Building **Circularity** into **Nationally Determined Contributions**

USER GUIDE

A Practical Toolbox

UN environment programme

One planet handle with care

UNDP

United Nations Climate Change

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About the project:

The joint project "Building circularity into NDCs" is coordinated by UNEP/One Planet Network Secretariat, UNDP and UNFCCC secretariat. The project aims to support countries to assess, prioritize, integrate, and implement circular economy interventions in their updated NDCs to enhance ambition and accelerate implementation, while supporting a just and inclusive transition. This includes the development of a digital toolbox and this user guide, national piloting of the toolbox in three countries under UNDP's ClimatePromise, and the organization of regional capacity building workshops throughout 2023. These combined activities also aim to help accelerate efforts on net-zero commitments and Long-Term Low-Emission Development Strategies (LT-LEDS) through circular economy.

About the partners:

UNEP's One Planet Network is a global solutions-oriented stakeholder network that works together to accelerate the implementation of sustainable consumption and production and circular economy practices. It is built on a multi-stakeholder UN partnership that implements the 10-year Framework of Programmes on Sustainable Consumption and Production (10YFP). The network includes Member States, inter-governmental organizations, civil society and private sector organisations working on topics such as consumer information, public procurement, lifestyles and education, food systems, the built environment, tourism and digitalisation. It includes over 140 national focal points and counts more than 6000 organisational and 4000 individual expert members on sustainable consumption and production (SCP). UNEP hosts the Secretariat of the 10YFP and its One Planet Network. The 10YFP was established by the UN General Assembly to advance SCP. It is included in Agenda 2030 as Sustainable Development Goal 12.1. A Global Strategy for SCP 2023-2030 supports the shift to SCP.

UNDP's Climate Promise is the largest global offer on NDC support, covering over 120 countries and territories, representing 80 percent of all developing countries globally to enhance and implement their Nationally Determined Contributions under the global Paris Agreement. Delivered in collaboration with a wide variety of partners, it is the world's largest offer of support for the enhancement of climate pledges and implementation of the Paris Agreement. Learn more at climatepromise.undp.org and follow at @UNDPClimate.

UNDP is the leading United Nations organization fighting to end the injustice of poverty, inequality, and climate change. Working with our broad network of experts and partners in 170 countries, we help nations to build integrated, lasting solutions for people and planet. Learn more at undp.org or follow at @UNDP.

UNFCCC secretariat (UN Climate Change) is the United Nations entity tasked with supporting the global response to the threat of climate change. UNFCCC stands for United Nations Framework Convention on Climate Change. The Convention has near universal membership (198 Parties) and is the parent treaty of the 2015 Paris Agreement. The main aim of the Paris Agreement is to keep the global average temperature rise this century as close as possible to 1.5 degrees Celsius above pre-industrial levels. The UNFCCC is also the parent treaty of the 1997 Kyoto Protocol. The ultimate objective of all three agreements under the UNFCCC is to stabilize greenhouse gas concentrations in the atmosphere at a level that will prevent dangerous human interference with the climate system, in a time frame which allows ecosystems to adapt naturally and enables sustainable development.

Abbreviations and acronyms

10YFP	10-Year Framework of Programmes on Sustainable Consumption and Production Patterns
AFOLU	Agriculture, Forestry and Other Land Uses (IPPC category)
BTR	Biennial Transparency Report
BUR	Biennial Update Report
CDM	Clean Development Mechanism
CIF	Climate Investment Fund
CTF	Common Tabular Format
EPR	Extended Producer Responsibility
EMF	Ellen MacArthur Foundation
ETF	Enhanced Transparency Framework
GACMO	Greenhouse gas Abatement Cost Model
GAIN	Green Jobs Assessment Institutions Network
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GLAD	Global Life cycle Analysis Database
GCF	Green Climate Fund
GST	Global Stocktake
ICAT	Initiative for Climate Action Transparency
ICE	Inventory of Carbon and Energy
IFI	International Finance Institution
IEA	International Energy Agency
IPCC	Intergovernmental Panel on Climate Change
IPPU	Industrial Processes and Product Use (IPPC category)
IRP	International Resource Panel
LEAP	Low Emissions Analysis Platform
LCA	Life Cycle Analysis
LULUCF	Land Use, Land-Use Change and Forestry (IPPC category)
LT-LEDS	Long-Term Low-Emission Development Strategies
MRV	Measuring, Reporting and Verification
MDB	Multilateral Development Bank
NDC	Nationally Determined Contribution
PLE	Product Lifetime Extension
SCAN	SDG Climate Action Nexus (Tool)
SCP	Sustainable Consumption and Production
SCP-HAT	Sustainable Consumption and Production Hotspot Analysis Tool
SDG	Sustainable Development Goal
UNEP	United Nations Environment Programme
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
WRI	World Resources Institute

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Chapter 1

Benefits of circular economy for enhancing NDCs

It is now broadly recognized that the interlinked crises of climate change, biodiversity loss, and pollution and waste are driven by unsustainable consumption and production patterns.

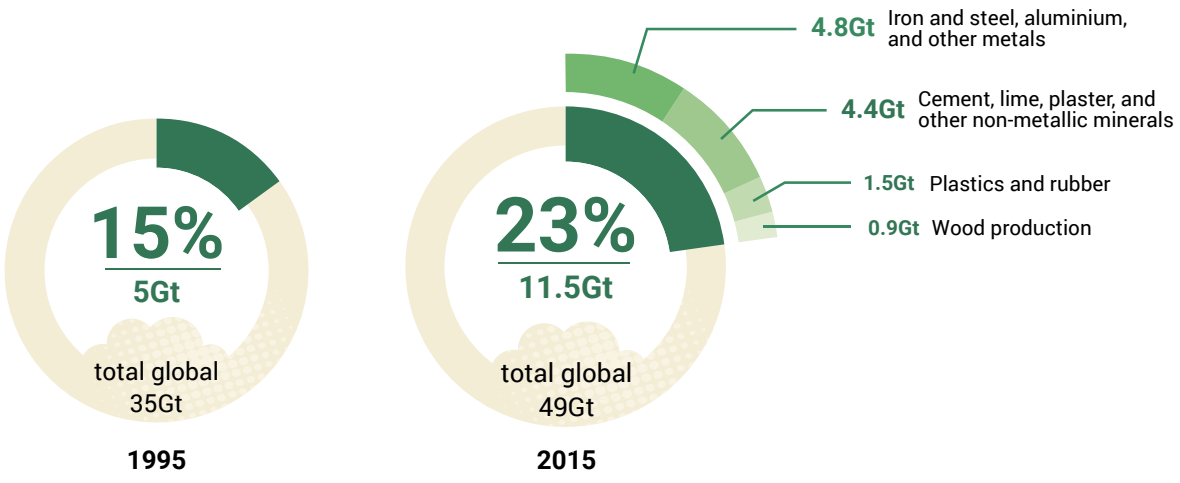
A missed opportunity. Demand for materials is a key driver of energy use, greenhouse gas (GHG) emissions and waste production worldwide (IPCC 2022a). While materials are required for societal needs, the amount of virgin materials extracted each year for our current linear production and consumption systems is rising, increasing GHG emissions, waste, and pollution through all stages of the life cycle from extraction to disposal. For example, construction and manufactured goods each account for 40 percent of the GHG emissions from global materials production (IRP 2020). At the same time, secondary materials account for only 7.2 percent of all material inputs cycled back into the economy (Circle Economy 2023).

Over 90 percent of all materials extracted and used are wasted. Secondary materials account for only 7.2 percent of all material inputs cycled back into the economy.

Source: Circle Economy (2023).

With current NDCs putting the world on a 2.1-2.9°C trajectory by end of the century (UNFCCC 2022), the urgency to raise climate ambition and accelerate implementation has never been greater. It is therefore paramount to leverage the untapped opportunity of integrating a circular economy approach into NDCs.

Figure 1.
Emissions caused by material production as a share of total global emissions 1995 vs 2015.



Source: International Resource Panel (2020). Resource efficiency and climate change - material efficiency strategies for a low-carbon future.

What is circular economy? Circular economy as part of a just transition aims to ensure that resources and materials are kept at the highest possible value for as long as possible along the value chain. Circular economy approaches can strengthen NDC targets as they complement existing GHG emission reduction efforts such as renewable energy and energy efficient strategies to raise ambition (GACERE 2021).

As such, circular economy is a sustainable economic model, in which products and materials are designed in such a way that they can be reused, remanufactured, recycled or recovered and thus maintained in the economy for as long as possible, along with the resources they are made from. The generation of waste, especially hazardous waste, is avoided or minimized, and GHG emissions are prevented or reduced (UNEP/EA.4/Res.1). Adopting circular thinking has the potential to restore ecosystems and rebuild natural capital, hence increasing resilience and sustainability.

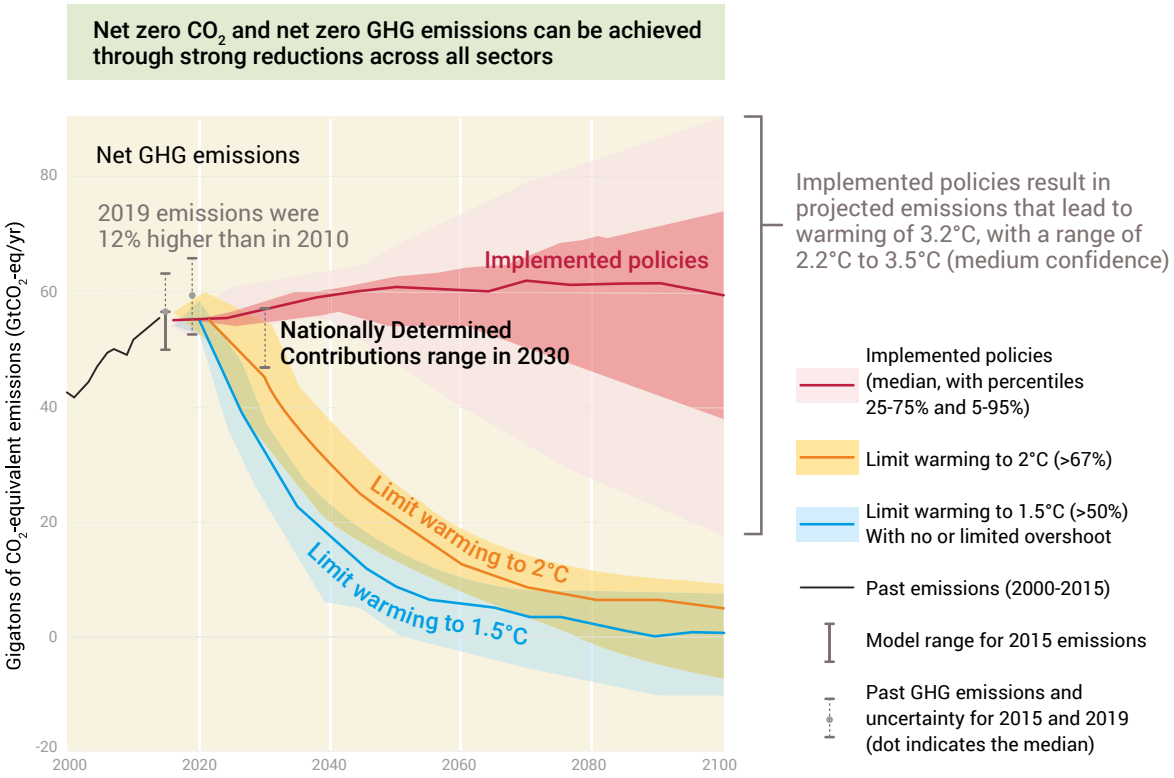
"When applied to four key industrial materials (cement, steel, plastics, and aluminium) circular economy strategies could help reduce emissions by 40 percent in 2050. When applied to the food system, the reduction could amount to 49 percent in the same year"

Source: EMF (2019).

Where are we now? While circular economy has gained increasing recognition to address climate change, only **27 percent of NDCs explicitly mention circular economy** as part of their mitigation measures (UNFCCC 2022). Of these 27 percent, circular economy references tend to focus on waste management, while there are clear benefits from integrating circular economy interventions in other areas of the NDC such as agriculture, industry, and transport.

Furthermore, the science underscores the need for **more circular material flows and coordination across sectors and value chains** to reduce environmental degradation and GHG emissions (IPCC 2023).

Figure 2.
Global emissions pathways consistent with implemented policies and mitigation strategies.



Source: Intergovernmental Panel on Climate Change (2023). AR6 Synthesis Report, Summary for Policy Makers.

The energy transition should be coupled with a shift in how we produce and consume materials. To achieve the energy transition, demand for critical minerals will increase. Clean energy technologies' share of total demand will rise steeply over the next 20 years to over 40 percent for copper and rare earth elements, 60- 70 percent for nickel and cobalt, and almost 90 percent for lithium. Electric vehicles and battery storage are already the largest consumer of lithium and are set to be the largest end user of nickel by 2040 (IEA 2022). A circularity approach for materials that is important for the energy transition, including photovoltaic panels, is key to ensure that environmental impacts are minimised. Circularity of materials in the energy sector can also yield economic benefits. It is estimated that raw materials recovered from photovoltaic panels could cumulatively yield up to USD 450 million by 2030 (Weckend S. et al 2016).

Broadening the scope beyond the accounting of territorial GHG emissions, for example "scope 3 emissions", gives the opportunity for countries and businesses to assess and reduce their footprint across value chains. This broader scope requires looking at the materials and embodied GHG emissions at each stage of the value chain and thus, most likely, looking across borders. This requires going beyond the traditional national GHG inventory accounting methods and NDC requirements.

What does it mean for jobs? Circular economy is a potential engine for economic growth, job creation, and value-addition (Preston F. et al 2019). Through circular economy, businesses can increase or supplement revenues and create new value (EMF 2019) as resource efficiency benefits are multiplied across the value chain. It is estimated that a circular economy approach could create over 4.8 million new jobs in Latin America and the Caribbean (ECLAC 2018) and 11 million new jobs in Africa by 2030 (European Commission 2021). Furthermore, projections show that a circular economy transition could increase women's share of employment globally (ILO 2018). However, to ensure a just and equitable transition, circular economy in NDCs must include policies to ensure an inclusive upskilling of the national workforce, including informal workers, while maintaining and creating dignified and green jobs and livelihoods (UNEP 2023a).

Circular economy can be crucial for adaptation and building resilience: Integrating the restore and regenerate dimensions into circularity reduces pressure on ecosystems that are key to building resilience against the impacts of climate change (GACERE 2022; EMF 2021a). Regenerative circular models are designed to increase the ecological productivity and/or biophysical function of an ecosystem or its components within existing land uses including contributions to human well-being derived from nature (Sitra 2021).

In the agriculture sector, locally-led agroecological practices can improve soil health and fertility by strengthening its capacity to absorb heavy rainfall, retain nutrients or subsist in times of drought. As a result, soils are more able to sustain crops and farmers' livelihoods, strengthen local economies and thus, help provide critical buffers to regional or global supply chain disruptions while lessening food insecurity.

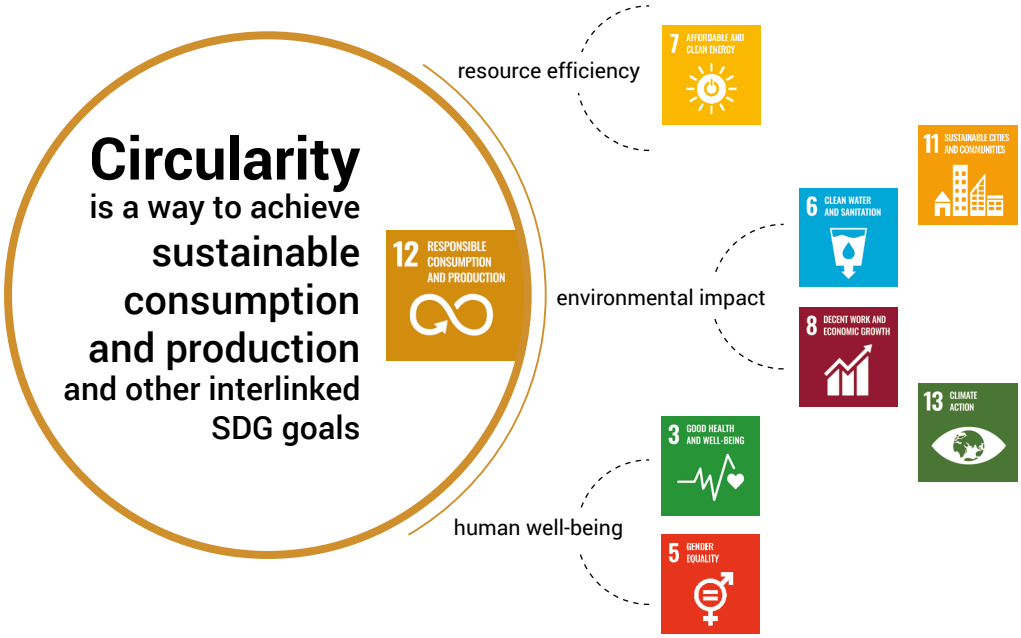
Food that is regeneratively produced also means using diverse, low-impact ingredients and crops, eliminating waste, and maximizing the nutritional value of what is grown. The regenerative production of food in a circular system also increases biodiversity on farms and in the surrounding ecosystem, while decreasing the pollution and climate impacts of the current linear food system (GACERE 2022).

In the textile sector, circular economy means that products are used more, made to be made again, and are designed with safe and recycled or renewable inputs produced in regenerative ways. In doing so, the sector can not only reduce the demand for virgin materials and eliminate waste and pollution, but also improve soil health, sequester carbon, and rebuild biodiversity while supporting the creation of safe, healthy conditions for textile workers and users (EMF 2021a; GACARE 2022).

In many low- and medium-income countries a large share of the population depends directly on the quality of forest, soil, and water resources for their subsistence. Whether this is referred to as jobs, livelihoods, or subsistence, it is crucial that these natural resources and Indigenous knowledge are protected against the adverse environmental, economic, and social impacts of the linear economy (UNDP 2021a).

Circular economy can generate benefits across the 2030 Agenda. New economic and climate-resilient development opportunities through circular economy cannot only support the creation of fair and decent jobs and skills development but research also shows other related benefits of circularity linked to sustainable cities, clean water and health as well as spurring sustainable lifestyles, reaping benefits across agendas.

Figure 3.
Circular economy reaps benefits across the 2030 Agenda.



Note: Based on the One Planet Network indicators or success and the SCP impact indicators as developed by the One Planet network, Life Cycle Initiative and the International Resource Panel.

Source: UNEP building circularity platform.

Chapter 2

Supporting countries to link circular economy to NDCs

Where is support needed? There are significant finance, knowledge, data and capacity gaps to be bridged between the circular and climate agendas. In particular, references to circular economy in NDCs are often broad frameworks or principles without specific interventions or policy instruments to specify how they will be implemented, tracked, or reported. There is therefore ample opportunity to address these gaps through coordinated support[1].

The "building circularity into NDCs" user guide and digital toolbox aim to support countries to assess, prioritize, implement and track circular economy interventions for increased ambition and implementation of their NDCs.

Digital toolbox: The toolbox provides guidance and tools for each stage of the policy cycle. Users can jump in at any stage with tools and options to report the interventions, targets, and indicators in the NDC. The tools have been selected according to established criteria including applicability at the national level, being previously tried and tested, and their relevance to the specific objectives of reducing GHG emissions. The tools allow the user to build on existing national data or use data from available tools as needed.

Who should use the toolbox? The toolbox is designed for policymakers working on national climate policy who are familiar with the NDC process but require guidance to identify and connect circular economy interventions and associated co-benefits (e.g. dignified green jobs) to the NDC. It is also for policymakers working on sustainable consumption and production and circular economy. Given the cross-cutting nature of the climate and circular economy agendas, the toolbox is useful for line ministries involved in the NDC process, such as ministries of industry, agriculture, planning, energy, tourism and gender, among others.

User guide: This user guide helps the user navigate the digital toolbox through each stage of the policy cycle. It outlines steps for each stage with guidance and key questions to consider as well as tools and case studies. The user guide also includes examples of the toolbox being applied in two high-impact value chains (food loss and waste, and buildings and construction).

1 Based on needs assessment interviews with countries and the 10YFP Post 2022 survey.

Known gaps and limitations.
The toolbox is designed to be intermittently updated with new tools, resources and case studies as they become available and should be considered a starting point for further research and collaboration on integrating circular economy into NDCs. It does not aim to provide tools for all aspects of transitioning to a circular economy, given the large scope that this entails. The authors actively seek to improve the toolbox for increased application by countries and welcome additional tools and feedback from practitioners.

- **There is no "one-size-fits all" approach:** the application of the proposed methodology and tools depends on regional and country context.
- **Data gaps:** outcomes depend on the availability and robustness of national data. This may lead to eventual gaps/limitations based on data availability.
- **Science-based indicators for circular economy:** the global discussion on indicators for circular economy is still ongoing, however this user guide provides some elements as a starting point.
- **Measurement, Reporting and Verification (MRV) of circular economy interventions:** MRV of circular economy interventions, particularly accounting of GHG emissions reduction impact is still at an early stage. While information to report circular economy interventions under Biennial Transparency Reports (BTRs) is provided as a reference (step 4.2), further research and analysis is needed on MRV of circular economy interventions to better link it with the NDC.

Chapter 3

Leveraging the policy cycle – key steps and tools

A circular economy intervention for the NDC could entail redesigning products, materials, services, and systems to keep materials at their highest value in circulation for as long as possible to reduce GHG emissions, minimize waste and pollution from the whole life cycle, and regenerate natural systems. Interventions will have specific goals for the prioritized sectors/sub-sectors in question.

When to update the NDC?

Parties to the Paris Agreement are required to update their NDC every five years, ensuring that successive NDCs represent a progression to the highest possible ambition, based on each Party's capabilities and capacities. **The next round of NDC submissions is due in 2025, and every five years thereafter**, and submissions should be informed by the global stocktake (GST)[2]. **A Party may adjust its existing NDC at any time to enhance its level of ambition.**

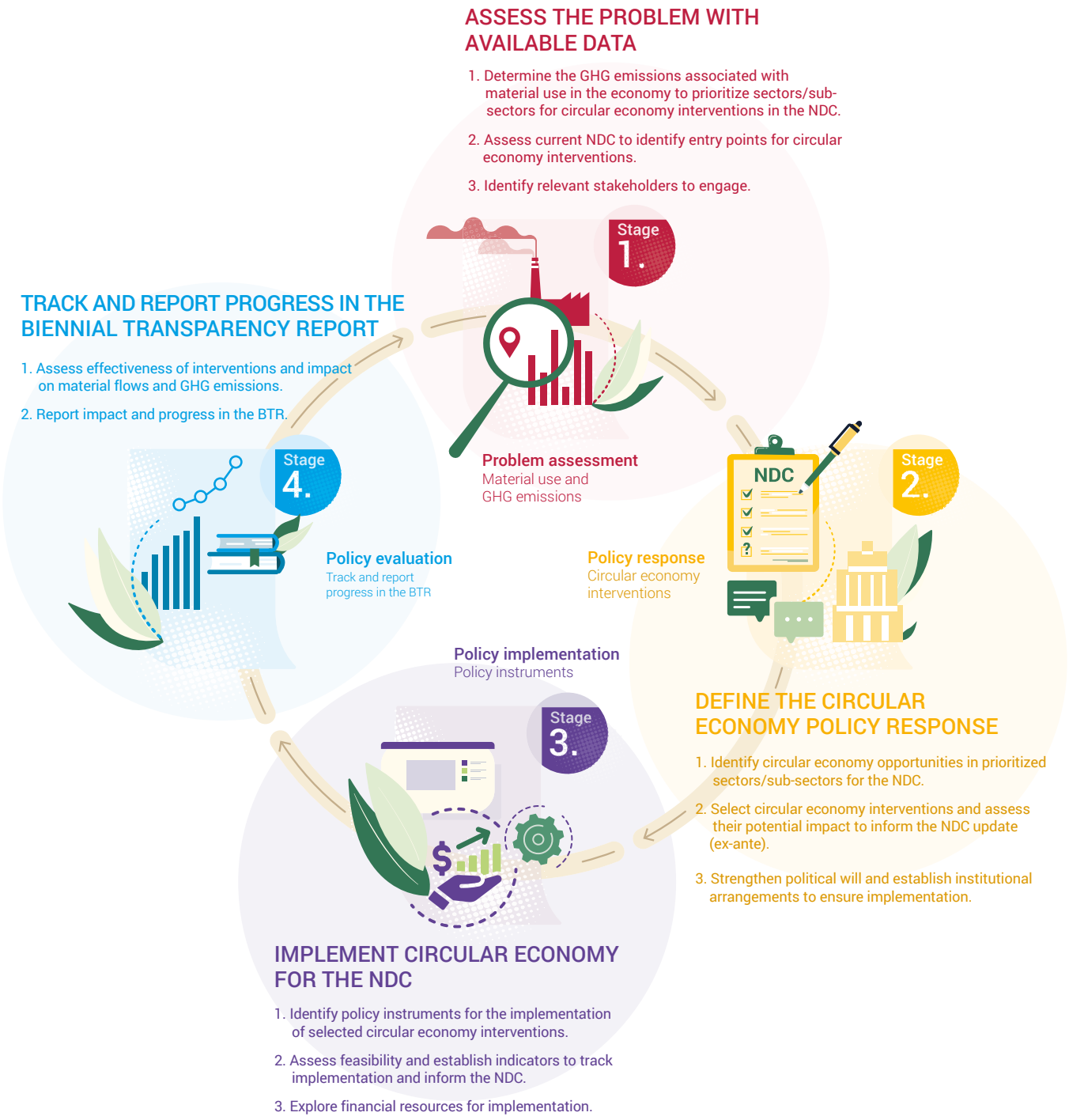
The NDC revision process enables a country to enhance its mitigation ambition and adaptation plans; expand coverage of GHGs and sectors; and provide an implementation plan referencing policies and actions. The revision process also helps to strengthen country ownership and inclusiveness, robustness, feasibility, institutional arrangements, and capacities for implementation.

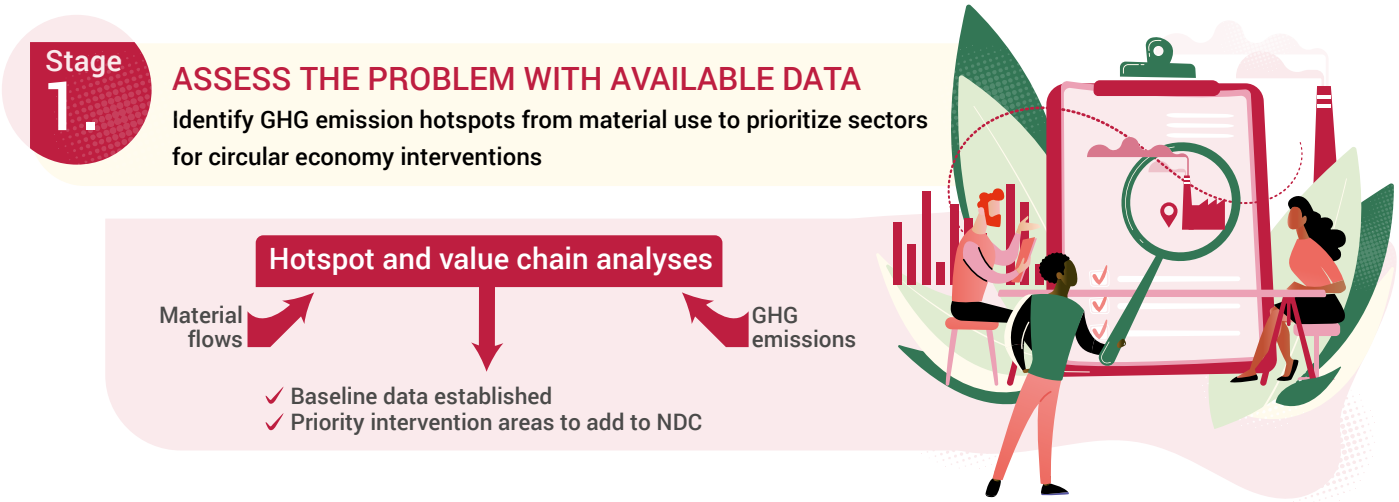
Getting started

Each stage of the toolbox is presented as an opportunity to assess circular economy interventions for climate action. Chapter 3 guides you through the stages of identification, implementation, and tracking of circular economy interventions, while linking back to the NDC so that additional GHG emissions reductions can be captured and contribute towards national climate targets including net-zero emissions commitments or targets outlined in national LT-LEDS under the Paris Agreement.

2 UNFCCC definition of global stocktake.

Figure 4.
An overview: The 4-stage policy cycle.





Stage 1 enables the identification of GHG emission hotspots from material use and prioritization of circular economy intervention areas for the NDC (steps 1.1 and 1.2). This stage also includes the identification of relevant stakeholders to engage (step 1.3). Existing national data that is available can be used as well as engaging national science and research entities to support with the data analysis. The results from this problem assessment phase can be used as a baseline during the evaluation phase (Stage 4).

A lead institution should be agreed to drive the planning, coordination, implementation and tracking for integrating circularity into the NDC and ensuring associated GHG emissions reductions are captured. Efforts would be coordinated with the NDC Coordination Committee when this exists, or through a national coordinator/focal point. It is also important to engage and potentially build capacities of line ministries in the identified sectors/sub-sectors for the successful planning, budgetary alignment, implementation, and reporting of circular economy interventions.

Table A. Summarizes key steps, questions, and tools for Stage 1.

1.1 Determine GHG emissions associated with material use in the economy to prioritize sectors/sub-sectors for circular economy interventions in the NDC

Which sectors/sub-sectors are major contributors to GHG emissions according to national inventories?

- National GHG inventories

What are the main consumption and production material flows associated with the GHG emissions and where are the hotspots?

- SCP-HAT modules 1 and 2
- Life cycle inventory database

Which sectors/sub-sectors should be prioritized for the interventions?

- Develop a short-list of priority sectors/sub-sectors from using the tools in this step

What is the socio-economic context of the identified priority sectors/sub-sectors?

- SCP-HAT (indicators on jobs and GDP)
- Social life cycle assessment

1.2 Assess current NDC to identify entry points for circular economy interventions

Which circular economy measures and associated targets are included in your current NDC? How does this compare to other countries' NDCs?

- Climate watch explorer
- NDC registry

Which new prioritized sectors/sub-sectors/GHG emissions need to be included in the NDC?

- Compare list of prioritized sectors/sub-sectors from step 1.1 against existing measures in the NDC

1.3 Identify relevant stakeholders to engage

Who are the key stakeholders linked to the identified priority sectors/sub-sectors and their value chains?

- ICAT stakeholder participation methodology
- Value chain approach

Tool/resource

STEP 1.1.
Determine GHG emissions associated with material use in the economy to prioritize sectors/sub-sectors for circular economy interventions in the NDC.

The tools provided in this step will help prioritize sectors/sub-sectors for circular economy interventions by identifying the direct and embodied GHG emissions from the extraction, production and consumption of materials (such as biomass, fuels, metals and minerals). The starting point is to review **national GHG inventories** and establish which sectors are major contributors to GHG emissions. Then, using the **Sustainable Consumption and Production Hotspot Analysis Tool (SCP-HAT)** carry out an assessment of material flows in the economy and identify the hotspots of GHG emissions in relation to material use. Depending on in-country capacity, it is recommended to prioritise 1-2 sectors/sub-sectors (or those contributing to a higher share of country GHG emissions) as a starting point. To refine the greatest potential impact in terms of material use and embodied GHG emissions and further prioritise sectors/sub-sectors, additional **life cycle assessment** information for key materials used in high-GHG emissions contributing sectors can be useful. This can be supported through a life cycle inventory database.

National GHG inventories provide the emissions profile for the sectors that are the major contributors to GHG emissions and thus a basis within the framework of the IPCC categorization as a starting point.

The SCP-HAT provides data from international databases[3] on a country's environmental and socio-economic performance, including material flow analysis. It offers empirical evidence of hotspots ('Hotspot Identification' module) where unsustainable consumption and production practices are prevalent, and action is most needed. Information is from the perspective of:

- **Domestic production** to understand the pressures and impacts from material production for the purpose of domestic consumption and export; and
- **Consumption footprint** to understand the pressures and impacts from the perspective of where consumption occurs (considering imports and exports).

In the context of this stage, the SCP-HAT enables (inter-alia):

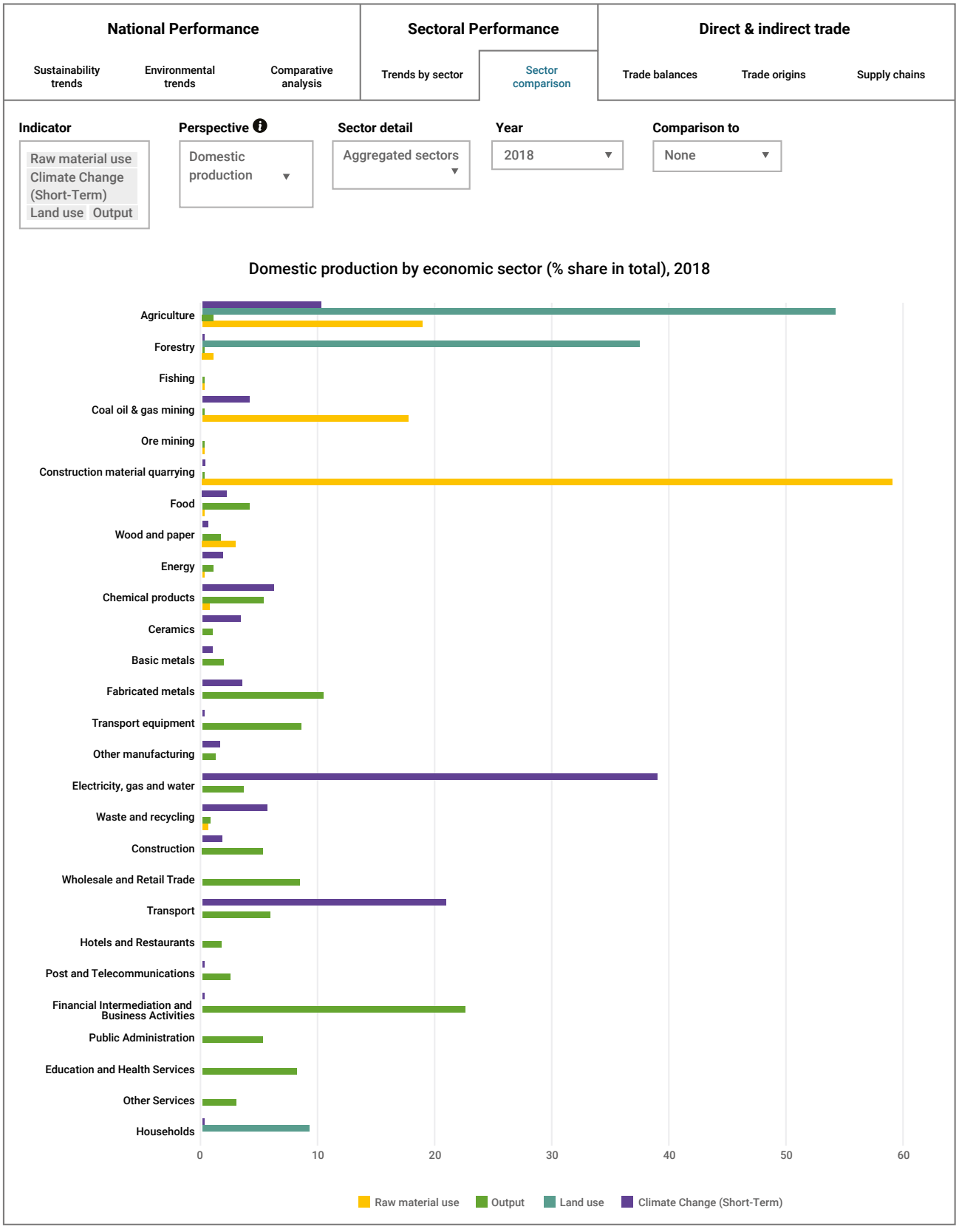
- An overview of the country's GHG emission performance and how it has evolved over time;
- An understanding of GHG emissions hotspot sector groups or sub-sectors;
- An analysis of which supply chains link GHG emissions with materials;
- A sector comparison for environmental performance, labour force (gender and skill) and GDP;
- A comparison of territorial GHG emissions and the country's carbon footprint; and
- An overview of countries where GHG emissions are "imported from" or "exported to".

The SCP-HAT includes information on a country's environmental footprint for 27 sector groups (and for selected countries for 98 sub-sectors). For each sector group, there is data from 1990-2018 for seven environmental indicators. The tool provides data according to socio-economic indicators including GDP, employment, value added, socio-economic vulnerability and output/final demand. Therefore, it is possible to compare sectors regarding their environmental performance as well as labour force (gender and skill) and contribution to value added/GDP.

The SCP-HAT compares sectoral contributions to domestic material extraction and GHG emissions as well as to the country's material and carbon footprint. Figure 5 illustrates from a domestic production perspective to what extent individual sectors or sector groups contribute to overall raw material use (i.e. domestic extraction), domestic GHG emissions and land use. This is in comparison to the sectors' share in the overall output produced. In this country example there is a divergence between sectors with large contributions to environmental pressures but low economic output and vice versa.

3 Databases such as EDGAR for GHG emissions or the database from the International Resource Panel for Material Flow Analysis.

Figure 5.
Screenshot from SCP-HAT Tool: Country example.



Case study: Application of the SCP-HAT to update South Sudan's NDC.

To identify new decarbonization policies and associated circular economy mitigation strategies for South Sudan's updated NDC, GHG emissions were analysed from a material flow perspective using the SCP-HAT. The assessment was conducted using the following steps:

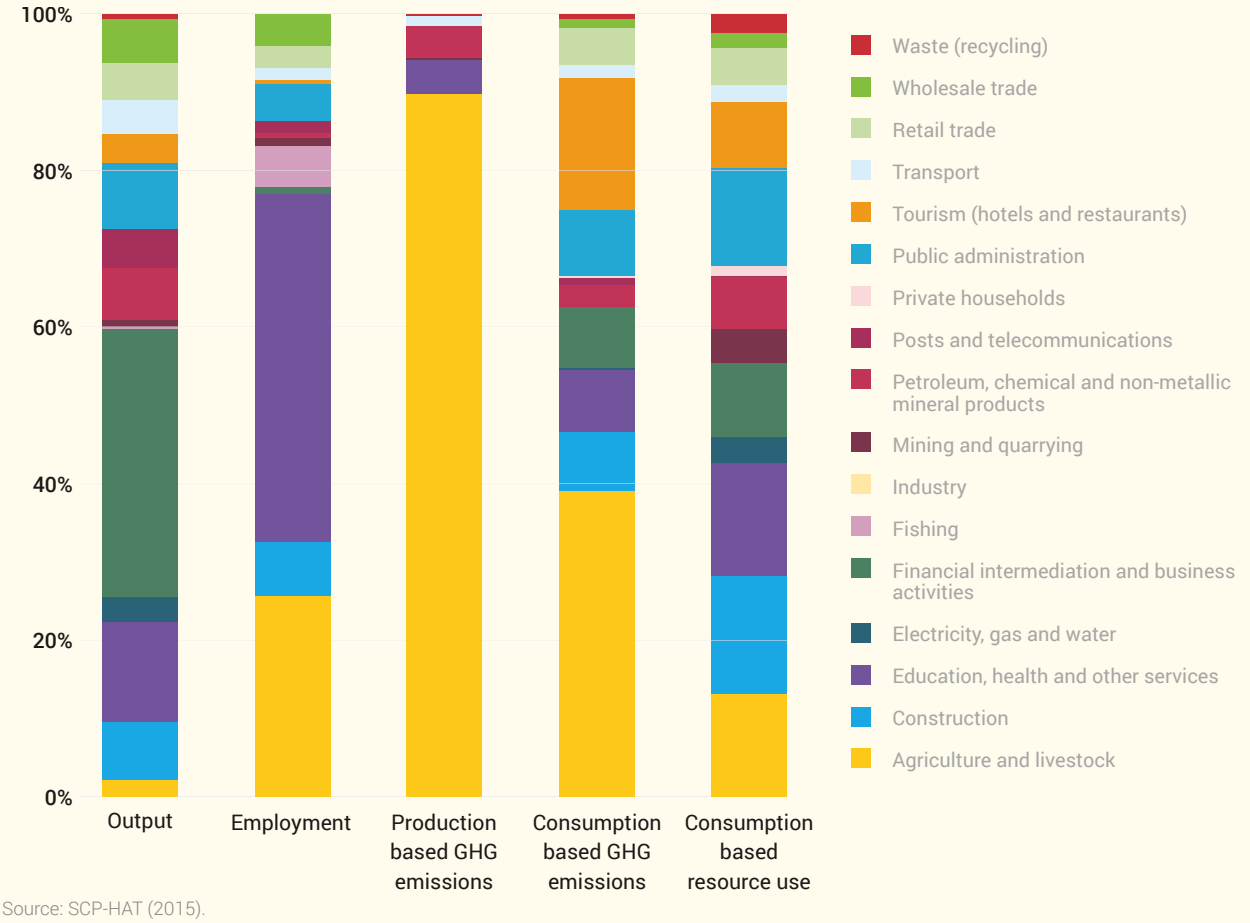
1. Extraction of data on South Sudan's economy from SCP-HAT;
2. Review of the status of South Sudan's economy from a climate change perspective; and
3. Use of information and data gathered to map material flows within South Sudan's economy.

GHG emissions from domestic production were mostly from agriculture and livestock, followed by the petroleum and service sectors. **In terms of resource consumption, industry, hotels, restaurants and other service sectors were significant, demonstrating that embodied GHG emissions were equally important.** It was also possible to determine the output, employment, and emissions profile of different sectors based on this analysis as well as sector-based directed mitigation and adaptation strategies.

The proposed sectoral strategies, if implemented, will help South Sudan achieve decarbonization targets compatible with the Paris Agreement's goals. In total, by implementing the identified circular economy strategies, South Sudan can reduce an estimated 109.87 million tCO_2e and sequester 45.06 million tCO_2e by 2030 while at the same time generating new jobs.

For more information on the method, please see South Sudan's second NDC submitted in September 2021 here.

Figure 6.
Social, environmental, and economic considerations.



Source: SCP-HAT (2015).

The SCP-HAT allows countries to link between the thematic areas of GHG emissions and raw materials i.e. to identify how actions in one area can help improve performance in the other. While NDCs are limited to territorial emissions, it is possible from the consumption footprint perspective to also identify how domestic consumption is contributing to environmental pressures or impacts abroad. This provides insight to further raise ambition (especially relevant for global north countries).

Life cycle analysis (LCA) inventory databases are used for quantification and characterization of materials and associated embodied GHG emissions across the value chain in the identified "hotspots". The LCA directory, Global LCA Data Access network (GLAD) provides LCA data for a wide range of individual raw materials or products. With the support of a LCA expert user, this information can be used to break down the hotspot analysis from the sector comparison and directly link the materials and GHG perspectives. GLAD datasets include cement, agriculture and food, non-metallic minerals, bamboo, batteries, chemicals and plastics, electronics, metals and wood[4].

The social life cycle assessment is a methodology that can be used to identify and analyse the social impacts (positive or negative) on stakeholders of products and services across their life cycle and related value chain. Information on types of stakeholders is available in step 1.3.

The information from the SCP-HAT and additional LCA complements data on GHG emissions from sources in national inventories and enables an assessment in relation to GHG hotspots and material flows. In doing so, it can support the prioritisation of circular economy interventions based on highest GHG emissions reduction potential.

The aforementioned analyses can also be complemented with assessments of trends, natural assets and produced/existing material stocks (e.g. buildings) alongside relevant national data.

Case study: Circular economy opportunities identified for the NDC update in Lao People's Democratic Republic (Lao PDR)

An **analysis** was conducted in Lao PDR to identify GHG mitigation opportunities and integrate circular economy measures into Lao PDR's updated NDC. This analysis utilised a material flow analysis, trends assessment of natural assets and produced stocks, policy, and business case analyses.

The initial assessments determined the circularity of Lao PDR by identifying 332 national material flows and determining whether each is circular or linear. The consumption-based circularity gap for Lao PDR specifies the share of domestic consumption from renewable or secondary resources, and for which materials are recovered at the end-of-life phase. Consumption in Lao PDR is estimated to be **27 percent circular**. Imported goods and materials account for 5.6 percent of the consumption-based GHG footprint.

The analysis identified 17 circular economy interventions that can reduce Lao PDR's carbon footprint from 106 to 58 million tCO_2e/year and help it achieve carbon neutrality by 2040. They include substituting carbon-intensive construction materials with wood-based construction, improving the circularity of food systems to decrease food loss and waste and improve livestock efficiency, and promoting the use of public transport and its electrification to decrease road transport emissions. The analysis found that solid waste disposal could be reduced by 86 percent and 2.6 million tonnes of food waste and losses could be avoided. As a viable business opportunity, 82 percent of the circular GHG mitigation potential will provide returns on investment in under 2.5 years. **Moreover, the GDP from a circular economy in Lao PDR could reach $16 billion by 2050 and generate 1.6 million green jobs.**

The overall analyses **prioritized circular economy opportunities that offer GHG mitigation potential, create green jobs, reduce waste disposal, and increase GDP.**

Source: UNDP (2021). Circular Mitigation Opportunities in Lao PDR. A Metabolic Approach to Defining a Resource-Efficient and Low-Carbon Future.

4 Global LCA data access network. Some datasets require a paying fee.

Summary of tools for step 1.1:

- National GHG inventories.
- SCP-HAT enables an initial prioritization for action based on hotspots of raw material use and GHG emissions among other impacts. A dedicated user journey for applying SCP-HAT in the context of NDCs is availble here.
- GLAD is an open-source directory of LCA datasets, from independent LCA database providers worldwide which provides additional information on the priority materials in relation to the hotspots.
- Social life cycle assessment is a methodology to identify and analyse social impacts.

Additional knowledge resources:

- Circularity gap reports can provide additional information on how other countries have evaluated their material use and how much of their economy is circular.

STEP 1.2.
Assess current NDC to identify entry points for circular economy interventions.

This step enables an analysis of the NDC to identify entry points for new sectors/sub-sectors or GHGs to be added. While economic sectors described in material flow analyses and circular economy interventions may be different from IPCC GHG inventory categories, the results of step 1.1 help assess opportunities and entry points for circular economy interventions in the country's NDC through:

- The emissions profile according to the national GHG inventories in line with the IPCC categories; and
- The GHG emissions from material flows based on information from life cycle-based tools (e.g. SCP-HAT).

The next step is to review the country's current NDC to identify areas relevant to circular economy interventions such as additional sectors or sub-sectors, GHGs and emissions reduction efforts. It may be helpful to compare findings with the NDCs from other countries. Hence this step includes tools to explore other countries' NDCs.

Table B. Scope and coverage of GHGs and sectors in NDCs as of September 2022.

Energy	In 100% of NDCs
Carbon dioxide (CO_2) emissions	In 100% of NDCs
Methane (CH_4) emissions	In 91% of NDCs
Nitrous oxide (N_2O) emissions	In 89% of NDCs
Agriculture; land use, land-use change and forestry (LULUCF)	In more than 80% of NDCs
Waste	In more than 80% of NDCs
Industrial processes and product use (IPPU)	In 76% of NDCs
Hydrofluorocarbon (HFC) emissions	In 53% of NDCs
Perfluorocarbon (PFC) and Sulfur Hexafluroide (SF_6) emissions	In 36% of NDCs
Nitrogen trifluoride (NF_3) emissions	In 26% of NDCs

Source: UNFCCC (2022). NDC Synthesis Report.

Circular economy interventions can expand the scope and coverage of efforts under the current NDCs, for instance beyond CO_2 emissions in energy sectors. For example, food loss and waste reduction measures will mitigate CH_4 emissions from not only the waste sector but also from agriculture and LULUCF sectors. Additionally, resource efficient manufacturing processes and product design have the potential to reduce CO_2 and non-CO_2 emissions from IPPU, waste and other sectors. Circular economy interventions in service sectors can also expand the coverage of GHGs in NDCs. For example, tourism has an extensive value chain and is mentioned in 53 percent of NDCs.

Summary of tools for step 1.2:

- NDC registry maintained by UNFCCC secretariat shows the latest official NDCs as well as previous versions communicated by countries.
- Climate watch NDC explorer enables a keyword search for circular economy references in other countries' NDCs. Whilst actions might not be specified as "circular economy", a search for the overall circular economy concept or related terms can help identify frequently referenced sectors and context and provide examples of appropriate measures to inspire action.

STEP 1.3.
Identify relevant stakeholders for consultations (including government institutions).

Based on the outcome of steps 1.1 and 1.2, it is important for the lead institution to map relevant stakeholders across the value chains of the priority sectors/sub-sectors to engage them throughout the process of identifying, implementing, and tracking circular economy interventions in the NDC. This helps ensure an inclusive and participatory process, builds local and national ownership of the circular economy interventions, and strengthens political will. It also serves to build an understanding of the different activities, drivers, and pressures across value chains while facilitating further collaboration with stakeholders, an important factor of success. Depending on national context, line ministries should be included in this process.

Stakeholder maps can be used to determine who is affected by the impacts of material use and potential changes to ensure that the transition for stakeholders from a linear to circular economy is fair and just. Stakeholders include all agents of change, including municipalities, businesses (at all stages from raw material production or extraction to waste management), consumers, informal workers, women[5], Indigenous peoples, young people, local communities, private sector, research institutions and all those who will be affected by any decisions made.

Summary of tools for step 1.3:

- The value chain approach enables an understanding of the full value chain in relation to the identified hotspots of material use and GHG emissions. This also identifies relevant stakeholders along the value chain.
- ICAT stakeholder participation methodology is a tool for countries to enhance stakeholder participation in the design, implementation, and assessment of proposed interventions through greater transparency, trust and ambition.

Stage 1 Checklist

By the end of this first stage users should have:

1. Data on the GHG emission hotspots in relation to national material use/flows enabling a prioritization for circular economy interventions that can be used as a baseline in the evaluation stage (stage 4).
2. A shortlist of 1-2 prioritized sectors/sub-sectors and corresponding entry points that can be incorporated or enhanced with circular economy interventions within their NDC.
3. Life cycle analysis information on the impacts of the materials across the value chain in the aforementioned sectors/sub-sectors and from which circular economy interventions can be identified.
4. A preliminary understanding of the prioritized value chain and relevant stakeholders to engage in the next stage.

5 To ensure that the perspectives, challenges and needs of women are integrated gender-responsive, planning and implementation is paramount.

Application of stage 1 for food loss and waste:

Using the proposed steps, policymakers can identify GHG emission hotspots of food sub-sectors (and thus, the potential for GHG emission reductions as well as priority entry points). The national food loss and waste baseline can also be measured and used to later develop measurable indicators and targets. The food loss index and the food waste index provide clear methodologies for measuring and reporting on food loss and waste under Sustainable Development Goal (SDG) 12.3 to halve food waste and reduce food loss across supply chains.

In some cases, it may be useful to conduct a food systems mapping, including a gender-sensitive mapping of food losses which will provide information on specific gender-based constraints that hinder women's and men's ability to efficiently participate in the food value chain, from production to consumption. Assessing opportunities at various stages of the food system as well as engaging associated actors through stakeholders consultations will be critical.

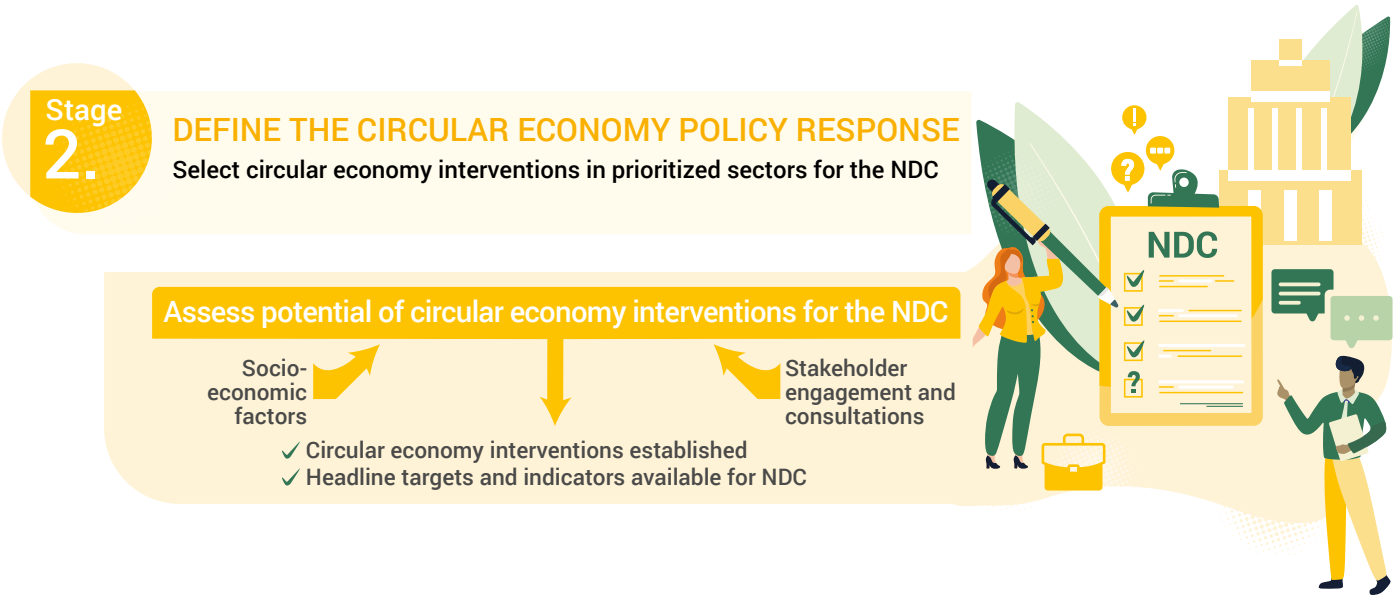
The complete application for food loss and waste can be found in Chapter 4.

Application of stage 1 for buildings and construction:

Using the proposed steps, policymakers can identify and prioritize hotspots in material use and GHG emissions in relation to buildings and construction with particular attention to embodied emissions and the life cycle of materials used in the buildings and construction value chain. The user can then assess the NDC to identify entry points to incorporate sub-sectors and/or GHGs in relation to the identified hotspots. For example, this can be in 1A2 Manufacturing Industries and Construction, 2A1 Cement Production, 2C1 Iron and Steel Production, 3D1 Harvested Wood Products, Waste.

This stage also enables an understanding of stakeholders to engage across the value chain, cognizant that in buildings and construction governments exert significant influence as 1) regulators of financial markets, 2) investors in the construction sector, and 3) urban and territorial planners, and regulators of the construction sector.

The complete application for buildings and construction can be found in Chapter 4.



This stage selects circular economy interventions that can reduce the GHG emissions identified in stage 1 and raise the ambition of the NDC. It requires diving deeper across the value chains of the prioritized sectors/sub-sectors to identify opportunities for circular economy interventions. The potential impacts and externalities of the interventions will be assessed from a national economic and political perspective while also assessing targets and indicators to inform the NDC (step 2.2). Finally, this stage provides examples of strengthening political will and tools for establishing institutional arrangements for integrating and monitoring the implementation of circular economy interventions effectively (step 2.3).

Circular economy interventions for priority sectors and/or sub-sectors.

The circular economy intervention should aim to **keep materials at their highest value**[6] **for as long as possible along the value chain and encourage the regeneration of natural systems** to reap the greatest benefits in terms of material use and GHG emissions reduction overall. Closing or slowing material loops along the value chain will prevent waste from being generated and can extend the lifespan of products and minimize the quantities of materials required. Upstream interventions will therefore enable a higher multiplication of benefits across the value chain than downstream.

Reduce by design (upstream intervention) is therefore the overarching principle (see Figure 7) to minimize resources, materials, energy, input use, and waste across the value chain while maximizing new market and job creation opportunities, stimulating industries and skills. The design phase should also take into account social justice and gender-responsive considerations. Chemicals of concern should be kept away or easy to separate from recycled streams.

Life cycle thinking enables the identification of strategic entry points in the value chain and to be aware of trade-offs to avoid burden-shifting. Circular economy interventions **have little chance of success if undertaken in isolation** as circular economy is an economy-wide, systemic approach and enabling measures need to be factored into policymaking. Hence the need for a set of reinforcing policy instruments to be coordinated and implemented in **collaboration with the key stakeholders.**

6 "Value" in this context includes the value for society including economic, environmental and social.

Figure 7.
Circular processes can be grouped into categories based on potential impact and value retention loops between users and business.

Overarching principal with highest co-benefits

Reduce by design is the overall guiding principal for circularity and the most impactful – reducing the amount of material used, particularly raw material, should be applied from the earliest stages of designing products and services. This leads to the design of products and services that are using less materials per unit of production and/or during their use.

Why? Reduce by design influences all stages of the life cycle of a product or service: less raw materials are extracted, production has been designed to use less materials, and consumption patterns and the end-of-life are influenced by the design for less impact and waste.

Restore and regenerate – solutions designed within existing land uses to increase the biophysical function and/or ecological productivity of an ecosystem or its components. For example, designing food products that make use of diverse, low-impact, ingredients and crops, eliminate waste, and harness all the nutritional value of what is grown i.e. producing food in a regenerative way.

Substituting carbon intensive materials with regenerative materials can be an effective lever to reduce emissions as certain materials have the potential to store carbon (e.g. wood). These interventions alter material flows in a way that reduces emissions or enhances sinks. However, a full life cycle assessment is required to understand the impacts of the alternative material.

Responsible use

Refuse – refusing the product or service by the consumer or user can result in the product or service becoming redundant. For example, rejecting single-use packaging or unnecessary products or services. By refusing to buy or consume a specific product or service, users send a strong signal to the market.

Reduce – reducing the consumption of certain products or services can help retain the value of a product or service for a longer time period.

User to User

Extending the lifespan of products and their parts

Re-use and re-sell – re-using and re-selling implies no modification of the product or service, little cost to the user, and a high potential for longer value retention of the product or service. Re-usability by selection can encourage producers to offer more robust products and materials with a longer lifespan.

Repair – sending a product to a business intermediary, to the retailer, or directly to specialised shops for repair. Repair is also considered as a service to users.

Refurbish – modifying an object that is considered waste or modifying a product to increase or restore performance and/or functionality, meet applicable technical standards or regulatory requirements, or to make a functional product that is at least similar to the one originally developed. The restoration of functionality, but not value, enables a partial new service life for the product.

Remanufacture – standardizing industrial processes in which a product or module which has been sold, can be restored to a same-as-new or better condition and performance. This enables 'as-new' products at significantly lower environmental impact and lower cost to the producer and potentially the customer.

User to Business

Option with the lowest co-benefits

Repurpose – re-using discarded goods or components adapted for another function, the material gets a new life cycle (e.g. plastics used in handbags). Repurposing enables financial savings through reduced costs of production by obtaining reclaimed materials as well as the reduction of waste generation and associated treatment requirements.

Recycle – recycling is a valuable source of materials. However, it requires specific systems, technology, and infrastructures to collect materials to be recycled. Materials can be recycled by removing impurities through different techniques and technologies such as manual work, mechanical work, chemical and metallurgical processes, with the aim to improve material quality.

Business to Business

User to User = shorter loop, where a product or component remains close to its user and function
User to Business = medium/long loop, where a product or component is upgraded and producers are involved again
Business to Business = long loop, where a product or component loses its original function

Source: Adapted from UNEP building circularity platform and Sitra, Chatham House (2021). The role of the Circular Economy in addressing the global biodiversity crisis.

Table C. Summarizes key steps, questions, and tools for Stage 2.

2.1 Identify circular economy opportunities in prioritized sectors/sub-sectors for the NDC

What are the current policies and practices in the value chain of the prioritized sectors/sub-sector?

- Value chain approach (including stakeholder consultations and desktop research)

What are the challenges/barriers to circularity?

- Value chain approach (integrating climate resilience and gender responsiveness)

What circular economy opportunities exist across the value chain?

- List of knowledge hubs to find case studies and best practices

What has worked well in a similar country context and can be learned from other NDCs?

- Climate watch explorer

2.2 Select circular economy interventions and assess their potential impact to inform the NDC update (ex-ante)

What is the GHG mitigation potential (and costs) of interventions to inform the NDC update with targets and indicators?

- IPCC GHG inventory guidelines
- CDM methodologies
- Life cycle inventory database
- GHG protocol and policy action standard
- ICAT policy assessment guides
- Circular indicators for governments

What are the potential socio-economic and environmental impacts of the interventions?

- Life cycle inventory database
- SDG Climate Action Nexus (SCAN) tool

How to assess job creation based on the identified interventions?

- Green jobs assessment model
- Circular economy jobs tool

2.3 Strengthen political will and establish institutional arrangements to ensure implementation

How to strengthen institutional arrangements and coordination for implementation?

- How to create a national circular economy roadmap

Tool/resource

STEP 2.1.
Identify circular economy opportunities in prioritized sectors/sub-sectors for the NDC.

Prior to identifying the circular economy interventions and in consultation with the relevant stakeholders identified in stage 1, it is important to use the value chain approach to:

- Review the **value chain in the prioritized sectors/sub-sectors** to gain an understanding of what practices and policies already exist and the drivers that are shaping the operations (e.g. where the point of influence is for change). This information will support the decision-making process for where the intervention areas should be in order to address the identified hotspots of material use and GHG emissions. This should include information on **gender differentiated roles and contributions in the sectors or areas of intervention**.
- Carry out an assessment to enable a broader understanding of the **challenges and barriers** to circularity e.g. access to finance and technical capacity, as well as successes to be considered when identifying circular economy interventions for the NDC.

Participatory and inclusive consultations will increase the success and acceptability of policies, can help encourage interventions with greater impact and accelerate implementation.

What circular economy opportunities exist along the value chain?

Knowledge hubs and exchange platforms provide information on circular economy policies, plans or initiatives that already exist and have been successful elsewhere. This knowledge can be applied to develop or even replicate the most effective interventions, adapting to national contexts and capacities.

List of circular economy knowledge hubs:

- The UNEP circularity platform provides resources on building circularity for different stakeholder groups and for specific sectors.
- The knowledge hub by Circle Economy is a database of case studies, categorised in a detailed typology of 7 main and 80 subtypes, on circular economy.
- Ellen MacArthur Foundation case studies and success stories from governments, cities and businesses.
- Product lifetime extension hub includes cases and tools for product lifetime extension and building engagement within and across different sectors.
- Circular economy earth includes information on circular economy related policies worldwide.
- NDC Partnership knowledge portal provides guidance on good practices.

By the end of this step, a list of proposed circular economy interventions will have been developed which can be assessed with the tools in the next step for an ex-ante evaluation.

Summary of tools for step 2.1:

- The value chain approach outlines the methodology of analysing drivers, pressures and impacts in order to prioritize action across value chains.
- Toolkit for value chain analysis integrating climate resilience and gender responsiveness
- List of knowledge hubs (listed above)
- Climate watch NDC explorer enables an understanding of what has worked well in other countries' NDCs in a similar context.

STEP 2.2.
Assess proposed circular economy interventions for potential impact to inform the NDC update (ex-ante).

Step 2.2. provides tools to assess the potential mitigation and socio-economic impacts of the circular economy interventions to select the most effective ones. Circular economy interventions should aim to reap the most benefits from the full life cycle of the material. As this is an ex-ante assessment it is helpful to first establish the system boundary.

What is the system boundary? Circular economy interventions can cover different economic sectors and geographies. Defining the «boundaries» of the intervention entails defining the sectors, processes, stakeholders and other aspects affected by the intervention (directly and indirectly).

Assessing the GHG mitigation potential (and costs) of different interventions.

Tools to assess the impact on GHG emissions (based on traditional GHG reduction methodologies):

- **IPCC guidelines for national GHG inventories** are used to prepare national GHG emissions and sinks. Emission factors can be used to estimate the GHG reduction potential of a circular economy intervention. It can also be applied to estimate the potential of a project at a specific facility, organization, and location, but should be used with caution to avoid double counting. For example, by ensuring the scope of emissions source and removal sinks under control of the project (system boundaries) are clearly defined and measured. The IPCC guidelines are complemented with software to help calculate emissions/removals and the emissions factor database.

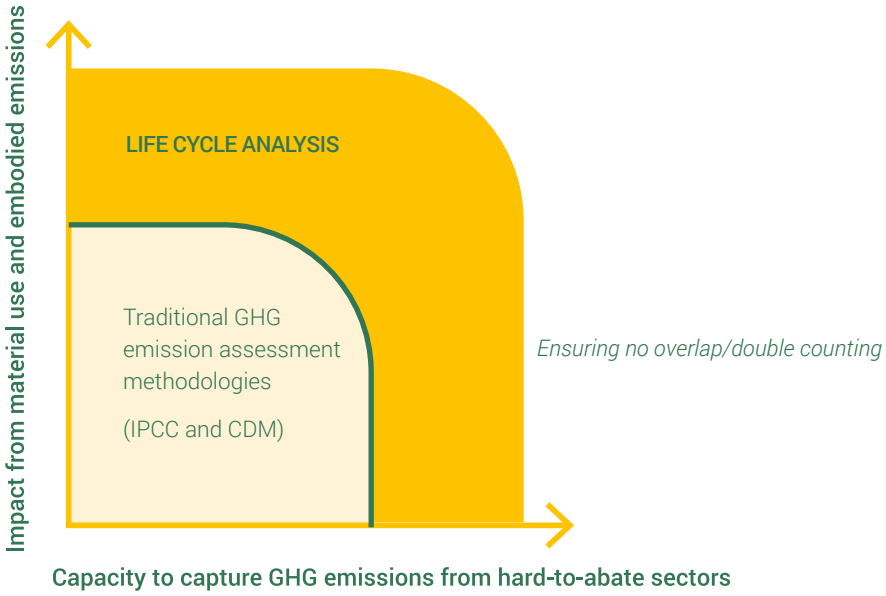
- **Clean Development Mechanism (CDM) methodologies** provide procedures to calculate GHG emissions reductions from activities that can be identified as circular economy interventions – a complementary tool to prioritise interventions based on potential impacts. CDM methodologies can be combined with IPCC guidelines for national GHG inventory methodologies to cover methodological gaps, make solid assumptions, determine the processes to be included in the analysis, as well as the allocation of GHGs according to the sector. Using them can make it easier to align the GHG potential of circular economy interventions to the national monitoring, reporting and verification (MRV) framework system.

- **GHG protocol policy and action standard** provides an approach to estimate the GHG impacts of policies and actions. It assists with baseline, ex-ante and ex-post assessment, a monitoring and uncertainty assessment and for verification/reporting impacts. It includes a calculation tool, online course and sectoral guidance (energy supply, transport, buildings, AFOLU, and waste).

Tools to assess the impact of selected interventions on material use (life cycle-based tools):
Traditional GHG emission assessment methodologies and guidelines currently do not capture the "embodied" emissions along the life cycle of products and materials. To ensure circular economy interventions will reduce GHG emissions from the hotspots associated with material use, it is important to carry out an estimation of impact from material use. Life cycle assessment tools can provide estimates of the impacts of substituting one material with another during a product life cycle, facilitating such comparisons.

Figure 8 demonstrates how life cycle analyses in ex-ante assessments increase the capacity to capture GHG emissions from material use and facilitate comparisons for material substitution.

Figure 8.
Life cycle analysis to measure embodied emissions and the impact from material use.



Life cycle inventory databases such as **GLAD** (as per stage 1) provide an open-source directory of datasets, from independent LCA database providers worldwide.

Assessing the potential socio-economic and environmental impacts of the intervention.

Life cycle analysis tools can provide data on socio-economic and environmental impacts. However, there are other tools that can also be used to analyze the co-benefits and trade-offs including the **SCAN tool**.

The SCAN tool provides a high-level analysis of potential positive or negative impacts, synergies and trade-offs of climate action on the SDGs, which can support the selection of interventions. It includes a method to analyze climate actions and linkages by sector or category, as well as mitigation or adaptation approaches. This tool also helps policymakers across different ministries to achieve greater policy coherence. The SCAN tool covers mitigation categories and actions across seven sectors including electricity and heat, transport, buildings, industry, waste, agriculture, and forestry.

Case study: Application of the SCAN tool in Lebanon.

The SCAN tool was used in Lebanon to assess the linkages between the mitigation and adaptation sectoral policies that make up Lebanon's NDC as well as the linkages to national SDG targets and sub-targets with the aim of increasing the implementation of the two multilateral processes.

Collaborating with the Presidency of the Council of Minister's office and the UNDP SDG team to avoid duplication of efforts, ensure the full integration of results, and efficiency of implementation, Lebanon carried out an assessment of the positive and negative impacts between the mitigation and adaptation sectoral policies that make up Lebanon's NDC, including in agriculture, forestry, energy, and industry, among others, and the SDG targets and sub-targets.

This was done through two main steps:

1. Identify progress indicators of NDC policies to inform SDG progress and vice versa, to synchronize reporting; and
2. Operationalize coordination between institutions responsible for the implementation and reporting of both the NDC and SDGs.

Coupled with local expertise, the analysis identified potential linkages between specific recommendations included in each of Lebanon's climate related plans and policies and with the SDGs. For example, the renewable energy policy can be linked to poverty reduction (SDG1) since it seeks to reduce the cost of energy and provide more reliable service in remote areas. The analysis also includes the identification of potential linkages to all of the SDG targets, with recommendations for policy-makers in agriculture, forestry, energy, renewable energy, energy efficiency, solid waste, solid waste NAMA, public transport, private transport, water, biodiversity, and industry.

Source: Synchronizing Lebanon's NDC and SDGs for Enhanced Implementation.

Assessing job creation based on the identified interventions.

Ensuring fair and dignified jobs for all is critical for a just transition[7] to a circular economy where jobs will be both created and displaced. To understand how jobs are affected in the transition to a circular economy, four dynamics need to be considered:

1. Just transitions whereby people shift from jobs in the linear economy to new opportunities in the circular economy (re-skilling and training will be required);
2. Ensuring shifts towards dematerialization and new circular economy opportunities are inclusive and integrated with development priorities at all levels (policy coherence);
3. Existing circular jobs are preserved, for example, by securing the regenerative capacity of natural assets on which these jobs rely; and
4. The creation of new jobs in the circular economy based on regenerative secondary resources (UNDP 2021b).

The shift from jobs centred on the linear economy to activities based on circular models should be accompanied by retrained, higher skilled and fairly-paid workers, thus resulting in an upscale of the national workforce. It is key to ensure workers whose jobs were associated with high-emitting or extractive sectors are not left behind and that the transition includes gender-responsive policies. Creating new jobs is particularly important for socio-economic marginalised groups (e.g. informal waste workers or migrants) and can help ensure a fair integration of informal workers into the formal sector, while addressing issues of gender equality, women's empowerment and health.

7 The ILO defines "just transition" as "greening the economy in a way that is as fair and inclusive as possible to everyone concerned, creating decent work opportunities, and leaving no one behind."

Quantifying the job potential: The added value of each circular economy intervention can be estimated based on the monetary value of an increase in the production of regenerative materials or in the recovery of secondary materials. The job potential of each individual intervention is quantified with the sectoral employment elasticity[8]. Dedicated tools for analysing the job creation potential, include:

Green jobs assessment model which is designed to analyse and design policies that maximize job creation and minimize and protect job losses. Capacity building and policy advice is supported through the Green Jobs Assessment Institutions Network (GAIN). It enables the quantification for how climate related policies affect job creation, including for women and young people. It is a macro-economic modelling framework based on input-output tables or social accounting matrix. Policy scenarios can be modelled to compare effects on jobs, skills, gender, growth, income distribution, household groups and other job characteristics. The sectoral aspect allows for a comparison of green versus conventional industries.

The circular economy jobs tool provides data and evidence in relation to the employment potential of the circular economy. It enables policymakers to align their efforts with the skill needs of different regions, industries and sectors and obtain a baseline for defining sectors for scenario modelling. The tool makes use of microsimulation to quantify the impact of policies to ensure the policy won't disproportionally affect a specific sector or population group.

Updating NDC targets and indicators for identified circular economy interventions.

Targets. At this stage, NDC targets can be updated with the circular economy interventions by defining clear quantitative targets to inform the NDC update. This can be through strengthening the ambition or scope of existing targets by reflecting potential impacts of the circular economy interventions on sectoral categories or GHGs in the NDC.

New targets can also be created if the sector or GHG is not yet included in the NDC.
Examples of targets can include (non-exhaustive):

- Reducing waste by 50 percent
- Percentage of substituted materials that are less carbon-intensive (with LCA to avoid burden shifting)
- Reduce material use by 20 percent in the value chain (of prioritized sub-sector) compared to baseline levels

These can be translated into the level of GHG emissions reductions to reflect it in the new or updated NDC.

Indicators need to link directly with the NDC targets but will depend on what can be measured, how data is collected, transparency systems, the sector and national context. A benchmarking of similar interventions in countries with similar context can be helpful. Indicators can feed into one or several targets depending if the circular economy intervention is cross–sectoral. If cross-sectoral, it is important to decide where to assign or "distribute" the impacts between sectors. While indicators can be set at this stage it is preferable to review and update the indicators once the policy instruments are selected (Stage 3) to help guide policy development and obtain financing.

Circular economy indicators linked to GHG reduction targets can be based on, for example:

- Domestic material consumption (DMC) and raw material consumption (RMC);
- Renewable content of materials used in production processes;
- Circular use rate of materials (referring the R interventions from figure 7);
- Material and footprint intensity;
- Waste generation (total, municipal or waste at final disposal);
- Food waste generation; and
- National recycling rate[9].

8 Employment elasticity is a measure of the percentage change in employment associated with percentage change in economic growth.

9 Options have been elaborated from the joint UNECE/OECD guidelines for measuring circular economy: conceptual framework, statistical framework and indicators - prepared by the task force on measuring circular economy.

Circular indicators for governments provides a starting point to develop indicators for tracking circularity and examples of what other countries have done.

GHG protocol mitigation goal standard provides an approach to design, assess and report on the mitigation goal. It assists with estimating baseline scenario emissions, accounting methods for tracking progress, and calculating allowable emissions in the target year(s) to understand future emission levels associated with meeting the goal. An online course and illustrated video are publicly available.

ICAT policy assessment guides chapters 3 and 4 inform how to assess GHG emission impacts on policy areas (renewable energy, buildings efficiency, transport, agriculture and forestry) as well as transformational change potential. It also provides guidance on impacts of actions at sub-national level and by non-state actors.

After completing steps 2.1 and 2.2, the information necessary to select the most appropriate circular economy intervention(s) for the NDC should be compiled for decision-making/selection. An additional process for the development of indicators in stage 3 can also be carried out once policy instruments are selected.

Table D. Summary of tools for step 2.2.

Impact on GHG emissions	Socio economic impacts, synergies and trade-offs	To develop targets and indicators
IPCC guidelines for national GHG inventories	SCAN tool	Circular indicators for governments
CDM methodologies	Green jobs assessment model	GHG protocol mitigation goal standard
GHG protocol policy and action standard	Circular economy jobs tool	ICAT policy impact assessment guides
Global LCA data access network		

Additional knowledge resources:

- The GHG abatement cost model (GACMO) provides guidance to calculate and track the GHG reduction and economic effects of approximately 100 climate mitigation actions organised by the 24 types of mitigation actions that have been used in the CDM.
- Low emissions analysis platform (LEAP) is a tool for climate change mitigation assessment, including emissions projection in NDCs. It is a scenario-based modelling tool to track energy consumption, production, and resource extraction in all sectors of an economy. It can account for both energy sector and non-energy sector GHG emission sources and sinks.

Case study: Identifying circular economy interventions to enhance The Gambia's revised NDC.

Twenty circular GHG mitigation opportunities were identified based on analyses of data on resource flows, stocks, material consumption and production footprints, and embodied carbon in value chains. Together, the circular opportunities can reduce national GHG emissions by 36 percent, while reducing The Gambia's international carbon footprint by 38 percent. Furthermore, they can reduce national solid waste volumes by 37 percent, reduce government expenditures on fertilizer subsidies, shift the tax base away from labour to encourage job creation and reduce the reliance on imported goods and materials. This would reduce the trade deficit by $116 million, or 7 percent of import volumes.

Nine of the twenty opportunities have a high or very high job creation potential. Job potential is low when the measure replaces, rather than creates, domestic jobs or when the investment is capital intensive, rather than labour intensive. Job potential is high when the measure can create new jobs and safeguard existing ones in the wake of climate change and future degradation of natural assets.

Circular mitigation option	Estimated GHG mitigation potential by 2030 tCO2e		Costs	Solid waste avoided t/year	R M E extraction avoided t/year	Imports reduced mil $/year	Job potential
	Domestic	International					
Practice multi-strata agroforestry	423,000	64,000	Medium	0	164,000	34,000,000	High
Adopt climate-smart agriculture	205,000	51,000	Medium	0	60,000	51,000,000	Very high
Improve livestock productivity	196,000	1,000	Medium	9,000	n /a	200,000	Medium
Use improved cookstoves	153,000	0	Medium	0	147,000	0	Medium
Reduce food losses	90,000	9,000	High	59,000	45,000	3,500,000	Medium
Recover organic waste	77,000	0	Low	64,000	n/a	0	Medium
Use rewood from agroforestry	27,000	28,000	Low	0	233,000	8,600,000	High
Practice circular procurement	10,000	10,000	Medium	n/a	n/a	n/a	Medium
Use local construction materials	0	110,000	Low	0	0	n/a	High
Pursue circular energy transition	0	6,000	High	0	1,000	0	Low
Incorporate passive building design	n/a	n/a	Low	0	n/a	0	Low
Substituting HFC23	705,000	0	High	n/a	n/a	n/a	Low
Implement extended producer responsibility	0	29,000	High	18,068	26,000	n/a	Low

Source: UNDP (2021). Circular Mitigation Opportunities in The Gambia: A Metabolic Approach to Defining a Resource-Efficient and Low-Carbon Future.

STEP 2.3.
Strengthen political will and establish institutional arrangements to ensure implementation.

This step requires tools that can help facilitate consultations with relevant stakeholders identified in step 1.3 and support the establishment of a coherent and common agenda for the identified circular economy interventions. Informing and consulting with the identified stakeholders is critical for the viability of a successful policy response.

Institutional arrangements and stakeholder consultations for circular economy.

Depending on national context, a lead institution will have agreed (as early as step 1.1) to drive the process of integrating circular economy into the NDC and monitoring implementation. Relevant line ministries would already be engaged (e.g. Ministries of Environment, Agriculture, Economy, and/or Planning).

It is important for the government to align institutional arrangements for circular economy with reporting national GHG inventories and progress of NDC implementation in order to link the processes[10]. Coordination at all levels of government will help avoid duplication of efforts and support policy coherence and budget alignment, ensuring that financial and human resources are optimally used. Sub-national actors will benefit from clear coordination at the national level as they are key to helping bridge the gap between ambitious national climate targets and the concrete actions required on the ground, e.g. at city level. Furthermore, a major factor of success will depend on the engagement of **the highest level of decision-makers.**

While establishing a roadmap or plan for circular economy interventions is a significant step, it must succeed through to the stages of implementation to have impact. It is therefore important to allocate sufficient resources and develop a verification component across responsible line ministries to adequately monitor progress through each phase of implementation.

Plans or roadmaps can anchor on pre-existing cross-ministerial coordinating committees or new structures can be established to coordinate (including with the identified stakeholders) and monitor the progress and implementation of the established circular economy intervention(s).

Roadmaps.

A circular economy roadmap is a tool that helps define the country's vision, goal, and commitment to transition to a circular economy as well as the major steps needed to reach it. It also serves as a tool for comprehensive consultations and creates a shared understanding/ common agenda.

Benefits of a circular economy roadmap:

- Sends a clear signal to the private sector, including investors, on the government's direction, goals and targets.
- Keeps key government agencies engaged, fosters reassurance moving forward and facilitates financing for implementation.
- Engages key stakeholders, creating a shared understanding and mindset of changes needed.
- Builds a path from plans to action with clear ownership.
- Increases the visibility of circular economy related policies.
- Inspires others to become involved in the transition.

10 Toolbox for institutional arrangements on reporting national GHG inventories and NDCs progress by the Consultative Group of Experts (CGE), available here.

It is also possible to establish a common agenda without a roadmap. Some countries have established a series of circular economy interventions and targets in sectoral or development plans. Whether a plan or a roadmap, it is key to align with the national context and policy landscape as well as link to the NDC.

How to create a national circular economy roadmap? This tool created by Sitra, the Finnish Innovation Fund provides information on the different phases of developing a roadmap and shares specific examples of how it was done in Finland. Defined steps and checklists support the user to adapt the tool to their country context. The roadmap was followed by the development of a national strategy in 2021.

Case study: A circular economy roadmap for Finland.

In 2016, Finland prepared a national roadmap for a circular economy under the leadership of Sitra, the Finnish Innovation Fund. The roadmap was launched to advance circular economy initiatives in Finland. The Finnish Innovation Fund Sitra then developed a guide to help other countries develop a circular economy roadmap, with 9 phases or steps identified:

1. **Establish the groundwork and plan the process:** Define the preconditions, create a project plan for the process, define team roles and ensure there are sufficient resources.

2. **Identify stakeholders and ensure effective participation:** Identify key stakeholders, invite them to develop ideas for actions and comment on the draft roadmap.

3. **Develop a situational picture with technical inputs and participation from stakeholders:** Establish a clear understanding of the current state of the circular economy. With the help of interviews and a comprehensive desk study, a situational picture was drawn up of Finland's current circular economy status, its strengths, and challenges.

4. **Establish visions and goals:** Create an inspiring vision with specific and measurable goals.

5. **Identify focus areas:** Define the focus areas based on the vision and strategic goals. Define the indicators that help measure the transition to a circular economy. In the Finnish roadmap the focus areas were food systems, forest-based loops, technical loops, transport and logistics, and joint national actions.

6. **Plan relevant actions:** Plan actions that lead to the roadmap goals. The roadmap is a combination of strategy and a tangible action plan. The means for achieving a shared mindset, measures prioritised, and responsibilities allocated for each measure.

7. **Compile and publish:** Start compiling the roadmap. Ask for stakeholders' comments. Communicate to inspire others to start their own actions to promote the circular economy. In Finland, the draft roadmap was presented to the public and it received 350 comments and ideas.

8. **Execution and implementation:** Define the management model of the roadmap and ensure stakeholder commitment to guarantee strong implementation. Remember to communicate. Between 2016 and 2019, Sitra enhanced the practical adoption of a circular approach by providing co-funding for over 70 projects. In addition to Finland's national circular economy roadmap, several companies, cities and organisations have prepared strategies for the circular economy and seized some of the opportunities offered by it.

9. **Evaluation and revision:** Evaluate ongoing projects, explore supplementary actions and decide on updates. In 2018, progress of the Finnish roadmap was reviewed by reflecting on the 2016 roadmap's objectives, focus areas and the progress achieved. The situational picture in 2018 was formed by comparing the 2016 objectives to the picture formed from written sources and expert interviews.

A more detailed description of the roadmap including lessons learned is available here.

Case study: Development of a circular economy roadmap in Chile.

Chile adopted a circular economy policy strategy through a comprehensive stakeholder consultation process, with the final product being a circular economy roadmap 2020-40 (CER 20-40). The starting point was the initiation of a law on Waste Management, Extended Producer Responsibility and Promotion of Recycling in 2016 as well as other factors such as the growing environmental awareness of society and a "business push" for circular economy. CER 20-40 established a vision and seven long-term goals along with indicators and associated targets. The first goal is that **the circular economy will have created 180,000 green jobs by 2040.** Twenty-seven initiatives are listed in the roadmap, including:

- **Zero waste firms** to promote the transition towards the circular economy model, especially those working with large flows of physical resources and generate high amounts of waste.
- **Circular procurement** to incorporate the environmental dimension in the purchase decisions of products and services, giving priority to circular strategies and business models, and preference to suppliers that demonstrate excellence in the sustainability dimension.
- **Information systems** for modelling the local environmental impact of goods and services through accessible national information systems for quantifying impacts through their life cycles.
- **Skills for a circular economy** to increase the offer of technical, professional, and postgraduate courses on these subjects in the higher and continuing education systems.
- **Transparency and traceability** for the circular economy to strengthen information and traceability systems for waste flows generated in the country.
- **Eco-labelling system** with a minimum standard for the development of eco-labelling for products and services, based on objective and comprehensive criteria of environmental impact.
- **Expand the range of products subject to extended producer responsibility (EPR)** so that new priority products are gradually included.
- **Recognition and inclusion of waste pickers** in the transition to a circular economy with a wide range of opportunities for decent work and participation.

In terms of coordination, each initiative identifies 1) a lead government institution; and 2) key actors. This ensures roles and responsibilities are assigned for implementation. The overall coordination of CER 20-40 is through an Executive Committee with members from both the public and private sectors, including the Ministry of the Environment, Ministry of the Economy, Promotion Production Corporation Agency and Sustainability and Climate Change Agency. The government of Chile included **commitments for a circular economy into its NDC update of 2020 under an "integration" component.**

Gobierno de Chile (2021). Roadmap for a Circular Chile by 2024.

Summary of tools for step 2.3:

Finnish Innovation Fund Sitra: How to create a national circular roadmap

Stage 2 Checklist

By the end of this stage users should have:

1. Assessed prioritized value chains and confirmed strategic entry points for circular economy interventions based on existing policies and practices.
2. Developed a list of potential circular economy interventions.
3. Assessed the impact potential of those interventions (impacts on GHGs and jobs) in order to update the headline targets and indicators in the NDC (ex-ante).
4. Developed a plan or roadmap to engage stakeholders.
5. Established a verification component to ensure the plan moves through the phases of implementation.

Application of stage 2 for food loss and waste:
With the priority food sub-sector(s) established with relevant data in stage 1, stage 2 will enable an analysis along value chains to identify circular economy interventions and policymakers can select interventions to help tackle food loss and waste through the assessment tools in stage 2. Measurable indicators and targets can be set and included in the NDC in stage 2 or stage 3, aligned within the framework of national action to deliver SDG 12.3.

Public-private partnerships on food loss and waste now operate in many countries including Mexico, South Africa and Indonesia, and have helped to reduce food loss and waste by 27 percent in the UK since 2007. Consumer behaviour change programmes are also working effectively to shift food waste behaviours in the context of SDG 12.3. (UNEP/WRAP 2022)

The complete application for food loss and waste can be found in Chapter 4.

Application of stage 2 for buildings and construction:
Users can conduct a deeper analysis with identified stakeholders to identify circular economy interventions. Although the planning, design and commissioning stage of buildings will be a critical point of intervention, consideration of the whole life cycle is important, including the decision on whether to build new or renovate existing buildings. Potential circular economy interventions will be assessed ex-ante with the proposed tools, including job creation.

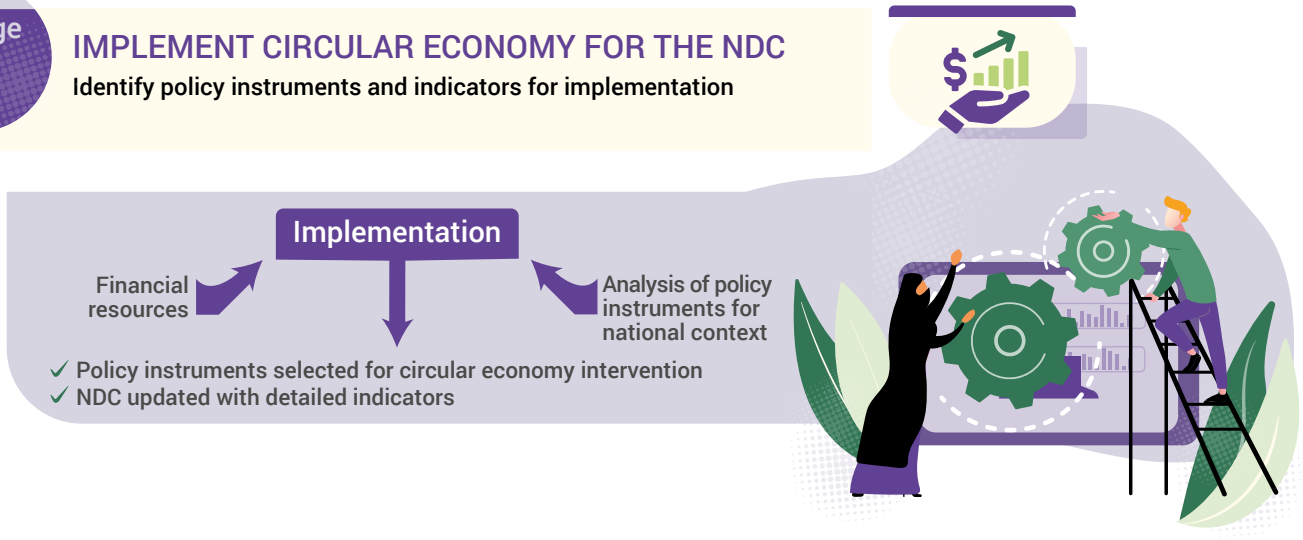
Examples of interventions include substituting materials by design, developing markets for local and sustainable construction materials according to national context and reducing and reusing construction and demolition waste. Measurable indicators and targets can be set and included in the NDC in stage 2 or 3.

The complete application for buildings and construction can be found in Chapter 4.

Stage 3.

IMPLEMENT CIRCULAR ECONOMY FOR THE NDC

Identify policy instruments and indicators for implementation



This stage focuses on the implementation of the selected circular economy interventions through policy instruments. While decisions will depend on the results from stages 1 and 2, there are key steps to guide you through this stage. These include selecting the policy instruments (3.1), assessing their feasibility, establishing indicators, and linking the process back to the NDC (3.2) as well as financing for implementation (3.3).

The objective of the policy instruments for each circular economy intervention is to achieve the GHG emissions reductions identified in stage 1.

As circular economy is a systemic approach, the policy instruments need to be coordinated as a coherent 'package' whereby the instruments are reinforcing and complementary towards affecting the same GHG emission source or sink[11]. Countries tend to use a combination of instruments, including incentives, information tools, voluntary schemes, standards and legal restrictions (UNEP 2020a). The effectiveness of policy instruments depends on the government's capacity to enforce, the potential of behavioural change, and the broader policy landscape. Collaboration across the value chain is also critical during the implementation phase to ensure that the relevant government, businesses, and financial actors are working towards the same goal.

In the NDC, countries can include information on their need for international support surrounding finance, technologies and/or capacity building to enable the implementation of the policies and measures to achieve GHG emissions reduction targets in the NDC. These aspects can be defined at this stage.

Case study South Sudan: Using public procurement to implement a circular economy intervention in the construction sector

An extract from South Sudan's updated NDC:

"Given that the majority of GHG emissions from the construction sector result from the use of imported goods such as cement, clay and limestone (SCP-HAT, 2015), South Sudan should develop policies encouraging sustainable procurement. For example, instead of procuring regular cement, South Sudan can incentivize the procurement of cement mixed with fly ash, which will have a smaller emissions footprint," Ministry of Environment and Forestry, 2021, Juba.

11 Method based on World Resources Institute: GHG Protocol Policy and Action Standard: An accounting and reporting standard for estimating the greenhouse gas effects of policies and actions (Chapter 5).

Table E. Summarizes key steps, questions, and tools for Stage 3.

3.1 Identify policy instruments for the implementation of selected circular economy interventions

Which policy instruments can support the implementation of the identified circular economy interventions (in stage 2) for achieving the GHG emission reductions from material use?

A non-exhaustive list of supporting tools to implement the circular economy interventions through a complementary set of reinforcing policy instruments:

- Product lifetime extension
- Extended producer responsibility
- Circular infrastructure design and spatial planning
- Industrial symbiosis
- Deposit-return schemes
- Bans
- Circular procurement
- Consumer information tools
- Sustainable lifestyles
- Circular tourism
- Carbon taxes

Which stakeholders identified from previous steps need to be involved to implement the policy instrument?

Use results from stakeholder mapping in stage 1.3 and the value chain approach from stages 1 and 2 to ensure relevant stakeholders are engaged

3.2 Assess feasibility and establish indicators to track implementation and inform the NDC

What are the costs and benefits of implementing this specific policy instrument?

Ex-ante societal cost-benefit analysis

What are the indicators to measure progress and how they can be linked to the NDC?

Circular indicators for governments

3.3 Explore financial resources for implementation

How can circular economy interventions make NDC financing more efficient or effective?

Finance gap assessments, innovative financial mechanisms, and NDC implementation plans, including:

- Investment and financial flows assessments
- Investment and financial flow methodology
- Climate finance explorer
- National voluntary carbon footprint guidelines
- Green bonds training

Tool/resource

STEP 3.1.
Identify policy instruments for the implementation of selected circular economy interventions.

This step provides examples of potential policy instruments that can be used to implement the selected circular economy interventions. There is **no one-size-fits-all** approach to implementing circular economy interventions, it depends on the sub-sector/product, national context and legislative system as to which policy instruments will be effective. However, examples are provided with corresponding tools. Also, one policy instrument alone will not be sufficient, a coherent set should be selected. Most policy instruments are effective **only** when implemented in coherence with other instruments.

Product lifetime extension (PLE): Short product lifetimes contribute to increased GHG emissions for many products while adding pressure on natural resources and pollution impacts. PLE means postponing or reversing product obsolescence through interventions. For example, by designing more durable products for longer use, by extending use through maintenance, and/or by recovering broken products for repair. A coherent set of policy instruments can support PLE and steer businesses and consumers towards circularity, ensuring that the highest value of materials in products is maintained for as long as possible (UNEP 2019). Related policies for PLE include but are not limited to:

- Laws against planned obsolescence
- Minimum durability criteria
- Right to repair legislation (for repair to be affordable and accessible for consumers)

Exploring product lifetime extension - The long view includes recommendations for product lifetime extension. Seven products are analysed: washing machines, refrigerators, TVs, mobile phones, laptops, and clothing.

Extended producer responsibility (EPR) aims to make producers responsible for the environmental impacts of their products from the design to post-consumer phase, incentivizing them to re-design the product and/or packaging, recyclability and reusability. For example, companies pay a fee that is used to collect, sort and recycle the materials from their products. It is thus a policy instrument with revenue-raising potential (WWF 2020) and a proven way to fund the collecting and processing of certain products after use at scale. EPR legislation can target upstream or downstream in the value chain. EPR has been applied to many sectors and products including plastics, batteries, consumer electronics, textiles and construction material (UNEP 2023b).

The **OECD Guidance on EPR** provides guidance and information on design and implementation of EPR policies, including cases by governments to better assess the cost and environmental effectiveness of EPR and its overall impact on the market.

The **EPR toolbox** is a collection of internationally relevant knowledge on the topic of EPR for packaging. Its aim is to promote knowledge exchange and enhance development of EPR systems worldwide.

Going circular: The EPR guide is an open-access online course to promote locally adapted EPR schemes for packaging and includes a number of case examples.

Deposit-return schemes incentivize re-use of packaging material and/or products by combining a tax or deposit when purchasing a product with a refund or subsidy when the product is collected and/or recycled (Walls 2013.) Such schemes also enable the return of packaging or associated products/components by consumers to collection points (UNEP 2020).

Guidance in relation to deposit-refund schemes can be found in the legislative guide for the regulation of single-use plastic products.

Circular infrastructure and spatial planning: For circular economy interventions to be implemented, it is necessary to invest in infrastructure for collecting and sorting of products, components, materials, fibres and in such a way that they can be safely re-used. This may require new kinds of waste recovery, reuse and recycling facilities – including treatment processes, sharing networks, reverse logistics and marketplaces (Global Infrastructure Hub 2021). Circular infrastructure is infrastructure that:

1. Facilitates the activities necessary for a circular economy (repair, re-use, recycling and resource recovery etc;) and/or
2. Minimises the amount of material used across the infrastructure life cycle or value chain (Global Infrastructure Hub 2021).

Information on how to advance with circular infrastructure is available on the global infrastructure hub/ infrastructure and the circular economy and associated brief.

Industrial symbiosis promotes circularity in the industry sector and is an important means for reducing GHG emissions and reducing dependence on imported materials. Through the exchange of materials and resources, it can provide mutual benefits for businesses including new revenue streams and reducing operational costs. It can also add value to materials, prolong material use and reduce the harmful effects of dumped waste (EMF 2021).

Case study: Industrial symbiosis in the Republic of Korea

By developing systematic waste and by-product networks among companies, the Ulsan Mipo and Onsan Industrial Park in the Republic of Korea collectively reduced 279,000 tons of oil equivalent in energy use between 2005 and 2016, resulting in a 665,000-ton reduction in CO_2 emissions. They also reused 79,000 tons of water and 40,000 tons of waste and by-products.

Source: The World Bank (2018). Eco-Industrial Parks Emerge as an Effective Approach to Sustainable Growth. World Bank News.

Consumer information tools increase the understanding of the role of consumption in generating GHG emissions. Tools can guide consumers in sustainable choices for goods and services (products), including their use and end of life phases (UNEP 2019a). However, in order to provide accurate and reliable information to consumers, consumer Information tools need to go hand-in-hand with traceability and repairability related policies.

The consumer information tools and climate change guidelines can support GHG emissions reductions in tourism, buildings, and food. Tools include certifications, voluntary standards, product declarations, ratings, marketing claims, foot printing, life cycle assessments, and product campaigns with recommendations for business and policy makers.

Case study: Consumer information and textiles

In 2020, France implemented an anti-waste and circular economy bill, aiming to transform the system of production, distribution and consumption from a linear to a circular economic model and eliminate waste and pollution from the design stage. As part of this bill, new regulations are upcoming to ensure that fashion and textile companies provide consumers with information revealing the environmental impact of products sold, and to prohibit the destruction of new, unsold textile merchandise except where they represent a health hazard.

Source: UNEP (2023). Sustainability and circularity in the textiles value chain.

Bans and restrictions can directly prohibit the production, import or export, distribution, sale or use of one or more products or product components. They can cover any part of a product's life cycle from production through to use, or target one specific behaviour, such as the sale of the product (UNEP 2020b). Guidance on the option of bans and restrictions in the case of single-use plastics is provided in legislative guide for the regulation of single-use plastic products.

Case study: Example of a national ban (legislation) in Jamaica

"Ban on single-use plastics including single-use plastic bags, packaging made wholly or in part of expanded polystyrene foam and single-use drinking straws made wholly or in part of PE or PP. Single-use plastic bags under the ban are those with dimensions not exceeding 610 x 610 m" (24""x 24"), with a thickness of 0.03 mm (1.2 mils), which are to be banned by 1 January 2021, and of 0.06 mm (2.5 mils), which are to be banned on or after 1 January 2021, regardless of whether the bag is, or is labelled as, degradable, biodegradable, oxo-degradable, photo degradable or compostable."

Source: Jamaica Natural Resources Conservation Authority (Plastic Packaging Materials Prohibition). Order of 2018 and the Trade (Plastic Packaging Materials Prohibition).

Circularity through government/institutional expenditure: Sustainable public procurement has significant purchasing power, accounting for an average of 12 percent of GDP in OECD countries and up to 30 percent of GDP in many developing countries (UNEP 2017). Thus, it can shift and grow new markets towards circularity, providing benefits including GHG emissions reductions.

Circular procurement focuses on closing energy and material loops within supply chains and fosters value retention along the entire value chain, which can yield a wider uptake of circularity (UNEP 2018). Circular procurement can be impactful if implemented in coherence with other policies such as traceability (across the life cycle), eco-design standards and incentives/tax schemes as well as other production related policies. With enabling conditions, procurement policies can incentivize repair, sharing, resale, and remanufacturing to maximise the use of existing assets and return on invested energy (EMF 2021c). Procurement criteria, can address, among others, the following aspects:

- Resource efficiency levels on a whole life cycle basis
- Recycled content inclusion (e.g. expectations on the percentage of recycled fibres in the case of procurement of textiles)
- Potential for reparability (e.g. ease of finding spare parts and maintenance), recyclability and/or the ability to dismantle products after use

In the NDC, cross-referencing procurement criteria and targets in relation to the prioritized sectors/sub-sectors can support an overall pull towards circularity and GHG emissions reductions in those sectors. To ensure synergies, this can also link to the SDG 12.7 reporting and established methodology[12].

Building circularity into our economies with sustainable public procurement.

12 SDG 12.7.1 methodology.

Sustainable lifestyles: Lifestyle changes could help the planet reduce GHG emissions by 40-70 percent by 2050 (IPCC 2022b). The right policies, infrastructure and technology can enable these changes, especially if implemented in high-impact sectors. Policies aiming for sustainable lifestyles are more effective if implemented with measures to discourage carbon-intensive options, while offering fair access to materials required to meet needs and ensure well-being. One evidence-based approach is through choice editing[13] (UNEP 2022a).

Enabling sustainable lifestyles in a climate emergency focuses on how to remove harmful and carbon intensive consumption options and how to integrate or scale up low carbon alternatives while offering fairer access to all.

Envisioning 1.5 degree lifestyles: Policies for low-carbon cities in 2030 explores the 1.5-degree lifestyles concept at the city level with findings from the project implementation in the six cities involved, including policy recommendations.

Instruments for circular tourism: The tourism value chain is cross-cutting and thus offers numerous opportunities for implementing circular economy interventions in relation to the materials utilized to deliver tourism services.

The Global Tourism Plastics Initiative provides methodologies and tools to accompany governments and businesses to eliminate problematic and unnecessary plastics, integrate reuse models and enhance rates of recycled content and recycling rates in the tourism sector.

Case study: Implementation of a roadmap for low-carbon and resource efficient tourism in the Philippines

The Philippines developed a roadmap for low-carbon and resource-efficient tourism with the overall target to reduce GHG emissions by 30 percent between 2020 and 2030 in tourism value chains, mainly hotels and venues. It was established that emissions came from:

- Generation of electricity
- The products and services that hotels procure (such as food, plastics, textiles etc.)
- The waste that they generate.
- Fossil fuels used directly by hotels,

The main sub-targets of the roadmap include for example a 50 percent food waste reduction target. Hotels and destinations were given guidance with actions to meet the targets. In the country, 42 participating businesses are implementing the integrated action framework through the use of resource efficiency and GHG measurements. In addition, 24 businesses have submitted GACMO tool data to understand the level of investment needed for further GHG reduction solutions, the payback period, the cost reduction, and the GHG reduction percentage.

In terms of results, some businesses have reported up to 60 percent reduction in food waste over a 2-year period and others up to 77 percent reduction in waste generation and up to 83 percent GHG emission reduction in the same period with associated economic benefits.

Sources: UNEP (2023) Status report: Transforming tourism value chains; UNEP (2019). Roadmap for low-carbon and resource-efficient tourism in the Philippines; and Club Paradise Palawan Sustainability Reporting Fact Sheet, Holiday Inn & Suites Makati Sustainability Reporting Fact Sheet, Nature's village resort Sustainability Reporting Fact Sheet.

13 Choice-editing involves the use of specified criteria and standards to filter out harmful or unsuitable options in the range of product and services being brought to the market. Traditional government use of choice-editing is common for public health and safety reasons (UNEP 2022a).

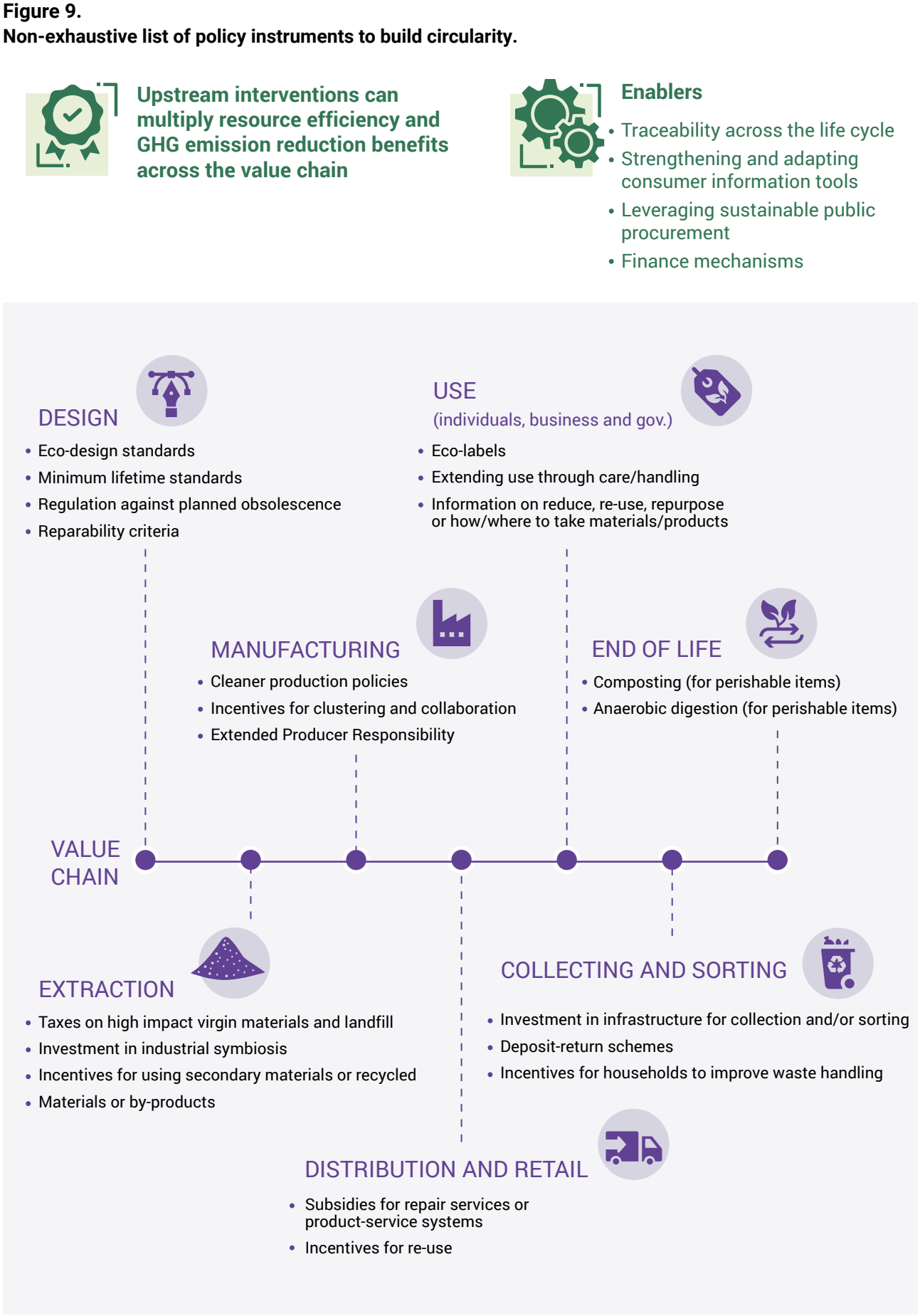
Carbon taxes are taxes levied on the GHG emissions required to produce goods and services and can help drive a twin agenda to improve circularity and reduce GHG emissions.

The carbon tax guide provides a practical tool for policy-makers that (i) helps them determine whether a carbon tax is the right instrument to achieve their policy aims and (ii) supports them in designing and implementing the tax that is best suited to their specific needs, circumstances, and objectives.

Other options can include taxes on virgin materials, recycled content mandates, and removal of virgin material subsidies (IRP 2020).

Figure 9 shows a non-exhaustive list of policy instruments to implement circular economy interventions across the value chain. Policies need to consider the full life cycle and the selection of a coherent set depends on the sub-sector/product and intended intervention areas.

Figure 9.
Non-exhaustive list of policy instruments to build circularity.



Summary of tools for step 3.1:

- Exploring product lifetime extension - The long view includes recommendations for product lifetime extension. Seven products are analysed: washing machines, refrigerators, TVs, mobile phones, laptops, and clothing.
- Guidance on EPR provides guidance and information on design and implementation of EPR policies.
- The EPR toolbox is a collection of internationally relevant knowledge on the topic of EPR for packaging. Its aim is to promote knowledge exchange and enhance development of EPR systems worldwide.
- Going circular: The EPR guide is an open-access online course to promote locally adapted EPR schemes for packaging and includes a number of case examples.
- The legislative guide for the regulation of single-use plastic products provides guidance on deposit-refund schemes, bans and restrictions.
- The global infrastructure hub/infrastructure and the circular economy and associated brief provide information on how to advance with circular infrastructure.
- The consumer information tools and climate change guidelines can support GHG emissions reductions in tourism, buildings, and food. Tools include certifications, voluntary standards, product declarations, ratings, marketing claims, foot printing, life cycle assessments, and product campaigns with recommendations for business and policy maker.
- Building circularity into our economies with sustainable public procurement.
- Enabling sustainable lifestyles in a climate emergency focuses on how to remove harmful and carbon intensive consumption options and how to integrate or scale up low carbon alternatives while offering fairer access to all.
- Envisioning 1.5 degree lifestyles: Policies for low-carbon cities in 2030 explores the 1.5-degree lifestyles concept at the city level with findings from the project implementation in the six cities involved, including policy recommendations.
- The global tourism plastics initiative provides methodologies and tools to accompany governments and businesses to eliminate problematic and unnecessary plastics, integrate reuse models and enhance rates of recycled content and recycling rates in the tourism sector.
- The carbon tax guide provides a practical tool for policymakers.

Additional knowledge resources:

- Sustainable public procurement guidelines
- Ellen MacArthur Foundation universal policy goals

STEP 3.2.
Assess feasibility and establish indicators to track implementation of policy instruments to inform the NDC.

This step covers the feasibility analysis and how to measure implementation progress of the identified policy instruments as well as their performance to contribute effectively to reach or enhance NDC targets though circularity.

Policy instruments, at times are not feasible due to barriers. Examples of barriers can be lack of technical capacity, finance and/or data, lack of a solid cooperation and information-sharing among stakeholders, inefficient cost structures, non-adequate markets, social rejection or others. Depending on the type of barrier, policymakers can propose appropriate enabling measures to remove these barriers. Enabling measures can be developed in consultation with key stakeholders, securing their ownership and buy-in during planning and implementation and their compliance with new policy instruments.

Assessing feasibility thus includes an additional assessment of the **barriers and enablers** (building on the analysis from stage 2.1 across the value chain) in relation to the identified policy instruments. This analysis does not have a tool but comprises a combination of desktop research and consultations with the identified stakeholders in order to validate the approach.

What are the costs and benefits of implementing a specific policy instrument (ex-ante)?

Selecting the most appropriate policy instrument requires an assessment of how to maximize the objective of the circular economy intervention and reap the most co-benefits. Both economic and societal costs need to be assessed. For example, interventions may have a disproportionate impact on low income-households which often have less financial leverage to adapt. Compensation for these households may need to be considered. Therefore, policymakers may often need to consider complementary policies based on this. Societal cost benefit analysis (SCBA) can support the assessment of policy impacts ex-ante and evaluate their impact ex-post.

The SCBA guidance tool helps assess the socio-economic impact of a policy instrument by assessing societal costs and benefits before an intervention is implemented. It can also support the identification of the most appropriate policy instrument in a specific context.

Establish indicators to measure and track implementation of selected policy instruments.

In this step, indicators can be defined to monitor implementation progress of the selected policy instruments and to evaluate their performance against the NDC targets. Indicators and data collection should therefore be integrated into the NDC implementation tracking systems and existing MRV structures.

Indicators can relate to changes in behaviour, technology, processes, or practices that result from the policy or action. For example, if the policy instrument aims to increase deposit-refund schemes (in the municipal sector) for obtaining higher quality secondary materials, the number of households participating in the programmes could be an indicator of successful implementation.

Some indicators used to measure policy implementation might be used for measuring GHG emissions reductions. For example, the volume of materials by type being reutilized in local industry might be an indicator that could be linked with GHG mitigation (provided that data is available). Interventions may involve one sector or combine several sectors, where policy instruments and their impact could be assigned. Therefore, it is important to identify the coverage of the interventions in an earlier stage (2.2).

Users can refer back to step 2.2 on indicators for complementary information. All indicators can be segregated by gender to provide insight as to how to policies and actions can have different impacts for different genders.

Summary of tools for step 3.2:

- Societal cost benefit analysis
- Circular indicators for governments

STEP 3.3.
Financial resources for implementation.

This step explores the financial resources which will be needed to implement the identified circular economy interventions including assessing finance gaps and needs, benefiting from financial flows for climate action through the integration of circular economy interventions in the NDC, and mobilising public and private finance.

Governments require funding to not only implement circular economy interventions but to also generate the conditions to unlock private funding. Considering the potential costs or savings from the SCBA carried out in step 3.2, there are a number of assessments that can be carried out to help assess the finance gaps and needs of the circular economy interventions and plans that can be developed to support their implementation. For the interventions to benefit from climate finance, it is important that they are embedded in the NDC, including the following related documents:

NDC implementation plan: The NDC implementation plan prioritizes mitigation or adaptation actions in key sectors, according to a set of agreed criteria in order to deliver on a NDC goal or target. The NDC implementation plan also describes the timeline, roles, responsibilities, institutional arrangements, policy linkages, and MRV plans.

NDC financing strategy: The NDC financing strategy identifies the most appropriate funding sources for priority NDC actions, including circular economy interventions. It also assesses barriers to investment and what financial and policy instruments could be applied to address those barriers and reduce or transfer risk. As part of the NDC financing strategy, investment and financial flows (I&FF) assessments can be carried out which help countries to identify the magnitude of shifts and increases of finance within a country as well as appropriate funding sources and incentive strategies. I&FF assessments can also help identify who is already investing in a priority sector as well as the main stakeholders.

NDC investment plan: The NDC investment plan identifies specific activities, projects, and initiatives to operationalize the NDC, including circular economy interventions. Investment barrier assessments can help countries identify specific barriers to investments in NDC action, including the circular economy, and are useful tools as part of developing an investment plan.

The implementation of circular economy interventions will require government expenditure, which can be generated or complemented through innovative financial instruments such as sovereign green bonds, carbon pricing, and blended finance.

Green bonds are fixed-income financial instruments, which are used to fund projects that have positive environmental and/or climate benefits. Green bonds are particularly well suited to finance sustainable development and climate action in the context of NDCs, including circular economy. Other thematic bonds such as sustainability bonds (whose proceeds support a combination of green and social projects or activities) and sustainability-linked bonds (which are not use-of-proceeds bonds but whose conditions are subject to environmental and/or social key performance indicators) are also suitable to finance the shift to a circular economy.

Carbon pricing is an instrument that curbs GHG emissions by placing a fee on emitting and/or offering an incentive for emitting less. A carbon price provides an economic signal to emitters that then can decide to either transform their activities and lower their GHG emissions or continue emitting and pay for their emissions. Placing an adequate price on GHG emissions sets economic incentives for low carbon development. There are many types of carbon pricing instruments, including the Emission Trading Schemes (ETS), carbon taxes, and carbon markets/ crediting mechanisms.

Results-based payments reward individuals or communities for undertaking actions that deliver an environmental result or outcome e.g. increase water purification, sustainable management of forests, or carbon sequestration. This funding mechanism is unlike other transfer mechanisms as they are conditional upon performance. Circular economy interventions that support the regeneration of natural resources could particularly benefit from this type of funding.

Blended finance solutions, including de-risking mechanisms, are an important instrument to unlock private finance for the circular economy whose innovative business models and technologies are often riskier or perceived as riskier.

Also, particularly in low- or middle-income countries, direct funding can be considered as a key source of financing, which also plays an important role to leverage private finance. Countries can tap into public sector finance from international financing institutions (IFIs) such as Multilateral Development Banks (MDBs), Green Climate Fund (GCF) and Climate Investment Funds (CIF), among others. There are options to explore on the climate finance explorer.

In addition to the above financial resources, private sector engagement is critical for accelerating implementation. Companies are increasingly recognising the need to climate-proof their operations and transition to circular business models while seeking to generate new revenue streams. Private sector actors can support the implementation of circular economy interventions through various approaches, including national voluntary carbon footprint initiatives.

National voluntary carbon footprint initiative: first pioneered in Chile, and subsequently in Panama and Peru, governments have established voluntary carbon footprint programmes which quantify and recognise voluntary efforts from public and private sectors to reduce GHG emissions. These carbon footprint initiatives provide online emissions calculators, together with a system of public recognition by means of approval awards for private companies, civil society organisations, and other actors that report, reduce or ideally make their operations carbon-neutral. Some initiatives also include a component to reduce the organisation's water footprint, seeking to improve the management of their water resources and link it to climate change strategies for adaptation. Circular economy interventions are also being explored.

Finally, strengthening technical capacities and knowledge through trainings, workshops and events is critical to foster knowledge sharing, national ownership and to accelerate implementation of circular economy interventions. International organisations such as UN agencies can play a key role in helping build these capacities. For example, an online training on green bonds offered by UNDP's Climate Promise for government officials and climate professionals familiarises participants with the latest developments in the green bond market, existing taxonomies and classification systems, and the life cycle of a green bond issuance, including pre-issuance, issuance and post-issuance considerations. This training will help policymakers better understand how these innovative financial instruments can be best leveraged for circular economy and broader climate action.

Summary of tools for step 3.3:

- Investment and financial flows (I&FF) assessments
- (I&FF) methodology
- National voluntary carbon footprint guidelines
- Climate finance explorer
- Training on green bonds

Additional knowledge resources:

- I&FF country examples
- NDC implementation guide that refers to development of plans and finance strategies.
- GGGI guidance for Small Island Developing States (SIDS).

Stage 3 Checklist

By the end of this stage users should have:

1. Identified a coherent set of policy instruments for the implementation of selected circular economy interventions.
2. Assessed the feasibility of policy instruments, including costs and benefits, and established indicators to measure and track the implementation of the selected policy instruments.
3. Explored financing for implementation, including leveraging NDC implementation, financing, and investment plans and other mechanisms.

Application of stage 3 for food loss and waste:
Appropriate policy instruments at various stages in the value chain from production, processing, and storage to transport and consumption can be identified and implemented in stage 3. Financial resources can be mobilised through public-private partnerships, voluntary agreements, and campaigns.

Examples of instruments include:

- Public awareness and extension programs, curbside pickup of organic waste and material recovery facilities in Dominica.
- A law introducing mandatory food waste assessments for all food service operators in France.

As an example of indicators, Vanuatu included "total number of people receiving training in food storage and preservation per year" as an indicator in their agriculture sector (UNEP, WRAP 2023).

The complete application for food loss and waste can be found in Chapter 4.

Application of stage 3 for buildings and construction:
A coordinated set of reinforcing policy instruments can be selected to implement the circular economy intervention.

Such policy instruments can include the revision of building codes to address the embodied impact of materials, mandated prefabrication and modular construction, support for industrial symbiosis in cement production and/or other materials, and procurement guidelines to support the use of sustainable construction materials in the design and planning stages. For example, by integrating a minimum percentage of recycled material within the procured building material, i.e. timber, aggregates, or steel, which can be a target in the NDC.

Financial and non-financial resources can be mobilised by key market players and in the NDC, countries can include information on the need for international support on finance, technologies and/or capacity building to support implementation.

The complete application for buildings and construction can be found in Chapter 4.

Stage 4.

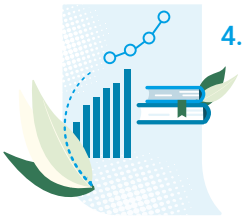
TRACK AND REPORT PROGRESS IN THE BIENNIAL TRANSPARENCY REPORT

Use baseline data from stage 1 to assess progress

- ✓ Assess interventions effectiveness on GHG emissions and resource flows
- ✓ Report impact and progress in the Biennial Transparency Report

This stage provides tools to conduct an ex-post assessment (step 4.1) on whether the circular economy intervention achieved the expected results as per the ex-ante assessment in step 2.2, such as reduced GHG emissions in a cost-effective manner. This stage also outlines a way to report the impact of circular economy interventions under the Enhanced Transparency Framework (ETF) of the Paris Agreement, specifically Biennial Transparency Reports (BTRs) with a view to inform the international community of the progress of NDC implementation (step 4.2).

Table F. Summarizes key steps, questions, and tools for Stage 4.



4.1 Assess effectiveness of interventions and impact on material flows and GHG emissions

What was the GHG emission reduction from the selected interventions?

- IPCC GHG inventory methodologies
- CDM methodologies (including additionality)
- Life cycle inventory database
- GHG protocol policy and action standard
- ICAT policy assessment guides

What were the socio-economic and environmental impacts of the interventions (e.g. jobs)?

- SCAN tool
- Green jobs assessment model
- Circular economy jobs tool

4.2 Report impact and progress in the BTR

Where do I report progress of circular economy interventions in the BTR and how is it linked to the NDC?

- Reference manual for the ETF under the Paris Agreement
- UNDP Transparency helpdesk
- Technical handbook for developing country Parties on preparing for implementation of the ETF under the Paris Agreement
- UNFCCC MRV/transparency helpdesk
- The UNEP Climate Transparency Platform

Tool/resource

STEP 4.1.
Assess effectiveness of interventions and impact on material flows and GHG emissions.

This step assesses the impact of circular economy interventions in terms of their effectiveness to reach the targets identified in stage 2. The ex-post evaluation should aim to quantify the effects generated by the intervention by isolating the effect of other factors that occur during the policy intervention period. For example, changes in the economy or in technology that affect the environmental impact regardless of the circular economy interventions.

Define the scope of the assessment - circular economy interventions and policy instruments: Stage 2 identified the circular economy interventions and stage 3 supports implementation through a set of coherent policy instruments. If this guidance is followed, it is recommended that each circular economy intervention is assessed as a 'package' as the policies would be reinforcing and complementary towards affecting the same GHG emission source or sink[14]. However, depending on the type of policies selected and how they interact, assessments can be conducted for both individual policies/interventions and packages.

Step 2.2 established the system boundaries for the circular economy interventions i.e. the «boundaries» of the intervention by defining the sectors, processes, stakeholders and other components that are affected by the intervention (directly and indirectly).

The GHG protocol policy and action standard (Chapters 10, 11) provides an approach for estimating and reporting the change in GHG emissions and removals resulting from policies and actions. It supports ex-ante and ex-post assessments, monitoring and uncertainty assessments as well as to verify and report the impacts.

Data collection for circular economy interventions can be done through existing institutional arrangements for MRV at national and sub-national levels (e.g. data for measuring the landfill of biodegradable waste can be collected from the local government).

The baseline from stage 1 and indicators from stages 2 and 3 can be used for the assessment of the impact of circular economy interventions and policy instruments on material flows, GHG emissions, waste and socio-economic aspects (e.g. jobs) as well as intermediate effects (e.g. changes in practices and behaviour).

Assessment methodologies are the same ex-poste and ex-ante: the same tools that were used for ex-ante evaluations in stage 2.2 will be used for this stage (ex-post). There are a number of tools for measuring impacts of circular economy interventions and policy instruments such as monitoring of indicators, economic modelling and econometric analysis. The selection of the right methodology depends on the type of intervention and policy instrument (e.g. implemented for one sector or across sectors) as well as data availability and level of expertise available to conduct assessments. In addition to the impact on GHG emissions, it is advised to assess socio-economic and environmental impacts (WRI 2014).

ICAT toolbox includes methodologies for assessing the impacts of policies and actions on GHG emissions and other aspects of sustainable development.

GHG accounting methodologies (e.g. IPCC national GHG inventory methodologies and sector-specific methodologies in ICAT toolbox and GHG protocol calculation tool), **supported by life cycle assessment databases such as GLAD** can help estimate the carbon mitigation effect of circular economy interventions covering different sectors (e.g. through product or service value chains). Key data can also be collected directly from relevant stakeholders in the value chain/sectors.

14 World Resources Institute (2014): GHG protocol policy and action standard: An accounting and reporting standard for estimating the greenhouse gas effects of policies and actions (Chapter 5).

For impact assessment at the level of the circular economy intervention, **the CDM methodology** to determine additionality could be used to isolate the effect of circular economy interventions from the effects of other events happening that might affect the sector under analysis. For example, the inclusion of energy and material policies and waste management regulations that were planned before the circular economy intervention might cause changes towards more efficient technology and/or materials with less embodied carbon. However, this should be accounted for separately from the circular economy interventions. The circular economy interventions are expected to have an additional effect in terms of materials, energy or other indicators. Identifying the additionality of circular economy interventions will be useful when adjusting them to reach the country´s mitigation targets linked to circular economy.

Summary of tools for step 4.1:

- IPCC GHG inventory methodologies
- CDM methodologies (including additionality)
- Life-cycle inventory database (GLAD)
- GHG protocol policy and action standard
- ICAT policy assessment guides
- SCAN tool
- Green jobs assessment model
- Circular economy jobs tool

STEP 4.2.
Report impact and progress in the BTR.

This step provides guidance on where to report progress and impacts of circular economy interventions with a view to ensure transparency of national efforts and to report success stories.

Parties to the Paris Agreement are required to submit the first BTR by 31 December 2024 at the latest which should include:

1. The national GHG inventory consisting of a national inventory document and the common reporting tables; and
2. Information to track progress towards the implementation and achievement of their NDC using common tabular formats (CTF).

The impact of circular economy interventions can be reported under the section on “Mitigation policies and measures, actions and plans, including those with mitigation co-benefits resulting from adaptation actions and economic diversification plans”. This section provides guidance on: II. Information necessary to track progress towards the implementation and achievement of a Party’s NDC with a focus on interventions that have the most impact on GHG emissions or removals and those impacting key categories in the national GHG inventory.

CTF table 5 describes specific information to be reported in the BTR such as:

- Objectives
- Type of instrument
- Status
- Sector(s) and gases affected
- Start year of implementation
- Implementing entity or entities
- Estimates of GHG emission reductions achieved and expected[15]

In addition, the government can report progress based on indicator(s) related to the circular economy intervention(s) in the context of tracking progress of the NDC (CTF table 4 provides specific information about indicators that should be reported such as unit, reference point, target level and year. Such indicator(s) will be also reported in CTF table 1,2 and 3)[16].

Consistency between the NDC recorded in the NDC registry and the description of NDCs in the BTR (such as data sources, coverage, methodologies, and assumptions) is important to ensure integrity of tracking progress of NDC.

Reference manual for the ETF is a tool for clarifying the requirements for the review and reporting of information in the BTRs. It also serves as a checklist for applying the accounting guidance and ensuring consistency between NDCs and BTRs, taking into account principles of transparency, accuracy, consistency, completeness and comparability which promote efforts for the overall integrity of the accounting framework and to avoid double counting.

Technical handbook for implementing the MRV arrangements under the Convention and the ETF under the Paris Agreement aim to improve awareness and understanding of the ETF and its modalities, procedures and guidelines by national experts and practitioners from developing country Parties so they can consider opportunities to improve current reporting and plan for the establishment of institutional arrangements and reporting under the ETF.

Transparency helpdesk aims to provide comprehensive capacity building support on climate data and transparency to francophone and lusophone countries and respond to countries' requests for support on MRV systems. Support is available to country governments and can be delivered through the following modalities: in-country technical support and training; south-south exchanges and networking (between two or three countries); regional training sessions; and funds transferred to countries if they are supported under UNDP's Climate Promise.

UNFCCC MRV/transparency helpdesk provides technical resources (such as library resources, discussion forum, webinars, expert database) for implementing MRV arrangements under the Convention and the ETF under the Paris Agreement.

The UNEP Climate Transparency Platform covers aspects relating to the ETF and continued reporting under the UNFCCC. You will find information on the agencies and initiatives providing transparency support and offer technical assistance, capacity building, and financial support to countries that are seeking to implement the ETF. Users can request support by clicking on the tab «request for support.»

15 Guidance for operationalizing the modalities, procedures and guidelines for the enhanced transparency framework referred to in Article 13 of the Paris Agreement, section 5. Mitigation policies and measures, actions and plans, including those with mitigation co-benefits resulting from adaptation actions and economic diversification plans, related to implementing and achieving a nationally determined contribution under Article 4 of the Paris Agreement (p17).

16 "Guidance for operationalizing the modalities, procedures and guidelines for the enhanced transparency framework referred to in Article 13 of the Paris Agreement, section 4. Structured summary: Tracking progress made in implementing and achieving the NDC under Article 4 of the Paris Agreement (p13)", "CTF table 1 Description of selected indicators (page 8), table 2 Definitions needed to understand NDC (page9) and table 3 Methodologies and accounting approaches (page 10-13)".

Summary of tools for step 4.2:

- Reference manual for the ETF under the Paris Agreement
- Technical handbook for developing country Parties on preparing for implementation of the ETF under the Paris Agreement
- UNDP transparency helpdesk
- UNFCCC MRV/transparency helpdesk
- UNEP climate transparency platform

Application of stage 4 for food loss and waste:
Policymakers can assess the policy effectiveness and impact on food loss and waste hotspots by comparing progress to the baseline identified in stage 1.

Progress can then contribute towards the NDC target by reporting the impact in the BTR and SDG 12.3 and 12.1 reporting.

The complete application for food loss and waste can be found in Chapter 4.

Application of stage 4 for buildings and construction:
Policymakers can assess the policy effectiveness and impact on unsustainable hotspots in buildings and construction by comparing progress to the baseline identified in stage 1 and using the ex-ante tools from stage 2 for ex-post assessment. Progress can then contribute towards the NDC target by reporting the impact in the BTR and SDG 12.1.1 reporting.

The complete application for buildings and construction can be found in Chapter 4.

Chapter 4

Application in sectoral value chains and systems

FOOD LOSS AND WASTE

Why is it important to reduce food loss and waste through circular economy to raise NDC ambition?

Food loss and waste is an area with huge potential for enhancing NDC ambition. If food loss and waste were a country, their GDP would be approximately US$950 billion and it would be **the third-largest GHG emitter in the world** (WRI 2019). Food loss and waste needs to be reduced across all stages of the value chain to meet the commitments set out in the Paris Agreement – from the production, processing, storage and transportation of food to the disposal of food loss and waste in landfills. If measures were included in NDCs to stop wasting food, countries could reduce emissions from the food system by an estimated 8 to 10 percent (UNEP 2021). Even if all non-food-related emissions were net-zero between 2020-2100, emissions from food systems alone would still exceed the 1.5°C limit between 2051-2063 if they were kept in the business-as-usual scenario (Global Alliance for the Future of Food 2022).

In addition to the emissions reductions, integrating circular economy interventions to reduce food loss and waste in NDCs could also contribute towards alleviating pressures on climate, water and land resources (SDG 13, 6 and 15), ending hunger, achieving food security, improving nutrition and promoting sustainable agriculture (SDG 2) as well as ensuring gender-sensitive food loss and waste interventions that support gender equality (SDG 5). Gender relations influence food value chains through the division of labour, roles, and responsibilities and can create disparities in access to and control over resources, services, knowledge and technologies. Understanding women's roles in the food system and specific food value chains is paramount.

Furthermore, productive and regenerative agriculture is estimated to be a US$1.4 trillion business opportunity (World Economic Forum and Alphabeta 2020). Regenerative farming is beneficial for producers, particularly small-scale producers, as it not only reduces the cost of input acquisition (e.g. fertilizers, insecticides and seeds) and environmental degradation but it can also generate twice as much profit despite lower crop yields (LaCanne, C.E. et al 2018).

Out of 193 countries that have submitted NDCs:

- 21 include reference to food loss and waste of which 9 mention food waste and 14 food losses (N.B. some appear in both lists)
- 39 include reference to food and organic waste recycling (UNEP, WRAP 2022).

There is therefore a lot of scope to support further integration and implementation of food loss and waste measures into NDCs. Various policy instruments can be used to address food loss and waste through circularity.

Table G. Identifying policy instruments and indicators for food loss and waste in the NDC.[17]

Examples of policy instruments (non-exhaustive)

- Redirect finance and subsidies to support the transition to regenerative agricultural practices such as agroecology.
- Broaden access to clean and decentralised energy to expand usage of adequate cooling and storage systems (avoiding post-harvest losses in processing, storage and transport stage).
- Public-private partnerships between governments, the food retail, food service manufacturing industries, supporting collaborative solutions to reduce food loss and waste across supply chains.
- Make measurement and public reporting of food loss and waste by large companies mandatory.
- Remove barriers to food redistribution via policies (e.g. liability limitations, tax breaks) that make it easier for food suppliers to donate safe (but unsold) food.
- Standardize food date labelling practices to improve consumer understanding on date labels and remove date labels where unnecessary.
- Include food waste reduction in school curricula and food waste reduction training in public procurement criteria.
- Develop consumer behaviour change programmes at national level to build enabling conditions to support food waste reduction and run targeted awareness campaigns to help consumers shift specific behaviours.
- Identify post-consumer "waste" streams that can be safely processed back into economically valuable and environmentally sustainable products.
- Ban food waste in landfills.
- Stimulate investment in waste processing infrastructure and improve food waste collection systems and technologies.

Expected impact on material flows

Reducing food loss increases the share of agricultural products which reach consumers. Potential effects include:

1. Agricultural production can be reduced, or
2. A larger volume will be exported to serve foreign consumers. In addition, organic waste volumes will go down.

Reducing food waste ensures the inputs and energy needed to produce food is not lost or wasted.

Expected impact on GHG emissions and sinks

The impact of reducing food loss and waste can affect territorial emissions in three different ways.

1. If the improved value chain efficiency increases exports, a larger amount of territorial GHG from agriculture and food value chains can be attributed to foreign consumers. That is poorly accounted for in national inventories but should be explained in the NDC.
2. If the improved value chain efficiency allows lowering agricultural production and freeing up land for other purposes, this will reduce emissions from agriculture.
3. Methane emissions will also be reduced from food waste disposed of at landfill and dumpsites, as well as methane emissions in waste water treatment systems.

Indicators

The main indicators are the Food Loss Index and the Food Waste Index which is measured in kilograms per capita per annum. Indicators at the level of material flows, can be translated into GHG impacts based on their embodied carbon. Other indicators are include:

1. Share of harvested products which reach the consumer.
2. Share of domestic agricultural production which is exported.
3. Amount of organic waste from food value chains which is disposed of landfilled.
   This can be translated into a GHG impact based on the methodologies to estimate landfill gas emissions or emissions from wastewater treatment systems from the IPCC guidelines for national inventories.

17 Table elaborated from WRI (2019). Reducing Food Loss and Waste: Setting a Global Action Agenda.

Integrating circularity for food loss and waste in the NDC through the 4 stages of this user guide

IPCC categories: waste, AFOLU, IPPU (depending on activities upstream in the value chain)

Stage 1: ASSESS THE PROBLEM WITH AVAILABLE DATA.

Using the proposed steps, policymakers can identify GHG emission hotspots of food sub-sectors (and thus, the potential for GHG emission reductions and cost savings as well as priority entry points). The national food loss and waste baseline can also be measured and used to later develop measurable indicators and targets. The food loss index and the food waste index provide clear methodologies for measuring and reporting on food loss and waste under SDG 12.3, to halve food waste and reduce food loss across supply chains.

In some cases, it may be useful to conduct a food systems mapping, including a gender-sensitive mapping of food losses which will provide information on specific gender-based constraints that hinder women's and men's ability to efficiently participate in the food value chain, from production to consumption. Assessing opportunities at various stages of the food system as well as engaging associated actors through stakeholders consultations will be critical.

Stage 2: DEFINE THE CIRCULAR ECONOMY RESPONSE.

With the priority food sub-sector(s) established with relevant data in stage 1, stage 2 will enable an analysis along value chains to identify circular economy interventions and policymakers can select interventions to help tackle food loss and waste through the assessment tools in stage 2. Measurable indicators and targets can be set and included in the NDC in stage 2 or stage 3, aligned within the framework of national action to deliver SDG 12.3.

Public-private partnerships on food loss and waste now operate in many countries including Mexico, South Africa and Indonesia, and have helped to reduce food loss and waste by 27 percent in the UK since 2007. Consumer behaviour change programmes are also working effectively to shift food waste behaviours in the context of SDG 12.3.

Stage 3: IMPLEMENT CIRCULAR ECONOMY FOR THE NDC.

Appropriate policy instruments at various stages in the value chain from production, processing, storage and transport to consumption can be identified and implemented in stage 3. Financial resources can be mobilised through public-private partnerships, voluntary agreements, and campaigns.

Examples of instruments include:

- Public awareness and extension programs, curbside pickup of organic waste and material recovery facilities in Dominica.
- A law introducing mandatory food waste assessments for all food service operators in France.

As an example of indicators, Vanuatu included "total number of people receiving training in food storage and preservation per year" as an indicator in their agriculture sector.

Stage 4: TRACK PROGRESS AND REPORT IN THE BTR.

Policymakers can assess the policy effectiveness and impact on food loss and waste hotspots by comparing progress to the baseline identified in stage 1. Progress can then contribute towards the NDC target by reporting the impact in the BTR and SDG 12.3 and 12.1 reporting.

Elaborated from country examples in the NDCs (UNEP, WRAP, Analysis 2022).

Tools for circularity in food systems:

- Enhancing NDCs for food systems: Recommendations for policymakers
- PACE circular economy action agenda food
- The food loss index and the food waste index
- The global roadmap for food waste reduction in tourism provides an action framework to accelerate food waste reduction in tourism sharing practical guidance for more sustainable and circular management of food.

BUILDINGS AND CONSTRUCTION

Why is incorporating circularity in the buildings and construction sector important to raise NDC ambition?

The building and construction sector accounts for 37 percent of the world's energy- and process-related carbon emissions and over 34 percent of global energy demand (UNEP 2022b). In fast-growing developing economies, construction materials associated with GHG emissions are expected to double by 2060. Approximately 100 billion tonnes of construction, renovation and demolition waste is generated annually with approximately 35 percent of that waste sent to landfills when it could be recovered (Chen, Z. et al 2022; UNEP 2022b). Globally, cement and steel are the largest sources of building material-related CO_2 emissions (World Green Building Council 2019).

The building and construction sector offers the most cost-effective mitigation potential of any industrial sector and co-benefits including job creation as well as improved climate resilience and adaptive capacity (IEA 2014). Emissions from the material cycle of residential buildings in the G7 and China could be reduced by at least 80 percent in 2050 through circular material efficiency strategies. Looking at the whole building life cycle, circular material efficiency strategies could reduce emissions from the construction, operations, and dismantling of homes by 35 to 40 percent in 2050 in the G7.

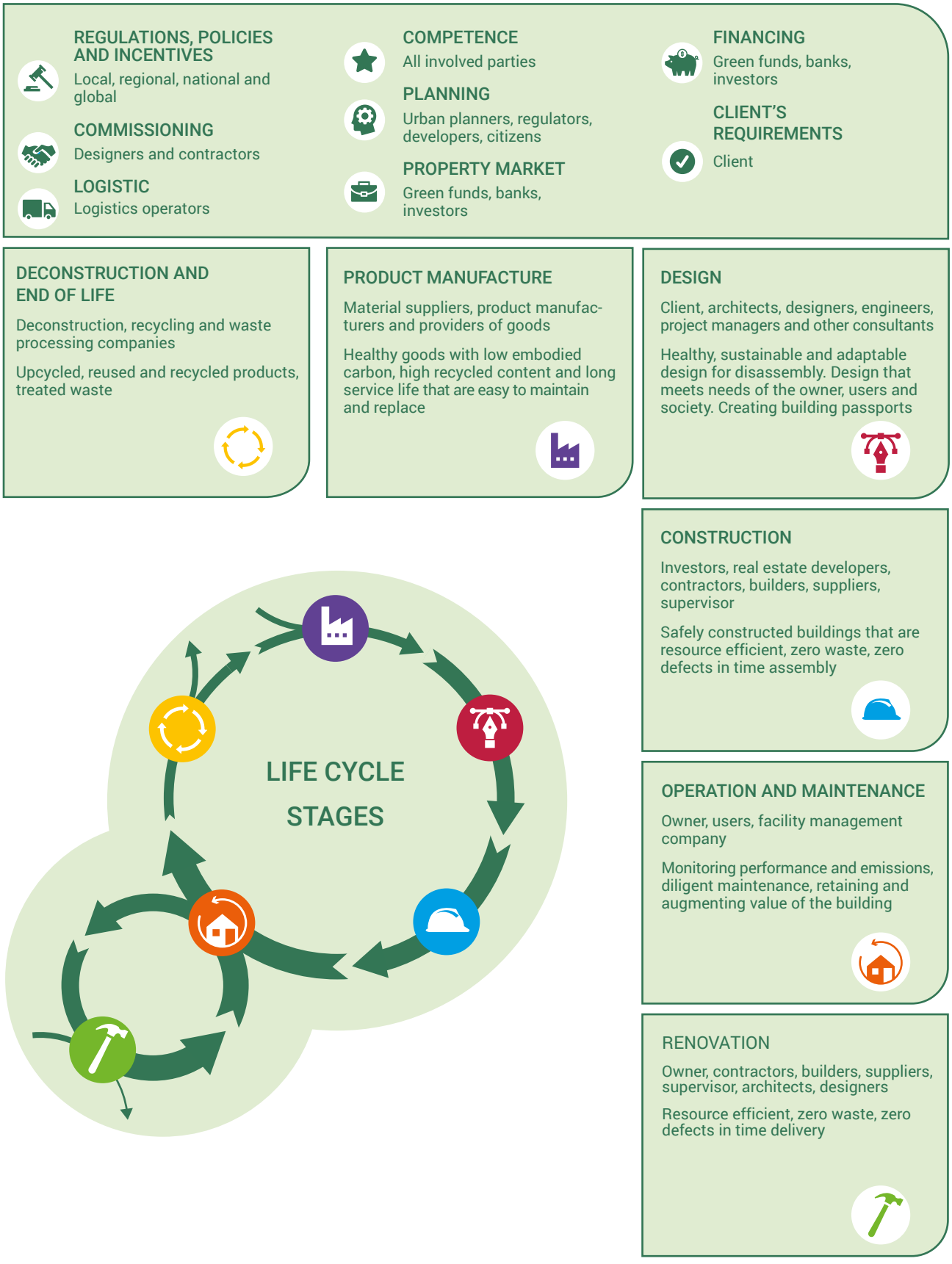
Buildings sector in NDCs - status: In 2021, 80 percent of countries referred to buildings as part of their NDC action plans, compared to around 69 percent in 2020 (UNEP 2022b). However, there is a lack of awareness in relation to the high levels of embodied carbon - emissions associated with materials and construction processes throughout the life cycle of a building or infrastructure. Circularity for decarbonisation and dematerialization of the building and construction sector is therefore crucial for global and national GHG emission reductions.

Figure 10.
Buildings sector transformation.

MINIMIZE EMBODIED EMISSIONS
Emissions from construction materials should be minimized by reducing the emissions intensity of steel and cement production and substituting lower carbon materials, including recycled materials, where possible.

Source: UNEP (2022). Emissions Gap report.

Figure 11.
Life cycle stages and actors in the buildings and construction.

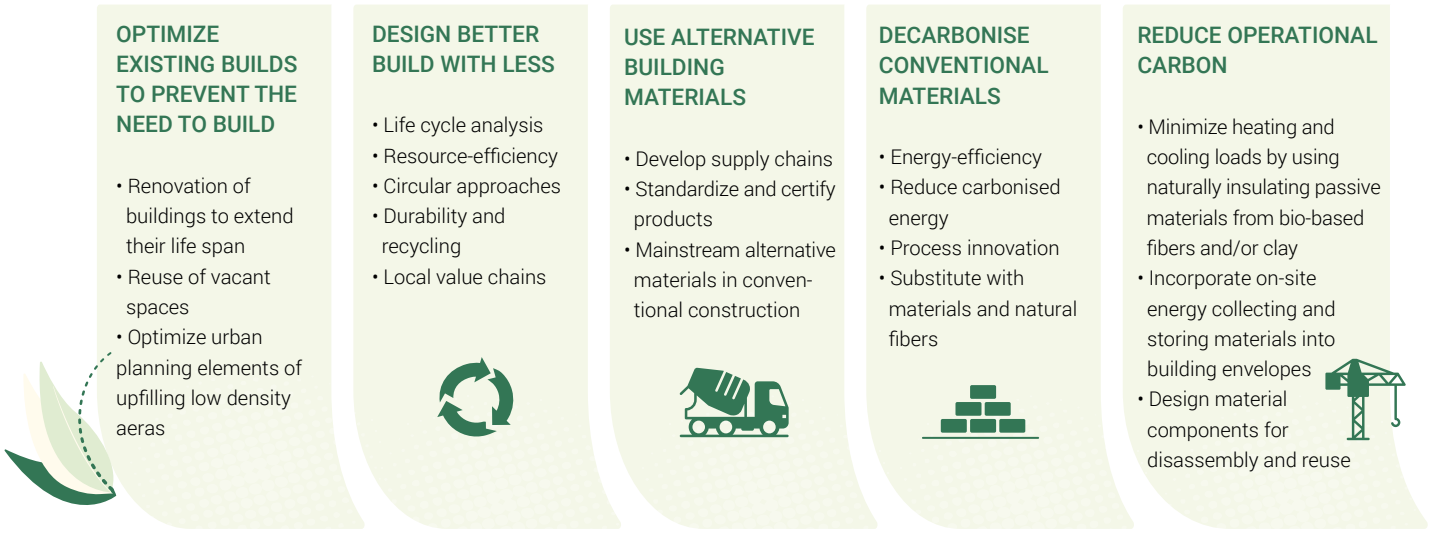


Source: One Planet Sustainable Buildings and Construction Programme adapted from Westerholm, N (2023). Unlocking the Potential of Local Circular Construction Materials in Urbanising Africa.

While impacts can be at different stages of the value chain, design is a crucial point of intervention and is shaped primarily through building codes. The influential actors in the construction value chain are governments, international organisations, financial institutions and major market players, who are primarily acting at the financing, planning and design stage of the construction value chain (UNEP 2021b). The decisions made at these stages shape the activity at the other stages. Governments exert significant influence as 1) regulators of financial markets, 2) investors in the construction sector, and 3) urban and territorial planners, and regulators of the construction sector (UNEP 2021b).

Decisions at the financing and design stage affect material choice, construction techniques, opportunities for increased building lifetimes, and end-of-life strategies including deconstruction, component reuse, and construction and demolition recycling (IRP 2020). However, change needs to happen across the whole building life cycle. In addition, construction doesn't necessarily follow demand[18]. Optimizing the use of existing buildings should also be an initial consideration before making the decision to build. This includes renovating buildings and making their life span longer and reusing vacant buildings. Figure 12 summarizes a five-pronged strategy:

Figure 12.
Whole-life and systems thinking approach for decision making.



Source: Adapted from UNEP (2022). Global Buildings Status Report for Buildings and Construction.

With the demand for floor space set to double by 2050, addressing this issue will require a concerted action along different dimensions as illustrated above.

18 One Planet Network (2021). Opportunities and gaps identified during the construction value chain consultations.

Integrating circularity in the buildings and construction sector to increase NDC ambition through the 4 stages of the toolbox

IPCC categories: 1A2 manufacturing industries and construction, 2A1 cement production, 2C1 iron and steel production, 3D1 harvested wood products, waste.

Stage 1: ASSESS THE PROBLEM USING AVAILABLE DATA.

Using the proposed steps, policymakers can identify and prioritize hotspots in material use and GHG emissions in relation to buildings and construction with particular attention to embodied emissions and the life cycle of materials used in the buildings and construction value chain. The user can then assess the NDC to identify entry points to incorporate sub-sectors and/or GHGs in relation to the identified hotspots. This stage also enables an understanding of stakeholders to engage across the value chain, cognizant that in buildings and construction governments exert significant influence as 1) regulators of financial markets, 2) investors in the construction sector, and 3) urban and territorial planners, and regulators of the construction sector.

Stage 2: DEFINE THE POLICY RESPONSE THROUGH CIRCULAR ECONOMY.

Users can conduct a deeper analysis with identified stakeholders to identify circular economy interventions. Although the planning, design and commissioning stage of buildings will be a critical point of intervention, the consideration of the whole life cycle is important, including the decision on whether to build new or renovate existing buildings. Potential circular economy interventions will be assessed ex-ante with the proposed tools including job creation. Examples of interventions include substituting materials by design, developing markets for local and sustainable construction materials according to national context and reducing and reusing construction and demolition waste. Measurable indicators and targets can be set and included in the NDC in stage 2 or 3.

Stage 3: IMPLEMENT CIRCULAR ECONOMY FOR THE NDC.

A coordinated set of reinforcing policy instruments can be selected to implement the circular economy intervention. Such policy instruments can include the revision of building codes to address the embodied impact of materials, mandated prefabrication and modular construction, support for industrial symbiosis in cement production and/or other materials, and procurement guidelines to support the use of sustainable construction materials in the design and planning stages. For example, integrating a minimum percentage of recycled material within the procured building material i.e. timber, aggregates, steel can be a target for the NDC. Financial and non-financial resources can be mobilised by key market players and in the NDC, countries can include information on the need for international support on finance, technologies and/or capacity building to support implementation.

Stage 4: TRACK PROGRESS AND REPORT IN THE BTR.

Policymakers can assess the policy effectiveness and impact on unsustainable hotspots in buildings and construction by comparing progress to the baseline identified in stage 1 and using the ex-ante tools from stage 2 for ex-post assessment. Progress can then contribute towards the NDC target by reporting the impact in the BTR and SDG 12.1.1 reporting.

Options elaborated from IRP (2020). Resource efficiency and climate change: Material efficiency strategies for a low-carbon future and global alliance for buildings and construction.

Tools for circularity in buildings and construction:

- SHERPA sustainable housing tool is a self-evaluation tool for project managers, communities, and other stakeholders involved in the planning, design, construction and assessment of housing projects. SHERPA assesses housing projects from inception through to site selection and design, choice of materials, and the recyclability of building materials used. Training packages are available and an explanatory video is available here.

- The re-think buildings toolkit is an integrated set of tools to "RE –think sustainability in the building sector" to support governments in transforming their buildings and construction sector, particularly the housing sector, in a resource efficient, low carbon, and climate-resilient manner. It also aims to raise awareness and strengthen the capacity of national stakeholders on sustainable buildings and construction related benefits and opportunities with an emphasis on material efficiency.

- Embodied carbon in construction calculator (EC3) tool is an open-access tool for benchmarking assessment and reductions in embodied carbon per material category, focused on the upfront supply chain emissions of construction materials. It helps policymakers, building owners, architects, construction companies and suppliers measure, compare and reduce the embodied carbon of the products they purchase, manufacture and procure. It can be used in both the design and procurement phases of a construction project.

- The inventory of carbon and energy (ICE database) is an embodied carbon database for building materials.

- Circular built environment reports provide a benchmark and recommendations on how to move forward towards a circular built environment.

Additional knowledge resources:

- Circular buildings toolkit
- Scaling the circular built environment: Pathways for business and government
- The business case for circular buildings: Exploring the economic, environmental and social value

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Annex 1
Summary of stages, steps and tools

Table A. Summarizes key steps, questions, and tools for **Stage 1.**

1.1 Determine GHG emissions associated with material use in the economy to prioritize sectors/sub-sectors for circular economy interventions in the NDC

Which sectors/sub-sectors are major contributors to GHG emissions according to national inventories?

- National GHG inventories

What are the main consumption and production material flows associated with the GHG emissions and where are the hotspots?

- SCP-HAT modules 1 and 2
- Life cycle inventory database

Which sectors/sub-sectors should be prioritized for the interventions?

- Develop a short-list of priority sectors/sub-sectors from using the tools in this step

What is the socio-economic context of the identified priority sectors/sub-sectors?

- SCP-HAT (indicators on jobs and GDP)
- Social life cycle assessment

1.2 Assess current NDC to identify entry points for circular economy interventions

Which circular economy measures and associated targets are included in your current NDC? How does this compare to other countries' NDCs?

- Climate watch explorer
- NDC registry

Which new prioritized sectors/sub-sectors/GHG emissions need to be included in the NDC?

- Compare list of prioritized sectors/sub-sectors from step 1.1 against existing measures in the NDC

1.3 Identify relevant stakeholders to engage

Who are the key stakeholders linked to the identified priority sectors/sub-sectors and their value chains?

- ICAT stakeholder participation methodology
- Value chain approach

Tool/resource

Table C. Summarizes key steps, questions, and tools for Stage 2.

2.1 Identify circular economy opportunities in prioritized sectors/sub-sectors for the NDC

What are the current policies and practices in the value chain of the prioritized sectors/sub-sector?

- Value chain approach (including stakeholder consultations and desktop research)

What are the challenges/barriers to circularity?

- Value chain approach (integrating climate resilience and gender responsiveness)

What circular economy opportunities exist across the value chain?

- List of knowledge hubs to find case studies and best practices

What has worked well in a similar country context and can be learned from other NDCs?

- Climate watch explorer

2.2 Select circular economy interventions and assess their potential impact to inform the NDC update (ex-ante)

What is the GHG mitigation potential (and costs) of interventions to inform the NDC update with targets and indicators?

- IPCC GHG inventory guidelines
- CDM methodologies
- Life cycle inventory database
- GHG protocol and policy action standard
- ICAT policy assessment guides
- Circular indicators for governments

What are the potential socio-economic and environmental impacts of the interventions?

- Life cycle inventory database
- SDG Climate Action Nexus (SCAN) tool

How to assess job creation based on the identified interventions?

- Green jobs assessment model
- Circular economy jobs tool

2.3 Strengthen political will and establish institutional arrangements to ensure implementation

How to strengthen institutional arrangements and coordination for implementation?

- How to create a national circular economy roadmap

Tool/resource

Table E. Summarizes key steps, questions, and tools for Stage 3.

3.1 Identify policy instruments for the implementation of selected circular economy interventions

Which policy instruments can support the implementation of the identified circular economy interventions (in stage 2) for achieving the GHG emission reductions from material use?

A non-exhaustive list of supporting tools to implement the circular economy interventions through a complementary set of reinforcing policy instruments:

- Product lifetime extension
- Extended producer responsibility
- Circular infrastructure design and spatial planning
- Industrial symbiosis
- Deposit-return schemes
- Bans
- Circular procurement
- Consumer information tools
- Sustainable lifestyles
- Circular tourism
- Carbon taxes

Which stakeholders identified from previous steps need to be involved to implement the policy instrument?

Use results from stakeholder mapping in stage 1.3 and the value chain approach from stages 1 and 2 to ensure relevant stakeholders are engaged

3.2 Assess feasibility and establish indicators to track implementation and inform the NDC

What are the costs and benefits of implementing this specific policy instrument?

Ex-ante societal cost-benefit analysis

What are the indicators to measure progress and how they can be linked to the NDC?

Circular indicators for governments

3.3 Explore financial resources for implementation

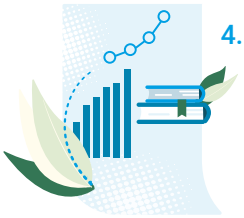
How can circular economy interventions make NDC financing more efficient or effective?

Finance gap assessments, innovative financial mechanisms, and NDC implementation plans, including:

- Investment and financial flows assessments
- Investment and financial flow methodology
- Climate finance explorer
- National voluntary carbon footprint guidelines
- Green bonds training

Tool/resource

Table F. Summarizes key steps, questions, and tools for Stage 4.



4.1 Assess effectiveness of interventions and impact on material flows and GHG emissions

What was the GHG emission reduction from the selected interventions?

- IPCC GHG inventory methodologies
- CDM methodologies (including additionality)
- Life cycle inventory database
- GHG protocol policy and action standard
- ICAT policy assessment guides

What were the socio-economic and environmental impacts of the interventions (e.g. jobs)?

- SCAN tool
- Green jobs assessment model
- Circular economy jobs tool

4.2 Report impact and progress in the BTR

Where do I report progress of circular economy interventions in the BTR and how is it linked to the NDC?

- Reference manual for the ETF under the Paris Agreement
- UNDP Transparency helpdesk
- Technical handbook for developing country Parties on preparing for implementation of the ETF under the Paris Agreement
- UNFCCC MRV/transparency helpdesk
- The UNEP Climate Transparency Platform

Tool/resource


UN
environment
programme

One planet
handle with care

U N
D P

United Nations
Climate Change