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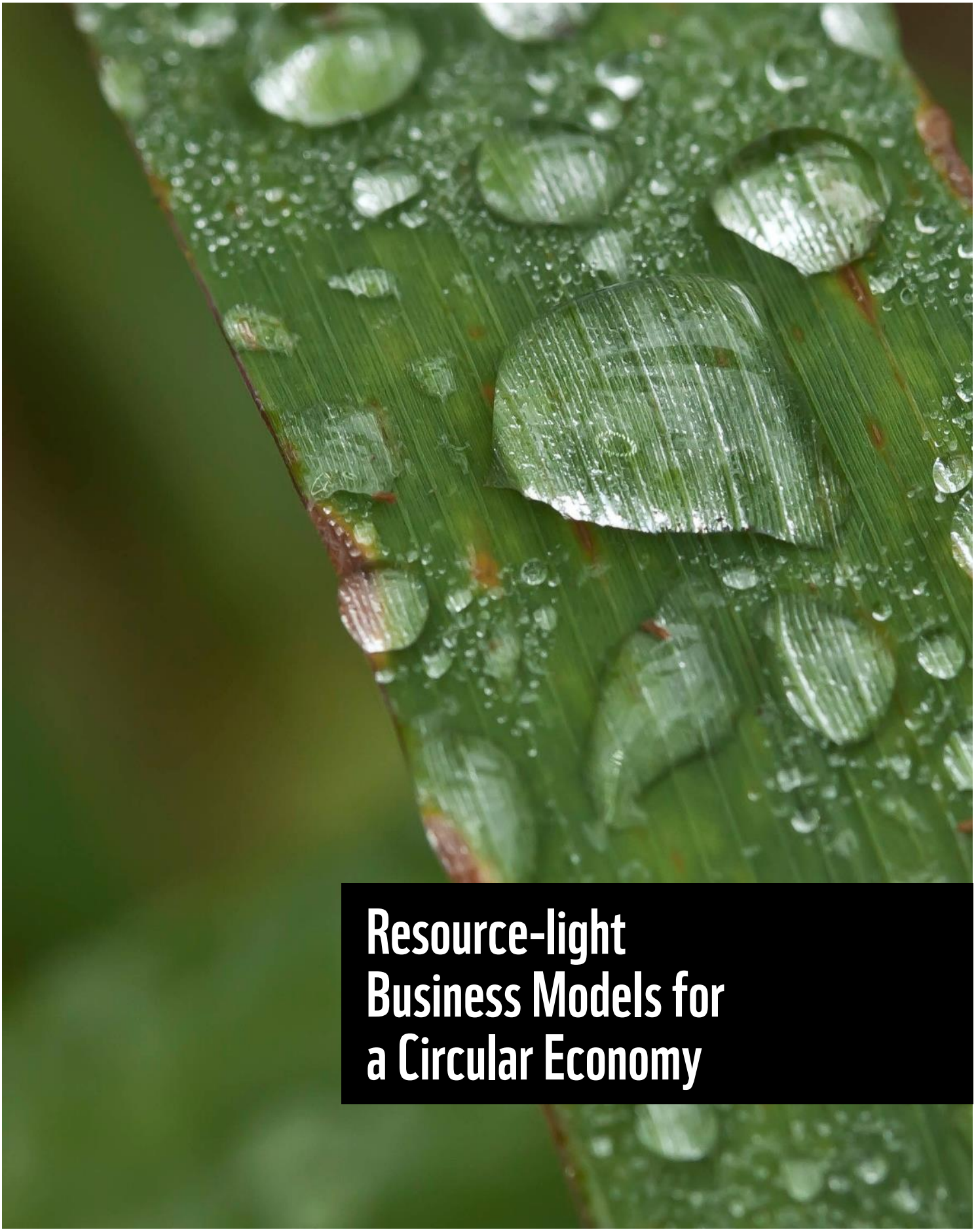

Resource-light Business Models for a Circular Economy

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Introduction

What are resource-light business models?
This note provides an overview of the principles and strategies of such business models. The term 'resource-light' was coined as part of a 6-month accelerator programme[1] held in Zurich in 2019. In contrast to traditional circular business programmes, the accelerator sought to integrate the moderation and slowing of consumption into its approach. Current circular economy strategies are failing to achieve the necessary reduction in resource use to operate within our planetary boundaries, due in part to our consumption habits. Consequently, there is a necessity to develop complementary strategies that address consumption as well as production. To highlight the key components of this complementary approach, this document catalogues a number of modifications to the circular strategies that bring together supply- and demand-side strategies in a business context.

This note should be used as a preliminary resource for practitioners, academics, and entrepreneurs seeking an overview of further iterations of circular business models. The strategies outlined in this document are based on a significant body of research and real-life examples to illustrate that these approaches can make economic, social, and – more importantly – environmental business sense.

[1] WWF Switzerland, the Impact Hub Switzerland, sanu durabilitas' ***Circular Economy Transition***, and the creative design agency ***reverse*** launched the 'Catalyzer program for resource-light business models' in May 2019. It was a pilot programme for start-ups and organisations seeking to scale or make their circular products market-ready whilst attempting to encourage a moderation of consumption. In brief, it tested whether two synergistic approaches of sustainable thinking, circular economy and slow consumption, could be brought together in a successful business model. The goal was to prototype circular business offerings were profitable while simultaneously minimising the use and depletion of primary resources. This pilot programme was financed by WWF Switzerland, the Mercator Foundation Switzerland and the energy company of the City of Zürich, EWZ. It was also supported by the Environmental Department of the City of Zürich.
This programme built on previous research conducted by WWF Switzerland on ***Business Model Innovation*** for larger scale companies.

1. Tackling planetary boundaries

More of everything – is that even possible? Our current global consumption and production system is rather linear and follows a 'take-make-waste' model. It is an extractive and resource-intensive model that disrupts the Earth system, breaching a number of key planetary boundaries (biodiversity, phosphorus and nitrogen levels) while others boundaries (climate change and land-system change) are at increasing risk (see Figure 1 below). The way we use natural resources is therefore integral to remain within a 'safe operating space for global societal development' (Steffen et al., 2015b), i.e. not to go beyond the limited biophysical capacity of our planet.

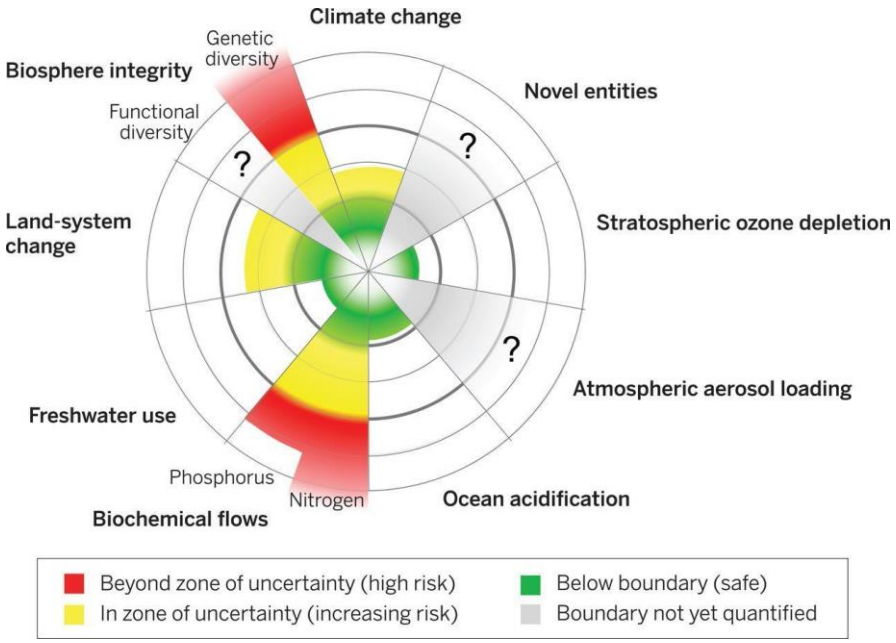

Figure 1. Current status – planetary boundaries. The green zone denotes a 'safe operating space', the yellow is the 'zone of uncertainty (increasing risk), and the red is a 'high-risk zone' (Steffen et al., 2015b).

Our consumption of natural resources and use of materials are, however, on a dangerous and unsustainable track: the global use of natural resources has more than tripled since 1970 and continues to grow (IRP, 2019). The extraction and processing of natural resources is responsible for more than 90% of biodiversity losses, water stress, and approximately half of our climate change impacts (IRP, 2019). This negative trend is a matter of great concern.

Furthermore, the social and environmental benefits and impacts of resource use are unevenly distributed across the planet. In countries like Switzerland, for example, the environmental impact of domestic consumption has decreased; however, this decrease is predominantly due to a shift in reliance on overseas production. Consequently the environmental impacts have merely been 'outsourced' abroad [to regions like China (6%), Europe (48%), US (7%)], where they continue to increase due to rising demand (Frischknecht et al., 2018). This trend is at odds with the need to remain within our planetary boundaries, especially regarding climate change. In order to meet the requirements for operating within these boundaries, i.e. within the safe operating space, Switzerland would need to implement a two-thirds reduction of natural resource consumption (Frischknecht et al., 2018).

Overall, this concept note emphasizes the role of resource and material extraction, processing and consumption within the context of the planetary boundaries – going beyond the narrow focus on energy (energy efficiency, renewable energy, energy decarbonization, etc.). A recent study (EMF, 2019) suggests that while a global shift towards renewable energies could reduce greenhouse gas emissions by 55%, our current methods of production and land management (agriculture, forestry, and other land use) would still account for the remaining 45% of emissions. With regards to the production of materials (iron and steel, cement, plastic, wood, etc.), we have already seen an increase in global greenhouse gas emissions from 15% in 1995 to 23% in 2015 (IRP, 2020). The impact of this increase is considerable: an economy entirely fuelled by renewable energy and using the best available energy efficiency technologies would still exceed the remaining carbon budget consistent with meeting the 1.5°C target pursued by the Paris Agreement on climate change (IRP, 2020; EMF, 2019). This suggests that a significant rethink of our global production and consumption systems is necessary. Resource-light business models for circular economy can contribute to this crucial transformation. They are discussed in more detail next.

2. Resource-light business strategies in the circular economy

The circular economy should be about sustainability

Across the board, the lifespan of domestic appliances and consumer electronics in Europe has been in decline (Bakker et al., 2014). Consumer products such as mobile phones and clothing are increasingly treated as 'disposables' with quick replacement rates, yet our systems for dealing with the increasing levels of waste remain inadequate. However, according to a European survey, 77% of EU consumers would prefer that products are manufactured in a more robust and repairable manner, thus reducing commodity turnover rates and its detrimental impacts (European Parliament, 2017). Although current systems do not allow for this, consumers' willingness for environmental considerations demonstrates ample opportunity for a future circular economy that provides better services to consumers (Stahel, 2010), but also tackles core sustainability challenges such as climate change (Geissdoerfer et al., 2017).

Although it has great potential as a solution for our global resource and economic issues, we need to remain critical about why the circular economy is put forward as a sustainable pathway in the first place: to meet human needs while minimising the environmental impact associated with doing so (Allwood, 2014; Desing 2020). Therefore, it is important to focus on the environmental impact and resources usage when framing the concept of the circular economy.

To allow businesses, policy makers, and citizens to navigate and evaluate different circular economy solutions, it is helpful to simplify and categorise circular economy options according to their resource focus. Here we introduce the following resource strategies: (1) narrowing, (2) closing, and (3) slowing resource loops (Bocken et al., 2016; Stahel, 2010; McDonough & Braungart, 2002). In short, the circular economy prioritises the optimal use of products and resources over time and can be categorised by three distinct resource-loop or resource-light business strategies – narrowing, closing and slowing resource loops - discussed next[2].

Narrowing resource loops

Narrowing resource loops is about decreasing material and energy use per product. Many companies in the linear economy already engage in this strategy as it reduces costs and increases profit, but the eco-efficiency of designing and producing products in the right way can be very impactful.

Lightweighting products is a prime example of narrowing resource loops, such as reducing the weight of an aluminium drinks can so it is lighter to transport, or reducing the weight of an aircraft for greater fuel efficiency.

Narrowing the loop is certainly not insignificant. A case study of the Velodrome in London's Olympic Park revealed a 27% reduction in the use of steel in its roof construction due to innovative design measures; in contrast, the nearby Aquatics Centre was designed in a more traditional manner and ended up five times as heavy (Allwood et al., 2012). Creating and specifying lightweight design can therefore significantly reduce environmental impact.

Closing resource loops

Closing resource loops refers to the practice of ensuring both production material (and resources) and the finished product can be – and are – recycled. It is generally accepted that recycling is a widely-used and successful environmental practice. While significant and important as a strategy, it should be understood that for major global manufacturing materials such as steel, cement, paper, glass, plastic, and aluminium, recycling is complex and its assumed energy-saving effects less clear. For example, aluminium drinks cans can be recycled in a near closed loop (with about 5% virgin material added), but these cans constitute just 1% of all aluminium use globally (Allwood, 2018). For glass, the recycling status and potential are high, but the energy savings of recycling are low (Allwood, 2018).

While recycling certainly reduces reliance on virgin material inputs, we also need to think about the energy and emissions it takes to recycle, as well as the quality of the recycled products (for example, when we recycle paper, we need to cut down fewer trees, but paper fibres get shorter when you recycle).

Because of the limitations of recycling, we must also focus on slowing the loop for greater environmental benefits.

[2] None of the examples in the following sections are meant as endorsements, but rather as illustrative examples of business practices in the circular economy

Slowing resource loops

Slowing resource loops is about using products for longer. The goal is to create durable and long-lasting products, which would in turn slow consumption and decrease resource use. Slowing the loop is potentially the most impactful environmental strategy, but it is also the most challenging one to implement.

As an example, WRAP UK reports that an increase of 10% in second-hand clothes sales could save 3% in carbon emissions, 4% in water usage, and 1% in waste per tonne of clothing. Considering that the global average water footprint for 1 kilogram of cotton (e.g. a pair of jeans) is 10,000 – 20,000 litres depending on where the cotton is grown, the savings of reusing a pair of jeans or a t-shirt over time are significant (WRAP UK, 2017). Campaigns like ***Love Your Clothes*** that raise awareness of this issue – the amount of clothes we buy, the need to care and repair, re-fashion and upcycle, and eventually deal with unwanted clothes – are important to reduce unnecessary waste. While some companies (e.g. M&S, H&M) have clothing return programmes focused on recycling, others, like outdoor company Patagonia's ***Worn Wear*** campaign, focus primarily on reuse and repair.

The waste hierarchy and prioritisation

The three strategies above suggest that we need to prioritise the higher strategies in the waste hierarchy of avoiding, reducing, and reusing, before recycling (Figure 2). Avoiding waste and reducing resource use (narrowing the loop) and reusing products over a greater period of time (slowing the loop) are environmentally preferable and should therefore be prioritised in the resource-light circular economy. Closing the loop is also important, but follows after avoiding overconsumption and reducing material and resource use in the first place.

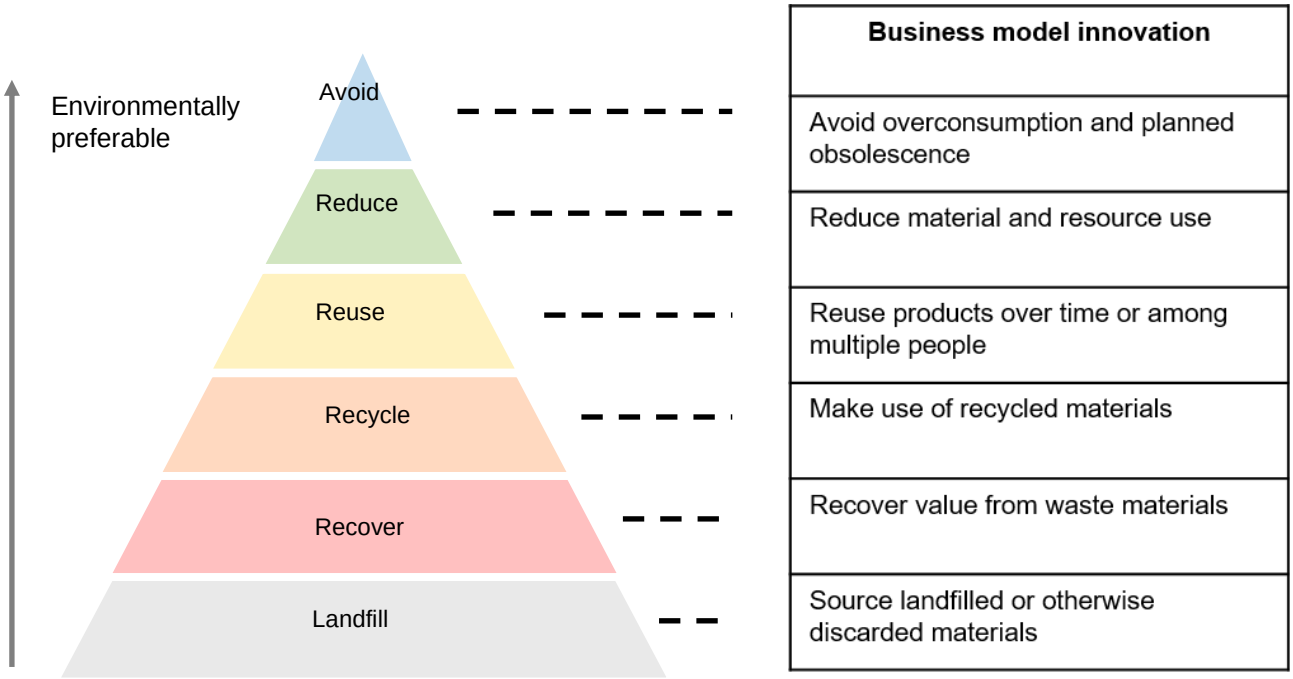

Figure 2. Waste hierarchy. Version of waste hierarchy taken from: Bocken & Short (2016).

3. Slowing the loop and sufficiency in businesses today

If we want to slow the loop and focus on resource-light solutions, a range of viable business options is possible, as discussed below (based on Bocken & Short, 2016; 2020).

Promoting quality over quantity

Promoting quality over quantity relates to higher pricing to cover the full or real price of the product (durability, life extension, repair, etc.). Companies like Patagonia (outdoor gear) and Vitsœ (furniture) are certainly not at the 'cheap' end of the price spectrum, but they provide high levels of service, repair, and support with maintenance and warranties (see case studies in Bocken & Short, 2016). They also encourage consumers to consider buying less and to become more conscious about the range of options in the waste hierarchy in Figure 2 (Bocken & Short, 2016).

Swiss box story: USM Modular Furniture Systems

USM Haller is a Swiss family-run furniture business. Sustainability and quality are at the heart of USM's philosophy. Since 1965, the company has built modular furniture for style and endurance using wear-resistant materials, fine craftsmanship, and durable designs. Their motto is 'produce furniture that lasts a lifetime' in order to reduce the need for buying new and instead maintain the old.

Not only is the company cradle-to-cradle certified, it has also been rewarded with the prestigious Greenguard certification for low chemical and particle emissions. To encourage and extended product life, USM has begun training and supplying four of the largest second-hand retailers for their furniture.

To become a fully resource-light business, the company could offer services to support clients when moving offices, track clients who use their repair service, and provide the opportunity to return their furniture for reverse engineering of the components at the end of life to ensure an ultimate reduction of primary resources used.

Focusing on service, not products

Work by Tukker (2004; 2015) suggests the potential of product service systems to reduce environmental impact – by as much as 90% – when providing and promising a specific 'outcome' to the customer (e.g. 'fresh air' or 'mobility') rather than the product (e.g. a room ventilation system or a car). By focusing on the eventual outcome or the service for the customer, rather than offering a specific product, the company is incentivised to optimise the life cycle costs and emissions. For example, a company might provide a 'clean linen service' to hotels, and by optimising and centralising the cleaning services reduce the overall cost and environmental impact. However, such a service will need to be 'designed' to optimise environmental impact taking into account all aspects from the materials and technologies used to the logistics.[3]

In the case of a pay-per-use model, providing an hour of car usage or paying per wash can provide resource-light outcomes, as it discourages individual consumption, encourages both reuse and recycling, and simultaneously reduces energy consumption during usage. For example, people who used a washing machine in the circular company HOMIE's 'pay per wash' initiative washed on average 30% less often and also at lower temperatures (Bocken et al., 2018).

Swiss box story: Sharely

Sharely is a rental platform where people can borrow or rent a wide range of items in and around their locality. This includes anything from motorcycles to power drills to chocolate fountains. The company is the largest rental platform for consumer products in Switzerland and a national pioneer of the sharing economy.

Sharely facilitates the entire rental process between two users: the search, the rental inquiry, the evaluation, the insurance, the payment, and the customer support.

The platform has been in existence since 2014 and their user numbers have been steadily growing. Today, it boasts 25,000 users, 16,000 products, and 10,000 transactions in total. Since its inception, Sharely transactions have contributed to the avoidance of an estimated 680 tons of CO_2 through reduction of consumption. That is equivalent to the annual global average CO_2 emission[4] for over 140 people.

[3] For an overview of principles that can guide the development of circular service offers from an ecological point of view, see Rytec (2017).
[4] According to the Global Carbon Project, Gapminder, and UN statistics, the global average CO_2 emission per capita is 4.8 tonnes.

Giving products a 2nd (3rd, and 4th etc...) life

One way to extend the life of products is to create your own second-hand markets by adding business strategies to collect, curate, prepare, and sell used products. Companies like Gazelle in the USA (gazelle.com) and LEAPP (leapp.nl) in the Netherlands are exploiting missed value by mobile phone and computer manufacturers by collecting, repairing, and reselling them. These strategies could also be employed by the original equipment manufacturers (OEMs) themselves.

A second way is to become a 'market maker' by providing a platform for second-hand goods resale. These platforms exist for all types of goods, from clothing to furniture and can be rolled out on a local, national, or even global scale (e.g. eBay).

Finally, charities have been involved in the second-hand trade for some time, and various non-profit organisations are supporting repair and reuse. A study by the Nordic Council of Ministers (Watson et al., 2016) estimated that reuse and recycling of exported textiles from Nordic countries provides a global saving of 190,000 tons of CO_2 thanks to offsetting new production.

Swiss box story: Revendo

Revendo restores used Apple computers, mobile phones, and other electronic hardware and resells it. Its goal is to combat the increasing amount of electronic waste produced in Switzerland.

Environmental sustainability and the reduction of consumption lies at the heart of Revendo's philosophy.

3 reasons why they opt for upcycling:

- It conserves resources.
- It reduces energy consumption (that would otherwise be used to manufacture new or recycle existing products). This in turn reduces air and water pollution.
- It reduces our need for new products and simultaneously controls over-consumption and its associated electrical waste.

The company launched in 2013 in Basel. In six years, the company has grown rapidly; it employs over 100 people and owns nine shops across Switzerland. In 2019 alone, Revendo helped avoid 130 tonnes of e-waste.

Lower cost frugal innovations

A further sufficiency strategy is to use more simple solutions focused on low tech, low resource solutions. For example, the Mitticool fridge is a small fridge from India made out of clay and uses water as a refrigerant that can then be consumed at the end of the day, thus making use of all valuable natural resources. Similar frugal innovations have been made with medical devices, which have been a major focus for Western multinationals (e.g. Philips, Siemens, and GE) in emerging markets (Kroll et al., 2017). Some of these innovations have successfully transferred to higher-income settings; however there remains much opportunity for further optimisation and innovation (Kroll et al., 2017).

Swiss box story: Lytefire

Lytefire pioneers solar thermal ovens, roasters, and cookstoves for low-income communities in which fuel is expensive and electricity grids are missing or unstable.

It is an impact initiative by Solar Fire Concentration Ltd, a Swiss-Finnish enterprise with an international team, which seeks to combat energy poverty that often results in deforestation, pollution, and ill-health in low-income communities. Their goals are to eradicate energy poverty, empower entrepreneurs with solar thermal, and minimise the damage of climate change by breaking down the barriers to solar energy.

They offer free construction guides, education, and low-cost solar thermal solutions (Lytefire 5) with no pollution, a high CO_2 savings potential, and a return on investment in as little as a year. The production cost of their ovens, which are made almost entirely with fully recyclable steel and glass, is around €1250 and they have a lifecycle of 15 years.

Different forms of consumption

A final strategy is to make the sustainable alternative more appealing, for example, replacing fossil fuel cars with electric cars, and replacing animal-based products with plant-based alternatives.

In the food industry, Oatly provides an alternative to dairy with oats-based milk, and sees its mission to provide a plant-based alternative as an important part of its sustainable growth strategy (Oatly, 2019).

In the car industry, Riversimple provides a hydrogen-fuel cell alternative to petrol cars to 'to address the environmental impact of personal transport' (Riversimple, 2019). Fuelled by hydrogen from natural gas, their car would emit 40gCO_2/km, which represents a 60% reduction on the emissions of the lowest emitting cars on the market today (Riversimple, 2019).

Lower carbon footprint alternatives that provide similar outcomes can be a final sufficiency strategy.

Swiss box story: Planted Foods AG

Planted is a Swiss ETH spin-off that produces vegan meat substitutes. These substitutes consist of purely natural ingredients: primarily plant protein and fibres, oil, and water.

With their plant-based products, the four founders seek to actively combat pollution from livestock farming, such as air and water pollution from methane or ammonia.

In total, commercial livestock breeding accounts for 18% of global greenhouse gas emissions and 45% of global land usage. The plant-based production of the company's meat substitutes consume less water, land, and energy, and emit fewer greenhouse gases.

In May 2019, the start-up made its first delivery and only eight months later their products could be found in over 60 restaurants in Switzerland as well as in some of the biggest retailer and restaurant chains in the country, such as Coop, Hiltl, SV-Group, and others. To scale their production facilities and accelerate research and development, investors have provided the start-up with approximately €6.5m.

4. Challenges in implementing Resource-light Strategies

This section discusses some of the challenges associated with implementing resource-light business strategies in the circular economy.

Demand and supply-chain focus: all are responsible

The circular economy requires transformation on both the production and demand side; 'techno-optimism' and overreliance on technological advancements is therefore misplaced with regards to solving planetary decline (Allwood, 2018). Solutions require appropriate policies and business responses coupled with shifts in individual responsibility and changes in consumption patterns. Resource-light business models integrate these ideals of sufficiency: they encompass the idea of demand-side moderation – for instance through consumer education – to curb consumption levels, and shift their promotion and sales tactics accordingly (Bocken & Short, 2016). This is also related to the rebound effects described in the paragraph below and consumer choice.

Rebound effects

Rebound effects relate to the negative environmental side-effects of sustainable solutions.

Rebound effects described in sustainability literature include: (1) **direct** rebound, related to the immediate increase in consumer demand attributed to lower prices from increased efficiency; (2) **secondary** effects, which are increases in demand of other goods attributed to consumers spending some of the energy savings elsewhere; (3) **economy-wide effects,** which refer to the larger and more unpredictable effects that increased efficiency has on prices and demand of other goods; and (4) **transformational** effects, which refer to the potential of energy efficiency increases to change consumer preferences, societal institutions, technological advances, regulation, etc. (Greening et al., 2000; Zink & Geyer, 2017).

In the circular economy, two other types can be added: rebound attributed to insufficient substitutability and rebound related to price effects. First, related to substitution, not all recycled material (e.g. plastic, paper) can substitute virgin material and some primary materials are still required (e.g. virgin plastic). Moreover, not all reused or refurbished products may appeal to everyone (Zink & Geyer, 2017). Second, with regards to price effects, when circular products are cheaper it is possible that more goods might be produced, sold, and used, thereby leading to increased material consumption (Zink & Geyer, 2017).

There are three conditions to ensure that resource-light approaches succeed in reducing these negative rebound-effects: circular alternatives should really act as substitutes; they should not increase overall demand; and they should draw consumers away from primary production and consumption (Zink & Geyer, 2017).

Energy use

How much energy is required to operate a circular economy?

First, almost all recycling processes operate by breaking down a solid waste stream into a liquid, which is then purified by some means, all of which requires energy (Allwood, 2014; 2018). Even renewables, such as solar power, that deliver zero carbon energy depend on the use of critical materials, require manufacture, and take up precious space and land (Chu & Majumdar, 2012).

Second, for energy-using products (e.g. computers, car engines, fridges), remanufacturing remains viable but this must be balanced with the potential energy-saving measures created by newer and more energy-efficient products (Gutowksi et al., 2011).

Ownership and happiness

Ownership is often associated with markets. It is also argued that market saturation has facilitated the prioritising of 'wants' above that of 'needs'. To illustrate: the average weight of cars globally is continuing to increase because consumers are demanding bigger cars (Allwood, 2018, p. 1051). Houses are similarly getting bigger – but with fewer people in them – leading to more unused space. These trends do not, however, correlate with increased happiness (Adcock, 2019; Bellet, 2019).

Prettenthaler and Steininger (1999) studied a car-sharing scheme in Austria and found that 70% of the households could theoretically save money by car sharing. However, in reality cars perform alternative functions that include providing a social space, storage, or acting as a status symbol; when these were taken into account, it was estimated that only 9% of households would still benefit from the scheme (Allwood, 2014, p. 453). Hence, next to status, these supplementary functions of goods would need to be more fully understood to effectively transform consumer behaviour.

Coordination and collaboration

Finally, collaboration is essential in a future circular economy to ensure the integration of different cycles of reuse, repair, maintenance, remanufacturing, refurbishing, and eventually, recycling.

This shows the importance of inclusive collaboration: "While more conventional approaches to sustainability, such as efficiency and productivity improvements, may be largely firm-centric innovations, circular economy and sufficiency initiatives by their nature demand a broader system-level approach, and the participation and cooperation of actors across government, industry and civil society" (Bocken & Short, 2020, p. 2)

5. Conclusion

This note provides an overview of the principles and strategies of resource-light business models. Its findings are based on a significant body of research and real-life examples that illustrate these approaches can make economic, social, and – more importantly – environmental business sense.

We advocate for strategies around sufficiency and slowing the loop to become more prominent in circular business offerings, the logic being that current circular economy strategies are failing to achieve the necessary reduction in resource usage to operate within our planetary boundaries. This comprehensive focus on both the demand- and supply-side necessitates engagement of consumers in possible solutions and collaboration with stakeholders more generally to slow, close, and narrow resource loops.

The following strategies are identified as viable business sufficiency strategies that slow the loop in the circular economy: promoting quality over quantity; giving products multiple lives; lower cost frugal innovations; and alternative forms of consumption. These all have the potential to significantly reduce environmental impact, so long as business solutions are purposely designed to incorporate environmental impact reductions. The framework of slowing, closing, and narrowing resource loops may therefore help business design solutions with a positive environmental direction.

Some of the challenges to implementation relate to: shared responsibility; rebound effects; energy use; and the need for coordination and collaboration. Being aware of such challenges will allow business to develop solutions that avoid environmentally detrimental outcomes and can create awareness of possible pathways towards implementation.

To conclude, we hope that this note will provide a useful resource for practitioners, academics, and entrepreneurs seeking to integrate proven resource-light strategies into their circular business innovations.

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