



Making Resilient Decisions for Sustainable Circularity of Fashion

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Abstract

The fashion and textiles industry, and policymakers at all levels, are showing an increased interest in the concept of circular economy as a way to decrease business risks and negative environmental impacts. However, focus is placed mainly on the material ‘stuff’ of textile fashion and its biophysical harms. The current material focus has several shortcomings, because fashion is a social-ecological system and cannot be understood merely by addressing its environmental dimensions. In this paper, we rethink the fashion system from a critical social-ecological perspective. The driver-state-response framework shows social drivers and ecological impacts as an adaptive social-ecological system, exposing how these interacting aspects need to be addressed for sustainable and resilient implementation of circular economy. We show how current responses to global sustainability challenges have so far fallen short. Our overall aim is to expand possibilities for reframing responses that better reflect the complex links between the global fashion system, culture and creativity and the dynamics of the living planet. We argue that reducing planetary pressure from the global fashion and textiles industry requires greater recognition of the system’s social drivers with more emphasis on the many cross-scale links between social and ecological dimensions. Resilient decisions aiming for sustainable circularity of the fashion industry must therefore pay attention to social activities *beyond* the industry value chain, not just material flows within it.

Keywords Circular economy · Fashion · Driver-state-response · DPSIR · Resilience · Social-ecological system

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Introduction and Background: the Need for Resilient Decision-Making for Sustainable Circularity

Decision-makers in today's fashion and textile industry increasingly recognise that they face global-scale sustainability challenges [1–4]. The sector has become a sizeable global industry, but increased production and consumption have accelerated material throughputs and increased disposal and waste, contributing to environmental changes at planetary scale. The industry is projected to recover from the pandemic and continue to grow [4–6]. Unless concerted efforts are made, its damaging environmental effects are expected to increase. Figure 1 shows that since 1990 the production of polyester and cotton and the consumption of clothing have steadily increased, all in line with an increasing world GDP. Figure 1 also shows the rise in carbon emissions and the loss of biodiversity since 1990 to which the fashion industry has been a significant contributor. In response to the fashion industry's negative impact on people and the environment, companies have created many coalitions, initiatives and platforms (Fig. 1, bottom panel). Still, despite the increasing number of initiatives and conversations, the fashion system's pressure on the planet is still rising. Also, the 2019 Global Pulse Report showed an increasing gap between the industry's growth and its progress on sustainability performance [15].

Along with engaging in initiatives for sustainable fashion, businesses are also increasingly referring to circular economy as the basis of their response. Principles of circular economy [16, 17] emphasise closed-loop, regenerative material cycles, as a means to maintain access to resources and extend use-life of goods. As such circular economy provides a way to reduce negative environmental impacts of the industry and by that also decrease business risks. Businesses often describe their intention to move the industry from a so-called take-make-waste business model — a shorthand for describing the linear value chain — towards a circular model to reduce negative social and environmental impacts from production and consumption. When businesses and policymakers talk about circular economy for the fashion industry, they

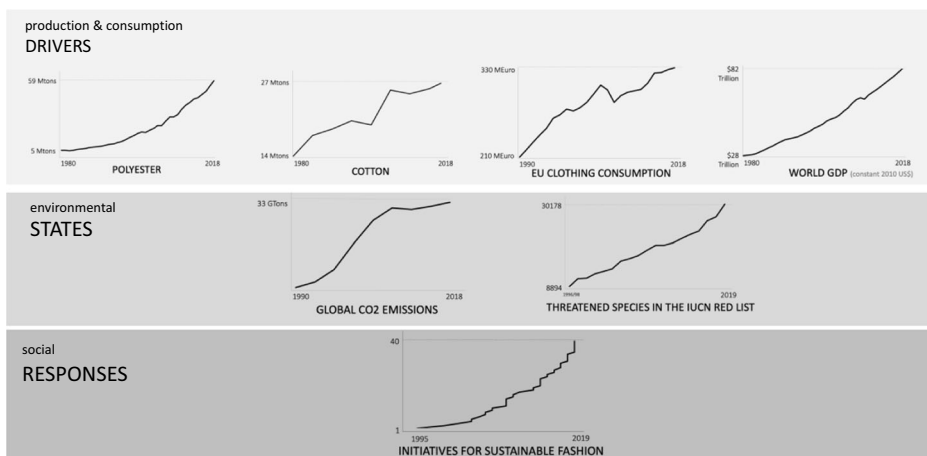


Fig. 1 Growth trends in production, consumption, environmental impacts and industry initiatives. Scales of the y-axis for each chart start at the 1990 value. Data sources: polyester production [7]; cotton production [8]; World GDP [9]; clothing consumption [10]; carbon dioxide emissions [11]; Red List species [12]; sustainable fashion initiatives [13, 14]

consistently primarily focus on the material ‘stuff’ of textile fashion and its biophysical harms. Obviously the industry faces major technical challenges due to the global scale of the industry and its material flows [18, 19] (see also Fig. 1), but we find this focus problematic primarily because fashion cannot be defined merely as material commodities. Strategies proposed for materials to cycle in the technical loop [5, 20, 21] — reuse, repair, rework and recycling — depend on users’ decisions. Studies on how and why fashion is used emphasise that non-material aspects of fashion, such as cultural values and social norms, are important determinants of fashion user decisions. Niinimäki [22] explored ways to approach sustainable design from the consumers’ view point and found that ‘the discussion and evaluation of values should be at the core’. In a subsequent article on fashion in circular economy, Niinimäki [23] identifies beauty, satisfaction and emotional experiences as aspects of long-term satisfaction. A Swedish study found that clothes are disposed not because of their material condition but due to non-material aspects [24]. Similarly, a study by Armstrong and colleagues [25] on use-oriented product-service systems found that what users ‘really want is an instrument to produce their identities and lifestyles, materially manifest or not’.

Nor can sustainability be addressed solely by focusing on the ‘stuff’ [material] from which clothes are produced and the impacts these processes have on the state of the environment, as fashion also entails the dynamic relationship between humanity and the natural world [26]. This relationship can be conceptualised in terms of complex adaptive social-ecological systems [27]. A social-ecological approach understands humans and nature as inseparable parts where ‘nature is inside us as much as we are inside nature’ [26, 28]. The nestedness of the system across scales means that all aspects of importance to human societies such as economy, justice and equality are shaped, are dependent on and coevolve with the biosphere. This is summed up by Folke and colleagues [26] who state that the ‘biosphere provides preconditions for achieving and sustaining dignity in human relations’.

In this paper, we take a social-ecological approach and focus on sustainability in its broad overarching sense as seeking harmony among human beings and between nature and humans [29]. We here bring together aspects of circularity, fashion and global sustainability, which is still a poorly charted terrain, and concentrate on the relationship between social and ecological issues in business responses to the unsustainability of the global fashion industry.

Fashion is a social-ecological system; as such it makes complex links between global industry, culture and Earth’s dynamics. One important way in which businesses take action to decrease their negative impacts is by engaging in various initiatives working for sustainability. But, seen from a social-ecological systems perspective, most of the international initiatives for sustainable fashion which businesses engage in focus on material ecological aspects. By doing so, they fail to recognise the intertwined nature of social-ecological systems. This failure has three shortcomings:

- It frames decision criteria and proposed responses to today’s pressures narrowly in either environmental or social terms, leading to risks elsewhere in the system and erodes resilience.
- It neglects the importance of vital social drivers that are causing today’s environmental harms. Different kinds of social actors have different capacities to change their own behaviour and that of the system as a whole.
- It contributes to a lack of recognition of the social contexts of changes in environmental conditions. Many decisions have different consequences depending on their specific place and context.

In this paper, we first describe the key concepts and present the *driver-state-response* framework which structures our analysis and helps us to clarify the causal links between social drivers, environmental conditions and options for social actions. In the second section, we look at a selection of current international ‘Sustainable Fashion’ initiatives, established from 2000 to the present day. We want to see if the objectives of these responses by the fashion industry to global sustainability challenges can show why the global fashion industry has so far fallen short of decreasing its overall negative impacts on people and the planet. In the third section, we apply the *driver-state-response* framework, coding the initiatives as *responses* that focus on social *drivers* or environmental *states*, and in the final section, we outline our insights for strategic decision-making for sustainability from a critical social-ecological perspective. We argue that the biophysical and social dimensions of the fashion system should be brought into the same social-ecological system perspective because the likelihood of achieving desired outcomes increases when responses are based on an adaptive social-ecological system perspective. This paper thus seeks to contribute to both research understanding of how to think about fashion as a complex adaptive social-ecological system which is also useful for business decision on engaging in resilient responses which have to add up to a sustainable fashion system.

Towards an Integrative Methodology

Throughout the paper, we refer to *sustainable circularity* as a key concept. It is relevant to focus on circular economy as it is increasingly presented as a response to today’s unsustainability. It is gaining interest from policymakers at all levels from national to global [9–11] and by the textile and fashion industry globally [5], with the motivation that it offers a systemic approach to design economic activities that benefits businesses, society and the environment. Therefore, because of the prominence of circular economy in business discourse towards sustainability, all initiatives for sustainable fashion have to relate to the framework. Circular economy involves steadily decoupling economic activities from environmental damage and the consumption of finite resources [16, 17, 30]. As such it is a framework for an economic system focused on material flows aiming to maintain a continuous flow of goods and services in socially and ecologically restorative ways. Sustainable circularity brings together the concept of circular economy with sustainability as a resilient environmental state for human development [28]. Sustainable circularity not only closes material cycles but also responds strategically to complex intertwined social and ecological pressures. Sustainable circularity promotes adaptive responses from societies and businesses that recognise the many cross-scale links among social and ecological dimensions. Hence, sustainable circularity is not merely about efforts to ‘close the loop’ of material flows as it emphasises the importance of better managed connections to the non-material aspects.

As a point of clarification, in this paper, we use the word *material* in its literal sense as ‘made of stuff’, not to be confused with the legal and financial senses of the word as ‘something of significance for decision-making’. Consequently, the term *non-material* is to be understood to refer to things that are not made of stuff, such as cultural values and social norms — even though these things are very often of significance for decision-making, as we elaborate below.

We structure our problem analysis of the fashion system using a *driver-state-response* framework (DSR, Fig. 2) [31]. The DSR framework (and its many variants) allows us to

clarify the causal links between social drivers, environmental conditions and options for societal actions, providing common ground for strategic sustainability discussions between researchers, companies and policymakers. In brief, this framework considers how social driving forces intensify ecological pressures, resulting in changes in the state of the environment. When these changes have severe enough impacts, societies respond.

We view the DSR framework in terms of an adaptive cycle [28, 32], which provides a simple but useful overview of the complex dynamics of social-ecological systems. Setting the DSR framework into a social-ecological systems adaptive cycle (see Fig. 2) helps us to describe the unsustainable social-ecological dynamics of the fashion system. The DSR framework enables identification of different suites of options for the actions required for the industry to navigate towards sustainable circularity, as well as to pinpoint insights towards sustainable and resilient outcomes of value chain activities.

Drivers of the fashion system are social activities carried out by businesses, policymakers and societies at large, as well as by individual fashion users. Sustainable responses thus include social structures and institutions that originate in social norms and values, which then determine actions and directions of change [33].

The state of the environment is influenced by Earth's fundamental long-term and large-scale dynamics and increasingly also by human activities associated with immediate resource use and direct ecological pressures. The planetary boundaries framework [34] stresses the rising risks associated with human-caused environmental change and characterises Earth system conditions that can maintain a resilient state for human development. Sustainable responses should thus be alert to such systemic global risks and focus on mitigating them [35].

Responses are here initiatives for sustainable fashion as a result of an undesired state of the environment and/or pressure from the driver. The fashion industry responds to global sustainability policies or to decrease business risks. Business risks derive from either the state of the environment, for example, climate change and biodiversity loss, or a driver of the system as in consumer attitudes towards working conditions or state of the environment.

Both social drivers and environmental states can thus be conceptualised as social-ecological hybrids [36] emerging from activities that span across the value chain — and where non-material links matter for the overall dynamics and sustainability of the system as much as

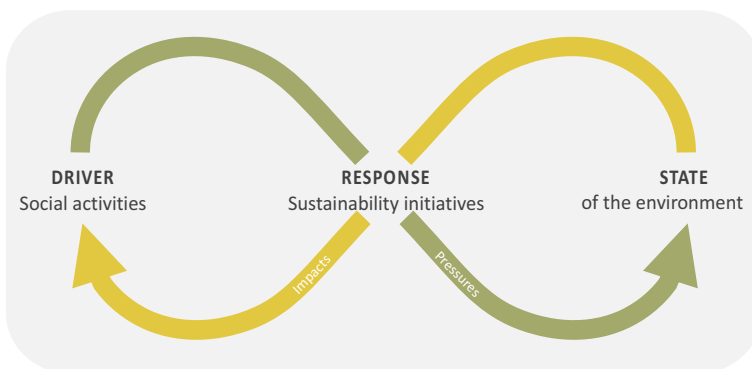


Fig. 2 The driver-state-response framework as an adaptive social-ecological system. The global fashion system is a social-ecological system in which social drivers and environmental states are intertwined. Calls to ‘close the loop’ of a linear take-make-waste economy focus on material flows, and the intersection of the green and yellow arrows is not recognised

material flows. Many response options are possible that could contribute to sustainable circularity, but resilient adaptive responses need to link across social and ecological perspectives.

We indicate how the adaptive DSR framework can be used to examine responses for sustainable fashion. We collated information on 45 selected international ‘Sustainable Fashion’ initiatives, established 2000 to present. These consist of the fashion initiatives mentioned in the corporate sustainability reports published by the 16 businesses with more than \$9 billion USD in market capital which Hileman and colleagues [13] identified as keystone actors of the textile fashion industry and the global initiatives for sustainable fashion reported on the map developed by the British Fashion Council [14]. We assessed information from the initiatives websites on their stated focus area(s), objective(s) and vision. We only want to understand if they are focusing on non-material/social aspects and/or material/ecological aspects of fashion. Based on the definitions above, we categorised each initiative as focusing on driver (ecological/material) and/or state (social/non-material). We then sorted them chronologically in Table 1. To place our selected initiatives as business responses in the context of global sustainability, we also chronologically added a column to Table 1 of multilateral sustainability agreements to which the European Union became a Party or a Signatory to between 2000 and 2019 [82].

There are two major limitations in this study that could be addressed in future research. First, our study focused on sustainability initiatives identified in previous studies of the fashion industry [9, 10]. These studies focus on the largest businesses and the most widely connected initiatives, but there might be additional international sustainable initiatives that are either not mentioned in the corporate sustainability reports assessed or accounted for in the sources we used. A more comprehensive search for initiatives might reveal better integrative practices and approaches that could be scaled up. Second, the sustainability initiatives were coded based on the main objectives as stated on their public websites. Among the initiatives which have projects for action, the individual projects might have a broader and more integrative focus than is stated in the overall main objective(s).

Problem Analysis: Does Circularity Erode or Enable Social-Ecological Resilience?

Today’s Piecemeal Responses Disconnect Social and Environmental Perspectives of the Fashion System

The fashion industry is fully aware of its global size and its social and ecological effects on a planetary scale, and many of its sustainability-relevant efforts involve working through a growing number of global multi-stakeholder coalitions (Fig. 1, Table 1).

The industry has long been responsive to accusations of problematic social impacts, such as sweatshops and exploitative working conditions [57, 58, 83, 84]. Twelve of the 45 initiatives are coded to be focusing on only drivers in Table 1. All these initiatives are focused on working conditions. These are often responses to local social issues and responding to individual social impacts such as the case of ‘The Fair Labor Association’ which was funded by a fashion business in 1999, after accusations of child labour and poor working conditions in Indonesia [83]. The notorious collapse of the Rana Plaza building in 2013 was followed by the creation of two initiatives the same year [57, 58]. The 2012 ‘Daewoo protocol’ [85] prohibited

Table 1 Forty-five selected international ‘Sustainable Fashion’ initiatives, established 2000 to present. Main sources: Hileman et al. [13] and the British Fashion Council’s Global Initiatives Map [26]

Multilateral sustainability agreements	Year	Responses: industry sustainability initiatives	Driver	State	Ref.	
Millennium Development Goals	2000	Solidaridad	✓		[37]	
	2000	UN Global Compact		✓	[38]	
	2002	Textile Exchange		✓	[39]	
Cartagena Biosafety Protocol	2003	Centre for Fashion Enterprise	✓		[40]	
	2004	Afirm Group		✓	[41]	
	2005	Fairtrade Cotton		✓	[42]	
	2006	HKRITA ¹		✓	[43]	
	2007	Redress	✓	✓	[44]	
	2007	CEO Water Mandate		✓	[45]	
	2009	Ethical Fashion Initiative	✓		[46]	
	2009	Better Work	✓		[47]	
	2009	Better Cotton Initiative		✓	[48]	
	2009	Natural Capital	✓	✓	[49]	
	2009	Global Fashion Agenda	✓	✓	[50]	
CBD Aichi Targets for biodiversity	2010	Sustainable Apparel Coalition		✓	[51]	
	2010	Sustainable Cotton Communique		✓	[52]	
	2010	Freedom of Association Protocol	✓		[53]	
	2010	Green Carpet Challenge	✓		[54]	
	2011	Zero Discharge of Hazardous Chemicals		✓	[55]	
UN Water Convention	2012	Sustainable Clothing Action Plan		✓	[56]	
	2013	Alliance for Bangladesh Worker Safety	✓		[57]	
	2013	Accord on Fire and Building Safety in Bangladesh	✓		[58]	
	2013	The Better Mill Initiative		✓	[59]	
	2013	Circular Economy 100	✓	✓	[60]	
	2013	Global Fashion Exchange	✓		[61]	
	2014	Canopy Style		✓	[62]	
	2014	Fashion Positive Plus		✓	[63]	
	2014	Organic Cotton Accelerator		✓	[64]	
	2014	Partnership for Sustainable Textiles		✓	[65]	
	UN 2030 Agenda	2015	Social and Labor Convergence Project	✓		[66]
	UNFCCC Paris Agreement	2015	The Relooping Fashion Initiative		✓	[67]
		2015	European Clothing Action Plan	✓	✓	[68]
		2016	Action, Collaboration, Transformation	✓		[69]
2016		Green Fashion Week		✓	[70]	
2016		GCNYC Fair Fashion Center	✓		[71]	
2017		Make Fashion Circular	✓	✓	[72]	
2017		Fashion For Good		✓	[73]	
2017		The International Society for Sustainable Fashion		✓	[74]	
2018		The Industry Charter for Climate Action		✓	[75]	
2018		Science Based Targets Initiative		✓	[76]	
2019		Fashion Pact		✓	[77]	
2019	Imagine	✓	✓	[78]		
2019	UN Alliance for Sustainable Fashion		✓	[79]		
2019	One X One		✓	[80]		
2019	Institute of Positive Fashion		✓	[81]		

¹ HKRITA short for ‘The Hong Kong Research Institute of Textiles and Apparel’

using cotton from Uzbekistan due to media reports on the use of child labour (but not because of the depletion of the Aral Sea). The social drivers of the initiatives in Table 1 are overwhelmingly related to working conditions and workers’ rights. Occasionally these impacts

pose risks to a company, but as Fig. 1 indicates, nothing has yet impacted the economic expansion of the global industry.

With media and consumers increasingly alert to environmental harms of the industry, 33 of the 45 initiatives tackle environmental problems. These efforts have largely been focused on production countries, but global businesses are beginning to recognise planetary-scale environmental priorities. The Fashion Pact [77] is an international CEO-led coalition committed to ‘stopping global warming, restoring biodiversity and protecting the oceans’. McKinsey, an international management consulting firm, published the ‘Fashion on climate’ report [86]. The UN-convened Fashion Industry Charter for Climate Action is a multi-stakeholder initiative with global outreach, with a vision to achieve net zero climate emissions by 2050 [75]. The Global Fashion Agenda is a forum for collaboration and cooperation on sustainable fashion, which recognises that the fashion industry ‘[...] is pushing the earth beyond its planetary boundaries and challenging social justice’ [50].

However, seen in terms of our adaptive DSR framework, the industry responses are split along social and environmental lines. Just 6 out of 45 sustainable fashion initiatives deal with both social and environmental dimensions. However, the social focus of these initiatives is only aspects relating to working conditions, not on the social drivers. The industry is doing very little to manage the justice and equity effects of a growing globalised industry in an environmentally pressured world. Not addressing the drivers who have outsourced the production not only shifts the problem to a material problem, it also misses the link of social and environmental justice which is needed to make change of the dynamics keeping the industry unsustainable. Also, viewed from the dynamic perspective of an adaptive cycle, by setting ambitious targets for the global environment far into the future, they can be seen as postponing action on social impacts that are already evident. No businesses have yet cut emissions by 8% or more per year — as needed if net zero targets are to be met [87] in order to stabilise climate and minimise climate risks.

Material ‘Take-Make-Waste’ Perspectives Miss the Powerful Role of Users

The expression ‘take-make-waste’ is gaining ground, frequently used in calls to shift to circular economy by both business and policymakers such as the World Resource Institute [88], the World Economic Forum [89], the Ellen MacArthur Foundation [5], the European Commission [90] and the UN Global Compact [91]. This widespread expression is a shorthand for a linear description of the value chain in just a few broad phases. The implicit response is to ‘take’ the material ‘waste’ into a circular production system. In reality, of course, the fashion industry is a complex global network with many steps along which value creation can take place, where environmental harms can accrue — and where different actors play powerful roles in shaping what material resources become available and where, when and in what forms.

The industry makes increasingly ambitious statements about sustainable circularity, for example, closing the loop to keep materials ‘at their highest value during use and re-enter the economy afterwards, never ending up as waste’ [5]. The responses are too often framed only in terms of material flows and improved textile and fibre production. They mostly emphasise technical issues needed to be overcome such as various aspects on recycling of waste [72, 92] and innovations related to textile fibres [43, 63]. Due to the material focus, these approaches miss to address what kinds of social structures are needed for a sustainable circularity of a system.

There is no doubt that today’s fashion system is driving planet-scale changes. Three key factors drive the industry’s increase in planetary environmental pressures. First, the *production*

of fashion textiles has burgeoned as markets and industrialised economic development become globalised. The bigger the industry grows, the greater the demand for Earth's natural resources and the release of polluting emissions. Sandin et al. [93] have shown that three-quarters of climate impact from clothing in Sweden comes from the production phase. Secondly, the speed of *consumption* has accelerated, as consumers worldwide buy more clothes, at lower prices, and use their clothes for a shorter time before replacing them with new clothes [94, 95]. Finally, fashion has a systemic lock-in to material *leakages* at every step in the life cycle of a garment. For example, part from material loss throughout production and recycling [96–98], a larger proportion of clothes is seen as almost disposable — worn for a season or even a day, then discarded or never worn before being discarded [24, 99, 100].

The phrase 'take-make-waste' reflects just two of these three factors: production and material leakage and loss. The key domain of consumption and the role of the consumer is very often missing in discussions of circular economy [101, 102]. The definition of 'consumption' refers to things being used up, but there are no users in the mainstream take-make-waste approach. What is taken and made is then somehow wasted without ever being used. A 'take-make-waste' perspective presents and thus reinforces a depersonalised view of a world. With a depersonalised approach, the industry's responses are predominantly focused on materials and technological innovation, such as novel fibres, and innovative ways to capture chemical pollution, offset emissions and collect waste materials (the focus of the environmental initiatives in Table 1).

Nevertheless, sustainable circularity is also constrained by fashion users' everyday decisions on what clothes to buy, use and dispose. Neither the actual material inputs nor the environmental harms caused by fashion are readily perceivable by consumers and are often not acknowledged by fashion brands themselves [99]. Fashion users, the social and cultural worlds they are part of and the nestedness of the material and non-material parts of their choices all play a vital role in controlling the 'return flow' of usable materials to the system. Yet very few sustainable fashion initiatives focus on fashion users, and none of the keystone actors assessed by Hileman et al. [13] collaborates with user-focused initiatives.

Normalising an approach that misses out users and the using of stuff has implications both for the diagnosis of the sustainability challenges of the fashion and textiles industry and the design of responses. The 'take-make-waste' approach fundamentally reflects and enacts a disconnect between what the industry does, the environmental conditions it engenders and the users' environmental awareness. As a result, despite being readily communicated and appealing, it becomes problematic when trying to express how the fashion system really can respond to its social and environmental harms. Societies tend to respond to ecological changes when the state of the environment degrades to the point that it creates negative social impacts. Fashion businesses respond to pressure from their customers, reflected in the industry's high ranking of consumer preferences as a strategic business risk [4]. Even where the industry's impacts are evident, the capacity for fashion users, companies and policymakers alike to respond sustainably is hindered by the difficulty of expressing the links between global environmental changes and the garments in an individual person's wardrobe.

Expanding the shorthand expression to 'take-make-use-waste' helps to integrate an adaptive social-ecological system perspective. This potentially helps to communicate a systemic understanding of the links between social drivers and environmental impacts at different phases in the value chain and in identifying options for resilient decisions towards sustainable

circularity. Furthermore, it is helpful when linking the personal and the planet, which is at the heart of sustainable circularity — motivating action *before* impacts and harms become real, responding to business risk through mobilisation of new kinds of relationships with customers.

Performance Assessments of Circular Production Miss the Global Social-Ecological Context

A social-ecological systems perspective is needed because environmental impacts of production depend as much on societal decisions about natural resource use as on the biophysical aspects of natural resource supply. But, even here the industry frames the environmental problem as material, missing out its social contexts. The material, production-based focus of fashion businesses' stated ambition to reduce contributions to environmental problems is apparent both in the initiatives they engage in and in the way they communicate with users. None of the initiatives in Table 1 proposes decreasing environmental harm by challenging social drivers, such as altering social activities for reduced material use at all scales.

Tools, metrics and tests for ecological impacts, such as life cycle and footprint assessments, give a partial perspective for business responses. Companies use life cycle analysis methods to obtain relative measures of environmental impact and improvement when alternative materials, products or processes are developed, but this information cannot readily be aggregated or compared beyond a narrow set of alternatives. In addition, the business sector often uses quantified amounts of materials taken at one place to offset elsewhere by compensatory payments, as if social and ecological diversity did not matter for system behaviour. But societies, cultures and ecosystems change over time, and demands for fashion are constantly changing. Applying rigid quantifications without attention to this complex changing context is a factor in erosion of resilience [103].

Framing questions narrowly in terms of changes in environmental conditions, disconnected from the social activities driving them and the impacts they cause [104], leads to misplaced responses. The industry makes statements on responses to planetary harms but fails to assess key elements relevant from a planetary social-ecological perspective. For instance, Sandin et al. [19] show that life cycle analysis of textiles does not assess impacts on biodiversity from large-scale monocultures; land use change and freshwater use do not properly represent the vast diversity in social practices and ecological contexts, and chemical pollution assessment disregards 'chemical cocktails', impacts of feedstock production for plastics and potential effects of chemicals and fibres released along the value chain. In addition, comparisons from alternative LCIA-informed fibre choices are treated as if different environmental impacts cancel each other out. Textile fibres have diverse societal impacts and affect the environment through multiple processes and feedbacks. Much more data is therefore needed to inform actionable sustainable circularity assessments.

Resilient responses need to accommodate the cross-scale dynamics of the system and be able to persist and evolve with social and ecological changes. Sharing futuristic visions about social wellbeing, closed-loop material flows and global change mitigation may play a role in mobilising paradigmatic change for the industry. However, it remains at the level of rhetoric unless it becomes possible to assess if efforts 'add up' towards sustainable circularity. At present, although we see signs that some businesses are beginning to mobilise towards sustainable circularity, this is impossible without comprehensive and comparable data and in the absence of an absolute baseline [105].

Insights for Strategic Decision-Making

The Fashion Supply Chain Is Connected Within a Social-Ecological Value Network

Industry leaders and policymakers alike are promoting the idea of shifting away from today's linear value chain and 'closing the loop': reclaiming valuable materials and using them to make new valuable products. But too often, businesses in the industry keep their focus for action narrowly on the production and consumption parts that relate directly to their activities. The fashion system needs to be seen in a different way. A system's perspective is needed to generate structural change of the current textile fashion system.

Until recently, planet Earth has not been seen as an important player in the fashion and textiles system, but this is changing as planetary pressures mount. Part of the systemic challenge for the industry is to recognise the global dimensions of the resource system. The industry is fully aware of its global size and the effect this has on an ecological planetary scale. The biophysical resource system and the business ecosystem extend the scope well beyond the 'take-make-sell' steps that link production and the sales floor. Multilateral sustainability agreements, media and consumers increasingly point towards the environmental states and planetary scale of the industry. Up until now, the fashion industry has either responded to its local and immediate impacts. Still the industry is faced with perpetuated responding to individual social impacts as in the cases of child labour in Uzbekistanian cotton fields [107], the Rana Plaza building collapsing in Bangladesh [108] and ethical impacts in cases relating to animals and furs [109, 110]. Occasionally these impacts pose risks to a company and are handled accordingly as part of a company's corporate social responsibility strategy, but as Fig. 1 shows, nothing has impacted the economic growth of the global industry.

The fashion industry is progressively making highly ambitious statements about what it is going to do for the global environment and share futuristic visions of sustainable circularity. Following this, the industry is attracted to the planetary boundaries framework and making planetary statements through global coalition of companies such as the Fashion Industry Charter for Climate Action with a vision for the industry to achieve net zero emissions by 2050 [75] and the Fashion Pact [77] which focus on three areas: stopping global warming, restoring biodiversity and protecting the oceans.

However, tackling the systemic challenge involves rethinking the scope of responsibilities and relationships and widening the focus of business action. Social dimensions add to the challenge too as societies and culture changes, and they are not constant over time. These changes take place alongside humans' material needs, which means that human's material and non-material needs for fashion are constantly changing.

The Fashion System Is Mobilised by Social Needs and Desires

Even though the industry clearly recognises that social actions are driving global unsustainability, it systematically leaves the social out of most of its rhetoric. Yet each step of the textile and fashion value chain is driven by people's needs and desires, which provide momentum to the system and play a critical role in determining material flows. The users of fashion are key to decreasing waste, keeping material in use and 'closing the loop' since they make decisions on what clothes to buy, use and what to dispose of as waste.

The needs users have for fashion are not primarily material, and their decisions are therefore not made based on LCA, circularity indices or material footprints. A plethora of research on

people's use of fashion points unanimously to the role of non-material aspects [111–113]. Users' decisions on what to wear reflect complex interactions between the user, their social conditions, fashion trends and social norms and values. Entwistle [114] argues that people in all societies dress their bodies, making the everyday act of getting dressed imperative for micro-social order. Users' decisions in dress are unpredictably complex processes where manifold variables, for example, social norms, rules and values; financial status; class; gender; user habitus¹ and fashion fads, shape how individuals orientate themselves to the social world. Niinimäki [22] argues that the discussion and evaluation of consumers' values should underpin sustainable design. Studies on fashion user's relationship with environmental aspects are marginal; however, studies found are agreeing that fashion users do not make decisions based on material sustainability. A study by Palomo-Lovinski and Hahn [99] showed unawareness and disconnection between consumers actions and the environment, Niinimäki [22] explored ways to approach sustainable design from the consumers' view point and found that 'the discussion and evaluation of values should be at the core', and a Swedish study found that clothes are disposed because of their material condition but due to non-material aspects [24].

A take-make-use-waste wording is a better way to describe the current linear model, because it normalises the social aspects — those of consumption, not just production — of the system in a way that is needed for sustainable circularity. Using a take-make-waste wording directs focus on material stuff and this is seen in the way fashion's contribution to environmental states is talked of. Bringing in the *user* by including the user phase to the rhetoric and adopt a take-make-use-waste approach potentially changes the discourse on what the problem is represented to be. It opens up for a social-ecological systems perspective in which humans are embedded in the biosphere and that separation of social and ecological systems are artificial and arbitrary [28]. When applying a social-ecological system approach, the drivers of environmental states become both social and material. Responses to the negative environmental states caused by value chain activities are traced back to the social drivers and the fashion users and their material and social needs for fashion (see Fig. 1).

The focus on environmental aspects by the industry's sustainability initiatives in Table 1 indicates that the materials are seen as the 'problem' behind the environmental states. As argued in "Material 'Take-Make-Waste' Perspectives Miss the Powerful Role of Users", a take-make-waste approach is a perspective where social action is reduced to focusing on material stuff when addressing the causes behind environmental conditions. Using a material perspective hinders a social-ecological perspective that emphasises that humans are integrated in nature because it does not include humans nor reasons driving human actions [28]. To understand underpinning needs driving the fashion industry — high-speed consumption, the global growth of production and the systemic lock-in to value chains with material leakages — it is relevant to elucidate the problem of a take-make-waste approach and the consequences.

Sustainable circularity is about better managed connections to these non-material aspects. Most of these needs and desires are out of scope of present-day business decisions, as they relate to different scales and levels in policymaking and society. Implementing circular economy responses needs to reach these 'deeper' cultural levels.

The fashion industry needs to reshape the ways that it views the users of fashion. At the moment, fashion users are at the heart of today's linear 'take-make-waste' system and play a

¹ *Habitus*, a concept coined by Bourdieu [108], refers to the physical embodiment of cultural capital and internalises individual's habits and skills gathered by life experiences.

vital role in determining the material flows and fates of fibres and textiles. Each step of the textile and fashion value chain is driven by people's needs and desires. Most of these needs and desires are out of scope of business decisions, as they relate to different scales and levels in policymaking and society. Changes in the fashion system will involve different amounts of people at different scales in society and will happen over different timescales.

Sustainable Circularity Is a Cross-Scale Challenge

Unavoidable reality that it is not about the relative benefits of fibres and textiles as such, it is about altering the quantity of fibres and textiles being produced. Halting the fashion and textile industry's negative impacts on the environment is crucial for the social systems that depend on Earth's life-support systems and to decrease business risks. The planetary boundary framework shows that environmental conditions are global, and the fashion system contributes to all of these conditions. Companies are expected to play an increasingly prominent role in maintaining and restoring Earth's 'safe operating space' for humanity, in key global policy contexts such as the 2030 Agenda, Paris Agreement and the Convention on Biological Diversity's post-2020 strategy. Table 1 shows that many initiatives respond to this by focusing on decreasing the fashion industry's negative contributions to global environmental states. When the industry's focus is drawn to a global and planetary framing to what its value chain activities are causing, their responses fail to capture the system's action both cross-scale (geographic spatial and temporal) and cross-level (consumer, communities, global humanity). Importantly by focusing on states at planetary scale, the fashion industry misses the underpinning drivers of the system.

Moving the fashion industry from a take-make-waste business model towards a sustainable circular business model requires that the industry rethinks what the system is. Changing a growing fashion and textile industry's negative contributions to the environment is about altering the quantity of fibres being produced, it is not about the fibres as such. The contributions to the environmental state climate change from the fashion industry come from the use of fossil fuels in the production phase [19]. For the industry to become sustainably circular and stop global warming, restore biodiversity and protect the oceans which are the goals stated by the Fashion Pact (see Table 1), it is crucial to also understand and pay attention to how and how long the final product is *used* throughout its lifecycle.

Changes in the fashion system will involve different groups of people in diverse societal contexts and will happen over different timescales. Bringing in users to the take-make-use-waste approach potentially changes the way solutions are thought about. It emphasises the need for a system change that is extending beyond transformation of the industry and its value chain activities. By including the user, social responses need to act across geographical and temporal scales and societal levels, from the customer, through the value chain, across the wider business ecosystem, to cultural norms and values.

The fashion system may undergo major transformations in important parts of the industry, but if the changes are not actualised across the system, the responses will not improve the system's capacity to learn and improve responses to the environmental states affecting the industry and society. There is a positive side to this. It is possible that sustainable circularity, as a social-ecological approach to a circular value chain, can have positive environmental benefits. Sustainable circularity offers opportunities for regeneration and restoration of ecosystems and maintenance of biocultural diversity. This requires new ways of working with multiple knowledge systems, including Indigenous and traditional, local knowledge. Focusing

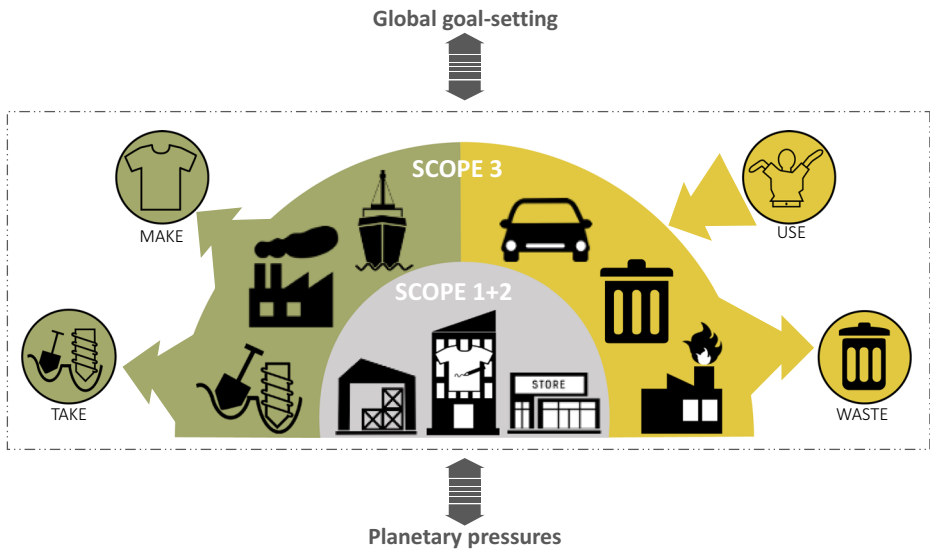


Fig. 3 Business perspectives on their direct and indirect impacts needs to be scaled up and out. Scopes 1 and 2 include issues the textile retail company can directly control, such as design phase, stores and offices, warehouses and means of transportation, and the emissions and wastes associated with purchased electricity and heating of these parts. Scope 3 accounts for phases in the value chain that are not directly owned or controlled by the textile retail company, but they can nevertheless influence those. Scope 3 includes upstream activities which involve producers and suppliers. It includes processes of production of raw materials, yarns, fabrics and garments, as well as storage and transport between all these steps. Scope 3 also includes downstream activities, mainly related to disposal or recycling of clothes. Figure is inspired and adapted from a figure developed by the Greenhouse Gas (GHG) protocol [106]

on the industry's material contribution to environmental states, within the production and retail phases of the three scopes in Fig. 3, risks eroding resilience even more, because these decisions are perceived as 'rational and informed', but they only capture a small part of the system.

Resilient responses need to accommodate the cross-scale dynamics of the system and be able to persist and evolve with social and ecological changes. Resilient responses need to scale up to recognise the global environment and scale out to include the fashion user. Businesses' circular economy debates would benefit from not only focusing on closing material cycles but instead extend their discussions of 'sustainable circularity' as a way to respond strategically to complex intertwined social and ecological pressures.

Conclusion

This article advances studies of (a) responses of the global fashion industry working to decrease its planetary pressures, (b) implementation of circular economy and (c) the role of the fashion user for sustainable circularity. This article advocates the need for transdisciplinary approaches where science, business and stakeholders work across scales using a social-ecological systems perspective to develop the knowledge needed to change the current path of fashion towards sustainable circularity.

Moving the fashion industry from a take-make-waste business model towards sustainable circular business models requires that the industry rethinks what its system actually is. The

adaptive driver-state-response framework we discuss here supports thinking about sustainable circularity in terms of resilient adaptive social-ecological systems. Our approach shows how international fashion industry responses miss the social-ecological links that are the defining feature of sustainability. These responses are also blind to the fashion users who are key for achieving ‘more fashion’ that is decoupled from ‘more environmental harms’. The dominant focus of responses on material flows and impacts is actually a risky problem because those flows have cross-scale (geographic spatial and temporal) and cross-level (consumer, communities, global humanity) contexts that matter in order to ‘add up’ for sustainable circularity. Resilient decisions for sustainable circularity of fashion need go beyond the industry’s current piecemeal approach to tackling its problematic social impacts and environmental pressures. It needs to extend its scale to link local-scale actions with planet-scale consequences and recognise the dynamic interplay of social drivers and ecological conditions if the industry is to succeed in achieving change towards sustainable circularity.

Today’s fashion industry acts when it considers itself obligated, usually in response to local, instantaneous and mostly social effects. Resilient decision-making towards sustainable circularity for textile fashion must pay attention to social activities *beyond* the industry value chain, not just material flows within it. Sustainable circularity is thus about having a social-ecological system perspective of fashion which is only possible when the links from social drivers to environmental consequences are included in responses for action. Sustainable circularity is about better managed connections to these non-material aspects. This does bring in additional complex processes to an already complex system, but an adaptive social-ecological system view highlights that responses must include acting across geographical and temporal scales and societal levels.

A driver-state-response approach brings attention to the many human beings involved in the social-ecological fashion system in addition to those involved in the production stages. Bringing in users as drivers of the system possibly changes the way that circularity solutions are thought about and reveals multiple potential opportunities for both societies and nature. A ‘take-make-use-dispose’ approach potentially changes the discourse on what the problem is represented to be. It is not an insignificant rhetorical change — rhetoric reflects actions and structures how to think about the fashion system.

There is an increasing interest from fashion businesses and policy at all levels in ‘sustainable circularity’. Our study begins to explore this uncharted terrain seeking to understand business responses to global unsustainability from a social-ecological system perspective. Future studies on this topic can help to identify successful business and policy responses which ‘add up’ to global sustainability.

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Declarations

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