



# **Circular Economy:** from Indicators and Data to Policy-making

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# 05

## Policy-making and the Use of Circular Economy Indicators



This section analyses how circular economy indicators can help countries to shift from a linear to a circular economy. The first part focuses on presenting examples of the different instruments that can be used at national level to promote the shift to a circular economy, while the second part discusses how core circular economy indicators can play an important role in developing and monitoring this process.

### 5.1 National Policy Strategies to Shift to A Circular Economy

This report is based on the definition proposed jointly by UNECE/OECD in the “Guidelines for measuring circular economy part A: conceptual framework, statistical framework and indicators” (2023), as no single international definition of circular economy is available.

#### Box 3 Definition of circular economy

A circular economy can be defined as an economy where:

- The value of materials in the economy is maximised and maintained for as long as possible;
- The input of materials and their consumption is minimised; and
- The generation of waste is prevented, and negative environmental impacts reduced throughout the life-cycle of materials”.

(UNECE 2023)

Developing a circular economy model at national level is a significant challenge for governments and a complex process, especially considering that the traditional production models are based on linear resource consumption, so structural changes are needed at national and local levels. In parallel to challenges linked to the implementation of a new production model, there are many opportunities arising from the development of a circular economy, that can result in benefits at



economic, social and environmental levels. Having said that, multiple stakeholders are fundamental in the shift to a circular economy:

- Governments as the creators of adequate conditions to promote changes at the production sector level and within the society.
- Businesses as producers of goods and services, and as the final responsible entity for decision making about production conditions and private investments, within the context of the regulatory environment.
- Consumers as their demand and behaviour have an important role in the shift to a circular economy as purchasers of the goods and services produced.

Related to the consumer's role on circular economy, "different studies around the world about consumption patterns, show that women tend to be more sustainable consumers and are more sensitive to environmental and health concerns. Women are more likely to recycle, minimise waste, buy organic food and eco-labelled products, and engage in water and energy saving initiatives at the household level. They also place a higher value on energy-efficient transport and, in general, have a higher preference for public transport than men. Women can therefore be key actors to move consumption towards more sustainable patterns. In this regard, public policies and new approaches to influence consumption decisions, such as behavioural insights should take into consideration a gender perspective" (OECD 2021).

There are different policy strategies that can be applied by governments to promote a circular economy model. Some of these strategies are introduced hereafter and are illustrated with examples from different countries. Implementation of such strategies requires a lengthy process and no universal solution is available. The different options should be adapted to each country considering its own economic, political, environmental, cultural and social characteristics.

#### Box 4 Consumers' role in Circular Economy

"Needs from consumers have the greatest impact on production and sales activities. When consumers take the lead in purchasing products with low environmental impact, companies are incentivized to develop environmentally friendly products. As a result, a wider range of environmental consumer choices will lead to even more environmentally friendly products and services. Consumers and businesses are "like two wheels of a cart" in the market as each depends on the other. Increased consumer and business awareness will play a significant role in the transition to a circular economy.

Of course, the most important element for promoting a circular economy is to enhance the environmental awareness of consumers. Consumers need to understand that they have a responsibility to actively purchase environmentally friendly products and to change their consumption patterns and lifestyles to incorporate higher circularity, through such behaviors as minimizing waste, with a perception that they are members of a circular economy system."

*Circular Economy Vision 2020  
(Japan, Ministry of Economy, Trade and Industry 2020)*

#### a. Institutional framework

There are two main aspects to be considered in the case of an institutional framework. The first aspect relates to the institution(s) responsible for the shift to a circular economy model while the second relates to the coordination between the different institutions, in connection with circular economy policies.

**Responsible institution:** As circular economy is a cross-cutting policy, it is important to set up a responsible institution at national level in charge of following up on the shift to this new model. Such institution can be one (or multiple) existing institution(s) or a newly established one, and is expected to coordinate all efforts and initiatives in place, also at project level, to achieve the goal of shifting to a circular economy model. As the process is lengthy, this institution shall have

access to all the information about the evolution and advancements on circularity, which would allow for focusing all national efforts in the same direction and shall act according to real needs.

**Coordination mechanisms:** the importance of having coordination mechanisms at different administrative levels is to avoid duplicating efforts and to minimize costs. Both horizontal and vertical coordination are fundamental to optimise the results of the different institutions' policies. The form of these mechanisms can vary from working groups, commissions, task forces or other forms.

#### Box 5 Institutional framework - country example: The Netherlands

"The government is responsible for policy on the transition to a circular economy and is accountable to the House of Representatives in this regard.

Within the government the State Secretary for Infrastructure and Water Management is responsible for coordinating the transition. This means that the State Secretary takes initiatives to accelerate the transition in the whole of the Netherlands and in all sectors, working together with all policy partners in the area of the circular economy. The State Secretary also draws up this policy programme, sends it to Parliament and organises monitoring.

The members of the government at the line ministries most closely connected with this issue are each responsible for circularity within their own remit. For the current product chains it concerns the Ministry of the Interior and Kingdom Relations (construction, plus coordinating ministry for spatial planning), the Ministry of Economic Affairs and Climate (industry, plus coordinating ministry for climate), the Ministry of Agriculture, Nature and Food Quality (agriculture), the Ministry of Infrastructure and Water Management itself, and the Department of Foreign Trade and Development Cooperation. Once every two years, the State Secretary holds bilateral meetings with the ministers of these ministries on the progress made, to see whether any adjustments are needed."

*National Circular Economy Programme (2023-2030)  
(Kingdom of the Netherlands, Ministry of Infrastructure and Water Management 2023)*

#### b. Policy framework

A defined policy framework allows governments to create a certain and clear environment for all administrators in general, and for the production sector in particular. The scope of this kind of instruments ranges from national strategies or plans that cover a great part of the economy, to sectoral plans or programmes that focus on one thematic area.

**National strategy or plan:** A general strategy for implementing circular economy at national level could simplify the development of other more specific and concrete instruments. This national strategy can be developed through several sectoral plans and/or other instruments and at different administrative levels. Examples of countries that have adopted national strategy or plan to encourage the shift toward circular economy are presented in Box 6, Box 7 and Box 8.

#### Box 6 Policy framework - country example: Colombia

In 2019, Colombia was the first country in Latin America to adopt a National Circular Economy Strategy (Estrategia Nacional de Economía Circular, ENEC).

"The Strategy aims to a new model of economic development that includes the continuous resources valorization, the closing of materials cycles, water and energy, the creation of new business models, the promotion of industrial symbiosis and consolidation of sustainable cities, in order, among other things, to optimize efficiency in the production and consumption of materials, and reduce the water and carbon footprint."

"The National Circular Economy Strategy prioritises six material and resources flows of major importance for the country: industrial and mass consumption products flows, packing material flows, biomass flows, energy sources and flows, water flows and building material flows".

*Circular Economy National Strategy 2019  
(Colombia, Ministerio de Ambiente y Desarrollo Sostenible and Ministerio de Comercio, Industria y Turismo 2019)*

## Box 7 Policy framework - country example: Spain

"In 2020, the Circular Economy Spanish Strategy was launched. This strategy contributes to Spain's efforts to achieve a sustainable, decarbonized economy, which uses resources efficiently and is competitive. This strategy will be materialized in successive triennial action plans.

The Strategy establishes the following goals for the year 2030:

- Reducing by 30% domestic material consumption in relation to national GDP, taking 2010 as a reference.
- Reducing waste by 15% with regard to 2010 waste levels.
- Reducing food waste throughout the entire food chain: 50% reduction per person in retail and households and 20% in production chains and supplies from 2020, thus advancing towards the Sustainable Development Goals (SDGs).
- Promoting reuse and reuse enabling activities until reaching 10% of municipal waste.
- Reducing greenhouse gas emissions to below 10 million tonnes of CO<sub>2</sub>eq.
- Improving water use efficiency by 10%".

*Circular Economy Spanish Strategy. España Circular 2030.  
(Spain, Ministerio para la Transición Ecológica y el Reto Demográfico 2020a)*

In addition to the Circular Economy Strategy, the Spain 2050 Strategy (España 2050) was adopted in 2021. The Spain 2050 Strategy identifies nine future targets, one of them being to "become a carbon neutral and sustainable society that is resilient in the face of climate change". Below is the list of goals relevant to achieve this target from the Spain 2050 Strategy.

- "Goal 21. Reduce our greenhouse gas emissions by 90% by 2050, meeting our commitment to achieve climate neutrality by the middle of the century (the remaining 10% will come from the absorption of carbon sinks).
- Goal 22. Drive the water transition as an essential pathway for adaptation to climate change, achieving a reduction in total water demand of 5% by 2030 and 15% by 2050.
- Goal 23. Reduce primary energy intensity by 36% by 2030 and 63% by 2050 compared to 2015 values.
- Goal 24. All electricity to be generated from renewable sources by 2050, with this percentage reaching 74% by 2030.
- Goal 25. Strengthen the role of environmental taxation, incorporating criteria that promote a just ecological transition into its design and application. Spain should reach the current average of European countries by 2030, and increase its ambition over the following two decades, in order to ensure that decarbonisation is completed, and the circular economy and environmental protection are strongly promoted.
- Goal 26. Increase the area of organic agricultural production to 25% by 2030, in line with the EU's Farm to Fork initiative, and to 60% by 2050.
- Goal 27. Increase wooded forest areas in order to protect biodiversity, improve ecosystem resilience and increase the capacity of carbon sinks, essential to achieving climate neutrality by 2050. Spain should adopt an average reforestation rate of 20,000 hectares per year during the period 2021-2050, compared to the current 15,000 hectares".

*Spain 2050 Strategy  
(Spain, Oficina Nacional de Prospectiva y Estrategia 2021)*

### Box 8 Policy framework - country example: Japan

In 1999, Japan approved the Circular Economy Vision, and it was “among the first countries in the world to make such a commitment, in order to cope with the pressing needs for waste disposal sites and other issues such as natural resource constraints.”

Twenty years later, Japan adopted the Circular Economy Vision 2020 that “indicates a new direction in letting Japanese industries shift to new business models with higher circularity and to improve the resource efficiency of their businesses, while taking advantage of our industrial structure.”

The Vision identifies key areas where the development of resource circulation systems is urgently needed. These areas are:

- “Plastics
- Textiles
- Carbon Fiber Reinforced Polymer (CFRP)
- Batteries
- Photovoltaic (PV) Pannels.”

*Circular Economy Vision 2020*  
(Japan, Ministry of Economy, Trade and Industry 2020)

Sectoral plans and policies: Specific aspects of circular economy can be covered by implementing sectoral plans and policies focused on the different pillars of circular economy. Box 9 and Box 10 present the South African and Colombian examples for policy frameworks at sectoral level.

### Box 9 Policy framework – sectoral example: South Africa

National Waste Management Strategy (NWMS) 2020

“The National Waste Management Strategy has the concept of circular economy at its centre. The following are the outcomes that will be achieved through effective and efficient implementation of the NWMS 2020 by all stakeholders from all sectors of the society:

- Prevent waste, and where waste cannot be prevented ensure – 40% of waste diverted from landfills within 5 years; 55% within 10 years; and at least 70% within 15 years leading to Zero-Waste going to landfill;
- All South Africans live in clean communities with waste services that are well managed and financially sustainable; and
- Mainstreaming of waste awareness and a culture of compliance resulting in zero tolerance of pollution, litter and illegal dumping.”

*National Waste Management Strategy (NWMS) 2020*  
(South Africa, Department of Environment, Forestry and Fisheries 2020)

### Box 10 Policy framework – sectoral example: Colombia

The National Plan for the sustainable management of single-use plastics 2021-2030

“The objective of the Plan is to implement a sustainable plastic management, based on instruments and actions of prevention, reduction, reuse, use, responsible consumption, generation of new business opportunities, linkages, jobs and technological developments, aims to protect natural resources and promote competitiveness.” The Plan establishes a set of goals, so that by 2030 “100% of the single-use plastics in the market will be reusable, recyclable, or compostable.”

**Box 10 Continued**

“The proposed actions included in the Plan are:

1. Not producing or using single-use plastics products.
2. Rethinking plastic products so they can be put in the market with better environmental characteristics (eco-design), substitution of materials to extend their lifetime, and facilitate cycles closing (recyclability, compostability).
3. Reducing: increasing the manufacturing efficiency by using less raw material.
4. Promoting products reuse by incorporating characteristics to extend their lifetime.
5. Reducing waste generation by actions about rational use and eco-design.
6. Increase the use of materials in a sustained way over time to reincorporate them into the production cycle or recovering their energy potential.
7. Discouraging the final disposal of materials in landfills.”

*National Plan for the sustainable management of single-use plastics 2021-2030  
(Colombia, Ministerio de Ambiente y Desarrollo Sostenible 2021)*

**c. Regulatory instruments**

Laws at different administrative levels can be adopted to accelerate the shift to a circular economy. One example of this kind of instruments is a regulation about the implementation of Extended Producer Responsibility Schemes (EPR schemes) for certain product sectors, such as the example of France (Box 11).

**Box 11 Regulatory instruments - country example: France**

In France, in 1992, the first EPR scheme about household packing was implemented. In 2018, there were already 14 compulsory EPR schemes in the country.

The first sectors where EPR schemes were applied included, in addition to household packing, paper, electrical and electronic equipment (WEEE), textile products, batteries and accumulators, chemicals, tyres, end-of-life vehicles, recreational or sports boats, punctured medical devices used by self-treatment patients, medicines for human use and furniture.

In 2020, the Law on the fight against waste and for the circular economy (Loi relative à la lutte contre le gaspillage et à l'économie circulaire), also named Anti-waste Law, was adopted. It extends the sectors where the implementation of EPR schemes is compulsory, including toys, cigarette butts, construction, and sporting and leisure equipment (Government of France 2020).

Since 1<sup>st</sup> January 2023, an EPR scheme has been introduced to tackle construction waste and to make manufacturers of construction products responsible for the waste generated.

According to the European Commission report “Construction and demolition waste management in France”, “France’s construction sector generates 42 million tonnes of waste annually and accounted for 26% of the country’s CO<sub>2</sub> emissions (or 115 MtCO<sub>2</sub>e) in 2016. These construction materials are sometimes thrown into illegal dump sites and pollute the environment. The removal of materials and clean-up of these dumpsites cost municipalities and taxpayers an estimated EUR 340 to 420 million.” (Deloitte for the European Commission 2015).

France is one of the countries with a wider implementation of this system in the world and more sectors will be included in this system in the next few years, i.e., professional packaging, chewing gum and single-use sanitary textiles.



#### d. Markets instruments

There are different instruments that can be used to promote the shift to a circular economy model from the financial perspective. Examples of these instruments are taxes, tax reliefs, exemptions and subsidies for circular economy business models. Box 12 presents the example of market instruments adopted by Spain.

In parallel to studying new market instruments, it can be interesting to review the existing financial instruments, to validate their utility and to identify if some of them have harmful effects from a circular economy perspective.

Circular Economy public procurement is also an effective mean to promote the shift to a circular economy, as it allows governments to influence demand and at the same time increase their credibility in the process.

#### Box 12 Market investments - country example: Spain

The Circular Economy Spanish Strategy (España Circular 2030) describes different policies to be used to enhance the circular economy, including fiscal policy and taxation.

“Fiscal policy and its derived instruments are efficient and effective means of increasingly achieving environmental objectives and resolving the problems identified in the sectoral agendas, especially as a result of the regulatory changes to be introduced by the implementation of the Circular Economy Strategy in the field of waste.

In this sense, from the environmental perspective, it is considered that taxing pollution, excessive use of resources or non-appropriate waste management can result not only in income for the public treasury, but also in the protection and restoration of the environment, by encouraging favorable behaviors in terms of the use of resources, the generation of waste and its treatment.

Fiscal policy in Spain has a considerable margin for development, as it is one of the European member states with the lowest tax burden on the

#### Box 12 Continued

environment, in relation to its GDP, this ratio being 1.86% compared to the European average of 2.44%. Therefore, it is plausible to apply finalist taxes to management options at the bottom of the waste hierarchy, such as landfilling or incineration. To be more effective, the proceeds should be used to prioritise the first options: prevention, separate recollections, and preparation for reuse and recycling.

Likewise, appropriate fiscal measures can play an important role and help to improve efficiency in the use of materials, the prevention of waste generation, especially food waste, the promotion of reusable products or products with better environmental performance, in terms of the circular economy, so that by 2030 the objectives of this Strategy are achieved.”

*Circular Economy Spanish Strategy. España Circular 2030  
(Spain, Ministerio para la Transición Ecológica y el Reto Demográfico 2020b)*

#### e. Information, awareness, education and training instruments about circular economy

The change from a linear to a circular economy requires the investment of different stakeholders, including the business sector, academia and society in general. It is essential to make available the information to all the actors so they can act at their corresponding level. At this point, it can be useful to use the circular economy indicators as a tool in the information process.

Circular economy awareness programs are initiatives that go further than simple information diffusion. They deliver key messages to target audiences about different aspects of circular economy, to provide the necessary information for promoting behavioral changes. Raising awareness as a part of educational activities targeted at the public is essential to support informed decision making by customers.

### Box 13 Information, awareness, education and training instruments - country example: Australia

The Australian National Plastic Plan 2021 recognises that “Good decisions are based on good information”. Following this premise, “the Australian Government has invested \$20.6 million to create a waste data visualisation platform. The public-facing data repository will bring together data from a range of sources to provide nationally consistent real-time information. Understanding plastic volumes, value and movement through the economy will support effective decision making and create new economic opportunities for businesses.”

In addition to this measure, the Plan “expands the Australian Plastics Recycling Survey to provide a comprehensive picture of the consumption, flow and recycling of plastics in Australia”.

To complete the information tools, “CSIRO’s National Circular Economy Roadmap for Plastics, Glass, Paper and Tyres: Pathways for unlocking future growth opportunities for Australia (the Roadmap) provides valuable information to support the circular economy. It will be used by governments, industry and researchers to inform future decisions on investment, policy development and research priorities.”

*National Plastic Plan 2021  
(Australia, Department of Agriculture, Water and the Environment [DAWE] 2021)*

Governments shall also ensure that the required skills to shift to a circular economy exist at national level for the business sector and the society. Several options regarding education and training are possible:

- Include circular economy into the curricula at the primary and secondary schools
- Technical training at higher level education
- Technical training to the business sector
- Upskilling and reskilling programmes to allow the shift to circular economy related jobs (e.g., redirecting coal mine workers to the renewable energy sector).

### Box 14 Information, awareness, education and training instruments - country example: The United Arab Emirates

The United Arab Emirates (UAE) Circular Economy Policy identifies eight common core areas of focus that will support the transition to a circular economy across the various sectors prioritized based on their current role in the national economy and on their potential for stimulating and developing a UAE circular economy (sustainable manufacturing, green infrastructure, sustainable transportation and sustainable food production and consumption).

One of the common core areas is building awareness. The Policy considers that “awareness and capacity development adopting circular economy principles is to adopt a new way of thinking and implies systemic and pervasive change. Having grown up with linear production systems and consumption patterns, business executives and consumers seldom look for circular opportunities. Worse, inertia and resistance to change can also pose a significant barrier to the transition to a circular economy. Therefore, there is a clear need for initiatives to raise awareness and understanding on the concept and principles with public officials, business leaders and the public.

There is also a need to build capacity in areas important for the circular economy, including in design and planning of goods, services and systems and in applying and implementing new technologies, methodologies and business models. Capacity building and awareness initiatives may include trainings and workshops, development of manuals or guidelines, multi-stakeholder networking and knowledge sharing events, and information dissemination campaigns. While the transition to the circular economy will lead to overall benefits for society, there will be some sectors, companies and individuals that will be adversely affected by the change. Groups disadvantaged by the changes should also be targeted and helped through retraining and other forms of support.”

**Box 14 Continued**

Examples of specific actions and initiatives proposed for the different sectors are:

- “Conduct capacity building workshops on applying circularity to the manufacturing sector in the UAE.
- Provide technical support and capacity building on technologies that can help manufacturers more efficiently collect, sort, separate, treat and use their waste.
- Conduct capacity building workshops on applying circularity to the infrastructure sector in the UAE.
- Magnify international cooperation and capacity building support in water efficiency, water harvesting, recycling, and reuse.
- Support the development and growth of businesses, bioeconomy entrepreneurs and business models that reduce food waste (for example by providing training and information on best practices including the better matching of supply and demand for food and the up-cycling of food).”

*United Arab Emirates Circular Economy Policy 2021-2031  
(Government of United Arab Emirates 2021)*

## 5.2 Circular Economy Core Indicators as A Tool to Develop Targeted Policies Aiming at Accelerating the Shift to A Circular Economy

### 5.2.1 National Use of Circular Economy Indicators

Having information of a set of indicators is essential and can be used for a variety of purposes, to help in the process of shifting to a circular economy:

- Circular economy indicators give information about the initial situation of the economy at national level, so strategies, policies and plans can be

formulated and/or adapted to real national conditions, circumstances and needs.

- Once policies are formulated, circular economy indicators can be used to track progress of the implementation of such policies against the different set objectives. As a result, progress can indicate the need for complementary policies to speed the shift or reevaluate the objectives by adjusting or reformulating existing policies.
- Circular economy indicators can also be used to inform the public about the initial situation and the progress achieved, in order to move towards a circular economy. This information process is very important because customers’ product demand can also influence the production sector decisions.
- Academia’s access to circular economy indicators data can also be a source of new projects, studies and proposals to promote the shift to a circular economy model.
- Finally, it is also relevant to add that circular economy indicators may allow to compare the results of the policies implemented in different countries. This can help governments to formulate or reformulate policies considering the success of the different measures applied in other countries with similar environmental, social and economic characteristics.

### 5.2.2 Policy-Making and Circular Economy Core Indicators

Circular economy core indicators can be used to develop different targeted policies to shift to a circular economy model. This section sheds the light on how circular economy is measured by topic, coupled with relevant indicators to each topic. Indicators are classified by colour (green or red) considering the impact of the indicator’s value on successfully transitioning to a circular economy. Circular economy related policies should be monitored and their results should be assessed according to the circular economy core indicators trends.

Real examples of circular economy related instruments at national level are also presented to illustrate the practical use of such a set of indicators.

## 1. Resources decoupling

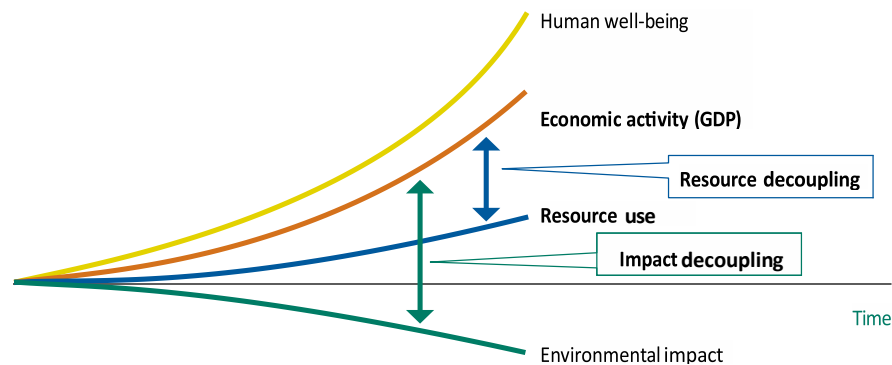
One of the main pillars of circular economy is decoupling the use of resources from economic growth. This is the reason why most national strategies and policies related to circular economy consider resource decoupling as a starting point to shift to a circular economy. With the aim of better understanding the scope of resource decoupling, Box 15 contains a brief explanation of this concept.

### Box 15 Resource decoupling concept

Resource decoupling occurs when reducing the rate of use of resources per unit of economic activity. Resource decoupling leads to an increase in the efficiency with which resources are used (material, energy, water and/or land).

Figure 3 shows resource decoupling, comparing the gradient of economic output over time with the gradient of resource input; when the latter is smaller, resource decoupling is occurring.

**Figure 3** Two aspects of 'decoupling'



### Box 15 Continued

Resource decoupling can be relative, when the growth rate of resources used is lower than the growth rate of a relevant economic indicator (for example GDP), or absolute, when resource use declines, irrespective of the growth rate of the economic driver.

Resource decoupling seeks to alleviate the problem of resources scarcity as it reduces the rate of resource depletion, while raising resource productivity, and it is also a potential solution for resources with high environmental risks of extraction or use.

*Decoupling natural resource use and environmental impacts from Economic Growth  
(United Nations Environment Programme [UNEP] 2011)*

Core circular economy indicators that can be used to monitor the results of policies related to resource decoupling are presented in Table 16. This group contains the indicators that serve to assess or measure the use of raw materials and water, and the use of recycled materials.

In a circular economy, absolute resource decoupling occurs when material consumption (DMC, RMC) or water stress decreases, while in relative resource decoupling material and footprint productivities increase.

Circular material use rate gives information about material substitution. In a circular economy, the circular material use rate increases, as recycled materials are used in the production processes instead of primary raw materials.



**Table 16** Circular economy core indicators related to resource decoupling

Framework	Themes	Proposed core indicators
Material life-cycle and value chain	The material basis of the economy	Material consumption and productivity
		<ul style="list-style-type: none"> <li>a. Domestic Material Consumption (DMC)</li> <li>b. Raw Material Consumption (RMC)</li> </ul>
		<ul style="list-style-type: none"> <li>c. Material productivity</li> <li>d. Raw Material productivity</li> </ul>
	The circularity of material flows and the management efficiency of materials and waste	Circular material use rate
Interactions with the environment	Natural resource implications	Intensity of use of renewable freshwater resources

Source: Author's elaboration

Note: indicators are classified by colour according to their ideal trend for a circular economy transition. Green colour represents that the indicator should increase while red colour corresponds to indicators that should decrease to reach a circular economy model.

Box 16 presents the example of the Netherlands with resource decoupling by presenting the objectives of their National Programme on Circular Economy.

**Box 16 Resources decoupling - country example: The Netherlands**

“The goal is for the Dutch economy to reduce the use of resources 50% by 2030 and to be completely circular by 2050. Considering these objectives, the National Programme on Circular Economy (NPCE) 2023-2030, contains four ways to make the Dutch economy circular:

- 1. Reducing raw material usage:** using fewer (primary) raw materials by abstaining from the production or purchase of products, sharing products or making them more efficient ('narrow the loop'). This NPCE aims, for example, to achieve a significant increase in circular procurement across government. This covers everything from desks and chairs to roads and waterworks.
- 2. Substituting raw materials:** replacing primary with secondary raw materials and sustainable bio-based raw materials (in high-value applications), or with other, more generally available raw materials with a lower environmental burden. An example is a mandatory percentage of recycled content.
- 3. Extending product lifetime:** making longer and more intensive use of products and components through reuse and repair will slow demand for new raw materials ('slow the loop'). An example of a measure aimed at increasing longevity is the introduction, as of 2023, of a registry of repairers of electric and electronic goods, so that people can easily find a technician to repair their appliance or device;
- 4. High-grade processing:** closing the loop by recycling materials and raw materials. This will not only reduce the amount of waste being incinerated or dumped, but ensure a more high-grade supply of secondary raw materials as well ('close the loop').

The National Circular Economy Programme (2023-2030) contains measures for each of these 4 approaches. It also contains measures for specific product groups, like furniture or homes, and supporting measures for specific focus areas such as education, circular procurement and circular business models.”

*National Circular Economy Programme (2023-2030)  
(Kingdom of the Netherlands, Ministry of Infrastructure and Water Management 2023)*

## 2. Impact decoupling

Another fundamental aspect of circular economy is impact decoupling, which is focused on the negative environmental impacts of the different stages of production and consumption activities. Box 17 details the concept of impact decoupling, while Table 17 covers the relevant core indicators that could be used to monitor impact decoupling.

### Box 17 Impact decoupling concept

Impact decoupling occurs when increasing economic output while reducing negative environmental impacts (see Figure 3 Box 15). Environmental impacts include negative impacts produced during resources extraction (such as groundwater pollution due to mining or agriculture), production (such as land degradation and emissions), the use of commodities (for example transport resulting in CO<sub>2</sub> emissions), and during the post-consumption phase (as wastes).

Impact decoupling can be relative, when the growth rate of the environmental impact is lower than the growth rate of a relevant economic indicator (for example GDP), or absolute, if environmental impact declines, irrespective of the growth rate of the economic driver.

Impact decoupling implies a more efficient resource use and is commonly associated with pollution prevention and control. Reducing environmental impacts does not necessarily have a mitigating impact on resource scarcity or production costs and may even sometimes increase these (for example, when wastewater treatment is applied).

Impact decoupling is particularly important when the use of a resource threatens human and/or ecosystem health (such as toxic emissions) and when technological solutions exist.

*Decoupling natural resource use and environmental impacts from Economic Growth (UNEP 2011)*

Circular economy core indicators that can potentially be employed for monitoring policies, programs and other instruments focused on developing a circular economy through impact decoupling measures are presented in Table 17. These indicators are, by definition, related to the environmental impacts linked to the production and consumption operations, such as waste generation, waste management, pollutants discharges to water bodies and air emissions.

Waste generation, GHG emissions and pollutant discharges to water bodies decrease in case of impact decoupling and a shift to a circular economy model. National recycling rate increasing correspond to an absolute impact decoupling, as well as the reduction of the amount of waste going to final disposal.

In a circular economy, waste going to final disposal should be minimized, while other alternatives as national recycling should be prioritized. Investments in waste management can be considered as a base to improve the national waste management system. Taxes on landfill and incineration can be applied to promote alternative waste management, as recycling, which accelerate the shift to a circular economy model.

**Table 17** Circular economy core indicators related to impact decoupling

Framework	Themes	Proposed core indicators
Material life-cycle and value chain	The circularity of material flows and the management efficiency of materials and waste	Total waste generation
		National recycling rate
		Waste going to final disposal
Interactions with the environment	Environmental quality implications (effects of materials extraction, processing, use and end of life management on environmental conditions)	GHG emissions from production activities
		Pollutant discharges from material extraction and processing to water bodies and share safely treated
Responses and actions	Improve the efficiency of waste management and close leakage pathways	Investments in waste management, waste collection and sorting
		Tax rate/tonne landfilled or incinerated

Source: Author's elaboration

Note: indicators are classified by colour according to their ideal trend for a circular economy transition. Green colour represents that the indicator should increase while red colour corresponds to indicators that should decrease to reach a circular economy model.

## 2.1 Waste generation and management

In general, waste sectoral policies and regulations, considering the reduction of waste generated and waste finally disposed in landfills, are bases of a circular economy model. As a first step, waste prevention should be applied to all stages of the life cycle in terms of quantity and quality (hazardous character of wastes). Once the waste is generated, it can be recycled to maximise the value of the materials in the economy. Recycling requires available waste recycling facilities to attend to the different types of waste (prior investment is required) and that waste collection systems are operational with high geographic coverage.

In case recycling is not technically possible, waste can be incinerated with energy recovery. Landfill is considered as the last option, and should be avoided where possible, because in this case, waste has left the economy and could not be a potential resource anymore. Box 18 and Box 19 presents national and sub-national examples of waste generation and management in Australia and Ontario, Canada respectively.

### Box 18 Waste generation and management - country example: Australia

“The National Waste Policy: Less waste, more resources (2018) embodies a circular economy, shifting away from ‘take, make, use and dispose’ to a more circular approach where we maintain the value of resources for as long as possible. The 2018 National Waste Policy provides a framework for collective action by businesses, governments, communities and individuals until 2030.

The following five principles underpin waste management, recycling and resource recovery in a circular economy.

1. Avoid waste:
  - Prioritise waste avoidance, encourage efficient use, reuse and repair.

### Box 18 Continued

- Design products so waste is minimised, they are made to last and we can more easily recover materials.
2. Improve resource recovery:
    - Improve material collection systems and processes for recycling.
    - Improve the quality of recycled material we produce.
  3. Increase use of recycled material and build demand and markets for recycled products.
  4. Better manage material flows to benefit human health, the environment and the economy.
  5. Improve information to support innovation, guide investment and enable informed consumer decisions”.

*National Waste Policy: less waste, more resources  
(Australia, Department of Climate Change, Energy, the Environment and Water 2018)*

The National Waste Policy is developed by the National Waste Policy Action Plan – Annexure (2022), which drives implementation of seven targets:

1. Ban on export of waste plastic, paper, glass, and tyres, commencing on the second half of 2020.
2. Reduce total waste generated in Australia by 10% per person by 2030.
3. 80% average resource recovery rate from all waste streams by 2030.
4. Significantly increase the use of recycled content by governments and industry.
5. Phase out problematic and unnecessary plastic by 2050.
6. Halve the amount of organic waste sent to landfill for disposal by 2030.
7. Make comprehensive, economy-wide and timely data publicly available to support better consumer, investment and policy decisions.

*National Waste Policy Action Plan-Annexure  
(Australia, Department of Climate Change, Energy, the Environment and Water 2022)*

### Box 19 Waste generation and management - city example: Ontario, Canada

According to Ontario's food and organic waste Framework, Part A: Action Plan, 2018, "The Province of Ontario is shifting to a circular economy. To achieve our goals of zero waste and zero greenhouse gas emissions from the waste sector, the province will lead transformative change in how food and organic waste is managed.

The Framework strives towards the achievement of the following objectives:

1. Reduce food and organic waste: Preventing food from becoming waste is a critical first step and has the greatest positive impact on the environment, the economy and society. Rescuing surplus food when it occurs further reduces food waste and ensures that edible food does not end up as waste.
2. Recover resources from food and organic waste: Increasing resource recovery, in particular from multi-unit residential buildings and the industrial, commercial and institutional (IC&I) sector will help the province reach its goals of zero waste and zero greenhouse gas emissions from the waste sector.
3. Support resource recovery infrastructure: Turning food and organic waste into valuable end-products recognizes the economic benefits of a circular economy. It is important that Ontario has sufficient infrastructure capacity and innovative technologies to process food and organic waste into valuable resources.
4. Promote beneficial uses of recovered organic resources: Supporting endproducts and sustainable markets for recovered organic resources is critical. This includes supporting beneficial uses which promote soil health, crop growth and enhance carbon storage. Promoting end-products like renewable natural gas and electricity can help replace carbon-intensive fossil fuels."

*Ontario's Food and Organic Waste Framework: Part A: Action Plan (Canada, Ontario Ministry of the Environment and Climate Change 2018)*

### 2.2 GHG emissions from production activities

Greenhouse gas emissions contribute to climate change and refer to carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O) and fluorinated gases (F-gases) emissions. Electricity generation, transport, industrial production processes and agriculture are sources of GHG emissions linked to production activities. In a circular economy, GHG emissions are minimized to mitigate climate change. Policies and plans can be developed to control the emissions from the production of goods and services. They can be developed by implementing standards to limit emissions and by emissions permits regulations.

At policy-making level, examples of actions related to energy production and consumption that can be considered to reduce GHG emissions are:

- Increasing renewable energies use and reducing fossil fuels demand.
- Increasing energy efficiency, promoting the use of more efficient technologies in terms of energy consumption.
- Increasing energy conservation by reducing wasteful energy consumption. Improving operations and maintenance, implementation of user activity detection systems and off-peak scheduling energy consumption are some examples of measures that can be promoted.

### Box 20 GHG emissions from production activities - country example: Nigeria

The overall objective of the National Climate Change Policy for Nigeria (NCCP) 2021-2030, "is to strengthen measures to reduce greenhouse gas emissions (direct and fugitive emissions), mainly from the energy (including power generation), oil and gas, biomass (agriculture, forest and land use), health, industry, transport, water and waste sectors." Hereunder, some examples of the measures included in the NCCP by sector:

#### "Energy sector

- Expand the production and use of renewable energy, particularly solar and wind, both on-grid and off-grid.



**Box 20 Continued**

- Promote energy efficiency and management activities that include new and innovative energy efficiency methodologies and techniques in power generation, including the use of gas-fired power stations, as well as retrofitting buildings and other infrastructure.
- Reduce transmission and distribution losses.
- Facilitate full transition to clean cooking fuel.
- Provide sustainable incentives and financial mechanisms to encourage and support the use of renewable sources of energy.
- Support cities in the country to undertake ambitious climate change mitigation actions.

**Industry**

- Pursue an alternative and sustainable path to industrialisation that takes advantage of innovations, technologies, and business models for improved energy efficiency in the industrial sector.
- Create and adopt green technology in industry and support low emission manufacturing systems.
- Accelerate industrial development utilizing energy mix with emphasis on renewables.
- Promote energy efficiency networks for industrial enterprises.
- Set efficiency benchmarks for manufacturing and businesses against international best practice for industrial energy usage.
- Support local research and development of ICT capabilities to promote energy “smart technologies”.
- Promote appropriate financing mechanisms for climate-friendly and energy efficient investment projects.

**Oil and gas sector**

- Pursue low-carbon transition for oil and gas companies in the country.
- Support low-cost, technically feasible solutions to reduce methane emissions in oil and gas operations, including recovery and use of escaping gas.

**Box 20 Continued**

- Incentivize the deployment of natural gas as Nigeria’s major fuel for power generation, industrialization, and domestic use, particularly cooking, towards stopping gas flaring.
- Facilitate sustainable regulatory frameworks and incentives, as well as financial mechanisms to end gas flaring by 2030.
- Investment and use of smart technologies in oil refining
- Reduce fugitive emissions in the sector.”

*The National Climate Change Policy for Nigeria 2021-2030  
(Nigeria, Federal Ministry of Environment 2021)*

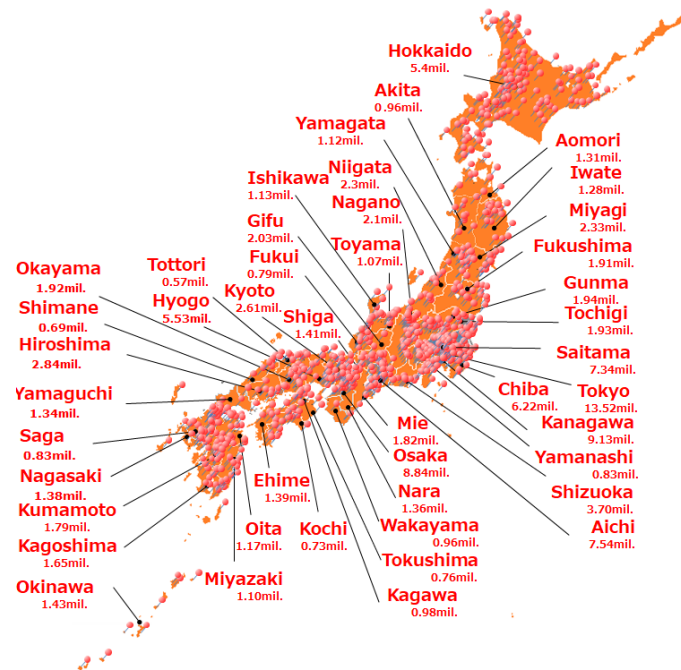
Nigeria’s Nationally Determined Contribution (NDC) updated in 2021 “has unconditionally pledged a 20% emissions reduction below Business as Usual (BAU) by 2030, and a 47% conditional commitment which can be achieved with financial assistance, technology transfer and capacity building from the more advanced and more willing international partners.”

*Nigeria’s Nationally Determined Contribution, 2021  
(Nigeria, Federal Government of Nigeria 2021)*

**Box 21 GHG emissions from production activities - country example: Japan**

In September 2023, in relation with the program 2050 Zero Carbon Cities in Japan, 991 local governments including Tokyo, Kyoto and Yokohama, announced their commitment to net zero carbon emissions by 2050. Figure 4 showcases the different prefectures and the population of each prefecture.

**Figure 4** Japanese prefectures and their habitants (expressed in million people) where the 2050 Zero Carbon Cities initiative is going to be applied



Source: (Japan, Ministry of the Environment 2023)

**2.3 Pollutants discharges from production activities to water bodies**

In a circular economy, pollutants discharged to water bodies should be minimized as they are considered lost economic resources. Hazardous pollutants as heavy metals or pesticides are to be completely avoided, due to their harmful effects to the ecosystems and human health.

Prevention is the first step to prioritize in policy-making and requires industrial processes modifications and/or the use of more efficient technologies, in terms of materials consumption, when they are available. Reuse of effluents already generated is the second alternative to avoid pollutants discharged to the environment. Once wastewater is generated, wastewater treatments reduce pollutants discharged to water bodies. Advanced wastewater treatments including polishing (as chemical reduction, carbon filtering or membrane technologies) should be implemented when technically feasible.

According to The United Nations World Water Development Report 3: Water in a changing world (World Water Assessment Programme 2009), 70 per cent of industrial effluents in developing countries are disposed of without previous treatment so reducing pollutants discharges remains a big challenge at policy-making level.

Reducing pollutants discharges to water bodies in a circular economy context may require a combination of several instruments such as a legal framework (including standards to limit the amount of pollutants discharged and discharges permits regulation), action plans and investments. Public and private investments in wastewater treatment facilities need to be supported at policy-making level to enable the shift to a circular economy. Box 22 presents Mexico's efforts in regulating pollutants discharges to water bodies.

**Box 22 Pollutants discharges from production activities to water bodies - country example: Mexico**

The Official Mexican Standard NOM-001-SEMARNAT-2021 establishes “the permissible limits of pollutants in wastewater discharges into receiving bodies owned by the nation.”

This Standard has been approved according to the National Development Plan 2019-2024. The Plan focuses among other objectives on the need “to guarantee the integral preservation of flora and fauna, a large part of the national territory will have been reforested and rivers, streams and lagoons will be recovered and cleaned up. The treatment of sewage and the proper management of waste will be widespread practices in the national territory and environmental awareness and the conviction of caring for the environment will have expanded in society.”

The Standard is adopted based on the fact “that the volume and concentration of pollutant loads in receiving bodies have increased as a result of population growth and economic activities, which makes it necessary to modify the permissible limits of pollutants in wastewater discharges into receiving bodies for their conservation.”

The Standard sets “the concentration of basic parameters, as well as pathogenic and parasitic contaminants, metals and cyanides for wastewater discharges to receiving bodies, must not exceed the value indicated as the permissible limit according to the type of receiving body” in different tables.

*Official Standard NOM-001-SEMARNAT-2021, 2022  
(Mexico, Secretaría de Medio Ambiente y Recursos Naturales 2022)*

**3. Taxes and government support to circular economy business models**

Taxes, exemptions, subsidies, and other transfers can be used to support the shift to a circular economy model. The existence of these instruments and their implementation can be monitored by using the circular economy core indicators presented in Table 18.

The existence of taxes, exemptions and subsidies supporting circular business models at national level can accelerate the shift to a circular economy. Before the implementation of new market instruments, additional comprehensive analyses of existing ones will allow to identify if any of them have harmful effects for an effective circular economy transition. Box 23 presents the Netherland’s experience in government support to circular economy.

**Table 18 Circular economy core indicators related to taxes, exemptions and subsidies**

Framework	Themes	Proposed core indicators
Responses and actions	Support circular use of materials, promote recycling markets and optimize design	Taxes and government support for circular business models

*Source: Author’s elaboration*

*Note: indicators are classified by colour according to their ideal trend for a circular economy transition. Green colour represents that the indicator should increase while red colour corresponds to indicators that should decrease to reach a circular economy model.*

### Box 23 Taxes relieves, exemptions and subsidies - country example: The Netherlands

According to the National Circular Economy Programme (NCEP) 2023-2023, “the market incentives based on the principle of ‘the polluter pays’ will help create a level playing field between the current linear economy and the circular economy. Examples of market incentives are price incentives (subsidies and taxes) which ensure that external effects are factored into the price.

The NCEP includes the use of existing and new tax and non-tax market incentives to improve the business case for circular products and services in a permanent manner compared to linear products and services, and to bring it in line with the R-ladder<sup>1</sup>. In this sense, the Programme proposed to phase out incentives that have a negative effect on the environment (so-called environmentally harmful subsidies).

Some examples of the measures proposed in the NCEP to be considered and/or used as tools to promote the shift to circular economy in different areas are:

- Levies for the use of primary fossil raw materials and subsidies for bio-based raw materials or secondary materials. At national level, the possibilities for taxing non-energetic use of primary fossil raw materials will be explored in order to stimulate the market for secondary raw materials. A tax on fossil raw materials will increase the market price and reduce demand and, on the other hand, a subsidy for bio-based raw materials or secondary materials will promote demand by reducing the price. This will form an incentive for circular innovations and business models and will thus reinforce the national market for secondary raw materials and for products and services with a circular design.
- Subsidies to the public information body Milieu Centraal for the implementation of the Sustainable Consumption framework programme in order to provide independent information to citizens to improve their sustainable and circular action perspective.
- Specific payments to municipal authorities for circular craft centres with the aim of realising a network of circular craft centres with nationwide coverage by 2030.
- Subsidies for professional support offered to repair volunteers (i.e. in repair cafés).
- Increasing the waste tax in 2027-2029 in order to make recycling a more rewarding alternative.
- Incentives for increased reuse and recycling of wind turbines.

The NCEP also includes the support to the “Subsidy for circular value chain projects” (in Dutch: Circulaire Ketenprojecten or CKP) with a focus on small and medium-sized enterprises (SMEs). This subsidy has been available annually since 2020 for SMEs that want to make a value chain (or part thereof) circular as part of a consortium of three to six SMEs. This way, businesses can receive a subsidy for hiring an independent process supervisor, for example. The scheme has been set up based on knowledge from the Circular Netherlands Accelerator and is being implemented by the Netherlands Enterprise Agency (RVO), on behalf of the Ministry of Infrastructure and Water Management. Until 2022, 575 entrepreneurs have been supported in 138 circular value chain projects.”

*National Circular Economy Programme (2023-2030)  
(Kingdom of the Netherlands, Ministry of Infrastructure and Water Management 2023)*

<sup>1</sup> R-ladder refers to a circularity model in which R-strategies are ranked according to their increase level of circularity (R1 Refuse and Rethink, R2 Reduce, R3 Re-use, R4 Repair, refurbish, remanufacture and repurpose, R5 Recycling and R6 Recover).



#### 4. Government and business R&D expenditure on circular economy technologies

Investment in Research and Development (R&D) allows to adapt and adopt existing circular economy technologies as well as to develop new ones, which at the end, allows to boost the competitiveness of the production sector. Governments can directly invest in R&D to develop circular economy technologies and/or promote R&D in the private sector using financing instruments as funds.

Investment in R&D by the business sector depends on several factors that can be supported at policy-making level:

- The adoption of circular economy technologies by the private sector requires that information about the existing technologies is available, as in some cases enterprises are unaware of technological advancements.
- The technical expertise to use new technologies is expected to exist at company level, and it can be supported by governments through capacity building programmes.
- The financial resources must be available either in the own company or by public financial instruments, as loans or grants.

The combination of these three aspects is often critical, especially for Small and Medium Enterprises (SMEs). Policy-making should support enterprises considering that investments require an internal decision-making process within enterprises where future benefits are perceived as higher than cost increases, so the enterprises do not lose their competitive edge.

Table 19 contains the circular economy core indicator related to R&D expenditure on circular economy technologies and Box 24 presents Spain's effort in that regard. Increasing investments in circular economy technologies supports the shift to a circular economy model.

**Table 19** Circular economy core indicator related to R&D expenditure on circular economy technologies

Framework	Themes	Proposed core indicators
Responses and actions	Boost innovation and orient technological change for more circular material lifecycles	Government and business R&D expenditure on CE technologies:

Source: Author's elaboration

Note: indicators are classified by colour according to their ideal trend for a circular economy transition. Green colour represents that the indicator should increase while red colour corresponds to indicators that should decrease to reach a circular economy model.

#### Box 24 Government and business R&D expenditure - country example: Spain

The Circular Economy Spanish Strategy 2030 establishes eight action lines, from which three of them have an inter-sectoral approach. One of these three inter-sectoral action lines is Research and Innovation, aiming to “promote both public and corporate research and innovation initiatives, especially under public-private partnerships, as drivers of change and transition towards a sustainable social and productive model, which is based on creation and transfer of knowledge and adoption of new technologies”.

According to the Strategy “research, innovation and competitiveness policies must be put at the service of the acquisition, development, and application of knowledge skills in technologies and innovation of processes, services and business models. In this regard, it is important to promote public funding of research, public-private collaboration and to encourage business investment in Research, Development and Innovation (R+D+i) and direct access to financial instruments such as loans, grants and venture capital to promote the creation of technology-based companies, thus allowing the generation of added value to the Spanish economy as a whole, increasing its domestic competitiveness and also the competitiveness of its exports”.

*Circular Economy Spanish Strategy. España Circular 2030. (Spain, Ministerio para la Transición Ecológica y el Reto Demográfico 2020b)*

## 5. Business investment in circular economy activities

Business investment in circular economy activities can be promoted by governments and supported by a loans/grants/tax credits system. This financial support is especially important in the case of SMEs as they usually have less capacity for investment and access to private financing.

Table 20 presents the circular economy core indicator related to business investment and Box 25 presents the United Arab Emirates' efforts in that regard. In general, increasing business investments on circular economy activities represents a collective effort to increase circularity.

**Table 20** Circular economy core indicator related to business investment on circular economy activities

Framework	Themes	Proposed core indicators
Responses and actions	Strengthen financial flows for a circular economy and reduced leakage	Business investment in CE activities

Source: Author's elaboration

Note: indicators are classified by colour according to their ideal trend for a circular economy transition. Green colour represents that the indicator should increase while red colour corresponds to indicators that should decrease to reach a circular economy model.

### Box 25 Business investment - country example: The United Arab Emirates

According to the United Arab Emirates (UAE) Circular Economy Policy 2021-2031, "since circular economy projects apply new technologies and business models, many in the financial sector argue that their projects are inherently risky and often not bankable. Consequently, inadequate access to financing poses a potential barrier to the widespread adoption by the private sector of more circular practices.

### Box 25 Continued

The government can play a key role in removing these barriers by collaborating with the finance industry to identify specific barriers and potential solutions and also through public private partnership arrangements. Moreover, the government could also directly provide financing, for example at early-stage development of new technologies, where the financial sector may be unwilling this could be through new or existing funds.

The United Arab Emirates (UAE) Circular Economy Policy identifies four priority sectors based on their current role in the national economy and on their potential for stimulating and developing a UAE circular economy. These are:

- Sustainable Manufacturing
- Green Infrastructure Sustainable
- Transportation
- Sustainable food production and consumption

The economic incentives related to promote business investment on circular economy activities for the four sectors include, among other:

- Assess the potential for incentivizing (through rewards/penalties) circular economy practices in the manufacturing sector and for adopting pollution prevention technologies.
- Develop financial instruments, programs, and investment schemes that strengthen the links between financial institutions and food producers and manufacturers to implement circular economy principles.
- Analyse how financial incentives or penalties could be used to encourage the uptake of new technologies and methodologies that will increase resource efficiency."

*United Arab Emirates Circular Economy Policy 2021-2031  
(Government of United Arab Emirates 2021)*

## 6. Circular economy sector

Expanding the circular economy sector is a challenge for governments but also presents several opportunities related to the increase of gross value added of these sectors and is perceived as a source of newly created jobs. Jobs in waste management or renewable energies are just a couple of examples. New job opportunities have a socially direct positive impact, in terms of alleviating poverty and improving health. In addition, according to the World Employment Social Output: the changing nature of jobs (International Labour Organization [ILO] 2015), as women are more often segregated into jobs with low pay, low security and limited social mobility, the rise of new jobs as part of the shift to a circular economy offers an opportunity to empower women. Policies for moving towards a more circular economy can be designed to encourage gender equality.

Table 21 contains the circular economy core indicators related to the circular economy sectors and Box 26 presents Australia’s experience in this area. In both cases, increasing values of the indicators are related to the implementation of a circular economy model.

**Table 21** Circular economy core indicators related to circular economy sectors

Framework	Themes	Proposed core indicators
Socio-economic opportunities for a just transition	Market developments and new business models	Gross value added related to CE sectorss
		Jobs in CE sectors

Source: Author’s elaboration

Note: indicators are classified by colour according to their ideal trend for a circular economy transition. Green colour represents that the indicator should increase while red colour corresponds to indicators that should decrease to reach a circular economy model.

### Box 26 Circular economy sector - country example: Australia

According to the National Waste Policy: Less waste, more resources (2018), “moving to a more circular economy has the potential to create new jobs and benefit the economy overall”.

In 2018, around 50,000 people were directly employed in waste related activities, including employees in the waste and material recovery industries, the business sector and local governments in Australia.

The Policy assumes that “for every 10,000 tonnes of waste that is recycled, 9.2 jobs are created, compared with 2.8 jobs if the same amount of waste was sent to landfill (according to the Access Economics Pty Limited report on Employment in waste management and recycling (Australia, Access Economics Pty Limited for the Department of Environment, Water, Heritage and the Arts, 2009)).”

*National Waste Policy: less waste, more resources (Australia, Department of Climate Change, Energy, the Environment and Water 2018)*

The recent published report Fact Sheet: Economic Contribution of the Australian Recycling Industry (2023), summarizes the achievements of the recycling industry in the country including:

- “The recycling industry contributed almost \$19 billion to the Australian economy and provided nearly 95,000 jobs in 2021–2022.
- \$465 in net economic activity is created for every tonne of material recycled.
- Collective industry turnover of over \$14.6 billion.
- Contributed \$5.1 billion in direct economic activity and an additional \$5.8 billion indirect value-add to GDP through flow-on demand for goods and services.
- Over \$1 billion invested in land, buildings, plant and equipment and vehicles in 2021–22.
- One job is supported for every 431 tonnes of material recycled.
- 30,606 direct jobs to Australians and another 25,709 indirect jobs through flow-on activity.



**Box 26 Continued**

- Provides for one in every 142 jobs in the Australian economy.
- Pays over \$2.5 billion in wages and salaries and an additional \$253 million in superannuation.
- Higher average employee livelihood in the recycling sector of \$82,618, compared to the Australian average weekly earnings of \$69,103.
- Recycling industry employment grew by 68.8 per cent compared to Australia's nationwide employment growth of 17.4 per cent over the same period.
- 1,828 recycling businesses operating in Australia.
- The recycling sector's value-add in current prices grew by 117 per cent over the past decade – significantly faster than Australia's gross domestic product of 45.8 per cent over the same period.
- The recycled materials delivered into the economy create further benefit, with usage of recycled materials valued at \$7.9 billion in 2021–22 and providing an estimated 37,920 jobs”.

*Fact Sheet: Economic Contribution of the Australian Recycling Industry  
(Australian Council Of Recycling (ACOR) 2023)*

### 5.3 Examples of the Use of Circular Economy Core Indicators for Policy Monitoring

Some countries have introduced a set of indicators to monitor the implementation of their circular economy strategies and/or policies. In some cases, a monitoring system has also been put in place to provide the information not only to the institutions responsible for policy monitoring but also to the public. This section includes some real national examples of the use of the circular economy core indicators for policy monitoring. Box 27 presents Spain's indicators for monitoring circular economy, Box 28 highlights Colombia's information system about circular economy while Box 29 describes the United Arab Emirates indicators set to monitor circular economy.

**Box 27 Indicators for monitoring the Spanish Circular Economy Strategy: Spain**

The Spanish Circular Economy Strategy 2030 includes the following 10 strategic guidelines:

1. “Protection of the environment
2. Product life cycle
3. Waste hierarchy
4. Reduction of food waste
5. Production efficiency
6. Sustainable consumption
7. Communication and awareness
8. Employment for the circular economy
9. Research and innovation
10. **Indicators:** Promoting the adoption of common, transparent and accessible indicators that enable to know the degree of implementation of circular economy initiatives, especially their social and environmental impact.”

The Spanish Strategy contains 27 indicators for monitoring the results of its implementation. Indicators are categorized in 5 groups:

1. Producers and consumers
2. Waste management
3. Secondary raw material
4. Competitiveness and innovation
5. Greenhouse Gas Emissions in the waste sector

The indicators proposed in the Strategy that correspond to circular economy core indicators are:

1. Domestic Material Consumption (DMC)
2. Municipal waste generation per capita
3. Waste generation (excluding major mineral waste) per GDP
4. Municipal waste recycling rate
5. Recycling rate of all waste excluding major mineral waste

**Box 27 Continued**

6. Circular material use rate
7. Share of jobs in circular economy sectors in total employment
8. Share of gross value added of circular economy sectors

The proposed indicators cover 42 per cent of the circular economy core indicators proposed in the Joint UNECE/OECD Guidelines for measuring circular economy Part A: conceptual framework, statistical framework and indicators.

Monitoring indicators are presented in Annex II of the Strategy which includes metadata information, such as indicator's name, unit of measurement, data source, frequency, initial and final date of available data, last data available.

*Circular Economy Spanish Strategy  
(Spain, Ministerio para la Transición Ecológica y el Reto Demográfico 2020a)*

**Box 28 Continued**

6. Share of gross value added of recycling sector
7. Share of industrial wastewater safely treated
8. Share of waste from the manufacturing sector going to landfill final disposal

The SIEC is an online platform that includes metadata for each indicator, including institutional contact information of the data source, indicator information (indicator's name, description, calculation, unit of measurement, data source, statistical operation, classifications used, scope, target population, geographic coverage, period of reference, date of starting data, dissemination information, data series available, frequency, dissemination channels), and additional information if required.

*Information system about circular economy (SIEC)  
(Colombia, Departamento Administrativo Nacional de Estadística (DANE) 2023)*

**Box 28 An Information System about Circular Economy: Colombia**

The National Administrative Department of Statistics of Colombia (DANE) has created an Information System about Circular Economy (SIEC), with 51 indicators, which aims to be used as a tool for monitoring the shift to a circular economy. The proposed indicators cover 42 per cent of the circular economy core indicators proposed in the Joint UNECE/OECD Guidelines for measuring circular economy Part A: conceptual framework, statistical framework and indicators.

The indicators included in the SIEC that correspond to circular economy core indicators are:

1. National recycling rate
2. Waste going to landfill as a final disposal
3. Waste generation per capita and by type of waste
4. GHG emissions from production activities
5. Circular use rate

**Box 29 Indicators for monitoring circular economy: United Arab Emirates**

The United Arab Emirates Circular Economy Policy (2021-2031) includes 21 potential indicators that could be used to monitor progress. Indicators are classified in 5 groups as shown below.

1. Economic performance indicators
2. Performance indicators in resource productivity
3. Performance indicators for renewable energy and Greenhouse Gas Emissions
4. Performance indicators in waste generation
5. Resource productivity indicators

The indicators included in the UAE Circular Economy Policy that correspond to circular economy core indicators are:

- Domestic Material Consumption per unit of GDP
- CO<sub>2</sub> emission per unit of GDP



**Box 29 Continued**

- Municipal solid waste generation intensity (Kilograms/person/day)
- Percentage of recycled waste as proportion of the total waste generated (hazardous and non-hazardous).

These indicators cover 25 per cent of the circular economy core indicators proposed in the Joint UNECE/OECD Guidelines for measuring circular economy Part A: conceptual framework, statistical framework and indicators.

“The policy will be developed by a detailed implementation plan for the transition to a circular economy that will identify Specific Measurable Achievable Relevant Timebound (SMART) targets. The plan will also allocate clear roles and responsibilities to key stakeholders, including responsibility for monitoring and evaluating progress using key performance indicators.”

*United Arab Emirates Circular Economy Policy 2021-2031  
(Government of United Arab Emirates 2021)*

National examples show that some countries are already making efforts to monitor their shift to a circular monitoring evidence based, but as harmonized international methodologies are yet to be adopted, the different proposals are not comparable.

International institutions are highly encouraged to step-up the work on developing the missing methodologies to calculate circular economy indicators and instruments for their data collection. This would allow countries to use harmonized framework for measuring their transition to a circular economy and present a robust basis for policy-makers to develop targeted policies.