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Circular Economy: An Introduction and Overview

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Introduction

The accumulation of waste and pollution in nature and urban and rural environments is the highly visible sign of the shortfall of the prevailing take, make, use and throw-away linear system of production and consumption. The juxtaposition is framed as Circular Economy (CE), a concept based on a take, make, use, recover and repeat circular system of production and consumption.

It is appropriate to approach CE as an expansion of Sustainable Consumption and Production (SCP). SCP has been on the international policy agenda since the 1992 Rio Conference and has largely focused on actions consumers and producers can take towards waste prevention, energy and water efficiency, etc., and the policies and partnerships that can scale up and mainstream such initiatives, as, amongst others, reflected in the stand-alone Sustainable Development Goal 12.

CE practice and policy are more recent, and have only entered the mainstream public discourse during the late 2010's.[1] Complementary to SCP, CE aims for a transformation of the economy, its key contributing sectors and the provisioning systems these are supporting, particularly: food, built environment, mobility and energy. SCP is integral to CE, however, not specifically focused on achieving the CE aim of an economy based on fully closed and circular material cycles. Vice versa, CE provides new impetus for SCP: the 2024 Pact of the Future therefore confirmed CE as the '*pathway for ambitious SCP and climate action*'.[2]

CE shares much of its ambitions with the Green Economy and, to a lesser extent, Bio-Economy, with e.g. Thailand even merging these into a concept of Bio-Circular-Green (BCG) Economy. As a point of differentiation, CE may have its first focus on inputs from nature into the economy (materials, energy and water), with Green Economy having its first focus on outputs of the economy into nature (waste, pollution) whilst the Bio-Economy is exclusively focused on maximizing the sustainable use of biomass and bioresources as energy and material inputs to the economy.

Materials Matter

Human life and wellbeing are contingent on maintaining the equilibrium in planetary conditions, a situation that is gravely at risk as six out of the nine – known - planetary boundaries are being progressively transgressed.[3] The unsustainable use of materials is the common root cause. Globally, the extraction and processing of material resources accounts for over 90% of impacts on land-use related biodiversity loss and water stress, over 55% of greenhouse gas (GHG) emissions (60% if land use change is included) and up to 40% of particulate matter related pollution.[4] Materials resource use globally tripled over the past five decades, and materials productivity – measured as the economic value generated per tonne of materials used – remained stagnant, with just 0.7% annual growth over the same period, a meagre comparison with the growth in energy and labour productivity over the same period.[5] The world needs to urgently and radically transform the management and use of material resources to mitigate the triple planetary crises at its roots, for which the CE has gained traction.

The Evolving Circular Economy Concept

There is currently no single Circular Economy interpretation. This poses a challenge for taking action, feeds scepticism among stakeholders and provides a breeding ground for different shades of greenwashing.[6] The plurality of CE concepts is a reflection of the different schools of thought that seeded CE concepts and its practice.

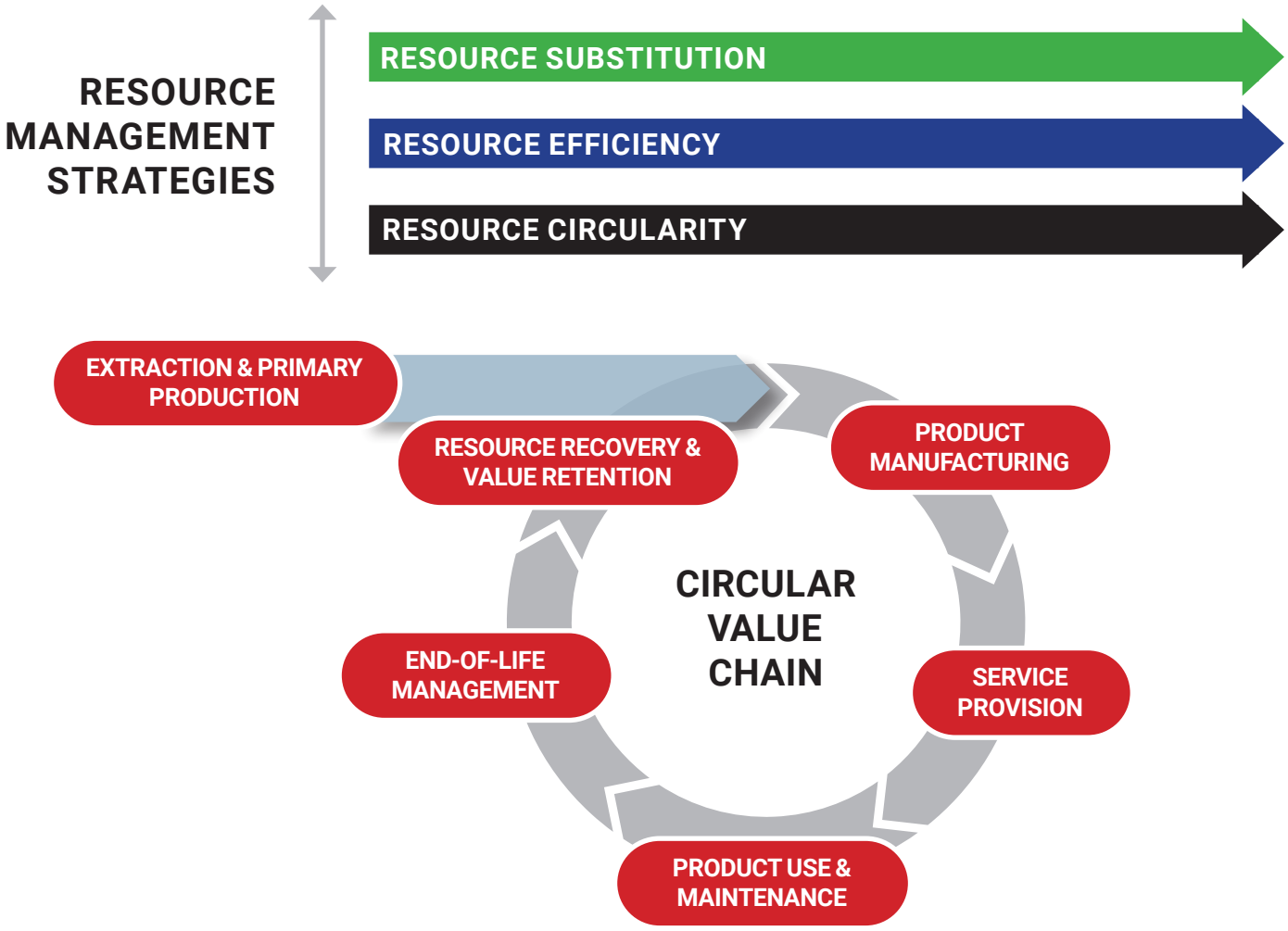
- First, an ecosystem metaphor that applies the material flow principles observed in nature into industrial systems, particularly: to eliminate waste; to circulate products and materials; and to regenerate nature.[7]
- Second, the established waste management hierarchy based on 3Rs (Reduce, Reuse, Recycle) has expanded to a CE hierarchy based on 10 (or even more) Rs (Refuse, Rethink, Reduce, Reuse, Repair, Refurbish, Remanufacture, Repurpose, Recycle and Recover).[8]
- Third, CE retains the economic value of products and components, particularly at the end of their life, calling for circular business models that slow, narrow, close or regenerate the use of materials.[9]
- Forth, CE is the practical way to decouple the economy and well-being from natural resource use through more circular, longer and more efficient use of materials and switching to renewable materials. [10]

Combining these perspectives, CE is best positioned as a system's solution to the use of – virgin - materials and other natural resources and discharge of – wasted – materials and other natural resources, with a view to bring both net inflows and net outflows into and from the economy and society as close as possible to zero. This system's perspective is aligned with the ISO59004 CE standard.[11] However, even with this standardization different CE interpretations are likely to prevail in the future.

Towards a Circular Economy Taxonomy

The EU SWITCH-Asia Policy Support Component has convened global dialogues with the Global Green Growth Platform (GGKP)[12] and regional Circular Economy knowledge platforms worldwide to converge towards a unifying CE taxonomy. This – work in progress – taxonomy approaches Circular Economy as: *"product- or business-process innovation at any stage in the development, use and retention of the user value of products and/or services that directly contribute to sustainable use of all natural resources, particularly through resource circularity, resource efficiency (including longevity) and resource substitution"*. As illustrated below, this positions CE as a two-dimensional innovation space, framed by six circular value chain stages and three resource management strategies. Working level descriptions of each are provided in below table.

1. Resource Management Strategies	
1. Resource Circularity	Keeping material and other natural resources in continued use through the recovery and repeat application of previously discarded materials, water and/or energy.
2. Resource Efficiency	Using materials and other natural resources (including energy, water and others) more efficiently, including using these more intensively and/or for an extended useful period of time.
3. Resource Substitution	Substituting a non-renewable (fossil- or mineral-based) material and/or energy by a renewable alternative.



2. Circular Value Chain Stages	
1. Extraction & Primary Production	The production of primary (also '*virgin*') materials as inputs for product manufacturing and/or service provision, including extraction, mining, agriculture, forestry and fisheries and associated primary materials production.
2. Product Manufacturing	The production of products, including its parts, components and packaging.
3. Service Provision	The provision of services, including the sourcing of the products consumed for and during the service provision.
4. (Product) Use & Maintenance	The use of products, including all activities required for their continued, efficient and effective utilization, such as servicing, cleaning, repairing, etc., as required.
5. End-of-Life Management	The segregation, collection and sorting of post-consumer waste of discarded products (and/or its consumables, parts and/or packaging) and of pre-consumer waste of discarded materials, water and/or energy generated during extraction, primary production, product manufacturing and/or service provision, and logistics and distribution.
6. Resource Recovery & Value Retention	The conversion of end-of-life material, water and/or energy resources into valuable secondary inputs and their application in any of the preceding stages of the same or any other circular value chain.

The implementation of circular innovations offers perspective for benefits to environment, economy and society. By advancing resource circularity, resource efficiency and resource substitution, CE can contribute to minimizing climate change, loss of nature and biodiversity, and pollution and waste (collectively the triple planetary crises of the present time), whilst also contributing to adaptation to climate change and addressing the losses and damages caused by climate change. The CE unlocks economic opportunity through value creation (reduction of resource use costs, increases in productivity and profitability), strategic advantage (expanding and diversification of products and markets) and economic resilience (reduced risks and improved continuity) – each of which can apply at micro level (firms and other economic units), meso-level (economic sectors or regions) and macro-level (economies). Furthermore, CE has potential to support social progress, in particular in terms of social security (ability to physically or financially provide for human needs), healthy society (ability to enjoy good health) and resilient society (preparedness for and ability to recover from adverse events).

SWITCH-Asia found that turning CE ideas into commercial realities at scale was critical dependent on having a sense of purpose, systematic innovation and design, utilizing both academic and practical and tacit knowledge, including traditional knowledge and proven cultural practices, and entrepreneurialism.

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