other advantages, too. «Whereas plants abroad use fossil fuels, here we do everything with electricity. And using indirect electrical heating means we can achieve higher temperatures. We also use a vacuum process». The plant can currently treat contaminants with an evaporation temperature of between 550 and 600 degrees. BOWA Recycling AG is planning to invest even more in thermal treatment and to expand its range of services. However, Schnyder sees potential for improvement in the demand for remediated soil in Valais. He points out that it is relatively low in this region, while some cantons have quotas that already need to be met.

Like BOWA Recycling AG, the industry is increasingly investing in the circular economy. However, a legal framework encouraging the integration of raw material recycling into projects is not easily put in place in Switzerland.

Fireforce invents smokeless fire



The combustion process developed by Fireforce Technology enables biomass to be converted into thermal energy in a very clean, efficient way – an innovation that has the potential to revolutionise heat production.

The countryside of Vaud is home to a new kind of burner, the result of André Van der Veken's research into biochar. André's work began with the conviction that it makes far more sense to avoid polluting emissions altogether, rather than capturing them after burning. The results exceeded his expectations: analyses carried out by an independent laboratory show that he has successfully developed an ultra-clean process for burning wood pellets and chips, thus opening the way to cleaner, more efficient, more compact and more economical heating boilers and incinerators.

PRACTICALLY ZERO POLLUTION WITH AN INCREASED OUTPUT

André Van der Veken's objective is not only to equip wood burners with the Fireforce technology in order to limit their polluting emissions, but also to replace traditional fossil fuel systems with this type of installation. «The target is industrial installations or district heating systems of 500 kW and more», he says.

Thanks to its extremely low gas and particulate emissions, the Fireforce process does not need any kind of electrostatic precipitator for the exhaust fumes; without this additional equipment, boilers and incinerators take up less space. Another benefit is the increased output of between 8 and 30%. «Our prototype

can take any kind of biomass with a moisture content up to 65%, which allows for the use of lower-quality, more competitively priced wood», André Van der Veken adds. The extended power regulation range means that the heat production can be closely adapted to users' requirements; this wide range also means that maintenance interventions are kept to a minimum provided usage is within the reference values.

THE FIRST 100% RENEWABLE OLYMPIC FLAME IN THE HISTORY OF THE GAMES

Regularly consulted for its expertise in the field of combustion, one of Fireforce's claims to fame is its development of the burner for the Olympic flame for the most recent Youth Olympic Games, held in Lausanne. Fuelled by wood pellets sourced locally, it was able to produce a flame in 24-hour cycles without the use of electricity – an excellent example of energy efficiency with clear environmental benefits. Another of Fireforce's notable contributions has been to the improvement of the technology used by Edelsun outdoor heaters.

FIREFORCE TECHNOLOGY
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Working towards zero-carbon concrete

Reducing the construction industry's worldwide carbon impact by one billion tonnes a year: this is the vision of the Bern start-up Neustark, which is developing high-tech solutions for climate-neutral 100% recycled concrete.

Worldwide CO₂ emissions from concrete production are twice as high as those from the entire planet's air travel industry, accounting for 7% of global emissions. Concrete is also the planet's biggest source of waste. Because it processes CO₂ and also reduces the amount of cement used to make concrete, the technology developed by Neustark is set to reduce the carbon footprint of concrete production. This spin-off of the Swiss Federal Institute of Technology in Zurich, founded in 2019, is headed by Valentin Gutknecht and Johannes Tiefenthaler. Gutknecht acquired his industry experience at Climeworks, the company that pioneered direct air carbon capture, while Tiefenthaler comes from a research background, investigating how CO₂ reacts with different mineral substances and how these substances can bond to make limestone.

To make concrete, you need to mix cement, sand, gravel and water. The technology developed by Neustark binds the CO₂ in the pores and on the surface of a granulate made from demolition concrete to make limestone. An innovative solution which means that less cement can be used without impairing the properties of the concrete. This enriched granulate can also be mixed with fresh concrete in place of the sand and gravel conventionally used.



OF CONSIDERABLE INTEREST TO THE CONCRETE INDUSTRY

«Producing the cement required to make one cubic metre of concrete emits more than 150 grams of CO₂», says Gutknecht. «Our solution currently enables us to reduce these emissions by 10 to 15%, and we're aiming to develop a totally carbon-neutral concrete». The technology is operational for commercial applications and is already being used in two Swiss concrete plants. Neustark is working with the Kästli group near Bern, where the CO₂ used is obtained from the biogas separation installation of a neighbouring waste water treatment plant. The solution is currently being delivered using mobile units, but an integrated facility is due to be installed there in the near future.

The technology is of considerable interest to the concrete industry. «We're talking to 80% of Switzerland's concrete producers, including Holcim, with whom we're carrying out materials tests». What does the future hold? Neustark wants to be 'operating stably' in Switzerland and neighbouring countries before it takes on the rest of the world. It has five serious international competitors. «But as far as we know, we are the only company to offer a simple solution that can be immediately incorporated into any concrete production plant».

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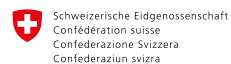
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