

Trade, Investment and Innovation

The Secrets to Unlocking the Next Frontier for a Circular Economy in the Asia-Pacific Region



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Executive Summary

The Asia-Pacific region has experienced rapid industrialization, population growth, and improved living standards over the past few decades. These developments, however, have led to increased material extraction, consumption, and waste generation, exacerbating global environmental challenges such as biodiversity loss and pollution. The linear “take-make-waste” economic model that dominates the region is unsustainable, with countries breaching critical planetary boundaries. A shift to a circular economy, which aims to decouple economic growth from environmental degradation, offers a solution by promoting systems where materials are used efficiently with limited waste, and nature is regenerated.

The circular economy presents a transformative approach for Asia-Pacific countries, many of which have expressed a growing interest in such strategies. Despite this interest, widespread action is yet to arise. Without bold, ambitious measures, the circular economy risks becoming just another concept, and the region may miss out on the opportunity to balance economic development with environmental sustainability.

Key Drivers of Circular Economy Implementation

Businesses in the Asia-Pacific region, from micro, small and medium enterprises (MSMEs) to large multinational corporations, play a pivotal role in driving circular economy activities. These businesses are uniquely positioned to integrate circular principles into their supply chains and offer circular

solutions. However, governments must create enabling environments to support and accelerate these activities. There are six key drivers for unlocking the circular economy across the region:

1. **Infrastructure:** Adequate digital and physical infrastructure is necessary to support circular activities such as waste separation, recycling, and resource recovery. Digital platforms can facilitate the exchange of recyclable materials, while physical systems for waste management, like those seen in China and the Republic of Korea, can significantly enhance recycling rates.
2. **Regulation:** Effective regulatory frameworks can incentivize businesses to adopt circular practices. For example, Japan and the Republic of Korea have implemented Extended Producer Responsibility (EPR) systems that hold manufacturers accountable for their products’ entire lifecycle, including post-consumer waste management. These regulations encourage businesses to design products with recyclability in mind and promote the use of recycled materials.
3. **Education:** Education and capacity building are critical for equipping the workforce with the skills needed to support circular economy activities. Programs such as Toyota’s employee training on sustainable practices are essential for fostering a circular mindset.

4. **Finance:** Financial instruments, including public and private funding, are vital to scaling up circular economy initiatives. Companies like Neste and Indorama Ventures have benefited from green financing frameworks and blue loans, enabling them to invest in practices such as recycling infrastructure and renewable energy production.
5. **Innovation:** Innovation is at the core of advancing the circular economy. Companies in the region have pioneered new business models, such as Viet Nam's Glassia Water, which offers bottled water as a service using refillable glass bottles. Additionally, regenerative agriculture initiatives in China exemplify how innovative practices can contribute to circularity.
6. **Collaboration:** Collaborative efforts between governments, businesses, and other stakeholders are crucial for scaling up circular solutions. Industrial symbiosis, as seen in Japan's Kitakyushu Eco-town project, demonstrates how businesses can collaborate to turn waste from one entity into resources for another, maximizing resource efficiency and reducing environmental impacts.

Policy Landscape and Maturity

Governments in the Asia-Pacific region have made varying levels of progress in developing circular economy policies. Japan, the Republic of Korea, and China are at the forefront, with comprehensive policies already implemented, such as Japan's Circular Economy Vision 2020 and the Republic of Korea's EPR framework. However, many other countries are still in the early stages of policy development, with some formulating roadmaps and calls to action.

The report identifies 79 policies across the region, each at different stages of maturity, from early-stage frameworks to fully implemented policies through enacting laws, regulations, and/or

economic or fiscal incentives. These policies cover critical areas such as waste management, recycling, and resource efficiency. Policy development and implementation lessons learned include:

1. Trade policies need to align with circular economy goals to avoid negative spillovers and support global sustainability efforts.
2. The success of new circular economy policies also relies on the effective enforcement of existing waste management and other related environmental regulations.
3. Society needs to be engaged to embrace shifts in consumption patterns and ensure their success. This is crucial when implementing circular economy policies. A significant obstacle is the frequent focus on waste management without equal emphasis on reducing waste at its source.

Business Initiatives in Circularity

Several businesses in the Asia-Pacific region have already taken significant steps toward implementing circular economy principles with and without government support. These businesses include Budweiser Brewing Company Asia-Pacific Limited; City Developments Limited; CLP Holdings; En+ Group; Indorama Ventures; Mahindra Group; and Unilever PLC. These examples highlight the potential for businesses to lead the circular economy transition. However, scaling these efforts across the region requires more robust government support and policy alignment. Key implementation challenges are high initial investment and upfront cost; supply chain and operational challenges; and ambiguity in definitions and requirements; consumer behavior and market demand; and limited capacity of organizations to implement and adopt circular economy policies.

The Next Frontier for Circular Economy in the Asia-Pacific Region

To fully unlock the potential of the circular economy, countries in the Asia-Pacific region must move beyond awareness and take decisive action. Governments need to implement and enforce policies that incentivize circular practices, while businesses must continue to innovate and collaborate. The next frontier for circularity in the region will be characterized by a level playing field where circular products and services are competitive in the market and linear practices are phased out.

With the right infrastructure, regulations, education, financial support, innovation, and collaboration, the Asia-Pacific region can lead the global transition toward a sustainable, circular economy that benefits both society and the planet.

I: INTRODUCTION

The Situation

The Asia-Pacific region has undergone widespread industrialization, population growth, and improvement in quality in life over the past decades, but this has also led to surges in material extraction, consumption, and waste generation. Like the rest of the world, countries in the Asia-Pacific region have relied on the linear take-make-waste economic model which has intensified global challenges such as breaching six out of the nine planetary boundaries which include biodiversity loss and environmental pollution (Richardson et al., 2023). The circular economy offers an exit from the status quo through creating a system where materials do not become waste and nature is regenerated so that economic development and environmental degradation can be decoupled from each other.

Countries in the Asia-Pacific region need a deep transformation into a circular economy as an important part of the way forward for development and leaders in this region have expressed significant interest in this (Lau et al., 2024). Within the past several years, the number of dialogues, debates, and public news stories about the circular economy has almost tripled which provides evidence of greater awareness and interest (Circular Economy Foundation, 2024). Although this is a positive development, speeches and targets announced have not yet been converted into ground-level actions and real impacts. Without any bold or ambitious actions, the circular economy will

remain as just a widely discussed concept at best and countries will miss opportunities to redefine how humanity within the Asia-Pacific region can find a balance between the needs of society and the limits of the planet.

Businesses of all sizes from micro and small-medium enterprises (MSMEs) to large-scale at the national and multinational level are the engine that run economies in the Asia-Pacific region by producing goods and services that meet the needs of society. At the same time, businesses have a critical role to fulfill to make circular economy a reality whether it is through applying the principles of the circular economy into their supply chains or through providing circular solutions. Businesses cannot take on this enormous mission alone. Governments across the Asia-Pacific region need to accelerate implementation of policies that support circular economy activities. Many circular economy policies already exist in the Asia-Pacific region, but they are at different levels of maturity. Businesses need wider support to scale up their circular activities.

There are several key elements required to both push and pull businesses to accelerate implementation of circular economy activities in the Asia-Pacific region. These key elements are infrastructure, regulation, education, finance, innovation, and collaboration. Businesses and governments are

already aware of solutions for each of these key elements to drive circularity, and success stories exist. However, it remains important to scale-up these efforts and continue to spread awareness.

The United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) promotes cooperation between its 53 member States and 9 associate members to pursue solutions to sustainable development challenges. ESCAP oversees a Sustainable Business Network (ESBN) that comprises business leaders, chief executive officers, and heads of sustainability from companies from and/or with substantial operations in the countries/economies of the ESCAP region. As building a circular economy is a priority area for improving development of the Asia-Pacific region, ESBN has established a task force on this matter. The task force aims to promote change towards more circular production and consumption, which involves sharing, leasing, reusing, repairing, refurbishing and recycling existing materials and products as long as possible.

The Purpose

ESCAP has commissioned this position paper to provide insights to motivate businesses and governments to support each other in accelerating the implementation of circular economy activities in the Asia-Pacific region. Specifically, this report aims to answer the question

“What can businesses in the Asia-Pacific region do to implement circular economy activities and how can better government policies accelerate progress?”

This report will explore

- What can both governments and businesses do to implement more circular economy activities in the Asia-Pacific region?
- What are successful examples of government policies that have encouraged businesses to implement more circular economy activities?
- What types of circular economy activities have businesses in the Asia-Pacific region implemented?
- How do regulation, innovation, collaboration, education, infrastructure, and finance drive more businesses to implement circular activities in the Asia-Pacific region?

This report will help readers understand

- The maturity of circular economy policies in the Asia-Pacific region
- The types of policies that can be developed and implemented to support circularity
- Examples of how policies can lead to more circularity activities in the Asia-Pacific region
- What leading businesses are doing to implement circular economy in the Asia-Pacific region
- Actions governments and businesses in the Asia-Pacific region must take to push the boundaries of a circular economy.

The scope of the research conducted covers all countries in the Asia-Pacific region, specifically in East and North-East Asia, North and Central Asia, Pacific, South and South-West Asia, and South-East Asia (Economic and Social Commission for Asia and Pacific (ESCAP), 2023). After this introduction, Chapter 2 briefly introduces the circular economy, categorizes the various kinds of circular activities,

and presents the opportunities and urgency for a circular transformation in the Asia-Pacific region. Chapter 3 discusses how circular economy activities support the United Nations Sustainable Development Goals (SDGs). Chapter 4 discusses how infrastructure, regulation, education, finance, innovation, and collaboration are the secrets to unlocking a circular economy. Chapter 5 reviews the maturity of 79 circular economy policies identified in the Asia-Pacific region. Chapter 6 presents examples of businesses that are members of the ESNB that have implemented circular economy initiatives in the Asia-Pacific region and discusses the challenges businesses often must overcome. The report closes with Chapter 7 that sets a vision for the next frontier of the circular economy in the Asia-Pacific region and calls for actions that must be taken.

The examples of circular economy activities provided in this report are intended to illustrate various approaches across the Asia-Pacific region. They are not meant to imply that these are the only effective or comprehensive examples available. There are numerous other initiatives that contribute to circular economy efforts, each with its own unique context, challenges, and successes.

II: CIRCULARITY AT A GLANCE

What is the Circular Economy?

The circular economy concept represents a system where materials do not become waste and nature is regenerated. A circular economy aims to keep products and materials in circulation for as long as possible through activities such as maintenance, reuse, refurbishment, remanufacturing, recycling, and composting (see Figure 1). The circular economy seeks to decouple economic activities from consumption of finite resources, which can address global environmental challenges such as climate change, biodiversity loss, waste, and pollution. The circular economy is based on three principles which are:

1. **Eliminate waste and pollution:** Move away from the linear take-make-waste system
2. **Circulate products and materials at their highest value:** Keep materials in as a product or as components or raw materials
3. **Regenerate nature:** Support natural processes and allow for more space for nature to thrive.

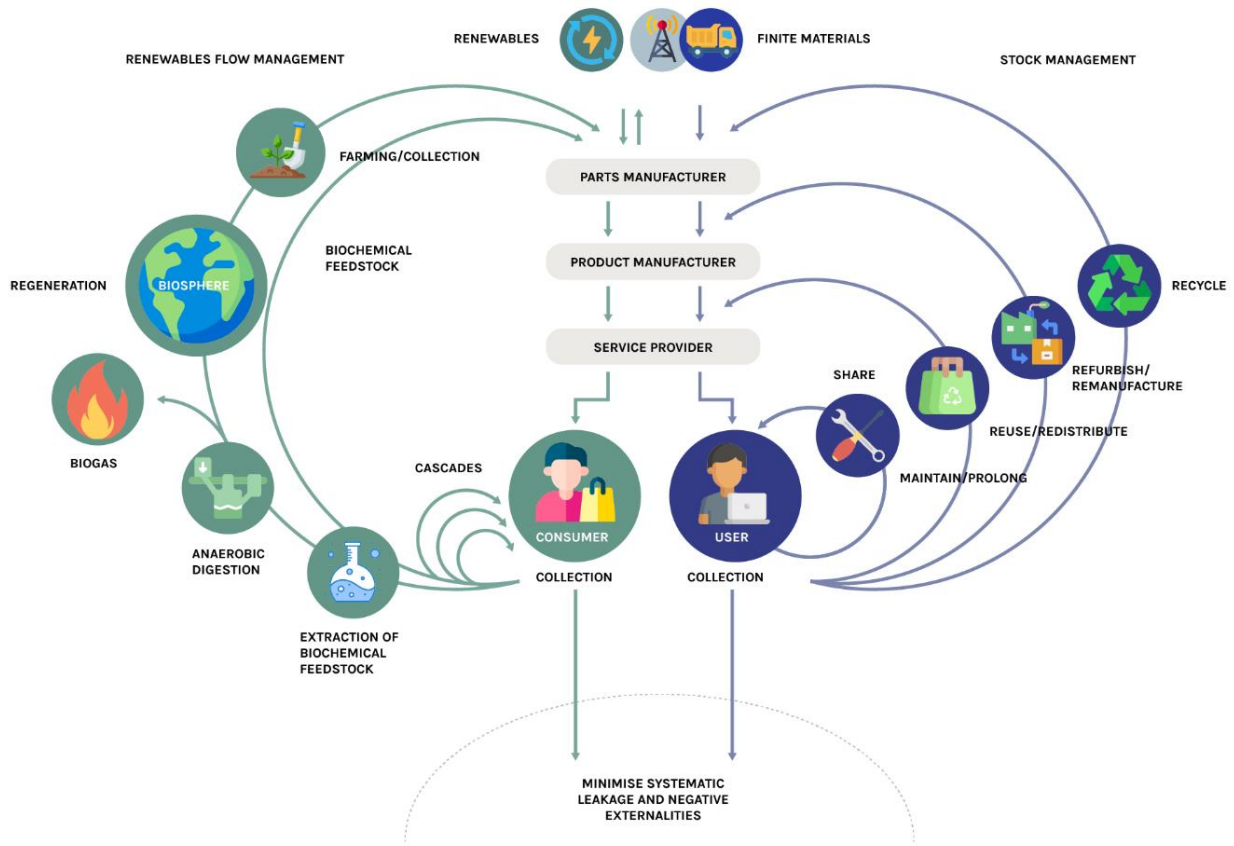
Eliminate waste and pollution. A linear take-make-waste system is a traditional economic

model where resources are extracted, used to produce goods, and then discarded as waste after consumption. This system contributes to waste and pollution because materials and energy are used only once, leading to the accumulation of discarded products in landfills and environmental degradation. Transitioning to a circular system emphasizes reusing, recycling, and regenerating resources, ensuring that materials remain in use for as long as possible. By doing so, we can significantly reduce waste and pollution, minimize resource extraction, and promote sustainability through more efficient use of resources.

Circulate products and materials at their highest value. This can be achieved by adhering to the waste hierarchy, a framework that prioritizes waste management strategies, starting with prevention, followed by reuse, recycling, recovery, and disposal as the last resort. The waste hierarchy emphasizes minimizing waste generation and maximizing the value of materials through reuse and recycling, reducing the need for new resources. By adhering to the waste hierarchy, we can reduce environmental impacts, conserve resources, and support the transition to a more sustainable, circular system.

Regenerate nature. Regenerating nature means

Figure 1. Visualization of the Circular Economy



restoring ecosystems, enhancing biodiversity, and allowing natural systems to renew themselves, rather than depleting them through human activity. This aligns with the principles of the circular economy by ensuring that natural resources are sustainably managed, allowing them to recover and continue providing vital services. By prioritizing regeneration, the circular economy promotes the health of ecosystems, reduces resource extraction, and supports long-term environmental sustainability.

Types of Circular Economy Activities

Achieving a circular economy requires deep changes across a complex system that upholds economies in the Asia-Pacific region. The solutions for creating a circular economy in the Asia-Pacific region will need to operate across different parts of a larger system built on collaboration and partnerships. Solutions should address the root cause of problems to create lasting change as opposed to short-term approaches that address only the symptoms. There are many different types of activities that can support the goals of the circular economy. These activities can broadly be organized into four categories that cover design, use, value recovery, and overall circularity support (European Commission, 2020).

Circular Design and Production Models. Design and produce products and materials with the aim of retaining long-term value and reducing waste. Promote dematerialization by making products redundant (i.e., eliminating the need for the product altogether) or replacing them with radically different product or service.

- Design and production of products and assets that enable circular economy strategies, through e.g. (i) increased resource efficiency, durability, functionality, modularity, upgradability, easy disassembly and repair; (ii) use of materials that are recyclable or compostable
- Development and deployment of process technologies that enable circular economy strategies
- Development and sustainable production of new materials (including bio-based materials) that are reusable, recyclable or compostable
- Substitution or substantial reduction of substances of concern in materials, products and assets to enable circular economy strategies
- Substitution of virgin materials with secondary raw materials and by-products.

Circular Use Models. Life extension and optimized use of products and assets during the use phase with the aim of retaining resource value and reducing waste to help improve usage and support service.

- Reuse, repair, refurbishing, repurposing and remanufacturing of end-of-life or redundant products, movable assets and their components that would otherwise be discarded

- Refurbishment and repurposing of end-of-design life or redundant immovable assets (buildings/infrastructure/facilities)
- Product-as-a-service, reuse and sharing models based on, including but not limited to, leasing, pay-per-use, subscription or deposit return schemes, that enable circular economy strategies
- Rehabilitation of degraded land to return to useful state and remediation of abandoned or underutilized brownfield sites in preparation for redevelopment.

Circular Value Recovery Models. Capture value from products and materials in the after-use phase

- Separate collection and reverse logistics of wastes as well as redundant products, parts and materials enabling circular value retention and recovery strategies
- Recovery of materials from waste in preparation for circular value retention and recovery strategies
- Recovery and valorization of biomass waste and residues as food, feed, nutrients, fertilizers, bio-based materials or chemical feedstock
- Reuse/recycling of wastewater.

Circular Support. Develop enabling digital tools and applications, education and awareness-raising programs, and advisory services to support circular economy strategies and business models

- Development/deployment of tools, applications, and services enabling circular economy strategies.

The Opportunities and Urgency for a Circular Transformation

Businesses in the Asia-Pacific region stand to gain significant benefits through implementing circular practices through products, services, and business models. These benefits include:

- **Cost savings from resource efficiency.** Through designing products for reuse, re-manufacturing, or recycling, companies can reduce their dependence on virgin materials and reduce raw material costs. Reducing waste generation and energy consumption will also lead to cost reductions during operations. For example, French-based Schneider Electric uses recycled content and recyclable materials in its products, prolongs product lifespan through leasing and pay-per-use, and has introduced take-back schemes into its supply chain. Circular activities accounted for 12 per cent of its revenues and saved 100,000 tonnes of primary resources from 2018-2020 (World Economic Forum, 2020).
- **New jobs and livelihoods.** The circular economy creates new jobs and livelihoods by fostering opportunities in recycling, re-manufacturing, and sustainable product design, which require skilled labor and innovation. Start-ups are driving this growth by developing innovative business models that emphasize reuse, repair, and resource efficiency, further expanding employment opportunities across various sectors.
- **Revenue from new business models.**

Product-as-a-service business models such as leasing, or subscription services can create continuous revenue streams instead of one-time sales.

- **Improved customer loyalty and brand value.** Companies that embrace circular practices can stand to enhance their brand image. This can help companies distinguish themselves in the market to consumers that are more eco-conscious.
- **Regulatory compliance.** As global markets and countries in Asia-Pacific implement more environmental regulations, companies that implement circular practices will stay ahead of financial penalties covering waste disposal, recycling mandates, emissions control.

Companies that fail to embrace circularity risk losing access to existing or new markets to sell their products and services and may not meet the expectations of investors that are building in circularity into their decision-making.

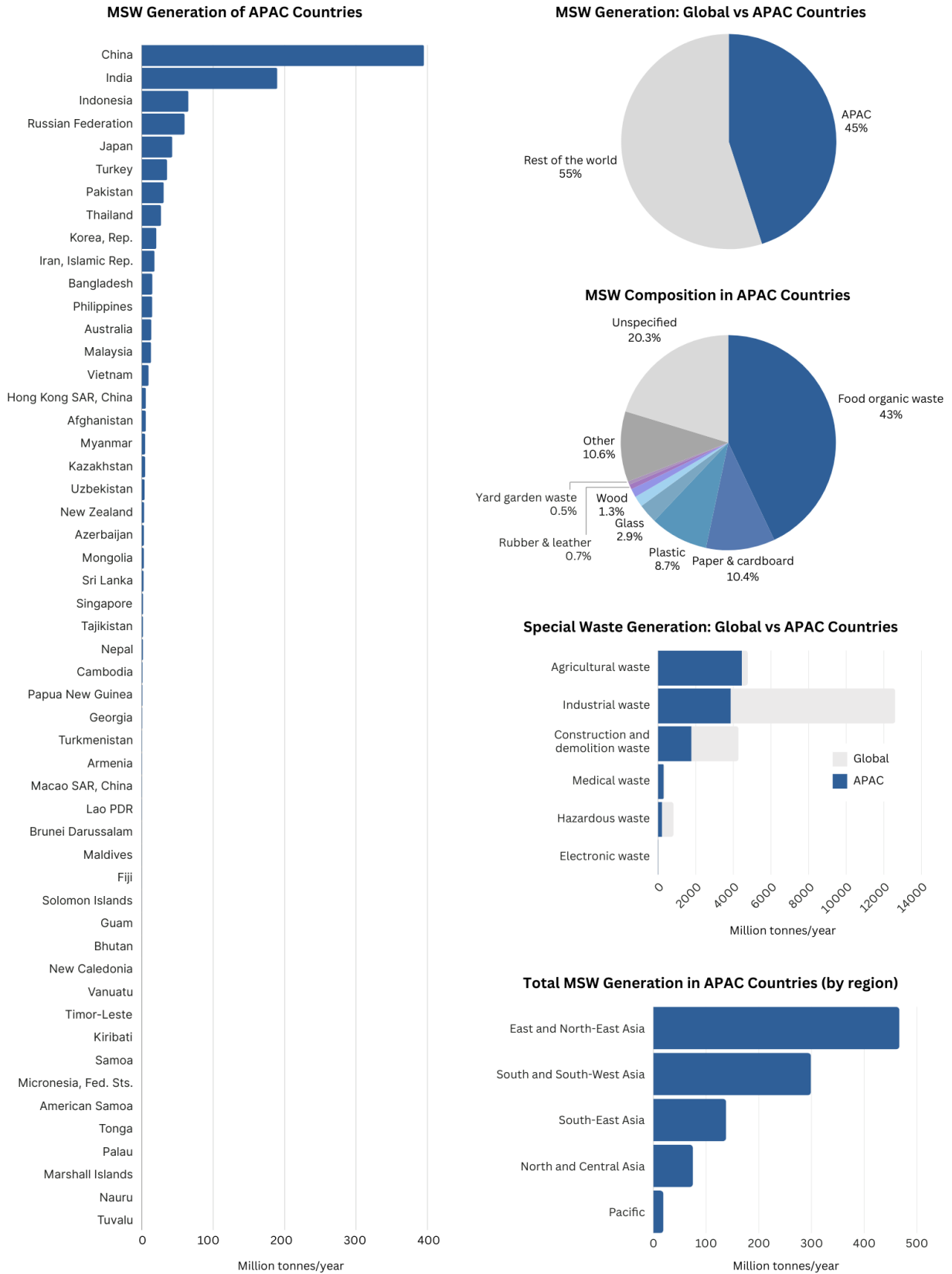
The Asia-Pacific region is in dire need to accelerate implementation of circular economy activities to deal with the growing demands for materials to power economies in the region and the consequential volumes of unmanaged waste.

- **Domestic material consumption.** The Asia-Pacific region's average domestic material consumption per capita in 2019 was 13.4 tonnes per capita, which is 18 per cent higher than the global average domestic material consumption (11.4 tonnes per capita) (Our World in Data, 2019).
- **Waste generation.** The Asia-Pacific region represents almost half (45 per cent) of the

total amount of municipal solid waste (MSW) the world generates each year (World Bank Group, 2024). Food and organic waste make up half (54 per cent) of all municipal solid waste generated in Asia, followed by paper and cardboard (13 per cent), and plastic (11 per cent). In terms of special types of waste,

agriculture waste is the highest, followed by industrial waste from a variety of manufacturing processes, and construction and demolition waste. Figure 2 illustrates the status of waste generation in the Asia-Pacific region (World Bank Group, 2024). This includes municipal solid waste (MSW) and other types of waste.

Figure 2. Waste Generation and Composition in the Asia-Pacific Region



III: CIRCULARITY AND THE SUSTAINABLE DEVELOPMENT GOALS

What are the SDGs?

The UN SDGs, established in 2015, encompass a comprehensive set of global objectives aimed at eradicating poverty, safeguarding the planet, and ensuring prosperity for all by 2030. There are 17 SDGs with 169 targets that can be categorized into three broad areas: social, economic, and environmental. The environmental and economic goals (SDGs 7-9 and 11-15 respectively) emphasize affordable and clean energy, decent work and economic growth, industry innovation and infrastructure, sustainable cities, responsible consumption and production, climate action, and the protection of life below water and on land. The social goals (SDGs 1-6, 10, 16) focus on eliminating poverty and hunger, promoting health and well-being, providing quality education, achieving gender equality, ensuring clean water and sanitation, and reducing inequalities. SDG17 promotes global partnerships to advance all the SDGs.

The connection between the SDGs and the circular economy is inherent and mutually reinforcing, with the circular economy holding significant potential to advance the SDGs established by the United Nations. The most robust synergies between circular economy practices and SDG targets exist in SDG6 (Clean Water and Sanitation), SDG7 (Affordable and Clean Energy), SDG8 (Decent Work and Economic Growth), SDG12

(Responsible Consumption and Production), and SDG15 (Life on Land), which demonstrate high levels of both direct and indirect contributions (Schroeder et al., 2019). More circular initiatives are emerging that improve livelihoods, empower individuals, and generate social benefits around the world (Kirchherr et al., 2017). These initiatives also set new examples of how a circular economy can also contribute to socially oriented goals such as SDG1 (No Poverty), SDG2 (Zero Hunger), SDG3 (Good Health and Well-being), SDG5 (Gender Equality), and SDG10 (Reduced Inequalities).

The SDGs can be achieved through circular economy activities at various levels: micro (products, companies, consumers), meso (eco-industrial parks), and macro (cities, regions, nations, and beyond) (Ghisellini et al., 2016a). Key strategies applied in these circular economy activities often include:

- **Retaining product ownership.** Companies adopting this strategy follow sustainable practices such as recycling raw materials and shifting from selling products to leasing them. The producer remains responsible for product maintenance and after-sales services. Such business models help reduce waste, conserve natural resources, and

minimize pollution, aligning with SDGs 6, 7, 11, 12, 13, and 17.

- **Product life extension.** This approach emphasizes designing goods with longer lifespans, reducing the need for frequent repurchases, promoting durability as a competitive advantage, and often allowing for premium pricing. This contributes to building sustainable communities and fostering consumer behaviors that support long-term environmental health, aligning with SDGs 3, 16, and 17.
- **Design for recycling.** Companies enhance material recoverability by redesigning products and manufacturing processes and often collaborate with experts in material recovery. These activities not only align with SDG12 (Responsible Consumption and Production) but also drive economic growth by creating new business models and job opportunities, contributing to SDGs 1, 8, and 9.

The circular economy emphasizes resource efficiency and sustainable consumption and production which are also key principles for achieving sustainable development. Resource efficiency involves optimizing the use of resources in production and consumption while minimizing negative externalities in the input-output process. Sustainable consumption and production refer to “the use of services and related products that meet basic needs and improve quality of life while minimizing the use of natural resources, toxic materials, and the emission of waste and pollutants throughout the lifecycle of the service or product” (United Nations, 2015a). In this context, SDG12, which focuses on “ensuring sustainable consumption and production patterns,” is particularly relevant to the circular economy, as its targets aim to integrate waste to the economic system

through closed-loop processes that mitigate negative externalities.

Responsible Consumption and Production

The primary goal of SDG12 is to establish sustainable global consumption and production patterns. To address these issues, SDG12 includes eight specific targets that promote efficient natural resource use, halving per capita food waste, sound management of chemicals and waste, reducing overall waste generation, and fostering sustainable business practices, public procurement, lifestyle awareness, and rationalizing fossil fuel subsidies. The circular economy can contribute to SDG12 by promoting the design of products with longer lifespans, reusability, and recyclability, aligning with SDG12.5, which aims to significantly reduce waste generation through prevention, reduction, recycling, and reuse. For example, Japan’s focus on resource efficiency and waste reduction through its “Fundamental Plan for Establishing a Sound Material-Cycle Society” has resulted in substantial decreases in waste generation and improvements in recycling rates (Ministry of Environment, 2000).

Circular economy practices also specifically contribute to SDG12.2 (efficient use of natural resources) and 12.4 (environmentally sound management of chemicals and all wastes throughout their lifecycle) by encouraging the use of sustainable materials and production processes. For instance, EPR systems, a commonly used instrument in the circular economy practices in many countries, hold manufacturers accountable for

the entire lifecycle of their products, encouraging sustainable product design and waste reduction (Liu et al., 2017; Maitre-Ekern, 2021; Rutkowski, 2020; J. Wang et al., 2021).

Moreover, the circular economy enhances resource efficiency by keeping materials in use for as long as possible through strategies like re-manufacturing, refurbishing, and recycling. Efficient resource use in the circular economy practices directly supports SDG 12.2, 12.6, and 12.A. Recycling materials is essential for enhancing sustainability and securing the supply of raw materials. Although research shows that recycling alone currently fulfills a relatively small portion of material demand, quality standards and eco-design along with recycling materials can significantly expand the market for secondary materials by lowering the demand for virgin materials and reducing the waste generation that helps in achieving SDG 12.2 and 12.6 (Mancini et al., 2019). Also, industrial symbiosis networks, where waste from one enterprise serves as a resource for another, demonstrate how circular economy practices improve resource efficiency (Cecchin et al., 2020; Martin, 2020). By recognizing the value embedded in waste, recycling can return materials to the economy, ensuring their continued use and preserving their inherent value and promoting SDG12.

Enhancing Industry, Innovation, and Infrastructure and Climate Action

The circular economy can also promote industrial innovation and infrastructure and technological development of SDG9 and enhance climate resilience and actions related to SDG13. SDG9

focuses on establishing resilient infrastructure, advancing sustainable industrialization, and supporting innovation (United Nations, 2015b). SDG13 aims to combat climate change by taking urgent measures to reduce greenhouse gas (GHG) emissions, enhancing resilience and adaptive capacity to climate-related hazards, and integrating climate change measures into national policies, strategies, and planning. With over half of the world's population now living in cities, mass transport, renewable energy, the growth of new industries, and information and communication technologies are becoming increasingly important (World Bank Group, 2023b). This increases GHG emissions from infrastructure, transportation, energy generation, and industries that significantly contribute to climate change, directly impacting the achievement of SDG13. Implementing circular economy practices that enhance energy efficiency, foster innovations, and improve the construction and infrastructure sectors are key strategies for reducing GHG emissions and climate actions, aligning with both SDG 9 and 13.

The combination of circular economy practices and industrial innovations can unlock new possibilities to contribute towards achieving the SDGs, including SDG 9 and 13 (Dantas et al., 2021). For instance, the Global Alliance for Buildings and Construction notes that the building sector alone is responsible for nearly 40 per cent of global energy-related GHG emissions (United Nations Environment Programme (UNEP), 2022). Circularity and innovations in infrastructure practices, such as using eco-friendly materials, implementing energy-efficient designs, and promoting public transportation, is crucial for reducing these emissions and supporting SDGs 9 and 13. Eco-construction materials are also at the forefront of

circularity practices in the building and infrastructure sectors. The development of bio-based, recycled, and reprocessed materials demonstrates how circularity and innovations in eco-construction reduce the environmental impact of construction activities (Bourbia et al., 2023; Papadaki et al., 2022; Peñaloza et al., 2016; Simion et al., 2013).

Moreover, smart cities serve as good examples of how integrating circular economy practices and innovations can help achieve SDG targets 9.1, 9.4, 13.1, and 13.2. Smart cities leverage technology and data to enhance the efficiency of infrastructure services, improve the quality of life for residents, reduce environmental impacts and promote climate resilience. For instance, Singapore has implemented an innovative waste management system as part of its Smart Nation

initiative (Wong et al., 2021). The country uses pneumatic waste conveyance systems that transport waste through underground vacuum pipes to a central collection point. This system reduces the need for waste collection trucks, thereby decreasing traffic congestion and emissions. Similarly, cities in China have also implemented green building programs as part of its smart city development initiatives (N. Wang et al., 2018). This requires incorporating recycled and eco-friendly materials and advanced energy-efficient management systems in new buildings, resulting in a significant reduction in energy consumption and emissions. These circularity initiatives align with SDG9 by promoting innovations, sustainable construction and infrastructure practices and SDG13 by addressing GHG reduction and climate actions.

IV: THE SIX SECRETS OF DRIVING CIRCULARITY

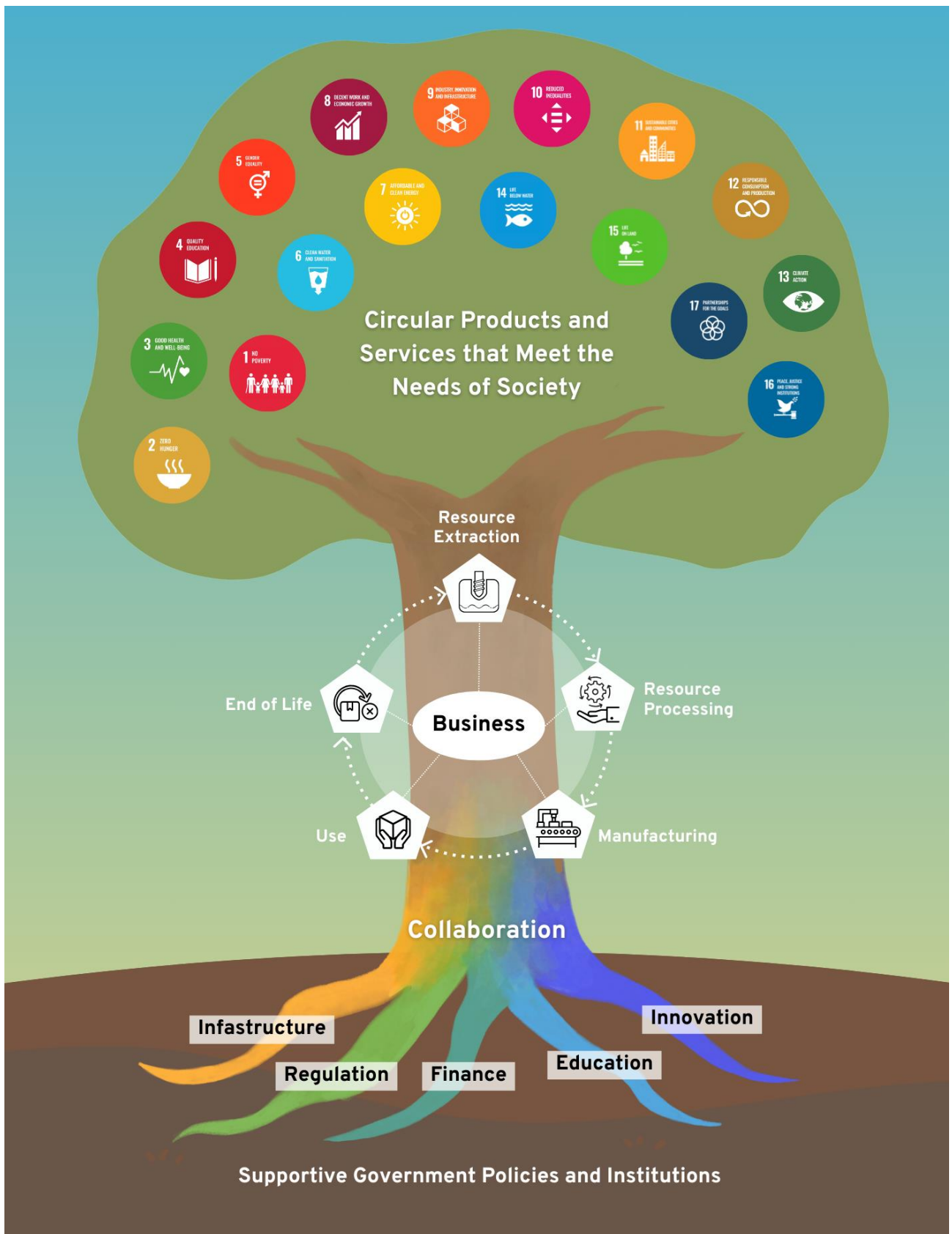
Businesses produce goods and services to meet the needs of society and economies. With a full view of the supply chain, businesses are in a strong position to implement circular practices to prevent impacts on climate, resource scarcity, and pollution. Many businesses have demonstrated their ability to implement circular economy activities independently because such activities have added value to their bottom line such as improved supply chain management, cost reductions, and enhanced brand value. At the same time, many other businesses require support from government policies and institutions and other actors in the supply chain to implement circular activities depending on the type of industry and market factors. The secret to accelerating businesses to implement circular activities is harnessing six key drivers which are infrastructure, regulation, education, finance, innovation, and collaboration. These six drivers are needed to both push and pull companies in the Asia-Pacific region to prioritize circularity and implement the necessary interventions.

Figure 3 illustrates a framework that represents how businesses can implement circular

economy activities when driven by infrastructure, regulation, education, finance, innovation, and collaboration and overall support from government policies. In this framework, businesses are a collective engine that can provide circular products and services to meet the needs of society. To achieve circularity, businesses need to take a life cycle approach in planning the necessary interventions from resource extraction all the way to end-of-life. Establishing infrastructure, regulation, education, finance, innovation, and collaboration between all actors is the secret to strengthening the ability for companies to implement circular activities at different parts of the life cycle of goods and services. These drivers of circularity are analogous to the roots of a tree that draw in support from government policies and institutions. The final circular products and services from businesses can support in achieving the SDGs.

The following sections explain each of the six drivers and how they support implementation of circular economy activities with real examples from the Asia-Pacific region.

Figure 3. The Six Secrets to Drive Businesses to Implement Circular Economy Activities



Infrastructure

Infrastructure refers to the fundamental physical and organizational structures and facilities that a society or enterprise needs to operate. To support a circular economy, the infrastructure needed includes digital systems and physical facilities that create conditions to support a circular flow of materials, energy, and products. Some examples of infrastructure that promote circularity include:

- **Digital infrastructure and platforms.** The Republic of Korea's smart waste management technologies exemplify how digital infrastructure can support the circular economy. The online recyclables trading system established by the Ministry of Environment enables sellers to provide detailed information on recyclable waste, including type, characteristics, quantity, and quality (Yoon, 2020). Buyers can then browse available materials by price, quality, and location to make purchases through the platform. This use of digital technologies in Korea's waste management also helps prevent illegal disposal, as authorities can monitor and verify real-time treatment records submitted by waste generators, transporters, and disposal companies.

Regulation

Regulations, in relation to circularity, are a set of rules or laws established by a government or any other authoritative body that are designed to maintain order, protect public interests, ensure fair practices, and promote safety and

compliance with established standards associated with circular economy activities. To help businesses implement circular economy activities, regulations need to create conditions that economically incentivize waste reduction and resource efficiency and mandate certain practices and prohibiting other undesired practices. Without regulations, companies and consumers will continue existing practices that create more waste and/or consume more energy and materials than necessary. Some examples of regulations that promote circularity include:

- **Minimum recycled content.** Mandatory recycled content regulations require products to include a specific percentage of recycled materials, promoting resource efficiency and waste reduction. The progress and implementation of these regulations varies across the Asia-Pacific region and most of these are emerging. In Japan, the government plans to amend the Resource Effective Utilization Promotion Act (1991) to mandate recycled plastic use and require regular reporting (Kyodo News, 2024). The Republic of Korea has also set recycled content targets for polyethylene terephthalate (PET) bottles, aiming for 3 per cent by 2023 and 30 per cent by 2030 (Lee et al., 2024). Indonesia's 2019 roadmap aims for 50 per cent recycled content in certain plastic products by 2029 (Asian Development Bank (ADB), 2024b). These regulations on mandatory recycled content aim to promote circularity by reducing reliance on virgin materials and encouraging recycling, thereby contributing to a more sustainable and efficient economy.
- **Extended Producer Responsibility.** This type of regulation aims to make producers

responsible for the environmental impacts of their products throughout the product chain, from design to the post-consumer phase (Organization for Economic Cooperation and Development (OECD), 2016). Since 2000, the Republic of Korea has successfully implemented an EPR system for four packaging materials, lubricants, tires, fluorescent light bulbs, batteries, and electronic products. With the enforcement of EPR, the Republic of Korea has been able to drive the circular economy transition by increasing recycling, reducing the use of raw materials, replacing natural resources, improving the production of environmentally friendly products, building a recycling industry, and reducing energy consumption (United Nations Environment Programme (UNEP), 2010b).

Education

Education in relation to the circular economy refers to the process of equipping individuals, businesses, and communities with the knowledge, skills, and values necessary to understand and implement sustainable practices that promote resource efficiency, waste reduction, and the long-term regeneration of natural systems. It encompasses a range of learning experiences, from formal education in schools and universities to professional training and community outreach, aimed at fostering a mindset that supports the transition from a linear economy (take-make-waste) to a circular one. Circular economy education emphasizes interdisciplinary learning, innovation, systems thinking, and collaboration, helping people to engage with concepts like product life cycles, circular design, closed-loop systems, and sustainable consumption.

Education in circular economy encourages the development of practical skills, such as eco-design, waste management, and resource recovery, which are critical to creating and sustaining a circular economy. Some examples of circular economy education include:

- **Reskilling and upskilling programs.** Reskilling and upskilling programs to drive the circular economy transition are needed at the workplace or company because employees are essential drivers and beneficiaries of change. Their skills, jobs, awareness, and decisions can help to achieve systemic change and will be influenced by actions performed (Circular Economy Foundation, 2024). Toyota, Japanese automobile manufacturer, introduced its Environmental Challenge 2050, aiming to achieve zero environmental impact across all its business operations in 2015. Moreover, Toyota believes that its employees' contribution is the only way to achieve true sustainability. Therefore, regular training programs educate employees on sustainable practices, while engagement activities invite ideas and feedback, developing an environmentally conscious culture (Toyota Management System, 2023).
- **Circular economy education for youth.** The STEAM Platform (2018), since its inception in 2018 at King Mongkut's University of Technology Thonburi (KMUTT), Thailand, is a leading circular economy accelerator of Thailand that is focused on training and coaching to empower young innovators in developing smart solutions to accelerate the transformation to a circular economy. The STEAM Platform offers internship programs for Association of Southeast Asian Nations (ASEAN) and international students to

acquire trending skills in the 4th industrial revolution (I4.0) and circular economy through experiential and peer-to-peer learning.

Finance

Finance refers to funds from public or private sources used to implement any type of circular economy activity. Finance is essential because it provides the necessary capital to invest and operate technologies, infrastructure, labor, and business models for circular economy activities. There are various type of mechanisms and models for mobilizing and deploying finance to support a circular economy across industries. Some examples of circular economy financing include:

- **Neste's green financing framework.** Neste is a Finnish company that specializes in producing renewable transport fuels using palm oil as feedstock from upstream suppliers in Malaysia and Indonesia. To combat deforestation associated with palm oil production, ensuring the traceability of raw materials becomes essential. In response, Neste established the Green Finance Committee and implemented the Green Finance Framework. This framework is used to finance or refinance eligible assets and projects that have been assessed and selected by Neste according to its criteria. This approach is an example for demonstrating that green finance contributes to sustainability and circularity in upstream supply chains, fostering confidence among investors and the public. The company has maintained traceability of all palm oil to the plantation level since 2007 and achieved 100% certification by 2013 (Lund, 2021).
- **Blue loans for financing plastic recycling infrastructure.** Indorama Ventures (IVL), a global plastic resin manufacturer, received a blue loan in 2020 to build recycling infrastructures and enhance the capacity of IVL's PET recycling plants in Brazil, India, Indonesia, the Philippines, and Thailand. This loan is to help the company achieve its sustainability goal of recycling 750,000 tonnes of PET globally by 2025 (Indorama Ventures, 2020). A blue loan certifies and tracks funds exclusively for projects that promote a blue economy, which involves the sustainable use of ocean resources for economic growth, enhanced livelihoods and jobs, and the health of the ocean ecosystem. The blue loan comprises a \$150 million senior loan from the International Finance Corporation (IFC) and parallel loans of \$150 million from the Asian Development Bank (ADB) and Deutsche Investitions- und Entwicklungsgesellschaft (DEG) (Asian Development Bank (ADB), 2020; Indorama Ventures, 2021).

Innovation

Innovation entails the process of developing and implementing new ideas, products, services, or methods that can create value or improve existing solutions. Innovation is essential in pushing the boundaries in what is possible in terms of business models, product designs and production systems that can support the goals of a circular economy. Some examples of circular economy innovation include:

- **Bottled drinking water as a service.** Glassia Water is a company based in Viet Nam, that

produces and distributes bottled drinking water to restaurants, hotels, and other establishments as a service through its business model innovations (Glassia Water, 2024). The company first opened in Da Nang and has expanded into Ho Chi Minh City. Glassia Water's glass bottles are designed for multiple uses, reducing the need for single-use packaging. Glassia collects the used empty bottles from its customers through the company's take-back logistics system for cleaning and refilling, which minimizes waste and the demand for new materials. Their life cycle assessment study highlights the importance of reusability and Glassia Water's business model innovation by showing that refilling and reusing its glass bottles just four times can outperform environmental impacts of single-use plastic bottles available in the market (Evergreen Labs, 2024).

- **Regenerative Agriculture.** The Modern Agriculture Platform (MAP), developed by The Syngenta Group in China, supports growers and food value chain partners by offering comprehensive services that cover the entire agricultural production and sales process (Syngenta Group, 2023). MAP also integrates and emphasizes "good seeds + good methods" as the core of its complete planting solution, which supports regenerative agriculture. With nationwide MAP technical service centers and demo farms, the MAP business promotes advanced technology applications and production trustee services. This includes hand-by-hand services and scientific guidance to the farmers to help them improve growing standards with sustainable practices. MAP offers a quality control and traceability system that ensures high-quality agricultural products, allowing

for better transparency about sustainable and regenerative farming practices. The MAP project exemplifies the circular economy by promoting regenerative agriculture, which focuses on restoring and maintaining the health of ecosystems, ensuring that natural resources are replenished rather than depleted. By supporting sustainable farming practices and improving resource efficiency, MAP helps create a system where agricultural inputs are used more responsibly, aligning with the circular economy's goal of minimizing waste and regenerating natural environments.

Collaboration

Collaboration involves different actors working together towards a common goal which entails sharing knowledge, resources, and responsibilities and leveraging the strengths and expertise of the different parties in the collaboration to create synergies and produce better outcomes that could not be achieved individually. In a circular economy, collaboration is essential in fostering innovation, optimizing resource use, creating new value chains, building stronger partnerships between public and private sectors, non-profits, and communities and consumer groups, and scaling up solutions. Some examples of circular economy collaboration include:

- **Supply chain engagement and collaboration.** In Japan, Toyota collaborates with its suppliers to enhance circularity through its "Toyota Green Purchasing Guidelines" (Toyota Motor Corporation, 2016). These guidelines aim at greening its supply chains through collaboration with all the business affiliates of Toyota and

providing measures they should take to reduce the environmental and health risk from the production processes. This collaboration also supports circularity by reducing reliance on virgin resources, promoting the recycling of materials, and extending the life cycle of components (*Ahmad & Beers, 2013*). By implementing this practical tool, Toyota helps the upstream suppliers to understand more about the requirements of their supply chain circular economy initiatives and improve transparency of purchasing and sourcing of the upstream automotive materials.

- **Industrial symbiosis.** Industrial symbiosis involves the collaboration between industrial facilities where the waste or by-products of one entity become raw materials for another (*Matsumoto, 2024*). This typically occurs among geographically proximate companies or factories within clusters or industrial parks, enabling the exchange of resources such as materials, energy, water, and by-products. The city of Kitakyushu's Eco-town project exemplifies this concept through its collaboration among private companies, academia, research institutes, and the government (*City of Kitakyushu, 2018*). The city government played a critical role in coordinating with various actors through the strategy of scale in policymaking and successfully implementing the project (*Guanwen, 2014*). The Eco-town project finally resulted in optimizing material use, reducing raw material needs and environmental footprint, and generating economic benefits through new job creation in recycling and resource recovery sectors (*City of Kitakyushu, 2018*).

Public Versus Private Sector Leadership in Driving the Circular Economy

Infrastructure, regulation, education, finance, innovation, and collaboration all have equal importance in driving businesses to implement circular activities in the Asia-Pacific. Certain actors in the public and private sectors are more suited to lead in particular drivers of circularity. Government agencies in the public sector are generally better suited to lead in regulation, infrastructure, and education whereas the private sector is generally better suited to lead in innovation and finance. Both public and private sector can lead in certain aspects of the six drivers to unlock circularity (see Table 1).

Table 1. Public vs Private Sector Leadership in Driving Circularity

	Public sector (government agencies)	Private sector (businesses)
Infrastructure	Lead in planning, developing, financing, regulating, and maintaining public infrastructure (physical and digital) that support circular activities.	Partner with governments to provide capital and expertise to implement and operate infrastructure that support circular activities.
Regulation	Establish and enforce regulations that promote circular practices and disincentivize or penalize linear practices.	Advocate for regulations that support circular business models based on the needs of businesses.
Education	Incorporate the principles of the circular economy in national education systems and skills building programs.	Conduct circular economy education activities within businesses and industry stakeholders and educate relevant consumer segments.
Finance	Financial instruments and mechanisms include government budgets, grants, subsidies, transfers, taxes, fees, levies, debt instruments, investment guarantees, co-financing, project finance.	Financial instruments and mechanisms include equity/debt financing, impact investments, accelerator/incubator investments, venture capital, individual/crowd-funding, philanthropy.
Innovation	Governments can lead in creating innovation hubs and ecosystems and support business incubators and accelerators that provide mentorship and resources for start-ups and social entrepreneurs focused on developing solutions to address circular economy challenges.	Businesses can lead in researching, developing, testing, and deploying new technologies and business models that increase the circularity of products and services.

Public sector (government agencies)	Private sector (businesses)
<p>Public and private sector actors can work with each other to fulfill specific roles in initiatives that collectively result in increased circularity of products and services across industries, sectors, and parts of the value chain. Forms of collaboration include:</p> <ul style="list-style-type: none"> • Policy and regulatory frameworks: Public-private working groups can draft policies that reflect the realities of various industries, ensuring regulations promote recycling, reuse, and resource efficiency without overburdening businesses. • Public-private partnerships for infrastructure: Public and private actors can co-finance infrastructure that enable a circular economy. • Innovation and research: Governments and businesses can support joint research initiatives that push the boundaries of circular economy technologies and business models. • Circular supply chains: Governments and businesses can collaborate to support supply chain transparency and traceability. Governments can set the regulatory framework, and businesses can implement the technologies and systems that enable transparency and traceability. • Extended producer responsibility schemes: Governments can create the legal framework, while businesses can establish reverse logistics systems for collecting and reprocessing end-of-life products. • Consumer awareness and education: Government agencies can provide platforms for campaigns that promote the principles of a circular economy, while private companies contribute by showcasing their circular products and practices. • Financing circular economy projects: Public finance can be used to de-risk private investments. Blended finance can mitigate certain risks of pioneering investments that cannot move forward on strictly commercial terms. The use of blended financing in circularity needs to be designed carefully so that circularity projects are not reliant on government support in the long term. 	

V: THE LANDSCAPE OF CIRCULAR ECONOMY POLICIES IN THE ASIA-PACIFIC REGION

Government policies have an important role in creating conditions in countries that incentivize a circular economy and disincentivize the linear economy status quo. Our research indicates that there are 79 policies in the Asia-Pacific region that cover circular economy. Each country in the Asia-Pacific region is at a different level of maturity in developing and implementing policies that promote circularity. The levels of maturity are defined as follows (Circular Economy Earth, 2020a).

In early stage: Policies for the circular economy are still in their early stages, and the government has yet to embrace it.

In scoping: A government has indicated the intention to develop a roadmap and is in the scoping phase.

In development: A government is currently in the process of developing a roadmap.

Call to action: National calls-to-actions aim to kick-start national dialogue and coordinated action on the circular economy. This can serve as a

critical pre-cursor to a roadmap or strategy.

Roadmap: National roadmaps offer a qualitative long-term vision and outline high-level focus and priority areas and actions. Roadmaps contain sufficient detail of policy actions and priority areas to subsequently produce more specific operational plans.

Operational strategy: Operational strategies outline time-dependent actions, specified action owners, a governance strategy including monitoring and evaluation, and consider financing whenever possible. They tend to have been adopted within an official government program.

Actual policy: The government has implemented the policy through enacting laws, regulations, and/or economic or fiscal incentives.

Figure 4 illustrates the timeline of circular economy policy development in the Asia-Pacific region. Figure 5 illustrates the distribution of 79 circular economy policies identified at their different stages of maturity. Figure 6 illustrates the number of policies in each region of Asia-Pacific.

Figure 4. Timeline of Circular Economy Policy Development in the Asia-Pacific Region

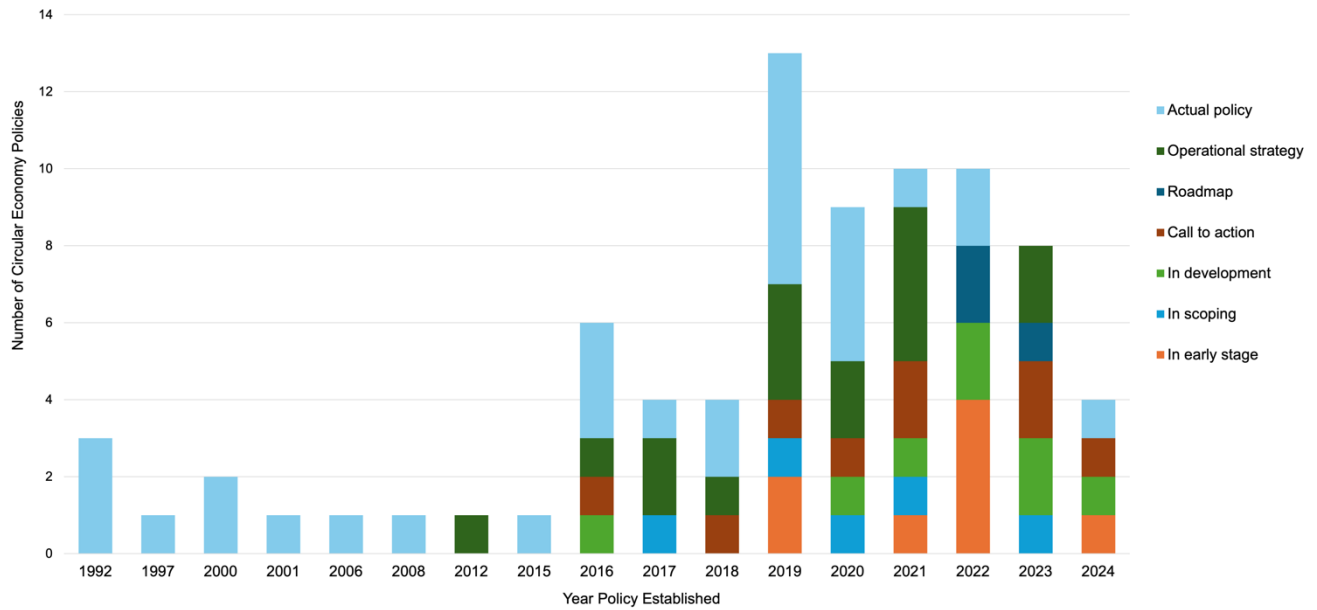


Figure 5. Distribution of Circular Economy Policies in the Asia-Pacific Region

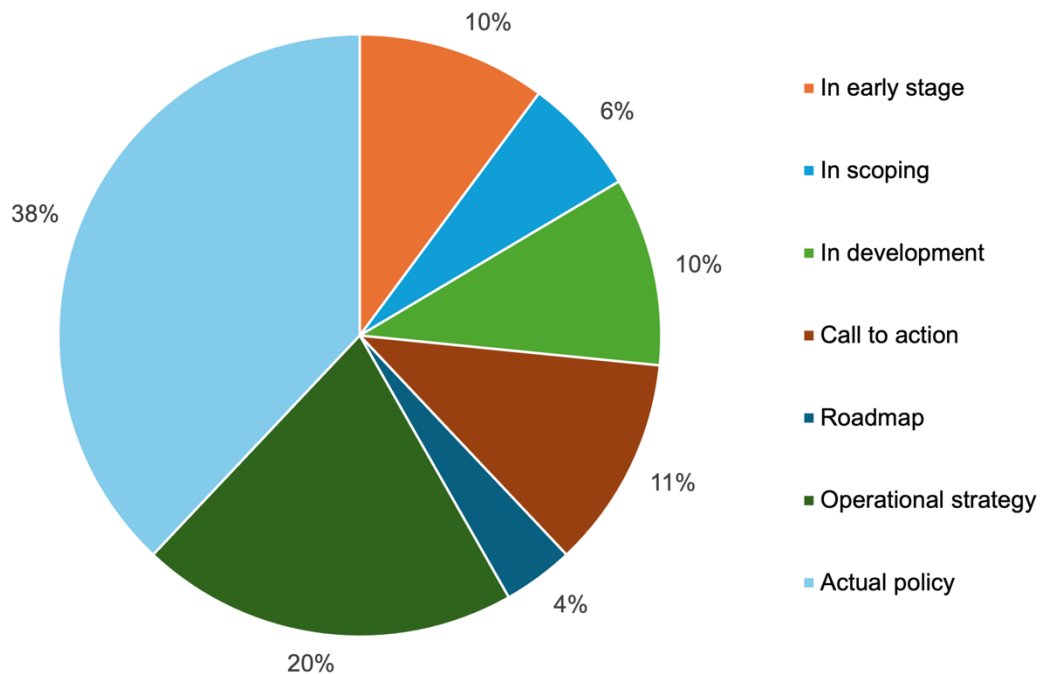
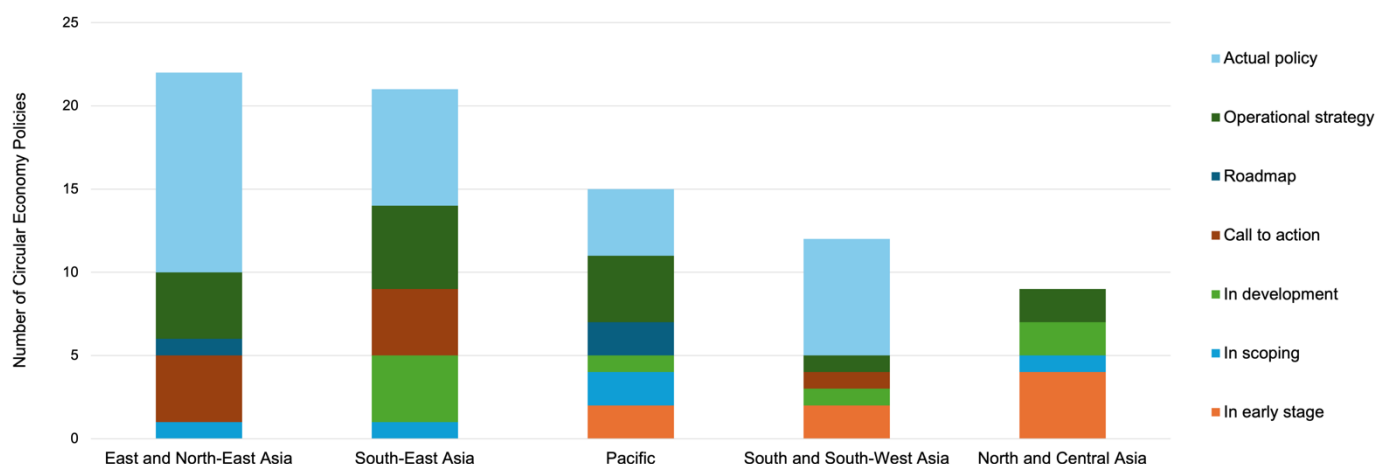


Figure 6. Number of Circular Economy Policies in Each Region of the Asia-Pacific



Circular economy policy development in the Asia-Pacific region started as early as 1992 in the form of actual policies implemented. The number of policies at different stages of maturity began increasing in 2016 in the forms of operational strategies, roadmaps, and calls to action.

One-third of circular economy policies in the Asia-Pacific region have been implemented, which mostly include EPR for packaging, single use plastics (SUP) and electronic goods and recycling of resources in Australia, Bangladesh, China, India, Indonesia, Japan, Mongolia, Palau, Philippines, Republic of Korea, Singapore, Turkey, Tuvalu and Viet Nam. Almost a quarter of the policies represent operational strategies and roadmaps, while the rest of the policies are in early stages of development.

East and North-East Asia has the highest number of policies followed by South-East Asia, the Pacific, South and South-West Asia, and North and Central Asia. Central Asia has a smaller population and is facing lower industrialization rates in contrast to faster developing countries such as China, India, and countries in South-East Asia. Thus, their effect of circularity development in

Central Asia on the global environmental scale is lower.

Although countries like Japan, the Republic of Korea, China, Singapore, Australia, and New Zealand are frontrunners, there is immense potential for further adoption. Other countries in the Asia-Pacific region also have strong visions that need to be translated into practice. While most countries have implemented waste management, plastic waste management, and EPR, a strong circular economic roadmap to fully capitalize on good management is still in its early stages. Current national policies are frequently not backed by stakeholder engagement and institutional frameworks with clear delegation of authorities, which results in scattered and limited implementation. East Asia and some South-East Asian countries have clear strategic roadmaps for establishing a circular economy, while the remaining regions are still in the early phases. A major barrier confronting the Asia-Pacific region is a lack of concrete policies, particularly those aimed at managing waste.

Maturity of Circular Economy Policies at the Regional Level

The following sections summarize the maturity of circular economy policies in East and North-East Asia, North and Central Asia, Pacific, South and South-West Asia, and South-East Asia.

East and North-East Asia

The East and North-East Asia region does not yet have a unified regional policy for circular economy. The region's countries are progressing at varying rates in developing relevant policy instruments. China, Japan, and the Republic of Korea are frontrunners for circular economy policies in this region, mostly at the stages of policy implementation and operational strategies. In contrast, policies in Mongolia and Hong Kong, China are at the 'in scoping' and 'call to action' stages.

In **Japan**, several policies are in the implementation phase, including the Law for the Promotion of Effective Utilization of Resources (2000), the Law for the Recycling of Specified Kinds of Home Appliances (2001a), and the Basic Act for Establishing a Sound Material-Cycle Society (2000c). Additionally, under the Circular Economy Vision (2020), the Ministry of the Environment, the Ministry of Economy, Trade, and Industry, and the Japan Business Federation established the Japan Partnership for Circular Economy to promote circular practices through closed-loop recycling systems for plastic materials and cross-industry collaborations for upcycling waste.

The **Republic of Korea** similarly has advanced policies focused on resource efficiency and waste reduction, notably through a

comprehensive EPR framework that covers electronics, packaging, and hazardous materials (United Nations Environment Programme (UNEP), 2010a). China is also at the 'policy implemented' stage, with a robust EPR system recently reinforced by the 2024 EPR scheme for mobile phones, effectively managing e-waste and promoting the recycling of mobile communication devices (Hu, 2021).

Other countries in East and North-East Asia are at different stages of policy development. For instance, **Hong Kong, China** is at the scoping stage with its "Producer Responsibility Scheme on Plastic Beverage Containers and Beverage Cartons (2021)". In **Mongolia**, policies are primarily at the "call to action" and "operational strategy" stages, focusing on resource conservation, waste reduction at the source, and embedding 3R principles (reduce, reuse, recycle) across sectors to advance a circular economy in accordance with the country's ecological balance aspirations (Asian Institute of Technology, 2017; Food and Agriculture Organization, 2016).

North and Central Asia

In North and Central Asia, the status of circular economy policies varies widely among countries without a unified regional policy and country-level policies at implementation stage. Kazakhstan and Kyrgyzstan are leading the region, both with policies at the 'operational strategy' stage. Azerbaijan, Tajikistan, Russian Federation and Uzbekistan are at the "early stage."

Kazakhstan outlines its circular economy approach in the "Kazakhstan-2050" strategy which emphasizes sustainable development, energy efficiency, and resource management (Government of Kazakhstan, 2020).

Kyrgyzstan has adopted a green economy strategy for 2019–2030 prioritizing energy efficiency, waste management, and the introduction of renewable energy sources (Food and Agriculture Organization, 2019).

Armenia follows in the ‘in development’ stage of circular economy policies, emphasizing its Waste Policy (2023) and EPR system (2023), aimed at improving waste management and sectoral capacities, while also developing an EPR model in line with international standards.

Georgia is in the “in scoping” phase, focusing on creating a National Roadmap for circular economy transition, indicating its early stage of strategy development (Ministry of Environmental Protection and Agriculture of Georgia, 2023).

Azerbaijan is implementing sustainability initiatives and SDGs alongside its Azerbaijan 2020 plan (Asian Development Bank, 2014) and Azerbaijan 2030 plan (United Nations, 2024).

Tajikistan is also exploring the circular economy through national dialogues, with some elements being integrated into its National Strategy on Waste Management and Green Economy (Asia Pacific Energy, 2016).

The Russian Federation is in the early stage of its circular economy initiatives on the ‘closed-loop’ economy that was launched in 2022 and is set to complete in 2030. As part of this effort, a large-scale infrastructure scheme is being implemented, involving the creation of eight eco-industrial parks across all federal districts.

Uzbekistan has circular economy strategies in the early stages, focusing on a green economy transition through its 2019-2030 strategy and addressing the current environmental and economic challenges to achieve a green, resilient and inclusive development (Ministry of Economic

Development and Poverty Reduction of the Republic of Uzbekistan et al., 2022).

Overall, the region shows varying levels of progress with most countries yet to implement specific circular economy policies. However, efforts toward circular economy practices are reflected in various policy instruments across the region.

Pacific

In the Pacific, the only regional-level strategy that exists is the Cleaner Pacific 2025 Regional Waste Strategy (2016-2025), which supports a circular economy (Secretariat of the Pacific Regional Environment Programme (SPREP), 2016). Most circular economy policies are in the early stages at the country level, as the adoption and implementation of strong and effective policies and strategies continues to be a challenge for Pacific Island countries and territories (Secretariat of the Pacific Regional Environment Programme (SPREP), 2016).

Australia is the frontrunner in the region with policies at the stages of implementation and operational strategy that have been implemented through state-level policy statements covering waste management, circularity, and recycling, such as the New South Wales (NSW) Circular Economy Policy (Melles, 2023). Australia’s National Waste Policy Action Plan (2019) incorporates circular economic threads to fine-tune waste reduction and management, with a special emphasis on plastic, paper, glass, and tires (Australian National Audit Office, 2022).

New Zealand has developed roadmaps for advancing circular economy, including the “Waste Strategy: Getting Rid of Waste for a Circular New Zealand 2023–50” (Ministry of Environment, 2023) and the “Circular Economy and Bioeconomy Strategy” (Ministry of Business, Innovation

and Employment, 2024). The former outlines a 30-year plan aimed at creating a low-emissions, low-waste society grounded in circular economy principles. The latter presents New Zealand's long-term vision for achieving a circular economy by 2050, fostering a circular public sector and establishing a bioeconomy framework.

Policies in other countries in the region, such as Kiribati and Samoa are in the early stage, Vanuatu is in the development stage, and the Cook Islands and Fiji are in the scoping stage.

Kiribati has implemented a 5-year country planning framework (2019-2023) to support its development objectives (Global Green Growth Institute, 2019) and align with the Kiribati 20-Year Vision (KV20), aimed at guiding Kiribati toward a healthier, wealthier, and more peaceful future (Ministry of Finance and Economic Development, 2016).

Samoa has adopted and tailored circular economy initiatives in collaboration with United Nations Development Programme (UNDP), launching the circular economy for the Recovery of Waste project, which focuses on addressing waste management challenges and recovering low-value waste items to promote a cleaner and healthier environment (United Nations Environment Programme (UNEP), 2024).

Vanuatu developed in 2020 a draft National Plastics Strategy 2020–2030. The strategy outlines five main goals: Reduce, Replace, Remediate, Recapture, and Reward.

Overall, circular economy policies in the region are widely diverse among the countries from the stages of early development and scoping to policy implementation and operational strategies.

South and South-West Asia

South and South-West Asia lacks a unified regional policy for circular economy. At the country-level, circular economy policies are still in the early stages in Bhutan and Nepal. India has implemented circular economy policies since 2016.

In **India**, the E-Waste Management Rules (2016) mandate businesses to ensure the safe disposal of scrapped electronic items and to recycle a minimum of 30% of the manufactured electronic products. To further address e-waste, the EPR e-waste regulations (2022-2023) require businesses involved in the sale, manufacture, purchase, transfer, dismantling, refurbishing, processing, or recycling of e-waste, including its parts and components, to comply with the EPR for e-waste management framework. Additionally, the EPR Scheme on Plastic Packaging (2016) strengthens circularity in the use of plastic packaging waste, promotes the development of new alternatives to plastics, and provides next steps for moving towards sustainable plastic packaging. Furthermore, the Steel Scrap Recycling Policy (2019) aims to promote circular economy in the steel industry by collecting, dismantling, and processing end-of-life products that are sources of recyclable scraps, thereby promoting resource conservation and energy savings. The Battery Waste Management Rules (2020) mandate that battery producers, including importers, take responsibility for the collection, recycling, and refurbishment of waste batteries, as well as the use of recovered materials to create new batteries (Circular Economy Catalyst, 2023). Moreover, the National Circular Economy Framework (2023) has been developed to call for action which emphasizes collaboration, awareness, and targeted actions for a sustainable and

prosperous future (Circular Economy Earth, 2020b).

Bangladesh has implemented the Ship Recycling Act (2018), an industrial circular economy policy that mandates ship recycling only in specific zones (Circular Economy Earth, 2021) and the Zero Waste policy (2018).

Turkey introduced reverse vending machines where citizens can exchange their plastic bottles and cans for public transport credits (KPMG Turkey and France, 2022). Turkey has also implemented the Circular Economy Platform (2018) as an operational strategy, providing companies seeking to accelerate their circular transition with a knowledge hub, an e-commerce platform, measurement tools, training, technical assistance, and consultancy services (KPMG Turkey and France, 2022).

The Maldives has made progress in transitioning to a circular economy and is currently developing the waste-to-wealth approach in the National Strategic Action Plan (SAP) 2022, with the intention of incorporating EPR into its waste management strategy (World Bank Group, 2022a).

South-East Asia

In South-East Asia, the only regional-level policy that exists is the Regional Policy: Framework for Circular Economy for the ASEAN Economic Community SEA Circular (2021). Most policies are already in place at the country level, while others are operational strategies.

Policies that have been implemented include **Indonesia's** Regulation on Road Map to Waste Reduction by Producers (2019), which requires producers to make a plan and report to reduce packaging and containers (Ministry of Environment and Forestry, 2020); the Extended Producer Responsibility Act (2022) in **The Philippines**, which

is primarily concerned with plastic packaging waste (Keslio, 2024); the Resource Sustainability Act (2019) in **Singapore**, which is applying EPR to e-waste, packages, and containers (Ministry of Sustainability and the Environment, 2020); and the Environmental Protection Law in **Viet Nam**, which applies EPR to e-waste, tires, batteries, and vehicles (Asian Development Bank Institute, 2022a). Furthermore, **Thailand** has been drafting an EPR scheme primarily targeting at the packaging wastes (Vassanadumrongdee & Manomaivibool, 2022).

Operational strategies include Wawasan Brunei 2035 in Brunei Darussalam, which incorporates strong elements of the circular economy (Wawasan Brunei 2035, 2019); the Twelfth Malaysian Plan 2021-2025 in Malaysia, which aims to move towards circularity (Ministry of Economy, 2021); the National Economic and Social Development Plan 2023-2027 in Thailand, which aims to transform Thailand into a circular economy and low-carbon society (ASEAN Circular Economy Stakeholder Platform, 2024) and the National Green Growth Strategy 2021-2030 in Viet Nam, which aims to accelerate the process of restructuring the economy in tandem with growth model transformation, promoting economic prosperity, environmental sustainability, and social equality (Socialist Republic of Viet Nam Government News, 2021).

Typology of Policies

The policy trends across the Asia-Pacific region showcase a variety of approaches towards fostering a circular economy. These include EPR and product stewardship schemes, green public procurement, and environmental labelling schemes and standards.

In the Asia-Pacific region, EPR is the most common policy trend and is an essential component of circular economy policies. EPR schemes can be mandatory with binding regulation or voluntary often known as product stewardship schemes (The Organisation for Economic Cooperation and Development (OECD), 2021). In Japan, the Republic of Korea, China, and Australia, EPR systems are well-established including “the Home Appliance Recycling Law” and “the Containers and Packaging Recycling Law” in Japan (Ministry of the Environment, 2001b, 2003); the Republic of Korea EPR system introduced in 2000 (United Nations Environment Programme (UNEP), 2010b); and China’s “EPR Scheme for Mobile Phones” (Hu, 2021).

In China and India, there are other EPR policies that are still in the development stage such as China’s “Circular Economy Promotion Law (2008)”, “the EPR System Implementation Plan (2016)”, and India’s EPR which began implementation in 2017 (SWITCH-Asia, 2023).

In South-East Asian countries, the advancement of EPR regulations is at three different levels across countries. The Philippines and Viet Nam are at the forefront with recently introduced specific EPR regulations in effect such as the EPR Act in the Philippines (Environmental Management Bureau, 2022; Keslio, 2024) and the incorporation of EPR into the Law on Environmental Protection in Viet Nam (Regional Knowledge Centre for Marine Plastic Debris, 2024). Singapore (Tan, 2023), Thailand (Vassanadumrongdee & Manomaivibool, 2022), Indonesia (World Bank Group, 2022b), Malaysia (Regional Knowledge Centre for Marine Plastic Debris, 2024c) and Cambodia (Regional Knowledge Centre for Marine Plastic Debris, 2024b) are actively working on developing and aiming to gradually implement

their EPR systems in the near future. In contrast, Brunei, Lao People’s Democratic Republic, and Myanmar lag behind with no current EPR legislation, action plans, or specific EPR provisions in their regulations (Regional Knowledge Centre for Marine Plastic Debris, 2024a).

Green public procurement is another policy trend in the region aimed at encouraging governments to procure circular goods by considering criteria such as product recyclability and repairability. Many countries in the region, including Japan (Ministry of Environment Japan, 2016), the Republic of Korea (One Planet Network, 2020), China (China Environmental United Certification Center, 2024), Australia (Australian Government, 2024), New Zealand (New Zealand Government, 2024), Singapore (Ministry of Sustainability and the Environment, 2023), Thailand (SWITCH-Asia, 2022), and Malaysia (SWITCH-Asia, 2024), have implemented green public procurement to varying degrees. Additionally, numerous eco-labels and environmental labeling schemes have been developed to support green public procurement and promote sustainable consumption and production across these countries. Although there is significant diversity in eco-label categories, the existing eco/environmental labeling schemes generally fall into three types as defined by the International Organization for Standardization: Type I Eco-labels (ISO 14024), Type II Eco-labels (ISO 14021), and Type III Eco-labels (ISO 14025).

Progress of Policies and the Six Secrets to Driving Circularity

The following sections describe the progress of circular economy policies in the Asia-Pacific

region in relation to the six secrets to driving circularity: Infrastructure, regulation, education, finance, innovation, and collaboration.

Infrastructure. In the Asia-Pacific region, infrastructure for circularity is unevenly developed. A United Nations Environment Programme (UNEP) report (2021) highlights how sustainable infrastructure policies and practices in buildings, transport and energy sectors in China, Japan, the Republic of Korea unlocked potentials to scale up circular economy. In contrast, while making progress, most countries in South and South-East Asia still face challenges in implementation of circular economy policies due to limited infrastructure development.

Regulation. Research indicates that countries such as China, Japan, the Republic of Korea, Australia, and Vietnam have comprehensive regulatory frameworks that drive circular economy practices. China's Circular Economy Promotion Law (2008) and Japan's various waste management policies (Ministry of the Environment, 2000a, 2000b, 2001b) are examples of strong regulatory support. Countries in South-East Asia are beginning to develop harmonized policies such as the "Framework for Circular Economy in ASEAN Community (2021)", although enforcement remains inconsistent and there is a significant need for effective implementation.

Education. There is a significant gap in education and knowledge dissemination in the Asia-Pacific region. Only a few developed countries such as Japan (*Fukuda & Zusman, 2024*), and the Republic of Korea (United Nations, 2016) have integrated circular economy concepts into their educational systems promoting sustainability from a young age. India has made specific efforts to introduce circular apparel aspects into leading design and fashion institutes. Although there is a

lack of holistic policies in the Asia-Pacific region that address education in promoting circularity, integration of circularity into the education system happens at a continuum and different countries have initiatives at varying degrees.

Finance. Implementing taxes on virgin materials, offering tax exemptions, and providing fiscal incentives are also essential components in circular economy promotion policies. For instance, China's Circular Economy Promotion Law (2008) also includes provisions for preferential tax policies for companies that engage in circular economy activities. In Suzhou, China, financial rewards are offered to companies that use recycled materials in production (Bao, 2023). Similarly, in Kazakhstan, the government offers fiscal incentives for companies investing in technologies that promote circularity (MINEX Forum, 2024). There are also green, blue, climate, and sustainability-linked bonds and loans offered by governments and commercial and development banks in several countries in the Asia-Pacific region that can be used to support circularity projects (Asian Development Bank (ADB), 2024a).

Innovation. Innovation is a key enabler of circularity as seen in countries such as Japan, China, the Republic of Korea, and Singapore where circular economy policies encourage research and development (R&D) to drive innovations. Suzhou Industrial Park in China is an example of circular economy innovation, influenced by the "Circular Economy Promotion Law (2008)" and the "14th Five-Year Plan on Circular Economy Development (2021–2025) (Chen, 2023)". The park utilizes industrial symbiosis, where companies collaborate to repurpose each other's by-products and waste materials as inputs for production, achieving significant reductions in waste and emissions while enhancing resource efficiency.

Collaboration. Regional forums such as the Asia Pacific 3R and Circular Economy Forum (2024) are instrumental in fostering collaboration among governments, businesses, and civil society. Japan and Australia are key players in promoting regional cooperation, particularly in areas like marine plastic pollution and sustainable resource management. Meanwhile, South-East Asian countries are also increasingly focusing on innovation through regional collaborations and partnerships, as seen in the recent launch of the “Framework for Circular Economy in ASEAN Community” (Association of Southeast Asian Nations, 2021).

Policy Development and Implementation Lessons Learned

There are several key lessons learned from the experiences of developing and implementing circular economy policies and regulations across the Asia-Pacific region.

Importance of alignment between trade policies and circularity objectives.

Domestic circular economy policies inevitably create cross-border impacts and spillovers, particularly in today's interconnected global economy where international trade is vital for advancing circularity (World Bank Group, 2023a). Trade facilitates the movement of goods and services across borders at nearly every stage of the circular value chain. However, there can be misalignments between trade policies and circularity objectives, and circular economy policies can sometimes unintentionally hinder trade (Bellmann, 2022). As the role of trade becomes more significant, policymakers must consider how trade can support the circular transition. For example, stricter regulatory standards in one region such as the EU might lead to production shifts to less regulated areas, creating "linear production havens" (World Bank Group, 2023a). This underscores the growing importance of aligning trade policies with circular economy goals to avoid negative spillovers and support global sustainability efforts.

Ensuring effective enforcement of circular economy policies along with the existing waste management regulations.

The success of new circular economy policies also relies on the effective enforcement of existing waste management and other related environmental regulations. Without robust implementation of these foundational laws largely due to limited resources, inadequate infrastructure, and institutional capacities, efforts to introduce circular economy initiatives may remain inefficient and ineffective. These cases are seen in most developing countries in South-East Asia, where the circular economy policies are well crafted, but are not being successfully implemented (Asian Development Bank Institute, 2022b).

Societal transformation and consumption patterns.

Engaging society to embrace these changes and ensure their success is as equally crucial when implementing circular economy policies. A significant obstacle is the frequent focus on waste management without equal emphasis on reducing waste at its source. If consumption patterns continue unchanged despite growing populations, circular economy systems are less likely to succeed. Public education and information campaigns are key to demonstrating the long-term benefits of a circular economy to build awareness and to enhance societal transformation and encourage sustainable consumption patterns.

New Circular Economy Policies for the Asia-Pacific Region to Consider

The implementation of circular economy policy instruments, including regulatory and economic instruments, enables the circulation of materials and related efficiency benefits (Cramer, 2022). Table 2 lists the upstream and downstream policies from around the world that could be useful in the Asia-Pacific region.

Table 2. New Circular Economy Policies for the Asia-Pacific Region

Policy	Description
Right to repair	This instrument aims to encourage more sustainable consumption by improving product repair and reuse, both within and outside of the legal warranty. In June 2024, the European Commission adopted the rule promoting the repair of goods. Under EU law, manufacturers of electronic goods including cellphones and refrigerators have reparability requirements. Manufacturers are required to provide customers with easily available information about their repair services. In January 2021, France imposed a reparability index regulation for electronic products. In July 2021, the United Kingdom enacted the Right to Repair Law, which requires manufacturers to provide spare parts for electrical appliances within two years of a model's launch and then, depending on the type of product, for 7-10 years after the model's discontinuation (European Commission, 2024).
Taxes and subsidies	A taxation framework considers the taxes and subsidies applied throughout a product's lifecycle, including production, use, and disposal (KPMG, 2024).
Production-stage taxes	These have been implemented in the form of resource taxes on raw materials. The United Kingdom imposes a tax rate of £200 per tonne on packaging that contains less than 30 per cent recycled plastic (KPMG, 2024).
Use-stage taxes and subsidies or relief	These have been offered as incentives to repair or reuse products (e.g. Reduced Value Added Tax (VAT) on repair services). Netherlands, Austria, and Sweden impose a VAT rate on repairs for bicycles, shoes, textiles and leather products (KPMG, 2024).
End-of-life stage taxes	This involves implementing a progressive tax system where the tax rates range from zero for waste prevention/reuse to the highest tax rate for landfilling to the lowest tax rate for recycling. The EU has implemented waste hierarchy taxes, such as the EU Landfill Tax and the Incineration Tax in Sweden (KPMG, 2024).

VI. BUSINESS CIRCULARITY INITIATIVES IN THE ASIA-PACIFIC REGION

Businesses produce goods and services to serve the needs of society. At the same time, resources are extracted and processed to provide these goods and services often through linear take-make-waste practices. Therefore, businesses play an essential role accelerating the transition to a circular economy in the Asia-Pacific region. Transforming businesses to become circular is challenging because the process often involves changing mindsets and disrupting established practices. The transformation can be accelerated through support in terms of infrastructure, regulation, education, finance, innovation, and

collaboration across all levels and actors in the supply chain.

Despite the challenges, major companies in the Asia-Pacific region have made significant strides to transform their businesses to become more circular. This study showcases several companies that are members of the ESCAP Sustainable Business Network by summarizing their circular activities and initiatives aimed at addressing resource efficiency, supply chain management, and business model and product innovations.

Budweiser

Profile: Budweiser Brewing Company Asia-Pacific Limited is a publicly listed company primarily focusing on brewing and distributing beer with a diverse portfolio of over 50 brands and a wide array of beer options.	
Circularity Activities	
Resource Efficiency	The company has engaged in enhancing the use of recycled materials such as glass, paper and aluminum in packaging; research and development in biodegradable packaging solutions; and collaborating with packaging and materials associations to adopt industry-leading practices (Budweiser Brewing Company APAC, 2023).
Supply Chain Management	The company worked closely with their suppliers to reduce the weight of their bottles, cans and other packaging materials in each market in 2022. The company also utilizes the World Resources Institute Aqueduct tool to monitor the supply chain, ensuring that the use of reclaimed water in production facilities annually increases (Budweiser Brewing Company APAC, 2023).

Business Model and Product Design Innovation	The company's Jinzhou brewery in China became the first in the Asia-Pacific region to pilot carbon capture utilization and storage technology within the beer industry. By capturing carbon dioxide (CO ₂) produced during the fermentation process, the surplus CO ₂ , with a purity level of 99.99 per cent, is transferred to a nearby partner site to support natural energy resource recovery (Budweiser Brewing Company APAC, 2023).
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City Developments Limited

Profile: City Developments Limited is a real estate company. It owns and manages a strong portfolio of residential and investment properties, in addition to hotels, across the world.	
Circularity Activities	
Resource Efficiency	To manage the impact of key building materials, the company applies a circular economy approach in its projects. This includes utilizing recycled materials, such as steel and concrete, wherever possible to close the waste loop. The company also promotes the use of alternative low-carbon materials at its sites and is actively exploring innovative building materials and methods to support its transition to net-zero. This resulted in the reduction of energy consumption, water use and waste generation of the company's businesses by 25 per cent, 20 per cent and 22 per cent, respectively, in 2023 compared to 2016 levels (City Developments Limited, 2024).
Supply Chain Management	The company has established a target to ensure 100 per cent of the appointed suppliers are certified by recognized environmental, health and safety (EHS) standards by 2030. In 2023, it is reported that 100 per cent of the main contractors and key consultants for property development have recognized EHS certifications (City Developments Limited, 2024).
Business Model and Product Design Innovation	The company's strategy emphasizes innovation and green solutions to drive growth, enhancement, and transformation. In 2023, the company implemented several green technologies, including a CarbonCure Concrete pilot at Irwell Hill Residences, which embeds recycled CO ₂ in concrete. This creates sustainable concrete without any compromise on performance. Other initiatives include energy-saving systems, carbon dioxide reduction in air-conditioned spaces, and digital solutions for hotel room management (City Developments Limited, 2024)

CLP Holdings

Profile: CLP is one of the largest investor-owned power businesses in Asia-Pacific with investments in China, Australia, India, and Thailand.	
Circularity Activities	
Resource Efficiency	Currently, CLP sets out waste recycling and reuse targets, including 100 per cent recycling of waste electrical and electronic equipment, scrap metals, and rechargeable batteries, as well as avoiding the use of single-use plastics in catering facilities. In 2024, CLP recently engaged some wind turbine suppliers to explore the opportunities for incorporating circular economy elements for wind turbine projects (CLP Holdings, 2023).
Supply Chain Management	The company's focus on the future allows CLP to commit to short- and mid-term environmental targets, which include increasing material recovery and reuse while reducing waste and emissions. These are their daily operational drivers, which also align with their long-term Climate Vision 2050 (CLP Holdings, 2023).
Business Model and Product Design Innovation	CLP has developed a CLP Group circular economy strategy and established the CLP Group circular economy Steering Committee, which includes key stakeholders from group-wide functions such as HSE, sustainability, commercial & supply chain, as well as project and operational representatives. The company's goal is to develop an understanding of their four circular economy pillars (value recovery, circular use, circular design & input, and conserving natural capital) and oversee the implementation of circular initiatives while also promoting current circular success stories (CLP Holdings, 2023).

En+ Group

Profile: En+ Group is the world's largest producer of low-carbon aluminum and renewables. En+ Metals segment is represented by RUSAL, a low cost, vertically integrated aluminum producer.	
Circularity Activities	
Resource Efficiency	In 2017, RUSAL launched its flagship brand: ALLOW aluminum. RUSAL also produces its ultra-low carbon aluminum brand ALLOW INERTA with inert-anode technology. The products under this brand have the lowest carbon footprint in the world, 0.01 tonnes CO ₂ -eq/tonne of aluminum, as confirmed by independent experts in 2023 (En+ Group, 2023).

Supply Chain Management	RUSAL aims to create a brand-new model of consumption and production in the non-ferrous metals sector that meets the future low-carbon and circular demand. This implies reducing the intensity of freshwater consumption from underground and surface water sources per tonne of aluminum by 20 per cent, bringing at least 15 per cent of alumina production waste, at least 95 per cent of aluminum and silicon production waste, and at least 20 per cent of post-consumer aluminum wastes back into the cycle by 2035 (En+ Group, 2023).
Business Model and Product Design Innovation	The company is exploring industrial technologies for carbon capture and storage and hydrogen economy to maintain its leadership role in the global market while achieving the sustainability performance (En+ Group, 2023).

Indorama Ventures

Profile: Indorama Ventures is a global chemical company with a wide network of manufacturing sites across North America, Europe, Asia, and Africa and is known for its extensive operations in the production of petrochemicals and polyester fibers.	
Circularity Activities	
Resource Efficiency	The company has committed \$1 billion to building recycling facilities to advance the polyethylene terephthalate (PET) circular economy and improve resource efficiency. It is reported that from February 2011 to September 2023, they achieved a significant milestone by recycling 100 billion PET bottles. This effort successfully prevented 2.1 million tonnes of PET waste from polluting the environment and led to a reduction of 2.9 million tonnes in their carbon footprint (Indorama Ventures, 2023).
Supply Chain Management	The company has undertaken various initiatives to enhance circularity throughout its value chain. These efforts include increasing the use of circular feedstocks, such as bio-based and recycled materials, which also contribute to lowering their scope 3 greenhouse gas (GHG) emissions related to purchased goods and services. The company is improving logistics management by shifting from road to rail transportation and prioritizing direct shipments over intermediary transshipments, reducing GHG emissions from both upstream and downstream transportation activities within their supply chain (Indorama Ventures, 2023).

Business Model and Product Design Innovation	<p>The ongoing creation of the Group-wide Sustainable Product Portfolio has integrated innovation as a central element in the company's strategy for classifying sustainable products. Indovinya, a global business division of Indorama Group, has established two specific targets for 2025 in relation to this portfolio:</p> <ul style="list-style-type: none"> • At least 15 per cent of revenue should be derived from sustainable products. • Starting from 2025, 50 per cent of all new products launched should be classified as sustainable. <p>In 2023, Indovinya, one of Indorama's three segments, reported that 6 per cent of its revenue came from sustainable products (with 40 per cent of its portfolio having been formally analyzed). Indorama's other two segments are in varying stages of similar sustainable product classification.</p>
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Mahindra Group

Profile: Mahindra Group is an Indian multinational conglomerate, headquartered in Mumbai with a presence in over 20 industries across hospitality, real estate, renewables, logistics, steel manufacturing, auto recycling, defense and aerospace.	
Circularity Activities	
Resource Efficiency	<p>The Group reports that the initiatives to enhance the resource efficiency of the products manufactured includes designing vehicles with end-of-life considerations in mind, promoting recycling and reuse of materials and implementing programs for the collection and recycling of batteries. This can be seen in the reported figures such as out of the 815,033 metric tonnes of waste generated, 761,859 metric tonnes (93 per cent) of waste are reused and 3,607 tonnes (0.4 per cent) of waste are recycled (Mahindra Group, 2024).</p>
Supply Chain Management	<p>The Group has a robust and systematic process for onboarding new suppliers, which includes evaluating their sustainability practices, social and governance standards, safety, and occupational health. Additionally, the company assesses the suppliers' engineering, manufacturing, inspection and testing, and quality systems while actively collaborating with suppliers and strategic partners to support their transition to more sustainable practices (Mahindra Group, 2024).</p>
Business Model and Product Design	<p>By adopting a low-carbon business model, the group has been investing in renewable energy technologies and infrastructure. They are also implementing circular practices, which include designing products for recyclability, managing their</p>

Innovation	disposal responsibly, and developing closed-loop systems(Mahindra Group, 2024).
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Unilever PLC

Profile: Unilever PLC is a multinational consumer goods company known for its diverse portfolio of products across various categories, including food and beverages, cleaning agents, beauty and personal care, and health and wellness.	
Circularity Activities	
Resource Efficiency	The company maximizes resource efficiency by generating renewable electricity at its factory sites and reformulating products to enhance their resource efficiency during use. Examples include designing laundry products under low temperature washing as standard and moving to renewable electricity and renewable heat, reducing scope 1 and 2 emissions by 74 per cent in 2023 from the 2015 baseline (Unilever PLC, 2023)
Supply Chain Management	The company has launched several initiatives to encourage suppliers to adopt regenerative agriculture practices, which enhance supply chain resilience and lower GHG emissions. These efforts include improving the traceability and transparency of the palm oil supply chain through satellite imagery and geolocation data to monitor deforestation, conducting independent supplier audits, and supporting transformations in the soy supply chain through investments (Unilever PLC, 2023).
Business Model and Product Design Innovation	<p>The company launched new lightweight packaging formats for Sure, Rexona and Dove roll-on deodorants, using around a third less plastic, designed for recycling and using less plastic than other toothpaste tubes in the market (Unilever PLC, 2023).</p> <p>The company helped to collect and process 61 per cent of their global plastic packaging footprint. It is reported that their businesses in Indonesia and Viet Nam continued to collect and process more plastic than they sold, through physical collection and the inclusion of recycled plastic in packaging (Unilever PLC, 2023).</p> <p>The company is also working to increase the number of reusable and refillable formats, as well as strengthen refill business models. In 2023, they expanded their network of refill outlets in Indonesia to around 800, with the dish wash brands Rinso, Sunlight and Wipol (Unilever PLC, 2023).</p>

Implementation Challenges

The following insights regarding challenges in implementing circular economy activities are based on research (Mahindra Group, 2024; Mungkung et al., 2021; Rizos et al., 2016, 2021; Thøgersen et al., 2019) and responses from select member companies of the ESBN.

High initial investment and upfront cost

Transitioning to circular practices often requires substantial initial investments in new technologies, infrastructure, and training staff to adopt new processes. For instance, setting up recycling facilities or redesigning products for reuse or recyclability are cost-intensive (Indorama Ventures, 2023). Indorama Ventures' experience highlights that building recycling facilities to improve the circularity in the plastic industry demands large-scale investments in infrastructure and technology which are capital-intensive and may take years to yield financial returns (Indorama Ventures, 2023). Such upfront cost may impose a significant barrier for many businesses, particularly smaller and medium sized firms. Consequently, convincing investors to fund circular initiatives can be difficult due to the perceived risks and longer payback periods associated with these projects. Traditional financial models may not adequately capture the value of circular economy initiatives, making it harder to secure necessary capital (Rizos et al., 2016). This reveals that many businesses are highly likely to struggle to make circular initiatives economically viable, particularly in industries, especially where traditional linear models are deeply practiced.

Supply chain and operational challenges

Supply chain practices are recognized as one of the major barriers for companies aiming to improve their sustainability performance, according to UN Global Compact participants (Mahindra Group, 2024). Meeting sustainability standards and criteria requires sourcing raw materials from suppliers who also adhere to sustainable practices. This can complicate supply chain management, logistics and transportation, transparency and traceability and suppliers' capacity. For instance, a leading multinational consumer goods company in our analysis sources raw materials from various regions, such as palm oil from South-East Asia, tea from India and Kenya, and soy from South America (Unilever PLC, 2023). Each of these suppliers operates under different environmental regulations and sustainability standards. Ensuring that circular practices, such as waste reduction and sustainable sourcing, are implemented consistently across the supply chain is challenging and requires coordination and investment for capacity building of the suppliers (Unilever PLC, 2023). Finance, collaboration, policy, and capacity building are critical for addressing supply chain challenges.

Ambiguity in definitions and requirements

Varying definitions and requirements can create barriers for businesses trying to implement circular initiatives, particularly in global supply chains (Rizos et al., 2021). For example, one of the challenges facing the aluminum industry is the definition of green or low-carbon goods in trade classifications. Different regions and organizations may have varying definitions and criteria for what constitutes "green or low-carbon aluminum". This lack of standardization can create confusion and difficulty for producers trying to meet multiple sets of requirements. A feasible approach to

address such issues is that the list of such goods should cover the defined environmentally preferable products that cause less environmental damage during production, consumption, or disposal (i.e., recycling) than substitute products.

A taxonomy for sustainable activities can be used to address ambiguity in definitions and requirements. A taxonomy is a transparency tool based on a classification system designed to help businesses and investors make informed investment decisions on sustainable economic activities. It plays an important role in scaling up sustainable investment by creating security for investors, protecting private investors from greenwashing, and helping companies in becoming more climate friendly (European Commission, 2023). The Asia-Pacific region countries in East and North-East Asia and the South-East Asia region have begun implementing the sustainable taxonomy in global markets, including Singapore, China, Hong Kong, Indonesia, Malaysia, Thailand, the Philippines, and the Republic of Korea. These countries are also actively working to align their taxonomies with the EU taxonomy. However, better uniformity across the countries in the Asia-Pacific region's taxonomies is critical for adoption and widespread cooperation. While the range of strategies reflects each country's different context, it also poses challenges to accessibility and uniformity. A uniform framework that aligns to international standards is essential for developing a sustainable financial system in the region (*Institute for Energy Economics & Financial Analysis, 2024*).

Consumer behavior and market demand

Shifting consumer behavior towards the acceptance and preference for circular products also poses a significant challenge for businesses implementing circular activities. While the

success of circular business models often relies on market demand for sustainable products, consumers are frequently accustomed to linear consumption patterns and may resist change, especially if circular products are perceived as less convenient or more expensive (Thøgersen et al., 2019). This resistance makes it more difficult to create and sustain demand for sustainable products in markets where price is prioritized over sustainability. For example, on the supply side, the high costs associated with laboratory testing and certification of bioplastic products to meet biodegradability standards represent a major burden, particularly for small and medium-sized enterprises seeking to compete with conventional plastics (Mungkung et al., 2021). On the demand side, the higher price of eco-labeled bioplastic products often leads to lower consumer willingness to purchase these items, preventing consumers' decisions towards pro-environmental purchasing behaviors (Mungkung et al., 2021).

Capacity of organizations to implement and adopt circular economy policies

Education and capacity building are important enablers within organizations at every level to understand, adopt, and effectively implement circular economy practices. For example, product development, marketing, logistics, and procurement are all affected by circular product and service offers. Employees across functions require understanding the circular economy strategy (Lacy & Rutqvist, 2016). Furthermore, it is important for the employees to gain conceptual knowledge about the principles of the circular economy. If employees are unaware of their conceptually different understanding of the circular economy, their attempts to accumulate knowledge may lead to misleading results (Ghisellini et al., 2016b). To enhance the adoption of circular

economy policies and practices, it is necessary to strengthen the education and skills of different professionals, such as designers, chemical and industrial engineers, procurement officers, product managers, etc. (Ellen MacArthur Foundation, 2013). Therefore, education and capacity building in specific areas like resource efficiency, waste reduction, and sustainable product design play a crucial role in enabling employees to implement circular economy effectively.

The Critical Role of Policy

Government policies, including regulatory, economic, and voluntary measures, play a crucial role in influencing businesses to implement circular initiatives. These policies provide the necessary framework and support infrastructure to promote the shift to a circular economy for both upstream and downstream activities. Government policies impact businesses in several ways.

National or regional circular economy roadmaps or plans set certain goals within timelines for achieving circularity. These roadmaps provide guidelines to businesses across emerging regulatory landscapes, enabling them to set up and promote circular practices accordingly.

An EPR policy mandates that manufacturers take responsibility for their products' entire lifecycle, which pushes businesses to design products that are easily recyclable and reusable (Chenavaz & Dimitrov, 2024).

Product design and labelling policies are critical to supporting circularity because they encourage companies to design products with a sustainability mindset. These policies can obligate companies to provide environmentally accurate

information, such as energy consumption, material use, and emissions during manufacturing, allowing consumers to make sustainable choices (Chenavaz & Dimitrov, 2024).

Economic incentives include environmental taxes and charges, green public procurement, subsidies and grants. Environmental taxes and charges are fiscal penalties levied to enforce activities that create waste, pollution, or result in other environmental damages. These policies mandate companies to design and implement their products that do not harm the environment, encouraging them to develop sustainable alternatives and practices.

Green public procurement policies can help create markets for circularity products and encourage businesses to produce and provide circularity products or services that meet government demand. Governments offer subsidies and grants to enterprises that adopt circularity practices or invest in energy-efficient technologies. For example, governments may provide subsidies for renewable energy projects or grants to enterprises that make investments in reducing waste or recycling technologies (Chenavaz & Dimitrov, 2024).

Micro, small and medium enterprises (MSMEs) face greater challenges with environmental legislation and implementing circular activities compared to larger companies. The regulatory criteria should be adaptable depending on the size and scope of the business's operations (Wasserbaur et al., 2022). Moreover, governments should create laws or regulations that promote circular business models and penalize those who fail to comply with circular principles.

The following examples from Japan, the Republic of Korea, and Thailand show how better government policies have helped promote circularity.

Japan

- **Policy:** The Home Appliance Recycling Law mandates that manufacturers of household appliances such as televisions, refrigerators, air conditioners, and washing machines are responsible for taking them back for recycling (Ministry of Economic, 2022). This has encouraged companies to design products that are easy to recycle and reuse.
- **Policy impact on business:** Companies such as Panasonic and Toshiba have implemented effective recycling programs and designed products that are simple to disassemble and recycle (Panasonic Group, 2024; Toshiba, 2024). In addition, this policy's approach has reduced not only waste but also allowed companies to recover valuable materials from old products, reducing the demand for virgin resources.

Republic of Korea

- **Policy:** The EPR system mandates manufacturers to take responsibility for the entire lifecycle of their products, including recycling and disposal. This policy encourages companies to design more recyclable and sustainable products.
- **Policy impact on business:** Companies such as LG and Samsung have developed take-back programs for electronic devices, resulting in higher recycling rates, as well as designed products that are easy to

disassemble and recycle (LG, 2008, 2024; Samsung, 2023).

Thailand

- **Policy:** Thailand has developed an investment promotion scheme as an economic incentive for producers in the petrochemicals and plastic value chain. The investment promotion scheme includes exemption of machinery duties and three years of cooperative income tax exemption with a cap of 50 per cent of the investment capital (The Board of Investment of Thailand, 2024).
- **Policy impact on business:** Companies such as Indorama, EcoBlue, and Envicco have used these economic incentives to manufacture recycled plastic pellets. Moreover, BASF, a chemical company, also manufactures chemicals from palm kernel oil and corn.

In the Asia-Pacific region, due to a diverse range of countries, the seriousness level of legal frameworks and enforcement mechanisms significantly influences the development and implementation of circular economy initiatives. Some countries in the region, such as Japan and the Republic of Korea, have implemented strong regulatory frameworks and have committed to enforcing environmental laws that enable more effective circular economy transitions. Other countries, however, face challenges of inefficient or weak enforcement of existing laws, or a lack of regulations due to weak governance structures or limited resources.

VII: THE NEXT FRONTIER FOR CIRCULARITY IN THE ASIA-PACIFIC REGION

Envisioning the Next Frontier

The next frontier for circular economy in the Asia-Pacific region is where countries have implemented the necessary interventions to flip the status quo and make circularity the default option for most of the population. In the next frontier, today's linear practices are minimal or used when all other options are not possible. Awareness about the circular economy and its importance is already widespread in public media and within public and private organizations. It is high time to focus all efforts on implementation to create the circular future that the Asia-Pacific region needs. The transition will not come without some trade-offs. Destabilization of certain existing linear practices is expected in the short-term to achieve long-term sustainable gains for society and the planet.

Resources and willpower must be mobilized from both the public and private sectors to bring the Asia-Pacific region into the next frontier for the circular economy. This next frontier will be defined by a level playing field for circular products and services to be attractive and competitive in the market. This can be achieved when most circular economy government policies across the region are fully implemented through enacting laws, regulations, and/or economic or fiscal incentives and fewer policies are at the stage of calls to action or roadmaps.

To unlock the next frontier for the circular economy, support will need to be maximized for infrastructure, regulation, education, finance, innovation, and collaboration to drive businesses to implement the principles of circular economy across their supply chains. The next frontier of circular economy in the Asia-Pacific region would achieve the following outcomes across the six drivers.

Infrastructure: Physical and digital infrastructure is established to facilitate waste prevention and product reuse, and treatment of valuable waste streams.

- Food, organic, and agriculture waste volumes are significantly reduced at the source or separated and valorized back into the biological cycle or captured energy such as biogas.
- Appropriately sized material recycling infrastructure is established near all major cities in the Asia-Pacific region for efficient collection, sorting, and recycling of key materials that currently cause pollution challenges such as plastics and electronics. Waste to energy incineration facilities are only set up to deal with low value non-recoverable waste streams and facilities are sized based on the expected non-recoverable waste volume.
- Digital systems are established that facilitate the exchange of information that enable

people to easily access product repair services, reusable product and service options, and material recycling.

Regulation: Countries across the Asia-Pacific region have implemented regulations that promote circular practices and regulations are well-enforced.

- Right to repair laws are established and enforced that mandate manufacturers to provide easily available information about their repair services and provide spare parts for electronics and other products.
- Reusable and refillable options are required to be available at establishments such as restaurants to reduce reliance on single-use items and packaging. The mandate should minimize the conflicts and constraints of the service providers.
- Consumption of products with recycled material content is incentivized through procurement regulations that mandate a certain percentage of new products to be made of recycled materials.
- EPR laws are established in all countries in the Asia-Pacific region with regional alignment and cover key waste types based on each country's context to increase recycling and reduce the use of raw materials. A transparent system is established for collecting and managing the funds generated by the EPR laws.
- Governments deploy adequate resources to enforce regulations that contribute to promotion of circular practices.

Education: The principles of the circular economy have become a fundamental component of national education systems and workforce training across generations of the population.

- The principles of the circular economy are embedded in national education curriculum and vocational and education training.
- Governments support programs that integrate the principles of the circular economy into strategies for workforce development to up-skill and reskill people, especially workers who are expected to lose jobs during the transition.
- Governments and businesses collaborate to educate the public about the circular economy and actions that can be taken to support the transition.

Finance: Governments create market conditions and provide public sources of financing that stimulate private investment in circular economy activities that offer both financial and development returns.

- Across the Asia-Pacific region, there are severe legal and financial penalties enforced for mismanagement of waste (i.e. open dumps and open burning). Landfill fees are high enough to push organizations to reduce waste generation or recover value through recycling processes.
- Subsidies for industries currently using linear practices are significantly reduced and the funds are transferred to subsidize circular activities that are unable to sustain themselves through traditional business models.
- Public funds are used to attract and de-risk private investment in circular solutions and infrastructure.

Innovation: Products and services that support the circular flow of materials and energy and regenerate nature are deployed and adopted.

- Regenerative farming becomes a mainstream practice in agri-food systems across the Asia-

Pacific region.

- Both off-the-shelf low-tech solutions and cutting-edge high-tech solutions are deployed to promote resource reduction and the circular flow of materials and energy.
- Product manufacturing minimizes resource consumption without compromising product functionality and products are designed for repair and recycling.
- Reusable products-as-a-service are readily available and cost-competitive for consumers.

Collaboration: All stakeholders across industries and the supply chain in both the public and private sectors share a common goal of scaling up circularity and establish partnerships with tangible outcomes.

- There are healthy partnerships between government agencies, businesses, research institutions and universities, and communities to develop and maintain industrial symbiosis networks and related infrastructure with a collective goal to exchange waste-to-resources at scale.
- Large businesses engage their upstream suppliers and MSMEs as a standard practice to help them understand more about the requirements of their supply chain circular economy initiatives and improve transparency of purchasing and sourcing of upstream materials.
- There is sufficient data transparency and traceability across all sectors to enable organizations of all types to collaborate effectively in implementing circular economy initiatives and measure progress towards reducing material consumption and waste generation and regenerating nature.

Arriving at the Next Frontier

Reaching the next frontier of the circular economy in the Asia-Pacific region comes with its challenges. Government agencies across the Asia-Pacific region have already taken initiative at the policy level to create conditions and lay a foundation for supporting circularity in their respective countries at different levels of seriousness. Major businesses in the region have already taken initiative within the control of their supply chains to implement circular activities that are relevant to their products and services. Bold and contextually appropriate action is still needed to see real impact in the short, medium, and long-term. The following sections prescribe what governments, businesses, and the ESNB can do to support implementation of circular economy initiatives in the Asia-Pacific region.

What Can Businesses Do?

- **Undertake a systemic diagnostic and create a strategy with buy-in from top management.** Businesses should conduct a systemic diagnosis of their entire value chain to understand how to embed a circularity mindset into the organization and identify tangible ways circularity can address business challenges and create value. The outcomes of the diagnosis can be transformed into a strategy that lays out what circular activities should be done, who will lead implementation of each activity, what resources will be allocated to support, and the value added at the end. Buy-in from top management will also be important to make circularity an organization-wide priority.
- **Establish company steering committee forums.** Companies can establish steering committee forums that comprise key stakeholders to provide an environment for members to share and learn where they can explore circularity opportunities from alternate design, procurement of sustainable products through to operational usage to expand life expectancy.
- **Learn from successful cases and replicate.** Many businesses are already implementing circular economy activities without government support. This shows that there are actions that can be done that add value to a business and can be done independently. Companies should aim to learn from the success of other companies and replicate if the circular activities are relevant to their industry.

What Can Governments Do?

- **Create a level policy playing field.** In general, governments need to change the rules of the game and create a playing field to enable circular solutions to succeed. The rules of the game should incentivize circular practices while penalizing the harmful linear practices. This will shape the nature and scale of economic activities across countries and industries.
 - **Adjust the economics in favor of circularity.** Governments should adjust fiscal policies and leverage public budgets to create prices that ensure that circular products and services are more valuable and can compete and replace products and services that rely on linear practices (take-make-waste). Taxation should ensure that prices of goods and services reflect and include both financial and social and environmental costs. Incentives for excessive material consumption need to be quickly transitioned out.
 - **Improve enforcement of regulations.** Enforcing regulations in general is still a major challenge in many countries in the Asia-Pacific region. Governments need to improve in this area so that existing and future regulations and other mandatory measures that support circularity (e.g., minimum recycled content, EPR, taxes and fines) can achieve their intended results sooner rather than later. The monitoring and penalties must be strict enough so that the individuals and businesses play by the rules.
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- **Support circular activities that are higher in the waste hierarchy.** In the waste hierarchy, activities such as reducing waste, repairing, and reusing products are the most preferred option. Recycling and recovery are on the lower end of the waste hierarchy, yet these activities are more frequently initiated globally. Governments should support circular activities that offer higher value for material use and waste prevention such as repairing but have experienced very low implementation compared to other circular activities. Certain activities may need to rely on regulations such as the EU's right to repair or subsidies to promote the activity or keep it operating.

What Can the ESN do?

- **Promote circular economy activities among similar business types.** Member companies of ESN that have already implemented circular economy activities could serve as circular "brand ambassadors" and advocate to companies in the same industry to do similar circular economy activities. Many companies of different sizes are generally aware about the circular economy and its importance, but often are not sure about the first steps to take. Members of ESN can help facilitate peer-to-peer learning among similar companies.
- **Engage governments collectively to advocate for action and change.** ESN members can assemble and advocate for policy reforms that would make it easier for businesses to implement circular practices. Engagement can come in the forms of providing consultations and expert input,

collaborating with the media to shape public opinion, and organizing roundtables and forums focused on engaging government agencies.

- **Create an online library of circular economy success stories and solutions from the Asia-Pacific region.** This report provides examples of how businesses have initiated circular economy activities and supporting policies governments have created. There are many more initiatives, success stories, and solutions across different countries, industries, sectors, and organization sizes (micro, small, medium, large) that are ongoing or have been accomplished and should be captured to inspire others. ESN could create an online library of circular economy success stories and solutions and catalog them according to different themes such as countries, industries, drivers (i.e., infrastructure, regulation, education, finance, innovation, collaboration). The case studies should be presented in a manner that intentionally push organizations to act.
- **Collect and communicate the not-so-successful circularity stories.** Although success stories are valuable, the not so successful stories are equally as important when it comes to implementing circular economy activities. The less successful stories are hard to find because organizations often avoid sharing these cases as this could affect their brand and reputation. ESN could support in learning about the less successful examples and find ways to present the findings in a manner way that does not compromise the confidentiality

and reputation of specific companies and industries.

Looking Ahead

The journey in transitioning to a circular economy in the Asia-Pacific region needs to be people centric even though the principles are grounded in technical and biological aspects. Governments, businesses, and a majority of the public are already aware about the circular economy or certain principles of this concept. Raising general awareness has already been accomplished over the past several years. It is now high time to focus on targeted awareness and communication and implementation of all the possible activities that can contribute to a circular economy. There is no single department, company, industry, city, or nation that should work in isolation in taking the Asia-Pacific region into the next frontier of the circular economy. Interventions should be applied with an understanding about its potential ripple effects. Systems thinking shows us the importance of targeting key sources of the issue, such as regulatory frameworks, bias towards prevailing business models, and value systems instead of tackling symptoms. We need to break through the mental barriers that limit us from reaching the vast possibilities that the circular economy can offer.

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