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STRATEGIES FOR BRAND OWNERS AND RETAILERS IN THE CIRCULAR BIOECONOMY TRANSITION

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1 Introduction

The Sustainable Development Goals (SDGs) and the Paris Agreement set the course towards a safe and just operating space under stable environmental conditions (UN/FCCC, 2015; United Nations Development Programme, 2015). We refer to the practices and developments in line with this course of action here as ‘sustainable’, although some criticism of the integration of SDGs into business strategies is expressed elsewhere in this book (see Chapter 2). As part of the transition from the current economic system to a sustainable and resilient one, the European Union aims, through its Bioeconomy Strategy (EC, 2018), to strengthen and boost biobased sectors, unlocking investments and markets while rapidly deploying local bioeconomies across Europe and improving the understanding of ecological boundaries. By definition, this includes

all primary production sectors that use and produce biological resources (agriculture, forestry, fisheries, and aquaculture) and all economic and industrial sectors that use biological resources and processes to produce food, feed, bio-based products, energy, and services. To be successful, the European bioeconomy needs to have sustainability and circularity at its heart.

(EC, 2018, p. 1)

The combination of these strategies will be further denoted as the transformation towards a circular bioeconomy. The transition implies a plurality of normative and quantitative targets which go beyond eliminating emissions and implementing efficient, circular use of resources, including stable, healthy conditions for individuals and the fair distribution of opportunities among all members of our society.

In the more general sustainable transition process, the role of policymakers and institutional actors, both at the national and regional level, has been broadly discussed (van Vuuren et al., 2015; Gómez Martín et al., 2020; Moyer and Hedden, 2020). However, the setting of framework conditions for economic activities, responsibility and opportunities for producers (including brand owners) and large retailers, are discussed to a lesser extent (Naidoo and Gasparatos, 2018; Istudor and Suciú, 2020). Moreover, studies of the sustainability of economic players have historically concentrated more on primary production, the sourcing of biomass and materials, the nexus of primary and secondary sectors (e.g., manufacturing, final energy supply), and more recently, on businesses in the information and communications sectors (Pohl et al., 2019) or even public administration and defence (SGR, 2020).

This chapter focuses on the significant role that brand owners and retailers play in the circular bioeconomy transition (e.g., in terms of products including apparel, beverages, chemical products, cleaning products, food products, furniture, paper products, plastics, sports goods, textiles, and wood products). Brand owners are businesses that supply well-established and known products in the current economy and they represent key actors in the incumbent regime. Retailers, on the other hand, are important actors and shape the circular bioeconomy through their responsible economic operations. European retailers are taking numerous steps to promote the transition to more circular business practices, including helping to valorise food waste, redesigning their products using recycled or recyclable materials instead of virgin materials, and employing renewable energy alternatives in their processes (Jones and Comfort, in press). With brand owners representing secondary-sector and retailers tertiary-sector actors, this less examined nexus accounts for significant shares of the energy and material flows of economic metabolism and thus deserves particular academic attention in bioeconomy transition research. To set the scene for this field, this chapter aims to excite the reader by asking and hypothesising about brand owners' and retailers' responsibilities, risks, and opportunities in the transition process under various system dynamics.

To clarify the possible roles of retailers and brand owners, in Section 2 we provide a theoretical background to the transition processes in general and offer a comprehensive but simplified typology of possible transition pathways. Based on this typology, in Section 3, we outline our findings regarding the risks and opportunities of brand owners and retailers and underpin them with examples of the circular bioeconomy and other transition processes. The conclusion (Section 4) summarises our findings and distils the primary take-home messages for the reader.

2 Beyond Technological Change: Sociotechnical Transitions

Analytical and descriptive approaches to discussing the path from invention to market diffusion are described by, for example, 'strategic niche management' scholars (Kemp et al., 1998), 'transition management' scholars (Perez, 2009), and

'technological revolutions' scholars (Rotmans et al., 2001). Partly building upon these approaches, the 'sociotechnical transition' concept forms a structural context for actively created, (re)produced, and refined activities of human actors who are from different social groups, yet share specific characteristics (Geels, 2005, 2004). Nevertheless, a sociotechnical transition is a multi-dimensional process that includes not only technological but also organisational, institutional, and socio-cultural change to fulfil societal functions such as transport, communication, and nutrition. The transition allows new products, services, businesses, models, organisations, regulations, norms, and user practices to emerge as either complementary or by substituting existing ones (Markard et al., 2016). Hence, retailers and brand owners – inherently social by nature due to their interaction and communication with different stakeholders throughout the value chain – hold a unique position for steering the transition onto a more sustainable pathway.

However, sociotechnical transitions do not occur overnight; they evolve through four developmental phases, which may even take several decades to complete (Geels, 2019). Energy system transitions take, for example, something in the range of 80 (oil/gas/electricity substituting coal steam power) to 130 years (coal steam power replacing pre-industrial energy sources) (Grubler, 2012). Previous studies have aptly described the development phases through which niche innovations pass towards ultimately replacing the incumbent regime (Kemp et al., 1998; Sandén and Azar, 2005; Geels and Raven, 2006; Schot and Geels, 2008; Klitkou et al., 2015; Sengers et al., 2019) and a more detailed discussion of sociotechnical transitions under the concept of sustainability-driven innovation is described elsewhere in this book (see Chapter 11).

In this chapter, we wish to focus on the timing and nature of different multi-level interactions between regimes and niches in the context of brand owners and retailers in the circular bioeconomy. We use the typology developed by Geels and Schot (2007), in which the timing of these interactions is central for determining the fate of niche innovations. Initially, a niche innovation does not act as a threat to the regime; this only happens when the external landscape developments open a window of opportunity by exerting pressure on the incumbent regime. A niche innovation can only break through this window if it is sufficiently developed. Meanwhile, the nature of interaction may have two distinct characteristics. Niche innovations may aim to replace the existing regime in a *competitive* manner, or they may seek to serve as a complementary mechanism to the current regime in a *symbiotic* relationship. Geels and Schot (2007) proposed four different transition pathways as combinations of the time and nature of the interactions between niche innovation development and landscape pressure: transformation (P1), de-alignment and re-alignment (P2), technological substitution (P3), and reconfiguration (P4). To categorise niche innovations into different maturity levels, we adopt terminology from the European Commission's funding schemes such as the Technology Readiness Level (TRL), which enables differentiation of innovation steps from the laboratory, via pilot and demonstration plants, to market introduction (EC, 2014). Figure 6.1 summarises the four

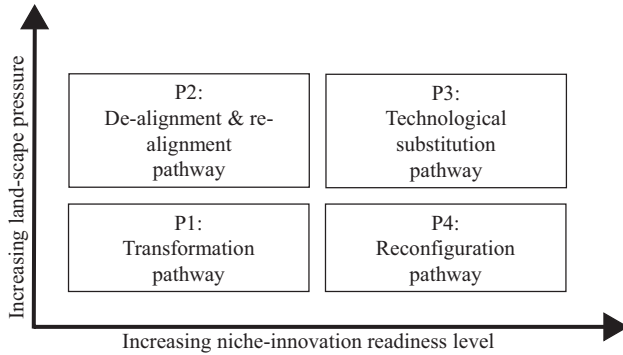


FIGURE 6.1 Transformation paths described as change types for different combinations of niche readiness level and landscape pressure level.

Source: Own illustration.

transformation paths of Geels and Schot (2007) as simplified combinations of landscape pressure and niche readiness levels.

The regime dynamics remain in a stable reproduction process of accustomed practices, leaving minimal space for radical niche innovations if no external landscape pressure exists, i.e., the business-as-usual scenario (BAU). Using the BAU scenario as a benchmark, the *transformation path* (P1: embryonic and symbiotic niche innovations) describes a situation with moderate landscape pressure but no sufficiently advanced solution from the niche level at hand. Good adaptive capacity is essential for incumbent actors to reorient development trajectories in response to gradually increasing landscape pressures and proposed alternatives. The basic architecture of the incumbent regime remains stable, allowing technical variations (i.e., mutations) or adopting symbiotic niche innovations. The *de-alignment and re-alignment path* (P2: embryonic and competitive niche innovations) describes divergent, large, and sudden landscape change. Rapid landscape pressure destabilises (de-aligns) the incumbent regime, thus creating a competition between co-existing niche innovations, until one of them fully develops and re-aligns a new regime. The *technological substitution pathway* (P3: fully developed, competitive niche innovations) describes high landscape pressure, and fully developed niche innovations use the open windows of opportunity to diffuse into the mainstream markets and eventually stabilise the new regime. When the niche innovation substitutes the existing regime, incumbent firms tend to lose their position unless they defend themselves by investing in improvements. Thus, this pathway has a technology-push character. The *reconfiguration pathway* (P4: fully developed, symbiotic niche innovations) describes the transition as being due to the cumulative effect of symbiotic innovations that originated in niches but then came to apply to the regime-level problems as supplementary or substitute components, thus creating 'new combinations' of old and new elements. P1 and P4 have a common characteristic, as the new regime originates from the

old one. But, in a transformation pathway (P1), the basic architecture does not change in response to the pressure. These two pathways (P1 and P4) are particularly relevant in the framework of the circular bioeconomy transition, as they describe situations in which landscape pressure is still low. Still, brand owners and retailers can play a crucial role in the transition process by trying to influence and steer trajectory of the innovation process.

The following section discusses the role of brand owners and retailers in the specific context of a sustainable transition towards a circular bio-based economy, based on the multi-level perspective and the four pathways discussed above. It also identifies and highlights potentially relevant synergies and barriers.

3 Brand Owners and Retailers in the Circular Bioeconomy Transition

As discussed in the introduction of this chapter, the transition to a circular bio-based economy is a complex and multi-dimensional process, because it requires radical changes in both cognitive and operational *schemas*. This ‘transition process’ dynamic structure requires innovative technologies from the supply side and regulatory and societal transformations based on a multi-actor ‘play’ in which brand owners and retailers have vital roles. Based on the phases of the innovation processes and the respective market diffusion characteristics discussed, as well as the theoretical framework of different typologies for the process dynamics (addressed in Section 2), this section employs a theoretical framework to highlight the incumbent regime brand owners’ and retailers’ responsibilities, risks, and opportunities in terms of either stimulating/accelerating or restraining/slowing down sustainability transitions under various framework conditions. At first, the BAU scenario is discussed from the advantageous position of the incumbent actors via various lock-in mechanisms. Then, the need to combine financial and ecological sustainability aspects in response to the shift in consumer demand for more sustainable products is highlighted. Finally, it depicts some circular bioeconomy examples, along with possible transition pathways under moderate (Section 3.1) and high landscape pressure (Section 3.2).

The BAU scenario contains no landscape pressure to steer production activities in a sustainable direction. Due to the lack of pressure, the incumbent actors (e.g., large brand owners that dominate the industry) do not necessarily feel the need to shift to more sustainable alternatives, and instead prefer to play safe in a stable reproduction process of accustomed practices that leave no space for radical niche innovations to break through.

Techno-economic lock-in mechanisms provide a safe atmosphere for the incumbent regime actors via economies of scale and long-term experience of learning-by-doing, thus yielding low cost and high performance. The regime actors do not take the risk of sunk investments and resist transitional change. Social and cognitive lock-in mechanisms can blind actors to developments outside their routines and mindsets (Geels, 2019). Institutional and political lock-in

mechanisms generally favour incumbent regime actors via existing regulations, standards, and policy networks, creating unfair competition for innovations (Kuckertz, 2020). Moreover, influential incumbent actors may use their power through market control or political lobbying to oppose breakthrough innovations. They may even leverage organisations such as industry associations or branch organisations to lobby on their behalf (Unruh, 2000). Concerning the option of lobbying to weaken pressure and thus delay the sustainability transformation, research is starting to reveal social costs, especially for climate policies. For instance, Meng and Rode (2019) empirically analysed US lobbying records and quantified expenses that could be avoided through a more robust climate policy proposal design.

Although the lock-in mechanisms stabilise incumbent firms' positions in the existing regimes, in a sustainability transition process, these firms can play a crucial role – contradicting Schumpeter's dichotomy – provided that emerging economic opportunities and/or attractive financial incentives exist. Legal regulations and public attitudes are also essential for changing the opinions of various types of actors. Therefore, the reorientation of the incumbent actors' financial assets, technical competencies, and political capital may also accelerate sustainability transitions without landscape pressure (Geels, 2019). Sustainability in business management practices can result from optimising the profitability of the firms. For example, Nakao et al. (2007) and Markley and Davis (2007) revealed a positive relationship between financial and ecological sustainability. Mathis (2007) and Youn et al. (2017) already showed that, in return, companies are highly likely to cater to consumers' demands for environmental friendliness and therefore have very good images among consumers. A positive company image can also alter consumer behaviour on the company's behalf. For instance, in their comprehensive research study of 18,980 consumers in 28 countries, the IBM Institute for Business Value (IBV), in association with the National Retail Federation, reported that 'over seven in ten consumers say it's at least moderately important that brands offer "clean" products (78%), are sustainable and environmentally responsible (77%), support recycling (76%), or use natural ingredients (72%)' (Haller et al., 2020).

3.1 Brand Owners and Retailers Steering Innovation – Moderate Pressure and Transformation (P1) and Reconfiguration (P4) Pathways

While adaptation and reactive strategies prevail in high-pressure situations, mitigation options and pro-active or 'daredevil' responses are characteristic of moderate pressure circumstances. Whereas the former strategies can be understood as market driven, the latter has the chance to be an investment in market-driving practices. In comparison to COVID-19, the climate crisis continues to exert low to moderate landscape pressure on the incumbent regime as it has done since the beginning of the second decade of the current century. However, its pressure

is noticeably increasing in the environment and in society. Moderate landscape pressure offers an opportunity for brand owners to reconsider their actions incrementally. It allows for strategic planning of innovation dynamics and the selection of solutions on the basis of a risk-minimising approach. It aims to maximise revenues from current products and services and incrementally amend them. On the other hand, niche innovations also suffer from low funding and support, as current 'pain points' are not yet painful enough.

Under moderate pressure circumstances, brand owners can still choose from a set of actions and combinations of these. Boiral (2006) differentiates between managerial, socio-political, and technical actions. Managerial action includes brand owners' self-commitment to environmental certification schemes (like ISO 14001 or EMAS – Eco-Management and Audit Scheme). Examples of socio-political actions are image campaigns, lobbying to enforce regulations, and institutional entrepreneurship. Technical action encompasses innovative designs, resource input substitution, and green investments motivated by external pressure and resource availability.

Under moderate landscape pressure and before initiating P1 or P4, corporate social responsibility (CSR) reporting can be understood as an issue that gains traction under retailers and brand owners. As CSR reports seldom follow a standardised approach and the respective information is presented in individual formats, a risk of greenwashing is associated with this type of socio-political action. Still, it can be assumed, and has partly been shown, that CSR reports 'indicate actual sustainability performance' (Papoutsis and Sodhi, 2020). In the new Circular Economic Action Plan to strengthen the European Union consumer law, the European Commission proposes 'further strengthening consumer protection against greenwashing' (in EC, 2020, p. 6). A combination of managerial actions, such as following standardised and certified procedures, can significantly improve the credibility of such reports. Furthermore, Demertzidis et al. (2015, p. 104) propose designing 'specific guidelines to record climate change information in financial and non-financial terms'. The Global Reporting Initiative (GRI) framework for sustainability reporting has developed a set of economic, environmental, social, and governance performance indicators, the aim of which is to represent the actual performance of corporate activities (GRI, 2021).

In their literature review, Istudor and Suci (2020) analysed the sustainability reports of six of the largest grocery retail corporations in the European Union. They emphasised that the activities of food retailers align with the bioeconomy and circular economy concepts. Auchan Holding, Ahold Delhaize, Carrefour Groupe, and the REWE Group in particular mention the GRI 308 Supplier Environmental Assessment Standard in their sustainability reports. The bioeconomy-related activities in the sustainability reports of the reviewed retailers are clustered into general groups, such as the use of renewable biological sources like electricity provided through the means of solar panels, and the use of methanation reactors to produce biogas from food waste; the use of certified paper stickers instead of plastic wrapping; and the use of recycled materials in the packaging

instead of plastic. Since 2014, globally sustainable and environmentally responsible investment has risen by 68%, and in 2019, it exceeded USD 30 trillion (McKinsey, 2019). Nevertheless, it is worth mentioning that the sustainability declarations of companies may misleadingly present their actions, prioritising reputation building rather than the attainment of sustainability goals, especially due to the lack of sector-level guidance and standards on measuring the impacts and contributions to sustainability goals (see also Chapter 2). Once again, it has to be mentioned, a gap may exist between the company's commitment and actual performance – known as greenwashing.

Another essential opportunity for brand owners regarding sustainable transformation can be seen in the current situation (moderate pressure) in institutional or corporate entrepreneurship or intrapreneurship in the case of externally supporting a niche innovation (Macrae, 1976). In contrast to business ecosystems, which focus on value capturing, the mentality of innovation ecosystems circulates around value creation (Gomes et al., 2018), a luxury that can be associated with P1 and P4, rather than with high-pressure pathways P2 and P3. Under moderate landscape pressure, brand owners can still choose whether they want to aim for costly and still risky value capture and direct implementation of deployable solutions or to be on the forefront and at the top of value creation by, for example, supporting and protecting quasi-independent innovation ecosystems, together with or without governmental funding for start-ups and small and medium enterprises. Box 6.1 presents circular bioeconomy examples of the P1 pathway.

Box 6.1 Circular bioeconomy example of initiating transformation pathway (P1)

Brand owners such as Novamont S.p.A., Arkema, Avantium Chemicals BV, Clariant AG, Lego Systems AS, and Henkel KGaA can be named here as actors in a potential P1 pathway and under the Biobased Industries Consortium (BIC) and Biobased Industry Joint Undertaking (BBI JU) flagship projects. This 'partnership aims to invest €3.7B by the end of 2024 - €975M from the [European Commission] Horizon 2020 budget, and the rest from the industry' (Ruiz Sierra et al., 2021 p. 105). It aims to establish a sustainable and competitive bio-based industrial sector in Europe, focusing on bringing together research competencies and industry, but also focusing on market creation via brand owners, retailers, and co-ordination and support measures. Envisaged TRLs are relatively high compared to other R&D funding schemes in BBI JU, and their successor, the Circular Bio-based Europe (CBE) partnership. The advanced solutions need additional investment and development to reach maturity and be appropriate for a P3 or P4 pathway.

Retailers play a unique role as intermediaries between market demand and consumer expectations in such a way that they can force their suppliers to achieve more sustainable business models (see Chapter 3 for a detailed discussion on sustainable business models), as well as promote and encourage changes in consumer behaviour that improve social and environmental issues (Ruiz-Real et al., 2018). Box 6.2 presents circular bioeconomy examples of the reconfiguration pathway.

Mainly on the basis of the P4 examples, we can see that retailers can act as gatekeepers as they determine product standards, communicate with consumers, and provide information on consumers' behaviour towards suppliers (Lai et al., 2010; Youn et al., 2017). As gatekeepers, retailers reduce the value–action gap by introducing sustainable products throughout the supply chain and communicating with customers about sustainability issues (Lee et al., 2012; Gleim et al., 2013; Youn et al., 2017).

However, suppliers are not always willing to co-operate with retailers. For example, Vermeulen and Ras (2006) illustrated the difficulties faced by two Dutch fashion companies in the greening of their global fashion supply chain. The first case was Van Bommel, a shoe producer, who reported that an Indian supplier was unwilling to engage in environmental performance assessment until Van Bommel paid for the cost of the environmental assessment. The other case was a clothing chain store, Peek & Cloppenburg, which was greening its retail range. The firm had to restrict their options inside Europe because the agents and factory tailors in South–East Asia did not co-operate, refusing to give information or identify opportunities for improvement.

Summarising the strategies of the moderate landscape pressure section, it is worth mentioning that a prerequisite for choosing between the various types of actions and being prepared for high sociotechnical landscape pressure is logically knowledge about these options and the operating space for incumbent businesses. Boiral (2006) stresses the importance of building up environmental intelligence

Box 6.2 Circular bioeconomy examples of initiating reconfiguration pathway (P4)

As one of the biggest food retailers in Europe, the Aldi South group has set itself a science-based target (SBT) to reduce its overall operational emissions by more than a quarter by 2025. The group urges its suppliers, who are responsible for 75% of product-related emissions, to adopt the same SBT by the end of 2024 (ALDI, 2021). Therefore, the suppliers have received questionnaires on their current product environmental footprints (PEFs) and can expect to face mandatory reporting of environmental metrics in the coming years. The strict enforcement of, for example, barcode printing position standards for quick processing at checkout allows us to only guess at the power that this retailer has over its suppliers.

in the light of increasing climate change pressure. This concept refers to appointing specialists who can anticipate the potential impacts of pressure changes on and between economic, social, scientific/technical, and political/regulatory issues. Economic issues, such as changing market opportunities and financing possibilities as well as competitive advantages, have to be taken into consideration and be placed in relation to employees' motivation, image, and legitimacy (social issues) as well as subsidies, tax reductions, and changes in regulations (political and regulatory issues), complemented by a comprehensive but detailed overview over the dynamics of niche innovations, strategically directed research, development and demonstration, and the implementation of effective data management practices (scientific and technical issues).

3.2 High Pressure from Sociotechnical Landscape – De-alignment and Re-alignment (P2) & Technological Substitution (P3) Pathway

The incumbent regime may be destabilised by divergent, large, and sudden landscape-level changes such as the COVID-19 crisis. This crisis has exerted significant pressure on all countries to increase hygiene standards and introduce measures to minimise the spread of pathogens over borders and through daily routines. The fragility of many global supply chains, mostly seen in response to the need for medical equipment, opened the debate on stock availability and short supply chains to increase systemic resilience. Another important domain is the susceptible area of centralised food production and its long-distance transport via supply chains. Some cities faced food supply problems during lockdown, and a need for shorter producer-to-consumer models emerged. Further, mobility and transportation have also called for specific measures, which have already been taken in pilot cases – giving more space to pedestrians and cyclists and limiting the speed of motor vehicles across the city.

Sustainable solutions can become mainstream in such a dynamic environment that combines economic regeneration, better societal outcomes, and climate targets (Morone and Yilan, 2020). In these specific high-pressure cases, brand owners are either confronted with niche innovations already set up to be deployed and to substitute prevailing solutions and products (e.g., higher sanitary standards and adapted certification schemes to prevent the virus spreading in supermarkets (Carrefour, 2021), innovative solutions for hygiene-related waste streams) or experience a situation in which the niche level offers no alternative deployable solutions. Box 6.3 examines the efforts of the Recover Better campaign as an example of a possible indication of the initiation of a circular bioeconomy de-alignment and re-alignment pathway (high landscape pressure but underdeveloped niche innovations) in the wake of the current crisis.

High landscape pressure is an opportunity for developed niche innovations, the symbiotic co-development of innovations with low technological readiness levels, and the 'prepared' brand owners and retailers who have followed a proactive strategy during times of moderate or no pressure. However, most businesses

Box 6.3 Possible circular bio-economy example of initiating de-alignment and re-alignment pathway (P2)

Under the Recover Better campaign, 155 companies – with a combined market capitalisation of over USD 2.4 trillion and representing over five million employees – have signed a statement urging governments around the world to *align* their COVID-19 economic aid and recovery efforts with the latest climate science (SBT, 2020). Some specific partners of this initiative prioritise evaluating the amount of single-use and other plastic waste created by increasing the consumption of essential goods and personal safety products due to the COVID-19 pandemic. The majority of the streams consist of personal protective equipment (PPE), single-use plastic bags, containers, and utensils for take-out food, and non-recyclable plastics to secure delivery packages of e-commerce purchases. Below are selected examples of the promotion of the transition to more circular bioeconomy practices in this campaign:

- i Mondelēz announced a packaging partnership with Philadelphia Packaging to utilise recyclable plastic containers in the European cream cheese market,
- ii SC Johnson announced a new Mr Muscle bottle made from 100% ocean-bound plastic through their global partnership with Plastic Bank,
- iii Henkel declared its commitment to sustainability and set an ambitious goal for 2025 to use fully recyclable or reusable packaging materials and to reduce fossil-based virgin plastics by 50% in its consumer goods packaging, in turn also reducing the volume of packaging.

can be expected to ‘tend to maintain the *status quo* and not react as long as they are not obliged to do so’ (Boiral, 2006, p. 323). Heavy industries with slow renewable cycles for infrastructure and production facilities in particular are only likely to have reactive responses, followed by large investments for replacing existing production processes and respective sunk costs. Reactive responses are also associated with a command-and-control type of pressure, in contrast to economic pressure and self-regulation, making room for proactive responses (Demertzidis et al., 2015). Businesses that do not respond at all play an essential role in the incumbent regime. Engau and Hoffmann (2011) define these types of passive stakeholders as ‘gamblers’ who cannot cope with the prevailing uncertainty or maximising profits and dividends before the definite downfall of their enterprise.

Although the authors cannot provide circular bioeconomy examples involving brand owners and retailers for the P3 pathway (high landscape pressure, high developed niches), it is useful to look at a historical example of the phase-out of chlorofluorocarbons (CFCs) and the role of industry in discussing possibly relevant dynamics in the upcoming circular bioeconomy’s P3 developments.

It took a decade to prove the Nobel prize-winning theory of Rowland and Molina that CFCs are causing a chain reaction in stratospheric ozone depletion. During this time, the use of CFCs sky-rocketed, led by the chemical companies Dow Chemical and DuPont, which mainly used them as a grain fumigant. Two years after proof was provided, the Montreal Protocol (1987) was signed, initiating the phasing-out of CFCs (Doherty, 2000). Although DuPont held the highest shares in CFC sales, it also 'acted as the industry leader in the global negotiations'. It influenced the primary negotiator, the US, to increase landscape pressure via bans (Rapid Transition Alliance, 2019). Environmental and health concerns had already much earlier resulted in policy action in the US (Doherty, 2000), forcing DuPont to develop alternatives which became an export hit once the Protocol was enacted.

Adoption and reaction strategies of companies include technical actions such as renewable energy investments, the design of and shift to environmentally friendly products and services, or investments in compensation measures and schemes (Boiral, 2006). In 2018, investments in renewable energy for power, heat, and transport (~USD 330 billion) and efficiency measures in industry, transport, and buildings (~USD 290 billion) significantly fell behind investments in fossil fuel supply and deployment (~USD 930 billion) (IEA, 2019). Thus, divestment strategies have to be considered next to governmental commitments to quit fossil fuel subsidies (~USD 430 billion in 2018) (IEA, 2021). Furthermore, companies such as Neste, which produce and retail fuel shifting to renewable and circular solutions, can be mentioned here (Il Bioeconomista, 2019), even though landscape pressure for renewable energy has only been significantly increasing since the last decade (Monk and Perkins, 2020).

Significant landscape pressure, in combination with low niche readiness levels, will leave brand owners and retailers, in addition to greening their supply chain, in a situation in which they have to buy into costly and readily deployable niche innovations. Even in this case, noteworthy market and policy uncertainties for the last development steps and market diffusion of these niche innovations have to be considered.

4 Conclusions

The transformation into a fair, just, sustainable, circular biobased economy relies heavily on the market introduction and market diffusion of technical, social, and organisational innovations. However, innovation processes take time, and the uptake of innovative solutions depends on several internal and external factors, especially correct timing and setting, represented as windows of opportunity for diffusing from niches to mass markets and eventually contributing to the incumbent regime of tomorrow. This discussion on the responsibilities, risks, and opportunities of brand owners and retailers in circular bioeconomy businesses was based on a theoretical typology of transition pathways describing the connection between the landscape pressure and readiness of existing

innovative solutions. With brand owners representing secondary-sector and retailers tertiary-sector actors, this less-examined nexus accounts for significant shares of the energy and material flows of economic metabolism and thus deserves attention in the context of transition to a circular bioeconomy.

The COVID-19 crisis shows us, once again, what it means to be confronted with high landscape pressure. Even though the impacts of climate change and the demand of society for transition to sustainability are significantly growing, the landscape pressure regarding the transformation into a circular bioeconomy is still relatively moderate, resulting in an insufficiently funded innovation ecosystem and many opportunities for the brand owners and retailers of the incumbent regime. This fact is reflected in the various circular bioeconomy examples and strategies we collected concerning the low landscape pressure transformation (P1) and reconfiguration pathways (P4).

In the future, retailers could play a leading role in the bioeconomy transition process, especially if they set strict sustainability requirements for their suppliers, by determining product standards, communicating with consumers, and providing information on consumers' preferences back to the suppliers. The ability to transmit suppliers' brands, as in food retail, might render this process much more straightforward than the retail of longer-life products such as electronics and cars. Due to consumers' lack of awareness of the suppliers and brands of the built-in elements, the more important are top-down policies and regulation.

When landscape pressure becomes significant, we hope to be able to choose from a high diversity of readily deployable innovative solutions. Latecomers will then still be able to switch to sustainable practices: based, however, on higher costs and increased risks of not securing relevant market shares. Hitting the crisis with only a few readily deployable solutions and mostly underdeveloped innovations has to be avoided at all costs. High landscape pressure and the lack of deployable solutions can result in a power vacuum and even non-recoverable catastrophes if resources (financial, human, and organisational) become insufficient for a competitive co-evolution of niche innovations. As Hansen et al. discuss in this book (Chapter 11) 'a tsunami of innovations' is necessary against a high degree of pre-market mortality. Still, the consequences of inaction, in the case of high landscape pressure, depleted resources, and underdeveloped niche innovations, would stand in no relation to the risks and costs associated with financing this 'tsunami' and overcoming techno-economic lock-ins, including sunk and vested investments as well as the current commitments of the incumbent regime and its brand owners and retailers.

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