DELIVERABLE 4.1

Circular Consumption conceptual framework and research design

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Developing circular pathways for a EU low-carbon transition

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Executive Summary

In order to arrest the environmental impact of our current system of production and consumption and support a sustainable future, CircEUlar aims to understand the dynamics and levers for a societal transformation towards a net-zero emissions circular economy. While there has been significant recent progress in research and theoretical development of the design and overall principles of a circular economy, such work has largely focused on the organisation of production/supply while conceptual work on the required participation from consumption/demand remains largely underdeveloped.

As part of that transformation, this document outlines the investigative approach to a culturally sensitive and context specific social scientific inquiry of the barriers and enablers of circular consumption practices across Europe. Combining a practice theory approach to consumption research with conceptual and methodological tools from environmental psychology, we investigate opportunities to reduce material flows and stocks (and associated emissions) through a wide range of measures to increase circularity. These include increasing the use of services rather than products, reducing overall consumption, as well as facilitating a reduction in waste and the associated resource use. Specifically focusing on the areas of digitalisation, mobility and buildings and household services, a conceptual and methodological framework is outlined with the goal of identifying consumption practices across these three focus areas that lend themselves to circularity. This is complemented with an in-depth investigation of the cultural, motivational, and structural factors that foster current and future engagement in circular consumption practices.

A two-stage mixed-methods data collection framework is outlined. An initial collection of retrospective consumption biographies from households and complementary expert interviews will inform the subsequent design and rollout of nationally representative circular consumption surveys investigating key factors shaping acceptance and adoption.

Keywords

Circular Consumption, practice theory, observable behaviour, consumption biographies, survey, digitalisation, mobility, buildings, household services.

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Abbreviations

CCPs	Circular Consumption Practices
CircEUlar	Developing circular pathways for a EU low-carbon transition
EU	European Union
UN	United Nations
WP	Work Package

Circular Consumption conceptual framework and research design

1. Introduction

The creation of more sustainable socio-technical systems is widely accepted as a necessary step towards a sustainable future (Geissdoerfer et al., 2017), to arrest the alarming impact of the global economic system on the planet's ecosystem services. This has also been recognised by a range of public and private institutions, with additional resources dedicated to research, supports and efforts to transform our production system (European Commission, 2019). Theoretical framings and visualisations of the circular economy have seen considerable development evolving from extending the lifetime of products in a linear production system (Haase and Lythje, 2022); to resource life-extending and waste management strategies (Blomsma and Brennan, 2017); through to the idealised form of a circular or closed loop system (European Commission, 2020)

In such a system, resource depletion and waste creation are supposed to be either minimised or (ideally) eliminated (European Commission, 2018) by narrowing, slowing and closing loops of material flow in the production system (Konietzko et al., 2020). While acknowledging the high external energy demands to fully close material loops (Bocken et al., 2016), narrowing and slowing loops reduce raw material demand in the system e.g. by ensuring longer product lifespans, displacing raw inputs with recovered materials and finding pathways for disused products to return as material inputs.

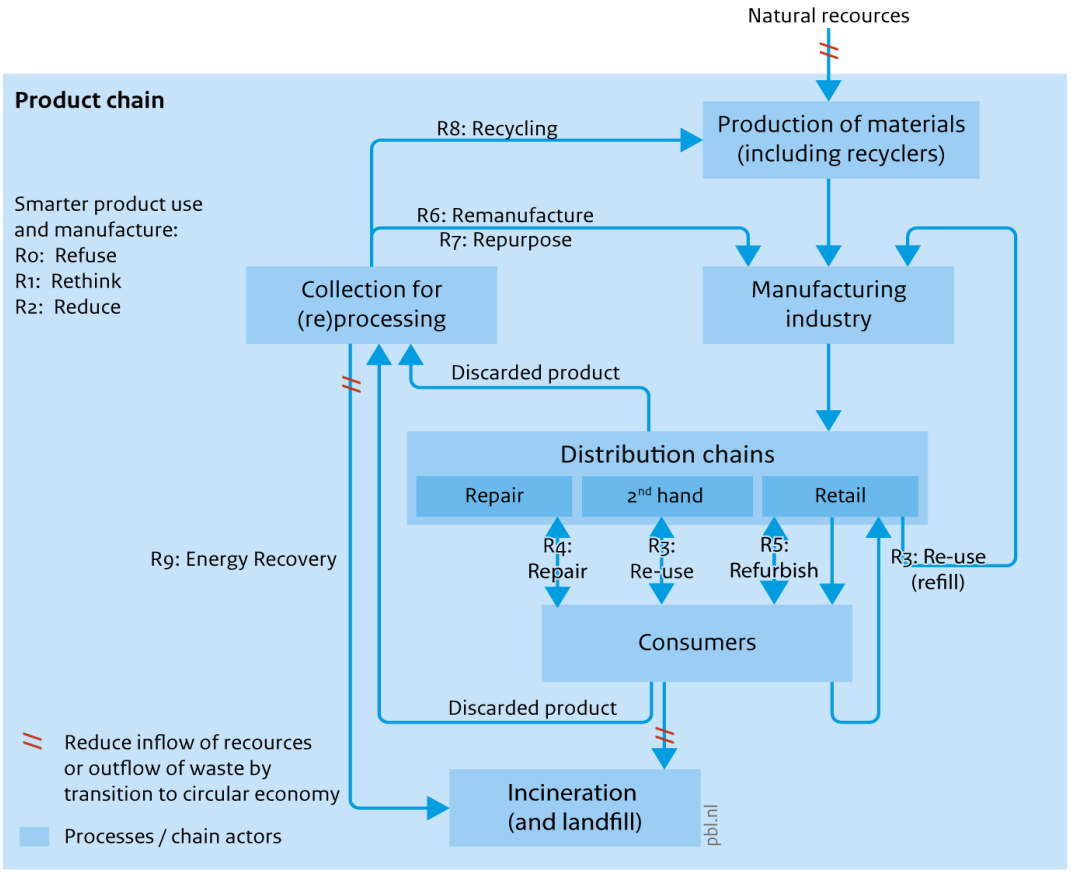

Figure 1: Circularity Strategies and the role of actors within the production chain (Potting et al., 2017)

Promoted by governments and business organisations (Korhonen et al., 2018), circular economy conceptualisations and strategies have to date largely focused on the production system (Camacho-Otero et al., 2018). This is exemplified by the 10R framework categorised by Potting et al. (2017) (Figure 1) and refined by Kirchherr et al. (2017) (Figure 2), although this is not necessarily reflected in the terminology used.

According to Kirchherr et al. (2017:223), 'all varieties of the R framework share a hierarchy as their main feature' with the first R ('Refuse' in the Potting et al. (2017) R framework) viewed to be a priority to the second R and so on (Potting et al., 2017, Sihvonen and Ritola, 2015, Van Buren et al., 2016). Kirchherr et al. (2017) reorganised Potting et al.'s (2017) Rs to create a hierarchy that reflects the level of priority assigned to each R in terms of its transformative potential in the transition from a linear to a circular economy. In other words, the higher priority Rs provide the greatest potential to reduce or eliminate resource use.

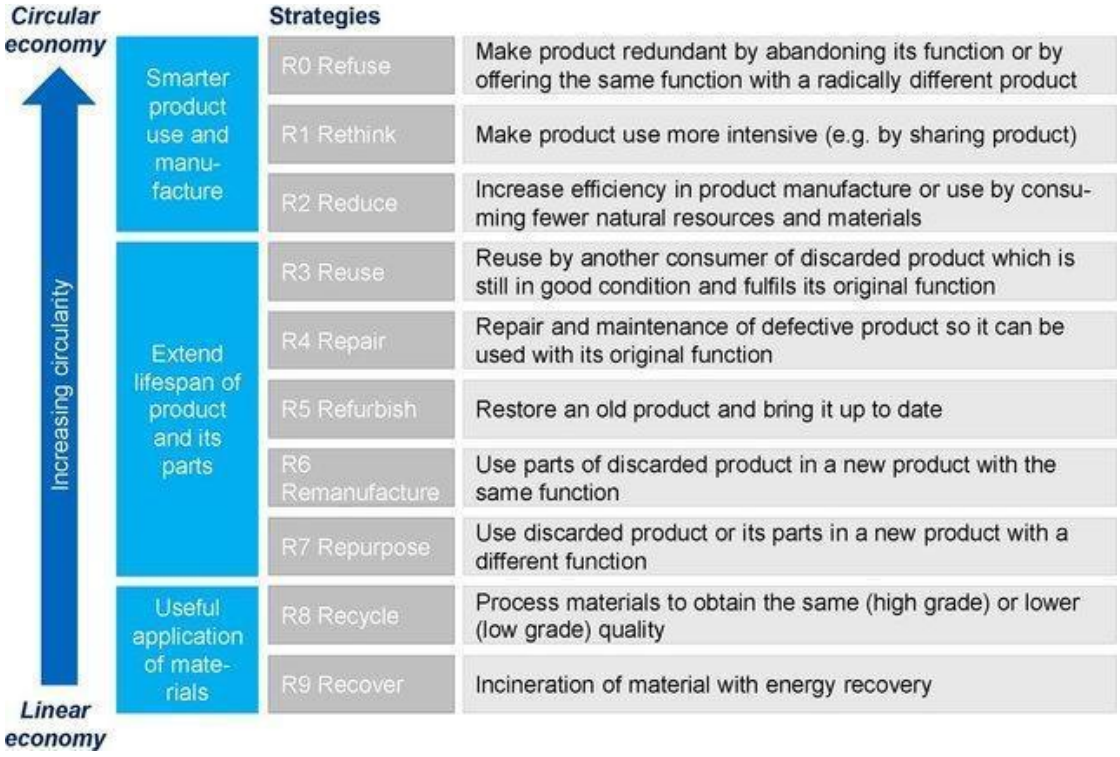

Figure 2: Circularity strategies within the production chain in order of priority (Kirchherr et al., 2017)

However, claims made in the literature concerning the exact contribution of circularity strategies to climate mitigation remain largely unclear, raising serious questions about their validity (Cantzler et al., 2020, Zink and Geyer, 2017, Zink and Geyer, 2019). According to Cantzler et al., (2020: 1), 'there is a lack of understanding of how much circular economy strategies can contribute to climate change mitigation', with most studies claiming but not demonstrating actual mitigation. Moreover, reductions in overall consumption through rethink and refuse strategies from a consumer perspective remain under-explored and marginalised. The IPCC's most recent report highlights the need to achieve absolute reductions in resource consumption and notes that some SDG goals (such as greater levels of efficiency facilitated by digitalisation) support environmental goals only if appropriately governed (IPCC, 2022).

Perhaps more importantly, many conceptualisations of circularity treat the consumer as a 'black box' without paying much attention to the social and material factors influencing consumption (cf. (Jaeger-Erben et al.,

2021) for a broader discussion that touches on these and related sociological points). For example, Kirchherr et al.'s (2017) top priority Rs may not necessarily be the most promising in terms of consumer acceptance and adoption, highlighting the urgent need for research that focuses on circular consumption behaviour and practices. This mirrors the growing recognition among scholars that new consumption cultures will be a critical part of the circular economy (Korhonen et al., 2018) and that demand side research on the role of consumers and civil society in the acceptance of circular offerings needs to increase (Haase and Lythje, 2022, Leipold et al., 2023).

CircEUlar contributes directly to the advancement of circular consumption research by focusing on cooperation or 'buy-in' from the demand side. Importantly, it treats the widespread adoption of **circular consumption practices (CCPs)** as central to curbing the consumption of non-renewable resources (IPCC, 2022). Broadly speaking, CCPs closely resemble the above-mentioned production-related circularity strategies. For example, recycling can occur throughout both the production and consumption phase. However, other CCPs occur exclusively on the demand side. For example, 'reuse' such as in the case of the consumption of second-hand items is predominantly confined to private consumption.

Policy efforts based on the early emerging 3 Rs of Reuse, Reduce and Recycle have been significant in recent years, with some degree of measurable success. Strong support through specific policy measures and targets aimed at establishing networks, structures and systems to facilitate circular consumption practices have contributed to this progress, especially in the area of recycling rates (European Commission, 1994, 2008, European Union, 2018a, 2018b). However, circular consumption research and associated policy measures regarding both well-established and emerging Rs remain disjointed, with monitoring indicators under continuous development (European Commission, 2020). For example, significant challenges remain even in the most established of circular consumption practices, with EU-wide recycling rates for municipal waste averaging at approximately 50% (Eurostat, 2022).

As part of continuing efforts to improve our understanding of circular consumption practices, WP4 aims to:

- **Characterise circular consumption behaviours and practices**
- **Understand cultural, motivational, and structural foundations and influencing factors that shape the acceptability and adoption of circular consumption practices.**
- **Strengthen the empirical evidence base for assessing and modelling the impacts and potentials of circular consumption for climate change mitigation.**
- **Advance circular economy policy development in Europe and beyond based on a clear understanding of consumer acceptance and engagement regarding circular consumption practices.**

To achieve these four objectives, the following sections describe the theoretical framing, research design, methodology and analytical structure of a cross-cultural investigative strategy into the barriers to and opportunities for increasing circular consumption practices across the EU.

2. Theoretical Framing and Aims

When considering the determining factors leading to consumer decisions to (not) engage in pro-environmental actions, historically, theoretical framings that (either implicitly or explicitly) overemphasise individual agency and that do not systematically consider the role of structural factors have dominated. These include prominent attitude, behaviour and choice (ABC) models that attribute unrealistically high levels of control to individual consumers (Shove, 2010, Akenji, 2014). In practical terms, this places a very significant burden of responsibility on consumers and sets a low bar for policy makers, with education and information provision serving as primary interventions to foster a shift in attitude and thus a change in outcome.

Consequently, models which generally rely on individual choices building to a broad social change have come under sustained criticism (Shove and Walker, 2010, Hargreaves, 2011, Jalas et al., 2017). This criticism has resulted in complementary conceptual frameworks and methods of investigation in which both intention and (in)action are investigated and tested under real world conditions (Sahakian et al., 2021) and where narrative explanations of the reasons behind observed actions are used to identify both barriers and opportunities for change. Similarly, there has been a move towards approaches that focus on moral considerations and habits (Steg et al., 2014), household-level behavioural change as a near-term reductions strategy that complements long-term shifts in (infra)structure (Dietz et al., 2009) as well as contextual, material and situational factors (Wiedenhofer et al., 2018, Stern et al., 1995). The recent IPCC report emphasized the role of infrastructures in enabling low-carbon and sustainable lifestyles – essentially understanding infrastructures as physical choice architectures (Chapter 5, IPCC 2022).

Social practice theory provides a suitable framework for investigating observable individual behaviours and their social and material foundations. While recognising the role of individuals as 'carriers' of practices, this theoretical approach prioritises practices as the main units of analysis. Practices constitute continuously reproduced and culturally mediated ways of doing which carry wider meaning for individuals (Greene and Rau, 2016). They are typically robust, resilient and resistant to change (Shove et al., 2012). Moreover, practices are shaped and reinforced by norms, structures and historical experience. For example, perceptions of second hand items as a sign of resource frugality rather than a sign of poverty or a matter of necessity may vary between groups based on their distinctive cultural, economic or social characteristics (Valor et al., 2022).

Questions concerning the degree of control individuals have over their engagement in practices constitute a central theme of practice-theoretical approaches to consumption research. Here individuals themselves are viewed as the 'carriers' (Warde, 2005, Hargreaves, 2011) rather than agents of practice and as such are not best placed to lead or cause social change (Jalas et al., 2017). In fact clarifying the intersection between individuals and practices remains a key conceptual challenge in the field of practice-centred consumption research (cf. Wilson and Chatterton (2011) for a pragmatic response to the 'beyond the ABC' debate).

Drawing on Spurling et al.'s (2013) iceberg analogy (Figure 2), **CircEUlar considers consumption as a consequence of the performance of practices** that are meaningful to individuals beyond the mere act of consumption and that are more or less routinized (cf. (Lavelle et al., 2015)). Importantly, observable behaviour provides important clues regarding people's willingness to adopt particular practices but it can only be properly understood when considering the underlying **(i) meaning attached to engaging in certain practices (ii) knowledge, skills and competences required and (iii) material conditions.** In this way, rather than simply modelling and processing the observable behaviour of individuals, the larger unseen reasons behind individuals' (non)engagement in CCPs can be analysed.

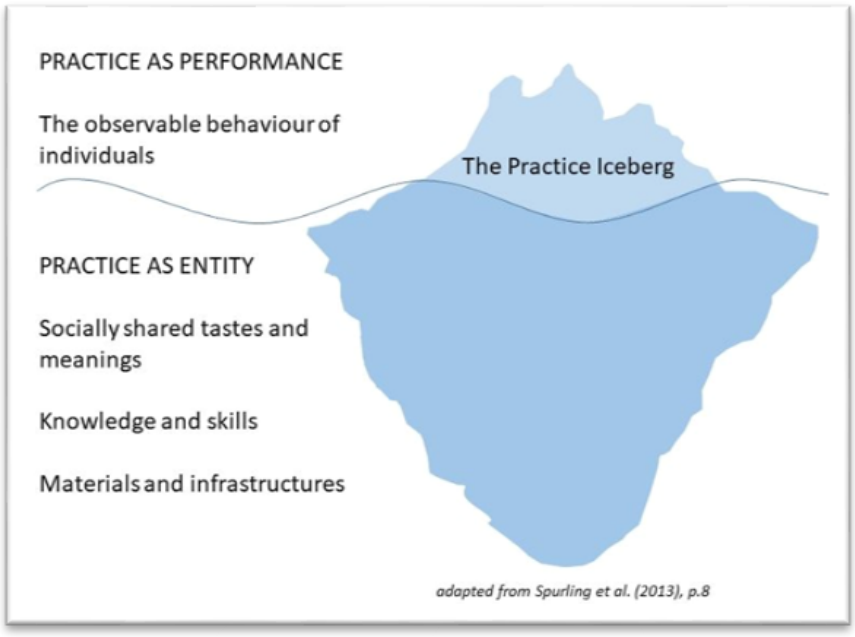

Figure 3: The Practice Iceberg: adapted from Spurling et al. (2013)

Focusing on what lies beneath observable behaviour, questions of taste and meaning as well as socially shared norms exert considerable influence over consumer engagement potential for certain CCPs. For example, the purchase/wearing of second hand clothing can be highly sensitive to the perceived risk of social embarrassment and perceptions of cleanliness (Silva et al., 2021) as well as previous exposure to the practice (Hur, 2020) and prior experience of any negative social consequences. Willingness to deviate from established social norms may thus be an essential element of early adopters of certain CCPs.

Other CCPs require knowledge, skills and competences that may lie outside the modern skill set of average consumers and are not always easily acquired. In fact, few education systems today promote circularity literacy and competences. For example, learning how to ride a bike or learning manual skills such as sewing or simple maintenance, may present challenges in later life. Moreover, willingness to engage in upskilling may vary significantly within the population (e.g., across age and social groups). Furthermore, repairing as a CCP may only make sense to the individual if they can carry out the repair themselves due to the comparison of skilled labour costs versus the costs of replacement.

Many CCPs also have substantial spatial and temporal requirements that relate closely to their material and infrastructural make-up. For example, buying and selling second hand goods via online platforms can be a very time-consuming activity, especially if the supporting infrastructure for sending and receiving goods is overly complex. How consumers perceive time in relation to their engagement in CCPs may represent a key predictor of outcomes and represents an important consideration (Smetschka et al., 2019, Jouzi et al., 2021).

To provide a baseline of circular consumption activity and identify opportunities for future engagement, CircEUlar WP4 aims to profile and identify:

1) **current circular consumption practices (CCPs)** both previously identified and as yet unidentified across all three focus areas that people report engaging in.

2) **promising practices** across the three focus areas that lend themselves to circularity in the future i.e. those which are most likely to be accepted and adopted and which offer the greatest opportunity to make substantial dematerialisation impacts.

3) **socially shared meanings, skills and competences and material conditions,** that foster current and future engagement in CCPs including **cultural, motivational, and structural factors**

4) **common characteristics** of high-potential consumer groups, that is, particular segments of society that are more likely to engage in promising CCPs because of certain characteristics (e.g. life stage, tenure status, access to existing stocks and infrastructures as well as socio-demographic and attitudinal factors and existing practice profiles)

5) **'gateway events'** that have triggered engagement in CCPs in the past (e.g. changes in life circumstances, personal interactions, 'material milestones', changes in resource allocation (e.g. time/income/space))

3. Research Design

Empirical work in WP4 will involve a two-stage mixed-methods approach to data collection and analysis. The first exploratory stage will be carried out through retrospective consumption-biographical interviews with at least 60 households across the Netherlands, Germany and Italy, with potential contributions from other European partners. Complemented by expert consultation on circular consumption topic, these qualitative consumption biographies will provide the basis for an extensive survey, to be administered to representative national samples in participating countries. The survey will capture the frequency of existing CCPs such as recycling, repairing and reusing, the perceived acceptability and workability of other promising CCPs as well as key factors shaping acceptance and adoption. Iterative content analysis of interview data triangulated with statistical and segmentation analysis of survey data will be used to identify factors that influence acceptance and adoption of circular consumption, and the characteristics of high-potential consumer groups.

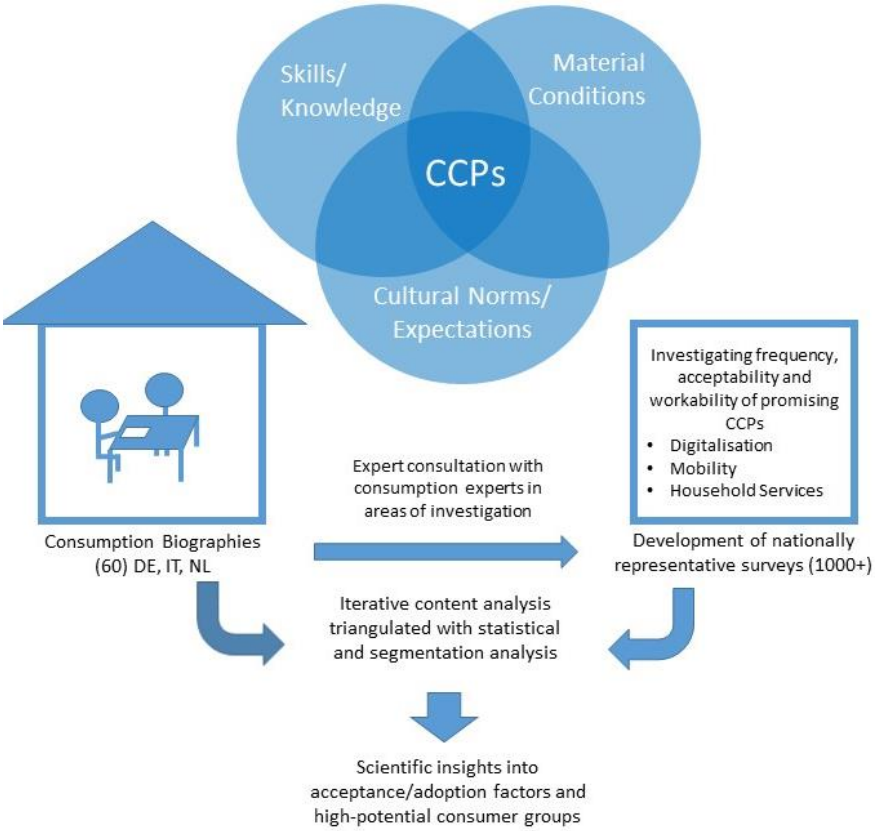

Figure 4: Circular Consumption Research Design

3.1 Focus Areas

In line with CircEUlar's commitment to investigate high-impact areas and opportunities for dematerialisation, the research focus will consider CCPs specifically in the area of mobility and household building services, two highly material- and energy-intensive demand sectors. In addition, the third focus area considers the ultimate extent of the potential contribution digitalisation may make to dematerialisation. The following outlines key points for consideration in each of the three selected focus areas.

3.1.1. Mobility

Mobility encompasses a set of practices that have shown to be highly routinized and resistant to change, reflecting prevailing patterns and organisation of educational, economic, social and cultural life (Mattioli et al., 2020). That said, there have been some recent shifts away from ownership of materially intensive modes of transport to models of sharing both commercially and non-commercially (Rodenbach et al., 2018). In Europe, this trend is most pronounced in larger cities with younger, highly educated populations, with the growth of commercial short-term vehicle rental and new e-mobility options facilitated by technological advancement and digitalisation (Ortega Hortelano et al., 2020, Wilson et al., 2020). In addition, the growing competition for public space in many urban centres across Europe has translated into mounting costs and restrictions with regard to parking private vehicles, making car and bike sharing models more competitive/attractive and appealing to certain groups with particular mobility patterns (Ramos et al., 2020). Some dematerialisation in the mobility sector has also been facilitated by a rise of second hand trading in mobility-related goods (e.g. vehicles, spare parts), partly aided by low cost or ad-funded trading and sharing platforms. There is also evidence of historical and current examples of non-commercial sharing/pooling

practices in rural and peri-urban areas (e.g. informal car sharing, giving lifts to neighbours, etc.) (Nitschke, 2020). However, recent global trends, which may have been facilitated inter alia by weight-adjusted emissions standards (International Council on Clean Transportation, 2014), also include increases in physical car sizes and private vehicle ownership (International Energy Agency, 2019). Future efforts to dematerialise mobility could necessitate a return to smaller vehicle sizes, in addition to promoting 'voluntary carlessness' (Sattlegger and Rau, 2016), 'car shedding' (Hess, 2022) and car-free living that rely on public transit and/or active mobility options to satisfy the mobility needs, where appropriate. This would also require complementary improvements in public transportation and cycling and walking infrastructure.

The recent pandemic provided an opportunity to observe a natural shock to mobility patterns and study a fundamental (albeit temporary) shift in expectations (Kraus and Koch, 2021), infrastructures and outcomes surrounding certain mobility routines (Greene et al., 2022). Recent research has confirmed however that such change was largely restricted to certain socio-economic groups (Ecke et al., 2022, Reiffer et al., 2022), with some stated intentions around future mobility suggesting that without structural change primary mobility practices would rebound in the medium term (Harrington and Hadjiconstantinou, 2022).

In addition to dematerialisation potential offered by modal shift, CircEUlar will assess the acceptance and adoption of promising circular mobility practices by focusing on the potential of sharing practices, new forms of public transport and, repair and maintenance efforts to prolong the lifespan of private mobility stocks (e.g., cars, bicycles, mini cargo systems, etc.). Resistance to change in current car-dependent mobility practices as well as their strong dependence on public infrastructure will receive particular attention in exploring the (non)acceptance and (non)adoption of mobility-related CCPs. Detailed data and insights on the acceptance and adoption of emerging circular mobility practices and their variation across different social groups will be generated drawing on data such as modal ownership, commuting patterns, modal shift potential and the perception of modal shift trade-offs. Impacts on time, financial cost, health, convenience, and perceived flexibility will be considered as well as factors influencing willingness to share.

3.1.2 Buildings and Household Services

In investigating CCPs at the household level, significant opportunities for dematerialisation have been demonstrated in the area of commoning (recreational/work/living spaces), sharing (utility services, laundry infrastructure, tools and equipment and other occasional use items) and absolute reductions in living space. However, demonstrable examples have often been restricted to experimental projects, local level spot initiatives and programmes for very particular stage-of-life contexts such as student housing, retirement communities and assisted living units. The extent to which commoning and sharing could be accepted or adopted in other contexts requires an interrogation of the circumstances in which individuals' willingness to share or reduce their living space could be shifted. This can be achieved by recognising the centrality of material conditions (e.g. urban form, housing infrastructure; size, structure and flexibility of rental market etc.), skills (e.g. collective management, dispute resolution) as well as the various meanings people attach to downsizing or sharing (e.g. attachment to own home, reticence to live with strangers).

Willingness to share/common may also significantly relate to factors such as levels of trust; reflected by existing distance/proximity to community and local engagement (Schreiner et al., 2018). Other factors such as replacement value, risk perception and socio-cultural norms such as in the area of personal liability insurance may offer explanations as to the presence of barriers or limits to certain CCPs. Additionally, some CCPs may be prohibitively abstract for participants to engage with or hypothesize about in certain socio-technical contexts, for example in cases where established institutions and structures may severely restrict realistic prospects for commoning within the pre-existing material stock.

People's ability to reasonably imagine themselves living in alternative residential scenarios may depend on their prior exposure and experience with such arrangements (e.g., sharing rooms, utility spaces, common areas). As such, key survey data points to be considered in this focus area will include tenure, household size, current shared areas, previous exposure to sharing arrangements (Stieß et al., 2019) and physical living area/space given the current trends towards smaller household sizes and larger living space per capita (Ivanova and Büchs, 2020). These, in turn, reflect wider societal and material conditions, including dominant approaches to (urban) spatial planning, housing market characteristics (e.g. ownership rates, borrowing, rate of rent increases etc.) and demographic dimensions (e.g. share of single and two-person households, ageing population).

3.1.3 Digitalisation

Digitalisation is evidently a double-edged sword regarding its social and ecological impacts. On the one hand, it is contributing to the 'Great Acceleration', including rapidly increasing consumption and resource use (Creutzig et al., 2022, Hynes, 2022). For example, digitalisation has been shown to facilitate material consumption by reducing the friction between buyers and sellers (e.g., fast fashion, e-commerce, instant delivery). It can also facilitate direct exchange through peer-to-peer online trading platforms or provide information on offline trading such as business listings. Consequently, rebound effects linked to digitalisation remain a serious challenge (Meshulam et al., 2022, Santarius et al., 2022), highlighting the need to monitor the long-term effects of new and established digital technologies on consumption practices and their social and material consequences. For example, increasing consumption of short-lived digital devices generates e-waste, the fastest growing type of consumer waste today of which less than 20% is currently recovered (World Economic Forum, 2019).

However, if appropriately regulated and politically steered as part of circular economy and net-zero strategies, digitalisation could support the shift towards low-carbon economies and consumption practices. For example, digitalisation offers the potential to significantly increase the recirculation of products through sharing platforms connecting providers and users of second-hand goods. Digitalisation can also contribute to removing barriers (such as imperfect information) to certain circularity-oriented markets as well as opening opportunities for new business models facilitating the switch from a product- to a service-based circular economy (Hedberg and Šipka, 2021) in line with dematerialisation strategies (Court and Sorrell, 2020). There are a large number of digital consumer-oriented innovations that can support emission reductions across household services, mobility, and food-related practices under appropriate conditions that guard against rebound effects towards increased consumption (Wilson et al., 2020). Additionally, digitalisation offers significant opportunities for disseminating knowledge on skills and strategies to enable reuse, repair, refurbish, remanufacture and the repurposing of goods. Digitalisation also harbours the potential to dematerialise well established resource-intensive mobility practices including both short and long-distance travel to physical meetings for either social or work-related purposes if these can be substituted by remote interactions using digital applications (van Ewijk and Hoekman, 2021).

Despite these opportunities, significant challenges remain. While there have been moves to regulate the digital sphere in terms of enhancing consumer protections and ensuring market competitiveness (European Union, 2022a, 2022b), there is currently very little evidence to suggest that governments and institutions have either the willingness or capacity to properly regulate and steer digitalisation to support circularity goals. As well as solving issues of trust related to the perceived security and privacy risks, the capacity to regulate the sharing of data across systems designed to bring about collective circularity and value networks rather than value chains (Ramesohl, 2022) has yet to be established (Antikainen et al., 2018). Specifically,

from a consumption perspective, certain CCPs facilitated by digitalisation may be limited in practical application, e.g., the digital dissemination of skills and knowledge may not translate well to the physical world in situations that require physically tangible learning-by-doing. Other CCPs may require significant change in cultural acceptance such as in case of the consumption of second hand (Valor et al., 2022) or refurbished items (van Weelden et al., 2016) in certain consumption categories and contexts e.g. post purchase food sharing (Makov et al., 2020).

The level to which people are likely to trust digital platforms, their confidence in data protection regulation and their perceptions of consumer protection may also be key components (Leon et al., 2013), explaining individuals' (un)willingness to accept the conditions of digitalised trade by allowing platforms to save their personal data to reduce transactional friction. The recent pandemic dramatically increased the experience of, and reaction to, physical-to-digital substitution of remote working, learning, governance, and social interaction practices (Grinin et al., 2022). However, it must also be acknowledged that digital transformations can have adverse social consequences (Hook et al., 2020, van Ewijk and Hoekman, 2021) which may not be accepted in the long run.

4. Methodology

Preparation for the identification of promising practices will involve the collection of evidence of existing CCPs from across Europe, assessing the circularity relevance of each practice identifying **"High", "Medium" and "Low"** practices to mark for further drill down and possible inclusion in the initial part of the survey that deals with current CCPs. In addition to the likelihood of acceptance/adoption, the potential impact of each CCP on environmental goals will also be considered. The Kirchherr-Scheme will be reassessed and likely updated to check suitability of segmentation of potential CCPs across the three focus areas. Consideration will also be given to a differential weighting of factors influencing likely adoption of CCPs across the three focus areas.

Stage One: Semi-structured biographical interviews that focus primarily on (i) past and current engagement in CCPs, (ii) life events and socio-economic circumstances that impact the adoption of CCPs, and (iii) considerations concerning future engagement in CCPs. Adopting a retrospective approach to biographical interviewing facilitates the collection of longitudinal qualitative data at one point in time (cf. (Jaeger-Erben, 2013, Müggenburg, 2021)). The interview guide will balance the need for structure, focus (i.e. on 'promising practices') and semantic equivalence across countries with the benefits of maintaining high flexibility to respond to interviewees' contributions. The latter will likely be particularly important in terms of CCPs that have not been identified previously. The interviews will feed into the investigative framing for the nationally representative surveys, e.g. informing the development of descriptive scenario vignettes assessing survey participants' willingness to engage in certain CCPs.

Purposive sampling will be of utmost importance here, given its capacity to improve the rigour and trustworthiness of qualitative data collection and interpretation (Campbell et al., 2020). For that purpose, biographical interviews in WP4 will involve interviewees in each country that have experience with CCPs, etc. (e.g. voluntary carlessness and car sharing; use of shared spaces; use of platforms and apps that facilitate trading and consumption of second hand goods) as well as interviewees who have not engaged in (many) CCPs previously. This focus on both non-engagers and those who are already engaged in CCPs will generate insights that will optimise survey design (e.g. identification of barriers to engagement in CCPs).

Stage Two: Following an initial section that covers basic demographics as well as the primary sampling criteria, the survey will focus on key data points pertaining to the elements of practice associated with promising practices identified in Stage One. This will be followed by a combination of closed-ended questions in response to **short vignettes describing a number of qualitative CCP scenarios**. The vignettes will contain detailed narrative descriptions to probe factors affecting respondents' acceptance and willingness to engage in CCPs in particular described contexts.

Sample Key Survey Data Points:

Digitalisation: Availability of supporting infrastructure, digital skills and experience, levels of trust in digital platforms and concerns with respect to security, privacy and other risks, perception of certain CCPs, prior experience/familiarity with digital based solutions

Buildings and Household Services: Tenure, household size, life stage, physical living area/space, presence of sharing/commoning/borrowing, previous exposure to sharing/commoning/borrowing arrangements, perceived benefits/costs

Mobility: Modal ownership, commute demand, modal shift potential (including access to shared pooled mobility), cost/benefit of modal shift (time, €, health, convenience, flexibility)

5. Analytical Structure

In attempting to identify different categories of CCPs, WP4 draws on Kircherr et al.'s (2017) framework categorisation from the production system and uses a modified version to reflect consumption side concerns and capabilities (Table 1). While the Kirchherr et al. (2017) 9R framework focuses on the impact of individual strategic actions from the production side, WP4 focuses on the consumer by considering the impact of engaging in specific CCPs across different areas of consumption and considers opportunities to develop greater circularity literacy. The categories and descriptions of CCPs have been adapted to focus on the interaction of consumers with the rest of the product chain i.e. focusing on the flows to and from consumers. Certain CCPs have been differentiated in order to recognise that different CCPs make demands on different elements of practice. For example, 'reorganising' may require specialist skills, knowledge and collective cooperation over and above the simple 'repurposing' of products at an individual level, whereas 'rethink' may imply greater changes in meaning or attachment to certain patterns or forms of consumption. This initial framework will serve to identify the tip of the CCP iceberg, i.e. relevant observable behaviour, before we consider the unobservable and often hidden elements of practice.

Table 1:Initial categorisation of CCPs

CCP	Description
Refuse (Abandon)	Abandon resource-intensive products and services that do not serve essential functions
Rethink	Substitute product or service for less resource intensive product or service which serves the same or similar function e.g. alternative mobility or shared living spaces
Reduce	Reduce resource intensity of consumption either by reducing frequency of use/consumption, or by increasing use efficiency e.g. through sharing/borrowing/lending
Reject	Reject resource-intensive features and additional functionalities that induce further consumption and do not impede primary function
Reuse	Extend the useful life of products by engaging in second hand markets (both formal and informal)
Repair	Extending the useful life of products by choosing to repair (either independently or through service provision) rather than purchasing new product
Refurbish	Accepting refurbished products as legitimate substitutes to new products
Remanufacture	Accepting remanufactured products as legitimate substitutes to new products
Repurpose	Repurposing products or by-products for other uses e.g repurposing durable containers for food storage
Recycle	Purposefully ensuring that products and materials that have passed their useful phase are disposed of correctly
Recover	Recovering waste for repurposing e.g. grey water usage
Reorganise	Reorganisation of existing material stocks in order to facilitate new applications.

Table 2. groups CCPs according to their impact on circularity (narrowing, slowing and closing loops) and provides selected examples across the three focus areas that illustrate their range and diversity. All CCPs reflect different constellations of material conditions and aspects of competence and meaning, which in turn influence their likelihood of ease of acceptance/adoption

Table 2: Sample CCPs under consideration for further investigation

	CCPS	**FA I (DIGI)**	**FA II (MOB)**	**FA III (BUILD)**
Narrowing loops through sufficiency and dematerialisation	*Refuse,* *Rethink,* *Reduce,* *Reject,*	Refusing non-essential digital services, devices and/or hardware Choosing modular hardware conducive to repair/replacement Using digital platforms which displace physical goods by providing rental, borrowing, or exchange services Rejecting bloatware (non-essential/pre-installed proprietary applications see (Elahi et al., 2020)) Physical-to-digital substitution of energy-intensive practices, inc. mobility	Voluntary carelessness, Car sharing Choosing standard bike rather than E-bike Modal shifts towards walking, cycling etc. Shifting from combustion to electric vehicles. Reducing frequency of (long distance) trips	Commoning (to reduce individual floor space, e.g. by installing shared kitchens, roof terraces, laundry rooms, repair spaces etc.) Reducing floor space via rental renovations, bedsits, house shares Reducing floor space via conversion/splitting of large single-homes into two or multiple housing units
Slowing loops by extending product lifespan	*Reuse* *Repair* *Refurbish* *Remanu-facture* *Repurpose*	Using second hand purchasing platforms Using online repositories for manuals and repair information	Purchase of second-hand mobility modes e.g. bicycles, buggys Repurposing of transport infrastructure at local or	Repurposing obsolete infrastructure e.g. converting fuel storage tanks to rainwater storage, converting disused urban buildings into living/commercial spaces Switching heating systems but retaining elements of heating infrastructure

		Using digital trading and training networks	household level (e.g. reuse of garages, esp. in densely populated urban areas)	Retrofitting Furnished rentals
Closing loops by minimising consumption related resource use	*Recycle* *Recover* *Reorganise*	Use of (low cost, low energy) exchange platforms Accepting digital networks which integrate consumer products into efficient provisioning systems (e.g., smart charging of electric vehicles, demand-flexible)	Use existing resources to supply innovative mobility solutions	Recover waste water for other applications such as irrigation or flushing Reorganise material stocks and create new applications e.g. innovative recreational spaces

In addition to analysing the constituent elements (Figure 3) of a range of CCPs, **aspects of structure/systemic** influence and **individual and collective agency** will also be considered, given that they will likely influence individuals' engagement. This will be necessary to distinguish CCPs that are perhaps best introduced and promoted by means of (infra)structural changes and those that could become established more effectively through people's bottom-up, collective engagement. For example, many commercial shared mobility offers are highly contingent upon well-functioning built and digital infrastructures (e.g., roads, rails, transport apps). In contrast, non-commercial shared mobility frequently relies on informal networks and high levels of social capital (Nitschke, 2020, 2022)

Depending on the location of the CCPs along an agency-structure continuum, different methods for advancing or increasing CCPs may be required, including a re-evaluation of where the appropriate focus of primary responsibility for change may lie i.e. with institutions, private commerce or consumers. For example, in the case of digitalisation, consumers may be very willing to reject non-essential digital 'services' such as bloatware (Elahi et al., 2020) and predatory consumer profiling (Manwaring, 2018) but have limited capacity to signal this in the market and/or lack the skills or competencies to refuse it (and the associated resource consumption) post purchase. In the area of mobility, voluntary carlessness is only practically possible for those with specific supporting infrastructure i.e. those resident in locations with adequate public transport or where destinations can be reached with other modes without loss of practical function.

Sample Key Survey Data Points

General Engagement in CCPs: Time Costs (actual/perceived), Personal Competences, Perception of agency, cultural acceptance

6. Challenges

6.1 Sampling

One of the key challenges presented by this methodological approach is to interrogate the efficacy of representative sampling for the purposes of modelling the potential for policy upscaling. Nationally representative sampling criteria that prioritise traditional socio-economic and demographic factors may not be appropriate when compared to other criteria more relevant to people's capacity to adopt particular CCPs in the three focus areas such as car ownership, life stage, tenure status and levels of digital literacy. This is particularly relevant when seeking to obtain critical information about the reasons behind those already engaging/not engaging in CCPs. For example, it may be the case that following the exploratory first stage that factors such as stage of life, tenure, level of urbanisation, living space, modal ownership, licence attainment, presence of children in the household, health status, exposure to gateway events, etc., may be much more relevant for the purposes of investigating CCPs in the select focus areas and for determining upscaling potential. The potential for giving priority to such data in selecting the sampling frame over more traditional socio-economic and demographic data will be determined by the availability and reliability of national statistics for these attributes.

6.2 Conflicts of goals and functions

Conflicts are likely to arise between environmental and profit-seeking goals where competitive markets rely on increasing consumption volume. Difficulties may also arise when considering a conflict of functions within the focus areas where prioritisation on the production side will likely remain with serving traditional market functions rather than serving dematerialisation, reducing environmental impact and/or reducing overall resource consumption. While an increase in CCP engagement may serve an increase of the circular share of overall economic activity, there is no guarantee that this will result in an absolute reduction of resource extraction or waste. Also, while a hierarchical framework for circularity exists, this does not necessarily translate to an environmental hierarchy. For example, in some cases recycling may present a better environmental option than reusing such as in the case of heating systems (Hummen and Desing, 2021). It is thus important to consider circularity and environmental impact on a case-by-case basis (Desing and Blum, 2023).

6.3 Rebound

While technological advancement may offer opportunities for increasing the prevalence of CCPs, the risk of consumption and production rebound remains (Zink and Geyer, 2017, Castro et al., 2022). Promising CCPs which offer the greatest opportunity to substantially dematerialise everyday behaviour and practices will need to be carefully analysed in context. Certain CCPs may yield negative impacts in certain contexts at the individual level where less intensive activities are displaced but may offer positive impacts at a macro level such as in the case of micro e-mobility (Asensio et al., 2022). The effective replacement rate of second-hand purchases facilitated by digitalisation is also a key factor in determining whether or not production has been displaced (Makov et al., 2019, Wieser and Tröger, 2018). Digital platforms may actually enable an increase in consumption and individually held material stocks. They may also divert what were previously social economy donations to the private market resulting in unintended social costs. Additionally, certain forms of consumption (i.e. highly energy intensive, polluting and/or waste generating) may simply be incompatible with circular economy goals with an overall reduction in resource use as a required component.

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