

Closed Loop Commerce: Lessons from the Field on Scaling Circular Economy Business Models

Xanth Mallett, Department of Criminology, University of New England, New South Wales, Australia. xmallett@une.edu.au

The circular economy is no longer just a vision to discuss at different conference tables, but has quickly come to be considered a business imperative [1]. In the Netherlands, manufacturers are converting post-consumer plastics into high-quality packaging. Japanese electronics companies are trying to recover rare-earth minerals from urban waste streams; they are cheaper to recover from the wastes than to mine. Today, construction businesses in South Korea get 20% of their total inputs from demolished structures. That's revenue lines — not sustainability side-projects. What our vanguard companies have seen, and at high-Ish cost – is that creating scale in a circular economy requires a new commercial logic in which the end of a product's life is also the start of another value creation cycle.

Today, less than 8.6% of the global economy is circular; estimates estimate that by 2030, a transition to circular practices could unlock USD 4.5 trillion new economic value globally [2] but as linear production has grown faster than the development of recovery infrastructure, the transition has shown minimal progress. The problems that this article addresses are those differences between potential and practice. It draws lessons from policy frameworks and industry performance measures from the Netherlands, Germany, Sweden, Japan, South Korea and India on the key structural differences between businesses that are in closed-loop commerce "at scale" versus in "pilot mode."

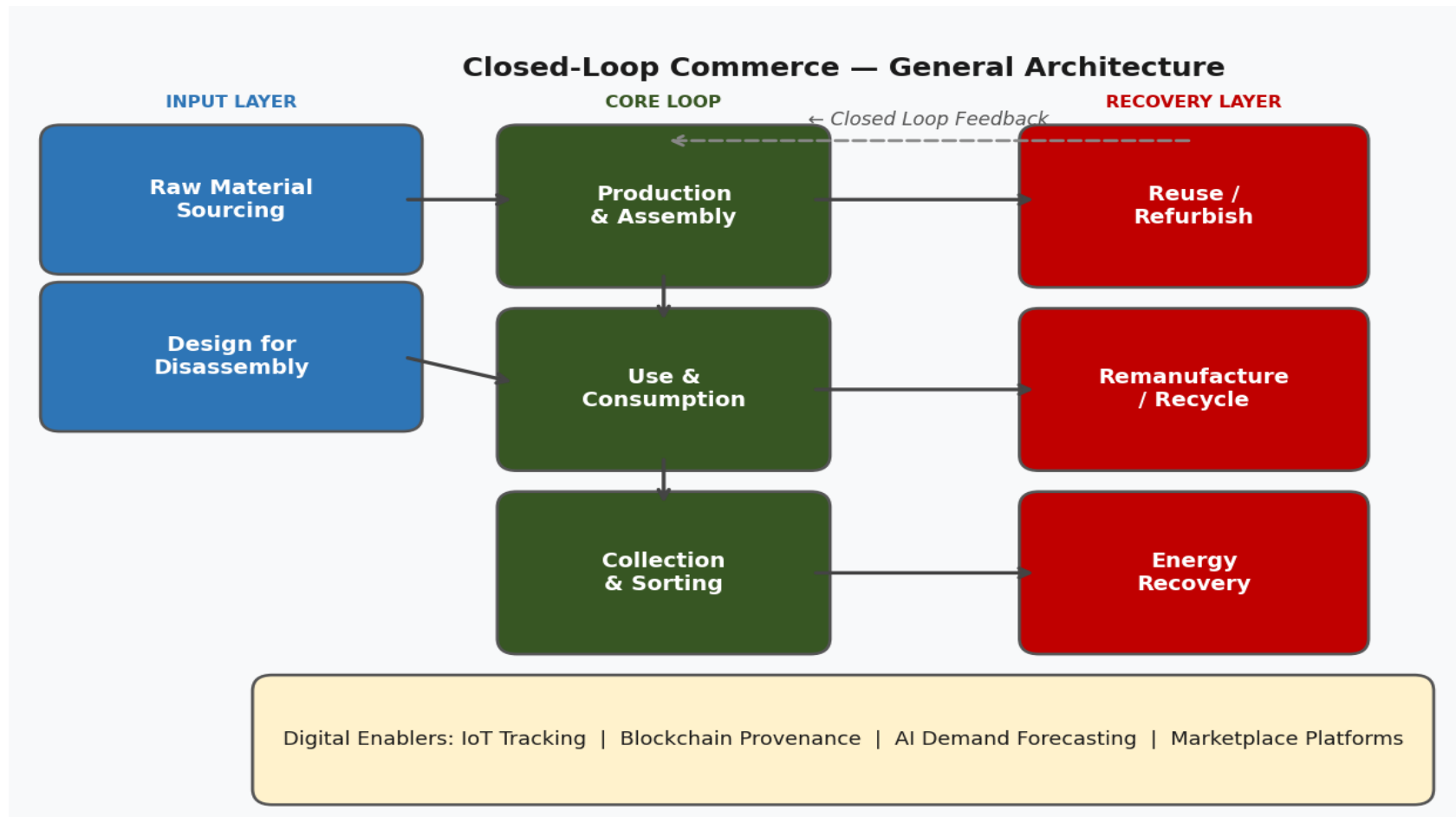


Figure 1: General architecture of a closed-loop commerce system

Figure 1 shows the three layers which are interdependent and any scaling circular business must master. The Input Layer regulates the type of material that enters the system; it is not just where the materials are being sourced, but at the point of design. Production and consumption are included in the Core Loop, as well as the collection and sorting processes, which are extremely important during the value chain, but in which collection

investments are virtually ignored. The Recovery Layer defines if end-of-life materials are reused at the highest value, as components, remanufactured assemblies or as recycled feedstock, or cascade down the lower value of energy recovery. Digital enablers, including tracking via IoT, blockchain systems that trace provenance, AI systems forecasting demand and digital marketplace platforms, match supply to recovery

capacity underpin all three layers. The problem for most scaling efforts is they are unable to integrate all three layers to operate as a whole, and not as a collection of departmental silos.

Where Countries Stand — and Why It Matters to Business

The policy environment frames commercial opportunity and this is clearly different across countries. Table 1 below provides a summary of six country profiles in terms of the dimensions that are more relevant for business scaling: year of comprehensive CE policy framework, diversion from landfill, composite CE Maturity Index, and estimated contribution of circular activities to GDP.

A 78% waste diversion rate is seen in the Netherlands, where waste diversion is provided by a dense ecosystem of material marketplaces that prices and trades waste flows as a commodity instead of a cost through legally enforced producer responsibility programs, for electronics, vehicles, and packaging. The regulatory certainty that allowed the automotive sector to invest decades ago in disassembly infrastructure was provided by the Kreislaufwirtschaftsgesetz (Circular Economy Act), initially introduced in 1994, and significantly updated in 2012, in Germany. The common denominator: policy holds over time [4]. India's 2019 framework is positive; however, 34% diversion rate takes the clue of India's infrastructure deficit that normally requires 10 years of constant investment to bridge [1].

Table 1: Circular economy policy and performance indicators by country (2022–2023)

Country	Policy Year	Diversion Rate	CE Index	GDP Impact (%)	Key Sector
Netherlands	2015	78%	82	4.1	Electronics
Germany	2012	69%	76	3.8	Automotive
Sweden	2014	73%	79	3.5	Packaging
Japan	2001	82%	77	2.9	Manufacturing
South Korea	2010	61%	65	2.2	Construction
India	2019	34%	38	1.4	Textiles

Sources: OECD (2023) [3]; Ellen MacArthur Foundation (2023); World Bank (2023) [1]; Ministry of Environment, South Korea (2022) [4].

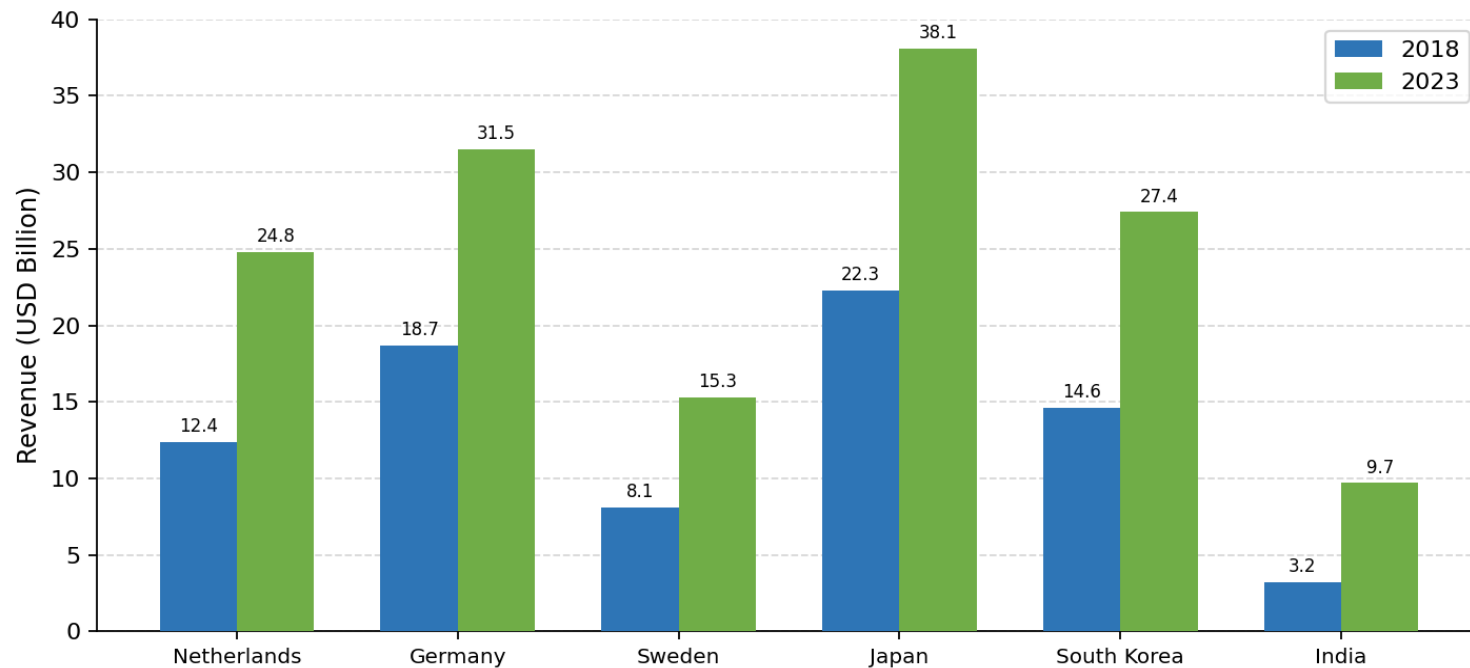


Figure 2: Circular economy revenue by country: 2018 vs. 2023 (USD Billion)

In absolute terms, the absolute revenue growth from circular activities has been highest in countries with the longest policy history as indicated in figure 2. The value of Japan's exports has increased from USD 22.3 billion in 2017 to USD 38.1 billion in 2018, an increase of 71%. This is the result of the electronics sector's urban mining and remanufacturing activities. The Netherlands grew by almost 200%, from USD 12.4 billion to USD 24.8 billion, thanks to innovation in the field of bio-based materials and industrial symbiosis networks around the Rotterdam port corridor. The most eye-catching growth is in India, which has increased from USD 3.2 to 9.7 billion, an

increase of 203% although the base is small and the growth is largely in the informal textile recycling sector.

The Three Structural Barriers to Scale

Practitioners consistently name three barriers that block pilots on circularity from going commercial scale across all six country contexts. The first is the quality and consistency of feedstock. If there is no consistency, a reverse logistics system that provides irregular volumes of heterogeneous materials cannot support the manufacturing process [3]. The packaging industry in Sweden tackled the issue by setting guaranteed minimum quality parameters for collected packaging materials

that have been adhered to by consumers almost to perfection (PET bottles over 90%). That discipline would otherwise mean that recycled feedstock would be sold at a significant price discount to virgin material, which would lead to a loss of economics.

The second barrier is that of demand side market development. There is regular overproduction of secondary materials, especially of lower grade fractions. The take-away message for business is that there is a need for a guaranteed offtake-market – in South Korea, a government policy to include a minimum percentage of recycled content in public construction projects – that can't be a transitional part of the way

to circular revenue, as the markets start to become fully functional after a certain turning-point.

The third barrier is the accounting gap. Most mainstream financial reporting focuses on expenses, not revenue, in the case of recovered materials and hides them in the expenses that boards and investors use to allocate capital. Successful companies, like some medium-sized Mittel stand manufacturers, have established a separate profit and loss account for their circular businesses, enabling them to become visible and secure both internal investment and green financing. In 2023, the Ellen MacArthur Foundation analysed that companies that had a dedicated circular P&L unit had a 2.3x steeper growth trajectory in their scale-up compared to those without a dedicated unit.

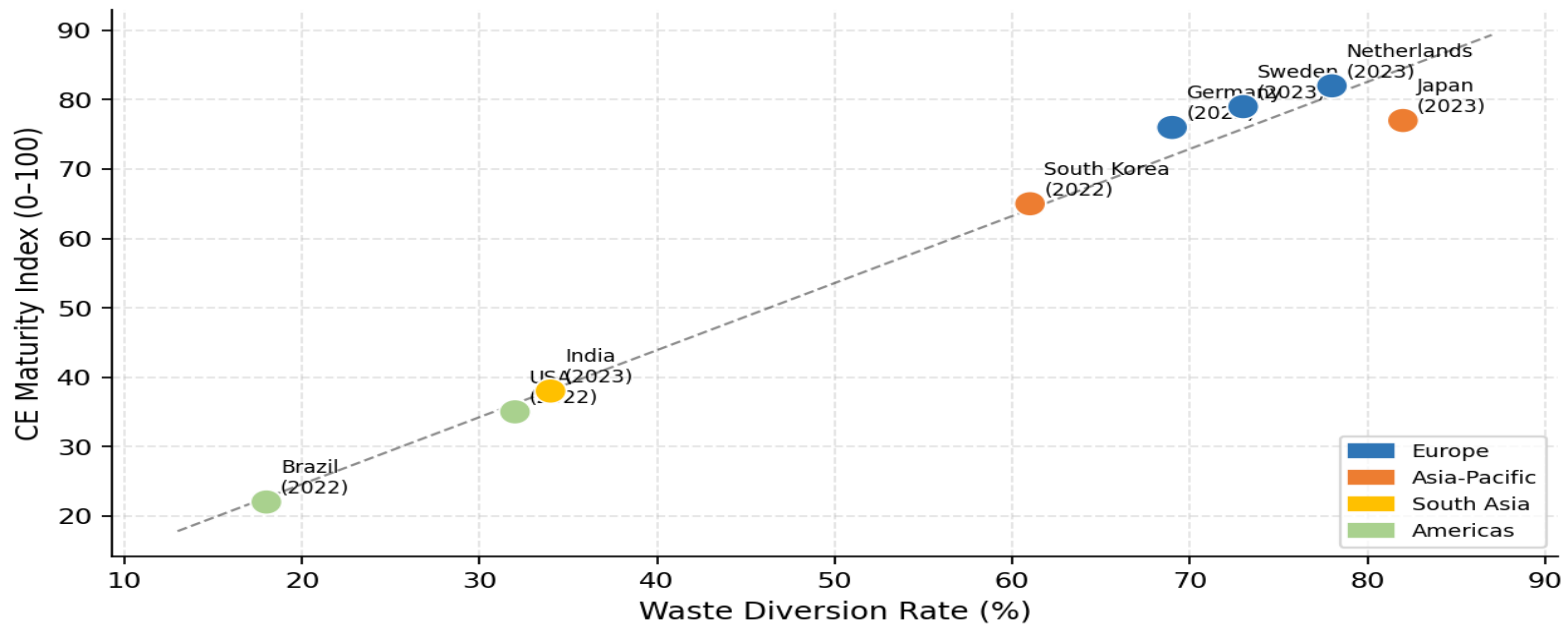


Figure 3: Waste diversion rate vs. CE maturity index by country

There is a strong positive correlation between waste diversion and CE maturity as shown in figure 3, though this is not a linear correlation, with the outlier points showing the importance of outliers. Japan is slightly off the trend line for its diversion rate, and high diversion does not necessarily mean that sophisticated business models are present; much of the recovery in Japan is in low value fractions. In contrast, Sweden is above the trend: the maturity index is far too high for the diversion rate for Swedish companies that have focused on high value streams (such as pharmaceuticals and advanced packaging). The difference between a quantity-led and a value-led circular system is commercially crucial for enterprises that have to decide which markets to market to or what partnerships to make.

From Field Experience: What Actually Scales

The most obvious take-home message from all six markets is that good circular businesses begin with recovery and do not begin with production. Firms that start with waste mapping and reliable waste streams and then invest in processing and manufacturing facilities, as opposed to designing a product and dealing with the end of life (EoL) later, always outperform those that do the latter. This is captured in the Dutch approach: There is an increasing number of manufacturers that are negotiating take-back agreements as a condition of sale, effectively making their customers into a captive feedstock supplier and turning the

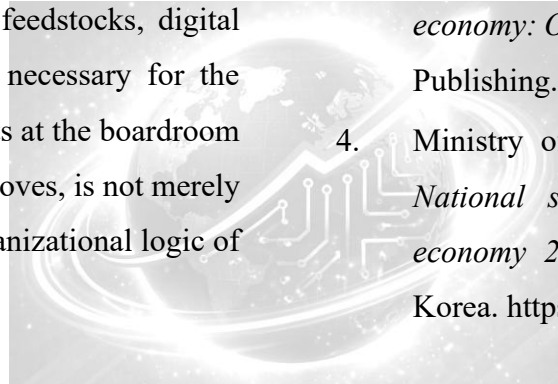
cost of returns management into a materials procurement benefit.

The other constant fuel is digital infrastructure. The cost of recovery is lowered because the recovery process can be done proactively and materials can be tracked and found through the power of the IoT, as in the Netherlands' electronics industry and Japan's automotive remanufacturing supply chains. That's not an "incremental" or "marginal" benefit, that's a turbo-boosted stream of secondary aluminium that's a lot purer and a lot more profitable to sell.

The path that India is taking is still in its infancy but the message is different: Informal economies can be elements of the circular economy and not barriers. With limited capital investment, the country's huge informal textile recycling industry can give rise to high material recovery rates, employing an estimated 2.5 million people. These networks can be formalised and incorporated into a more effective system, not supplanted by industrial-scale networks, and is the most capital-efficient way to scale emerging markets networks. A few global apparel companies have started formal collaborations with informal aggregators in Panipat (Haryana), supplying sorting machines and assured purchase of sorted fibres.

The Road Ahead

The findings presented above present a clear picture circular economy business models are beyond the proof-of-concept stage and into the consolidation phase. In the six nations analyzed, those with early policy enablers have seen their business environments thrive – and their growth trajectories are steep. As far as business operators operating in policy nascent nations, the opportunity window remains open – but not indefinitely. The businesses that will determine the next era of circular commerce are those currently making investments in feedstocks, digital collection systems, and funding structures necessary for the visibility and accountability of circular efforts at the boardroom table. Closed loop commerce, the research proves, is not merely a niche sustainability model – but a new organizational logic of competitive industry.



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