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Circular Economy Behavior: Incentives, Norms, and Rebound Effects

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ABSTRACT

The transition to a circular economy (CE) depends not only on technological innovation and policy reforms but also on widespread behavioral change among individuals, organizations, and governments. This paper examines the behavioral dimensions of the circular economy by exploring the roles of incentives, social norms, and rebound effects in shaping the adoption and sustainability of circular practices. It reviews the conceptual foundations of circular economy behavior and analyzes how economic, policy, regulatory, corporate, and consumer incentives encourage behaviors such as recycling, repairing, reusing, sharing, and refurbishing products. The paper further investigates the influence of social norms, cultural values, and group identity in promoting or constraining circular behaviors, highlighting the importance of norm formation, diffusion, and communication in facilitating collective action. In addition, it critically examines rebound effects, where gains in resource efficiency may inadvertently stimulate increased consumption and undermine environmental benefits. Various methodological approaches, including experimental, survey-based, observational, and modeling techniques, are discussed alongside case studies from the consumer electronics, textiles, plastics, and construction sectors. The paper concludes that achieving a successful circular economy requires an integrated policy approach that combines effective incentives, supportive social norms, robust governance, and continuous monitoring to minimize rebound effects and foster long-term sustainable behavioral change. Such an approach strengthens resource efficiency, environmental protection, and social equity while advancing the broader goals of sustainable development.

Keywords: Circular Economy Behavior, Behavioral Incentives, Social Norms, Rebound Effects **and** Sustainable Consumption

INTRODUCTION

The Circular Economy (CE) aims to reduce both high consumption and waste generation by promoting the extended use of products, materials, and waste through innovative business models [1]. Transitioning into a CE has significant and multiple social, economic, and environmental benefits and aims to improve socioeconomic recovery to respond to the COVID-19 pandemic [1]. In light of Circular Economy (CE), understanding the factors that foster the adoption of circular behaviors at a citizen and user level has gained importance for decision-makers and has been the subject of scientific investigations and a large number of behavioral frameworks throughout the last years [1]. These range from the general behavior for stability of Environmental-Related Consumer Behavior influenced by one approach of socioecological (social norm) and a bio-eco (eco-effective) conceptual framework for exploratory approach for sustainable design- to the User-Related Circular Economy Drivers with socio-psychological variables driving the interaction on user and on user within a quasi-legal collaborative framework [2].

Conceptual Foundations of Circular Economy Behavior

Circular-economy behavior has yet to be framed into a formal definition. Circular-economy behavior has been perceived as a tightly interlinked transdisciplinary topic, where academia, policy, industry, and civil society unite to identify endpoints in the circularity of materials that move through economies yet remain unable to specify behavior [2]. In circular-economy behaviour, it is 'durable' materials and 'products' whose end-of-life decision, rather than 'single-use' or 'disposable' items, retain the function of technology and continue to circulate within the economy and intended System-Products[3]. By the same logic, referring to citizens as 'consumers' who do circular things and

'users' does not capture how people engage, therefore the term 'citizen' delineates more to material decisions and reflects the link between divergences, cross-disciplinary merit and overlap among circular-economy behavior so leads to comprehensive 'Citizenship-in-Circular-Economy–Framework [1]. Colligated with designs for circular products and the System–Product approach. For example, the longer Citizen-in-Circular-Economy–Designs reside in the circular-economy academic Programs and address diverging problems within circular design approaches, the more decisions gravitate to refinements spanning across business or product-transfers/circular, extends delivery, system-components, up-grades or maintenance[2].

Definitions and scope

Critical concepts in behavioral science receive attention to outline what influencers should consider when trying to impact circular economy outcomes [3]. The objective is to clarify the implications of framing and the importance of existing incentives before a proposed eco-scenario rolls out to ensure coherence, alignment, and scalability [1].

2.2. Behavioral factors in circular economy adoption

Circular economy adoption encompasses various behaviors, one of the most salient being recycle: separate and/or dispose by products waste regularly to a collection system, commonly defined as enterprise waste streams [3]. Recycling is not just an act by itself but initiated multiple behavior and practice beforehand, concerning organizing, storing, sorting, and lastly collection. It is necessary to examine what pushes and prevents people from supporting this behavior to target the influential factors [4]. Adoption of circular behaviors is significantly driven by direct and indirect incentives, but merely making incentives freely available may not necessarily attract more participants [5]. External incentives externally, especially for desired behavior are effective mainly for individuals and groups already intrinsically motivated. A policy mix combining intrinsic and extrinsic incentives is needed to promote pro-environmental behaviors [2]. People also need public awareness of the particular legislation advocating for a specific behavior; otherwise, awareness constraint may block even intrinsic adoption therefore need extra support from policy [6]. In a circular system, people also complement the non-public needs to extend the range through help-seeking or knowledge sharing behavior, which is partly supported till collection point [1].

Incentives for circular economy behaviors

Incentives are actions or mechanisms that trigger human behavior; they induce people to do things they would not necessarily do spontaneously [7]. A well-known example of a successful incentive is the regulation in several countries prohibiting the free disposal of used electric and electronic appliances [8]. Individuals are disallowed from throwing these waste appliances into garbage bins and are offered monetary rewards for handing in said appliances at designated collection points. More than 70% of the total collection has been attributable to this legal incentive [8]. Incentives are complementary to norms. Individuals motivated by normative considerations, such as guilt or the feeling of violating social norms, can also be induced to act by appropriate incentives. For the case of environmentally harmful practices, regulatory disapproval can evoke responsibility [3], while pro-environmental appeals can evoke guilt for non-compliance [2].

Economic incentives

Circular economy behaviors are subject to multiple influences, operating at different levels, from individual to organizational and institutional [4]. Incentives are one of the key drivers affecting circular economy behaviors. Economic incentives are often considered a main source of motivation supporting the adoption of circular economy practices [5]. People are motivated either intrinsically (to satisfy personal values or for personal utility) or through external conditions. Financial incentives motivate behavior on a personal utility basis [2]. Eco-labels and environmental certifications can provide intrinsic motivation as they express an individual's environmental values. Financial rewards, however, generally lead individuals to question the genuineness of the environmental commitment [8]. People engaged in or any other costly behavior for a personal utility but still generating accumulated net socials benefits can feel that they have morally transgressed by engaging in inappropriate behavior [9]. External conditions can facilitate or impede behaviors motivated by environmental or social values, and wide heterogeneity in inertial and intermediary factors is observed [10].

Policy and regulatory incentives

As the Circular Economy (CE) is gaining momentum and global recognition, fundamental changes in Production and Consumption patterns are required to limit the Pressure on natural resources and ensure a fair Distribution of wealth. Incentives to adopt Circular Behaviours are manifold and need to be designed with care [11]. Risk of a Rebound Effect is present, where increased efficiency leads to increased use or Consumption [12]. Several factors shape a circular behaviour motivation. Some factors can be supported by Policy Incentives. Economic incentives are Price or non-Price provisions modifying the Cost and/or Convenience of circular products or Services [2]. The Rural Electricity Provisioning as implemented in Western India includes component and assembly guarantees for local-producing Rural Electricians [13].

Corporate and consumer incentives

Climate change and resource scarcity necessitate public and corporate efforts to promote more sustainable production and consumption; the urgent social need to preserve remaining resources encourages research on relevant consumer and corporate behaviours[14]. Different involvements and considerations establish consumers' and firms' priorities in circular economy behaviours. Public campaigns need to focus on precisely identified behaviours by elaborating incentives that motivate circular economy behaviours and are practically enforceable by providing sufficient scope for such behaviours [15]. Rather than implementing circular economy behaviours, economically unviable actions may hinder effective efforts by public authorities and not-for-profit organisations. For instance, circular economy behaviours become meaningless for those unable to afford to buy recyclable. Priorities in low socio-economic groups also differ significantly from traditional circular economy behaviours that focus primarily on pro-environmental aspects [16]. Individual behaviours such as preferences for unsanitary items weighing recycled- papers or discarding unnecessary refilled bottles may continue to occur under circular economy principles motivated by waste avoidance and maximised utility that remain unchanged[17]. Such behaviours fit into fully recycled or completely refilled options once the individual is more limited by waste than price [11]. These diverse international and individual scenarios differ fundamentally from classic findings [15]. Engaging medium-to-high socio-economic and corporate groups reflects a notion centred around economic efficiency and returns with incentives such as remuneration, materials, liquidities, and charging to put circular economy elements into practice [16]. Behavioural incentives for circular economy follow classical prosocial behaviours while diverging from the initial framework of pro-environmental behaviours because the circular economy is an economic perspective. Circular economy behaviours facilitate the circular economy itself and consequently simultaneously safeguard reciprocity, trust, and collective action within communities [17]. With different spatial scales and groups of, for example, regional or national, large or small firms, and low or very high income analysed yet, collective behaviour and the associated incentives still exhibit similarities. Economic motivation constitutes the leading group of behavioural incentives for non-core circular economy actions [18]. Combating impoverishment in specific locations like developing countries and less resource-abundant municipal regions remains a concern [3].

Social norms and cultural drivers

Social norms are fundamental components of human judgment and action, governing yet often circumventing conscious decisions. The existence of circular economy practices is influenced by public adherence to, and perceptions of, emerging norms[5]. Norms concerning recycling, repair, and sharing have achieved prominence in messages advocating circular economy principles. Adapted to a circular economy context, the definition depicts a social norm as consensually defined rules of behavior[6]. Following Biccheri's elaboration, an action becomes normative if a critical mass recognizes its appropriateness and wants others to comply. Current discourses promoting circular economies elicit onlookers, consumers, and firms to regard these actions as circular economy-oriented [4]. The emergence of social norms occurs in two systemic phases: formation and diffusion. Norm formation occurs through a five-stage evolution of the rule: [1] locals observe others co-ordinating an underlying action in a common situation; [2] a candidate interdependence emerges for co-ordination; [3] locals identify the rule to make explicit the candidate interdependence; [4] compatibles undertake the action without requiring price signals; [5] the process resumes with the candidate emerging as a norm. The diffusion phase encompasses four trajectories: local adoption engenders wider collective adoption; local fluctuations around more established rules and directives are monitored for stability or change; routinised actions become candidates for variation and local experimentation; [2] and systematic differences across a set of locations trigger a search for candidate explanations, including previously unnoticed and potentially transferable rules. The action, the specification of how, and the identification of who represent norms, standards, and regulations, respectively [3].

Norm formation and diffusion

The influence of social norms on recycling behavior in households has been examined within a recycling behavioral framework to analyze the extent of influence [18]. The framework includes four types of recycling activities: segregating at home, actively obtaining materials from others, treating materials as valuable, and communicating about recycling [19]. Fulfilling these aspects influences and is influenced by social influence in a loop. Norm activation occurs subconsciously and operates differently than direct social influence, being influenced by the behavior of other individuals [19]. Displaying behaviors such as placing materials for collection, obtaining materials, and treating materials as valuable increases the perception about what is considered normal behavior. Public policies and measures are sometimes poorly effective due to the existence of self-interest and doubtful-regard mechanisms, and reinforcement of a set of three recycling behaviors can be applied [20]. Research identifies distinct types of social-influence phenomena, leading to different help-structures and changing the influence each individual exerts on others. A pivotal action is necessary to enter the discussion-group influence mode, revealing that not all individuals are equally important in the process [21]. Exploring the dynamics of peer influence within a trapping state where gives and takes of materials may never happen offers insights into collaborative actions [22]. Norms regarding material value and non-zero-sum contributions create a different space compared to more straightforward

norms like recycling and littering. Such norms demand co-evolving behavioral adaptations and are more difficult to stimulate. Recycling activity carries a strict legal norm already becoming a social rule, relying on reinforcement to stay activated [21]. Norm-conditional, social-influence laws induce a discovery of recycling through endowing high material value, inquiring others about material value, and dropping non-zero-sum materials to enter a cooperating state where active discussions circulate recycling issues and comprehensive exchanges materialize. The activated discovery and discussion of recycling behavior gradually feed back into the recycling norm, close to the existing policy to promote sustainability [3 , 1 , 5].

Roles of social influence and identity

Social influence and group identity are powerful motivators of pro-environmental behaviors 6 and play important roles in a circular economy transition [18]. Group membership matters for the formation of environmental norms, creating situations where adherence to norms may be misaligned with individual values and leading to situations in which individuals act in non-sustainable ways to comply with group norms [7]. Multiple consumer identities related to circular behaviors, such as moral, frugal, and wasteful identities, coexist within the same individuals and activate different motivations for circular behaviors [19].

Rebound Effects in Circular Economy Practices

Rebound effects in circular economy practices encompass income gains that can be utilized for additional goods and services, thereby mitigating pollution or resource reduction. The magnitude of these rebound effects remains a topic of debate [20]. Macro-level repercussions emerge when efficiency improvements diminish resource demand, subsequently lowering market prices and spurring heightened demand from consumers or producers [1]. For instance, wind farms, despite being considered environmentally superior to coal power plants due to lower emissions, necessitate energy-intensive inputs such as reinforced concrete, steel, and cement, thus influencing the entire supply chain. Indirect or macroeconomic impacts may modify relative prices and stimulate investments in the face of insufficient capacity, potentially fostering economic growth that deviates from green objectives [21]. While studies have conventionally concentrated on energy rebound effects, the analysis presented here expands the focus to include a model that differentiates between investment and consumption goods [8]. A novel monitoring framework has been established to assess progress in curtailing material footprints, greenhouse gas emissions, and resource dependency [22]. Existing models predominantly emphasize enhanced recycling and resource efficiency, frequently employing static input–output analysis which possesses inherent limitations in forecasting future resource extraction. Such models imply flawless substitution of secondary for primary materials, neglecting considerations of infrastructure investment or endogenous demand. Static frameworks are ill-equipped to investigate leakage and rebound effects whereby heightened demand for recycled products counteracts environmental improvements [23]. The rebound effect posits that the widespread availability of inexpensive recycled products could amplify overall demand, attenuating the efficacy of circular economy initiatives [24]. The leakage effect, conversely, pertains to the transfer of industry from developed to developing nations in response to more stringent regulations, with waste embodied in trade escalating at a pace surpassing domestic waste [9]. Rebound effects may catalyze resource depletion when replenishment rates prove inadequate. The necessity of tailoring measures to specific contexts and income strata is underscored. Such effects frequently impede endeavors to bolster energy efficiency and advance sustainable development through technical innovations or consumer behaviors [1]. Investigations targeting consumer behavior indicate that individuals sometimes perceive a moral license within a singular product domain, resulting in diminished environmental consciousness elsewhere [21]. A theoretical model illustrates how virtuousness motivation can escalate resource consumption via exploration strategies [22]. Historical research presents notable gaps, including a scarcity of studies probing psychological processes and their environmental ramifications, alongside the absence of formal models quantifying behavioral effects on resource utilization [23, 24]. This study delivers an expansive elucidation of exploration–exploitation mechanisms underpinning rebound effects and quantifies their influence on resource consumption and sustainability [10].

Direct and Indirect Rebound Mechanisms

These effects are designated “rebound” effects because they can reverse the expected benefits of circular resource recovery, thereby, discouraging other circular economy, [10] recycling, and mitigation technologies [8]. A direct rebound describes an increase in activity efficiency leading to increased resource consumption due to lower per-unit costs. An example of this is where energy-efficient light bulbs reduce electricity demand that increases the numbers of lights used; thus, result in overall direct savings [1]. An indirect rebound arises when resources freed by one efficiency improvement are applied to additional tasks, leading to overall increased consumption and greater environmental burden [2]. A proportional share of productive resources saved by a temporary 10 % drop in motor vehicle travel, for instance, might subsequently translate into proportional increments in other vehicle-freight activities beyond shipments previously accomplished [3]. Direct and indirect rebounds operate through same general mechanism acting at different temporal, spatial, or aggregation scales[4]. The first resource freed by the activity improves the efficiency of resources; consequently, the structure indicates that these improvements lead to diminished marginal cost pricing.

Measurement and Empirical Evidence

Consumers often decide to pursue the circular economy, i.e. buy second-hand products or repair broken ones, not only with intrinsic dispositions but also because they anticipate lower costs from changes in production or government incentives [2]. However, driving down resource or energy costs might ironically incentivise greater consumption, the rebound effect [6]. Assessing the rebound comprises determining how much extra consumption follows increased efficiency in, for example, automobiles [7]. Similar approaches apply to circular-economy practices, where investigating second-hand markets and public-transport pricing reveals extra purchases of new goods and personal vehicles [11]. Consumers also seek efficiency to reduce time spent on chores. Such savings often yield additional chores, hence monitoring not only the level of effort in cleaning houses but the quantity of cleaning undertaken is essential[12]. In many instances, the rebound is indirect and occurs at a higher level, where the circular economy might reduce the need for separate waste collections yet additional waste arises from more extensive consumption [1].

Policy Implications to Mitigate Rebounds

Environmental policy studies increasingly recognize rebound effects the realization of potential environmental savings that do not occur because of indirect income-dependent responses expanding overall consumption. Circular economy (CE) measures often deliver savings in material resources, waste, pollution, and CO2 emissions, yet comprehensive CE models indicate that growth in demand fed by residual income could exceed savings achieved unless careful policy mitigates rebounds [8, 12]. CE practices encourage longer use and subsequent reuse and recycling of goods. Labelled direct rebounds material savings increased purchases of the same type of good, e.g., buying additional bicycles after already extending the life of a workhorse model and instead classify as indirect rebounds the three pathways that new work identify: architecturally close, similar goods, and temporally distant resourcing[13].One example illustrates teachable rebounds: large housing renovations that extend that building's life often create the income to furnish multiple sets of second homes, sometimes well outside the urban area permanently engaged[14]. Because many consumer circular practices remain local and sometimes also parallel with a totally different material or energy flow [13], physical modelling, but only for local presence, cannot isolate demand mechanistically nor direct-via-input-output effects micro-economically [15].

Methodological Approaches to Studying Behavior in Circular Economy

The circular economy (CE) cannot be achieved through technical and technological advancements alone; substantial and lasting changes in consumer behaviour and in the way people use goods, in general, are also required [1]. Behavioural spillover and social practice theory are relevant for understanding climate-related behaviours but have not been applied to circularity, which focuses instead primarily on product lifetime extension and reuse. Circularity is a complex concept and often difficult to communicate to the general public [16]. For instance, there is a clear distinction between encouraging longer product lifecycles and advocating for reuse. People's knowledge of and familiarity with circularity is relatively low compared to sustainability; therefore, any behavioural framework that assists in clarifying the aims, sectors, and initiatives in this case, tools, where, and how becomes a communication asset[17]. Prioritising the initiative rather than the circularity concept itself is often more effective. To encourage citizens to participate, the circular economy framework must enable them to move beyond the passive consumer role that imposes a sense of helplessness [18]. Engaging citizens as participants rather than merely purchasers also helps them feel part of a wider societal dialogue, making the circular economy personally and socially more relevant [19]. De-justification, which addresses the counter-productive behaviour of storing unwanted items, is part of a more general behaviour encouraging the removal of goods one possesses, whether via extended separation or effective disposal. The determination to store such items arises from beliefs that they continue to retain value or involve complex discharge or disposal considerations [20]. Circumventing or alleviating that rationale opens an opportunity for citizens to channel resources more effectively, whether toward donation, resale, or recycling[21].

Experimental and Quasi-experimental Designs

In recent years the interest in the potential of large-scale behavioral change to support a transition to a circular economy has grown [22]. Simultaneously, the number of studies exploring, testing, and documenting behavioral interventions that aim to stimulate various circular economy practices has increased. Circular economy behaviors span a wide range of practices and activities, however, little is known about the underlying behavioral drivers and the types of policy measures that can stimulate such behaviors [23]. Understanding the behavioral drivers that stimulate circular economy behaviors as well as the potential adverse consequences (e.g., rebound effects) of encouraging these kinds of behaviors is essential for developing effective and sound policies [3]. Four closely related factors can stimulate the adoption of circular economy behaviors: incentives, norms, socio-technical and cultural factors and the avoidance of unintended adverse side effects (e.g., rebound effects) [2]. Circular economy behaviors such as repair, sharing, and refurbishing have the potential to substantially reduce energy and material footprints, when these kinds of circular economy practices are stimulated, it is important to ensure that the rebound effects are minimized (e.g. rebound effects)[1]. The direction and intensity of behavior change induced by nudges, incentives or other interventions is often studied by comparing groups exposed to treatment or intervention with control

groups that are not such exposed. Randomized controlled trials (RCT's) are traditionally regarded as the "gold standard" for policy evaluation but are however less suitable for all circular economy behavior studies since in many cases both ubiquitous widespread polices or changes in the environment and the behaviors of interest aren't isolated enough to allow for a valid experimental design[23]. Other quasi-experimental approaches that rely on observational, before-after comparisons without the use of a formal control group have been developed and applied as an alternative for. Evaluation of interventions aiming to stimulate circular behaviors may also be conducted using other sorts of experimental methods [22]. These include laboratory and field experiments that rely on monetary and non-monetary incentives. Observational conditions would be part of either the laboratory or field experimental design of survey-based studies [24].

Survey and Observational Methods

To understand which factors drive circular economy behavior, researchers commonly turn to survey and observational methods [2]. These techniques have been instrumental in the study of pro-environmental attitudes and actions in general, both validating theoretical models of behavior and identifying barriers and incentives for a broad range of practices [3]. Surveys exploring material circular economy activities have highlighted the importance of perceived inconvenience, low effort, limited social norms, and lack of information, while evidence from the sharing economy indicates that daily job and family responsibilities can preclude circular practices in favor of simpler alternatives [4].In a domain where pro-environmental practices are well established, the emergence of repair communities and the creation of circular economy-related policies have attracted the interest of scholars. Investigations have sought to identify the role of proximity to repair facilities, awareness of associated programs, and socio-economic factors such as gender and age [5]. Prior to the COVID-19 pandemic, qualitative data suggested that the perception of repair as a viable alternative to replacement was increasing, albeit slowly, particularly among younger groups. Job security, although mitigated by telecommuting, emerged as a barrier; others felt overwhelmed and unable to approach the issue [6]. Specific survey questions and observational checklists designed for other author's studies can be employed or adapted to assess circular economy practices, materials, barriers, and motivations [7]. For example, circular economy consideration and engagement have been evaluated within the housing sector through a qualitative-quantitative survey. A parallel approach with standardized items addressing circular economy topics and circularity criteria may serve to determine the scope of the circular economy among different circular practices across materials [8].

Modelling and Simulation

Most captured attention has gone to experimental and survey methods concerning circular economy. However, modelling and simulation (M&S) have provided deep insights into behaviours interacting with circular economy. Relevant frameworks in systems thinking include agent-based modelling (ABM), system dynamics (SD), and multi-agent systems (MAS)[8]. Circles of sustainability model how intention-action behaviours converge towards sustainability. A circle around "pursue time-cycles" represents a time-oriented behaviour that underlies the pursuit of both the fast fashion and circular economy. An "exploration-exploitation" model examines the trade-off between exploration and exploitation of different domains [9]. Upon economising energy during the COVID-19 pandemic, the tendency to return to pre-crisis consumption levels and the impulse to indulge in more time- and energy-intensive practices are both driven by circular economy interventions. Circular economy initiatives hence run the risk of entrenching energy-inefficient exploitation routines and of fuelling rebounds in ephemeral, fast-service consumption [10]. More efficient technologies and behaviours often lead to more (energy) consumption. Rebounds occur via direct channels such as increased frequency or quantity of use. Policy incentives for initial reduction may inadvertently spur rebounds from compensating, indulgent behaviours elsewhere, within the same domain or across bounded behaviours [9].

Case Studies across Sectors

Circular economy behavior is a promising avenue for literature [10]. Nevertheless, existing research on circular economy, including practices and technologies, has generally paid limited attention to behavioral considerations [11]. It should be noted that consumer and business behaviors are crucial to promote circular economy practices widely across sectors [12, 14]. Both the need to better understand these determinants and the opportunity to build on existing disciplines motivate the examination of circular economy behavior. Two recent reviews and meta-analyses provided a robust overview of the large literature on sustainable, low-carbon, and energy-efficient practices and technology adoption, respectively, which serve as sound counterparts to the circular economy behavior framework [15]. The sections that follow illuminate key aspects comprising the circular economy behavior perspective. They follow an outline that delineates, the concept of circular economy behavior, distinguishing it from similar terms, the major incentives driving circular economy behavior, the social norms and cultural factors associated with circular economy practices, the rebound effects hindering progress, the applicable research methodologies, and relevant case studies focusing on consumer electronics, textiles, plastics, and construction [3].

Consumer Electronics and Repair Ecosystems

Consumer electronics represent a significant share of the waste stream, with the recycling and repair rates being low compared to other product categories [16]. There are several drivers to greater circularity in the consumer electronics ecosystem and the emergence of circular systems, which highlight the importance of circular economy behavior in this system. Circular economy behavior is shaped in part by several incentives, encompassing the circular economy incentive typology and rewards [17]. Between 2006 and 2016, global information technology equipment material recovery rate increased. Smartphones are increasingly designed without repairability in mind, impacting production and consumption environmental loads. Circular economy behavior encompasses remanufacture, recycle, refurbish, and repair activities [18]. Encouraging people to repair and maintain rather than replace devices, by promoting repair and spare parts, counteracts the detrimental design trend against repair [15]. Reuse of smartphone accessories among consumers has also been observed [19]. Consumer electronics, comprising communication, computing, entertainment, and other electronic devices, proliferated significantly from 1990 to 2017, but ownership rates are spread unevenly. Growth rates between 2010 and 2021 for various categories exhibit variance; some categories are plateauing, while others show exponential growth [20]. New products and supplementary purchases exacerbate material recovery hurdles [21]. Several European Union Member States previously acknowledged that large home appliances waste collection points are the most immediate improvement opportunity to close the loop [23]. Since 1992, a potential corrective in electronic and electrical equipment is provided through a business-to-business online catalogue and marketplace for the reuse of surplus equipment and to match buyers offering in the region. The scope, or willingness, to buy or sell second-hand small home appliances via online platforms across eleven nations increased by 30% from 2011 to 2017, monitored based on multiple indicators [16].

Textiles and Fashion

Fashion consumption is intrinsically linked to individual identity and societal values, presenting challenges for implementing Circular Economy approaches [17]. Given this context, the evaluation of alternative Circular Economy frameworks in fashion must include consideration of cultural influences, symbolic values, and social norms that shape consumer choices. Initial research has identified Fashion System Dimensions and Fashion Attitude Constructs as elements of interest for analysing Circular Economy frameworks [18]. The Fashion System Dimensions delineate the Economic Dimension, which emphasizes the garment's monetary value; the Socio-Psychological Dimension, in which the garment serves as a vehicle for individual expression; and the Socio-Cultural Dimension, associated with the preservation of cultural heritage [19]. The theoretical construct of Fashion Attitude further influences consumption practices [17].

Plastics and Packaging

A circular economy aims to reduce the demand for raw materials by following the waste hierarchy and focusing on reduction, reuse, and recycling [18]. The concrete, local, and pragmatic nature of required actions makes behavior change a central aspect of the transition. Therefore, understanding the factors influencing circular economy behavior is essential to designing appropriate initiatives and policies [19]. Several behavioral theories, mechanisms, and concepts can help identify and explain these influential factors. These considerations apply to circular economy behavior more specifically [20]. The transition to a circular economy is broadly defined as the ultimate goal to encourage circular economy behavior [18]. The preferred circular economy option is a circular society, as it encompasses much more than just a circular economy; society needs basic structures before an economy can be circular[21]. Circular economy behavior is also closely related to waste management behavior. The quality and composition of waste streams impact the chances of effectively reusing or recycling waste to close the material loop [19]. In addition, many interventions reported in the literature vary in the waste stream and consequently in the specific behavior being targeted [3]. Therefore, action in specific waste streams such as plastics and packaging, textiles and fashion, construction and built environment, and consumer electronics and repair ecosystems strongly influences the choice of factors to focus on [2]. Circular economy behavior is influenced by a set of factors that can be grouped into three broad categories: incentives, norms, and rebound effects [20]. Incentives are additional motivations for behavior change beyond intrinsic motivations. They can be economic, policy and regulatory incentives, or corporate and consumer incentives [21]. Norms are currently one of the strongest drivers for pro-environmental and pro-social behavior change. Several perspectives on the emergence, diffusion, and role of social norms help shed light on how to foster normative and behavioural change toward circular economy practices. Regular use of a circular option can reduce the perceived effort needed to apply that option [22]. The rebound effect can arise in different manners and on various scales. In behavioural terms, it is considered to emerge when the motivation to engage in a circular option decreases as that option becomes more frequently deployed [20].

Construction and Built Environment

The construction and building sectors face significant hurdles in pursuing circular economy strategies [20]. Building construction and demolition represent about 50 percent of total material flows across the European Union (EU) and some member states, which together account for more than 40 percent of annual greenhouse gas emissions

[10]. In general, construction and building materials constitute the highest number of inputs into the EU economy. Two solutions have been proposed to implement circularity and reduce material volumes in construction and building enterprises: [1] resource management, conceived during the design and construction phases, followed by extensive reuse through entire life cycles and the rapid re-integration of material flows, and [2] enhancement of perceptive ownership through sharing and transaction services [21]. The project CIKI aims to analyze and stimulate circularity level actions based on the EU Waste Framework Directive, policy developments, stakeholder requirements, and circular economy ambitions in the built environment [3]. Determining the level of circularity within the building sector and the conditions that promote and challenge circular economy initiatives throughout a building's life cycle represent primary aims of CIKI [4]. Specific drivers and barriers influence the circularity of other industrial sectors in economic and social aspects. Research ongoing in numerous countries across multiple continents seeks to elucidate the interconnections among circular economy value chains and facilitate the growth of circular building economy activities [5]. Essential topics for exploration in academic literature and elsewhere include which materials become available during the processes of refurbishment or demolition and how firms can organize their value chains most appropriately to engage in circular strategies [6].

Policy Design and Governance for Behavioral Change

Individuals and organizations decide to engage in circular economy behavior in the context of incentive structures and social norms that vary across sectors [3]. Incentives for adopting circular economy practices can have a significant influence on decision-making. Well-designed interventions can target decision factors where they matter most, and various kinds of incentives can be deployed accordingly [4]. Nonetheless, identifying the most effective form of incentive for any given choice remains an open problem [5]. Norms similarly adapt to sector characteristics and influence the extent to which organizations adopt circular practices [22]. Green design, for instance, is less commonly adopted in fashion than in consumer electronics because the practice has not yet become the norm. Norms are typically less visible than incentives but still put constraints on the policies and governance structures that organizations consider, and leveraging norms addresses circular economy behavior where incentives may already be optimized [3].

Designing Effective Incentives

Governments frequently resort to three types of economic incentives to stimulate circular economy behavior financial, fiscal, and market-based [5]. Monetary incentives are designed to change the balance between costs and benefits of a circular behavior: they subsidize the cost of acquiring circular goods or impose taxes on linear alternatives [3]. Regulatory measures, such as landfill taxes or incentives for recycling, drive the transition to a circular economy [2]. Market-based instruments motivate thousands of businesses to establish circular production and consumption patterns [6].Policymakers can implement circular economy measures successfully only if they understand the impact of fiscal and financial incentives on citizen behavior [7]. Households accept financial incentives but remain reluctant to sort waste if no financial compensation is offered. The perceived cost of acquiring circular goods remains higher than that of linear options in some cases, causing citizens to retain linear habits [8].

Leveraging Norms and Communications

The design of interventions to promote circular economy behavior can benefit from insights into the motivational power of social norms and the role of communication in norm activation and reinforcement. In contrast to incentives, which govern the trade-off between the costs and benefits of a behavior, norms govern the appropriateness of engaging in a behavior [7]. Circular economy behaviors are more likely to be adopted when they are perceived as socially acceptable or desirable [1]. Norms are notably salient in the context of circular economy actions because they are behaviors that people engage in, and therefore are more visible to others than private choices [8]. This degree of observability creates an opportunity to leverage norm-based approaches to facilitate circular economy behavior [9]. Norms exert a powerful influence on human behavior both consciously and subconsciously. Normative communications are a means of leveraging the influence of social norms to increase circular economy behaviors [10]. Norm-based and descriptive messages that inform individuals about the behavior of others can also activate norms and subsequently encourage circular economy behavior [11]. Norm communications are effective when individuals are aware of who their peers or groups are and can thus relate to normative messages [12]. Norm-based messages work particularly well if individuals assume their behavior is influenced by what others do, a process that reflects social contagion [13]. Norms can be activated by providing feedback on what individuals are doing relative to others [3]. Norm feedback communications indicate whether an individual's behavior is compliant or non-compliant with relevant group norms, reinforcing compliance with 'doing enough' and 'doing the right thing' messages as well as encouraging further action [14].

Monitoring, Reporting, and Accountability

Monitoring, reporting, and accountability are essential for effectively assessing progress toward circular economy (CE) principles [11]. Monitoring entails tracking changes in product and process performance indicators; reporting discloses or communicates information about the disposable, obsolescence, and material of the product; and accountability means an organization accepting performance responsibility and acting to improve that performance

[23]. Company-level sustainability indicators reflect corporate social responsibility along social, environmental, and governance dimensions [12]. Suitable internal sustainability metrics also can facilitate CE performance management [13]. For instance, the percentage of company products designed for easier reuse, disassembly, refurbishment, refurbishment, or recycling clearly signals the integration of eco-design principles in product development and stimulates consideration of the product life cycle [14]. Early work on CE monitoring frameworks and tools highlighted performance indicators specific to circularity, yet significant progress remains. CE indicators mainly reside at the national level, including materials flow analysis, life-cycle assessment, and carbon footprint. Many currently proposed indicators do not adequately capture the systemic, closed-loop features of CE [15, 16]. CE stresses zero waste generation and the importance of interconnectivity among parts, necessitating a systems perspective that considers spatial, temporal, and contextual factors [24]. Developing integrated measurement systems and holistic indicators is critical for evaluating whether nominally circular practices in fact drive meaningful systemic change [17]. Comprehensive indicators expectedly inform policy design, increase awareness, support standard development, and facilitate investment comparisons [18]. To enhance their value, indicators must be embedded in decision-making and implementation frameworks that prioritize managing transition processes and measuring the additional value generated by circular products to secure commercial viability and limit rebound effects [19].

Ethical Considerations and Equity in Circular Economy Behavior

Engaging citizens in the circular economy can help transcend the passive consumer role. Ethical considerations in the circular economy involve addressing resource efficiency, responsible disposal, and social practice theories. Consumer behaviour patterns, including reuse, donation, and waste reduction, are crucial for sustainable development [20]. The role of social influence, public policies, and behavioural insights is vital to promote equitable participation. Challenges include understanding the reasons behind waste storage and disposal behaviours, as well as managing rebound effects and negative spillovers from behavioural changes [21]. Developing frameworks to specify behaviour and establish common understanding of circular economy principles are essential [22]. Promoting social acceptance and addressing controversies in the concept help foster a more inclusive and ethical transition toward sustainability [1]. A policy mix combining both intrinsic and extrinsic incentives is needed to secure high observance of pro-environmental behaviours. Improving external conditions can facilitate norm observance among already motivated individuals [23]. External factors influencing behaviours vary; some are affected by social status, while others depend on infrastructure and habits. The drivers of each behaviour depend on perceived costs, whether behaviours are income-neutral or involve economic rewards or losses. Financial problems negatively impact recycling rates, even when recycling is cost-neutral, as economic stress can divert attention from environmental norms [24]. Bottle Bill legislation effectively increases recycling adoption rates and can counteract the negative effects of financial hardship. Extending deposit container laws to more materials and countries would improve recycling rates. Lower-income individuals are less likely to choose less-packaged or durable products, often due to lower cost of less sustainable options [2].

CONCLUSION

Behavioral change is a cornerstone of the successful transition to a circular economy. This paper has demonstrated that the adoption of circular economy behaviors including recycling, repair, reuse, sharing, refurbishment, and responsible consumption is shaped by a complex interaction of economic incentives, policy measures, social norms, cultural values, and institutional frameworks. While financial rewards, regulatory instruments, and corporate initiatives can motivate participation in circular practices, their effectiveness is significantly enhanced when combined with intrinsic motivations, public awareness, and supportive social norms that reinforce environmentally responsible behavior.The analysis further highlights that social influence and collective identity play a critical role in normalizing circular practices and encouraging long-term behavioral change. However, the benefits of circular economy initiatives can be undermined by rebound effects, whereby improvements in efficiency or cost savings stimulate higher levels of consumption, thereby reducing or offsetting anticipated environmental gains. Consequently, policymakers and practitioners must design interventions that anticipate and mitigate these unintended consequences through comprehensive policy mixes, behavioral insights, and effective governance mechanisms. Evidence from multiple sectors, including consumer electronics, textiles, plastics, and the built environment, demonstrates that successful circular economy implementation requires context-specific strategies supported by rigorous monitoring, stakeholder collaboration, and continuous evaluation. Experimental, observational, and simulation-based research methods further provide valuable evidence for understanding behavioral drivers and assessing policy effectiveness. Ultimately, the transition to a circular economy extends beyond technological innovation and resource efficiency to encompass fundamental changes in human behavior, institutional practices, and societal values. By integrating well-designed incentives, strengthening positive social norms, addressing equity concerns, and minimizing rebound effects, governments, businesses, and citizens can collectively accelerate the transition toward a more resilient, inclusive, and sustainable circular economy that delivers long-term environmental, economic, and social benefits.

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