



MICRO-CREDENTIAL

CIRCULAR ECONOMY FOR LAND AND WASTE MANAGEMENT

13.- Assessment Tools and Indicators of Circular Economy

Land and waste sustainability indicators

CELWS-W13-V02



Co-funded by
the European Union



Land and waste sustainability indicators

Exploring the assessment tools and indicators that measure our progress toward a truly circular, regenerative economic model — and why they matter now more than ever.



The Unsustainable Present: A Planet Under Pressure



Our current economic model is extracting far more from the planet than it can replenish. This chapter examines the scale of the crisis — from runaway resource consumption to the interconnected planetary emergencies threatening human civilization.

The Earth's Finite Capacity: A Stark Stark Reality



By 2050, if current trends continue, global consumption will require the equivalent of **three planets'** worth of resources to sustain. This is not a distant hypothetical — it is a trajectory we are already on. The dominant linear model of "*take, make, use, dispose*" systematically pushes humanity beyond planetary boundaries, depleting finite resources faster than nature can regenerate them. Oceans, soils, forests, and freshwater systems are all showing the strain. A fundamental rethinking of how we produce and consume is no longer optional — it is existential.

The Triple Planetary Crises: Interconnected Threats



Climate Change

Greenhouse gas emissions from linear production and waste drive global warming, disrupting ecosystems and human systems alike.



Biodiversity Loss

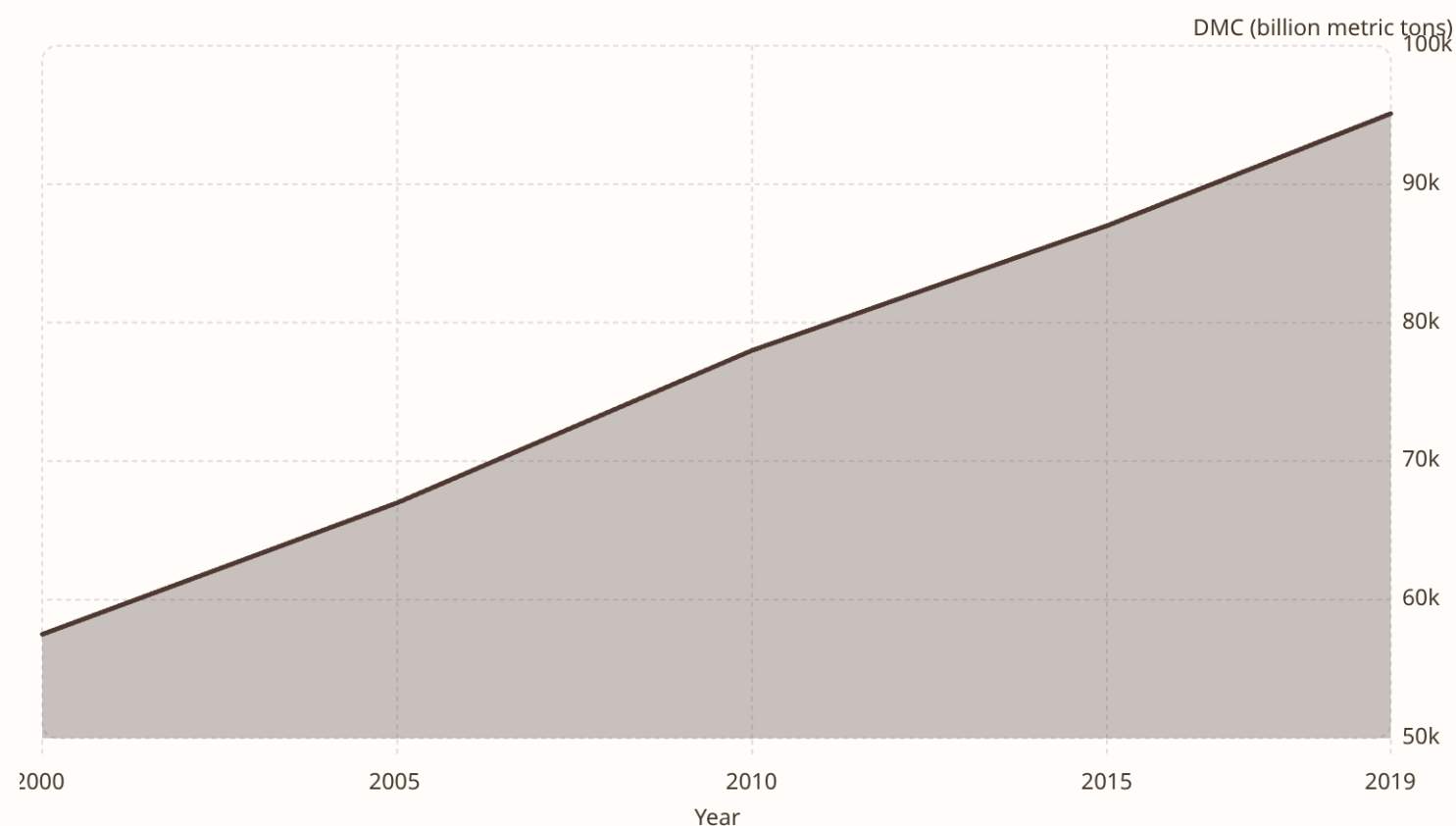
Habitat destruction, land degradation, and pollution are causing mass species extinction at rates unseen in human history.



Pollution

Chemical, plastic, and waste pollution contaminate air, water, and soil — undermining the foundations of life and well-being.

Domestic Material Consumption: A Growing Burden





Every policy decision, every production process, and every consumption choice either moves us toward regeneration or deeper into crisis. The indicators and tools explored in this presentation help us understand exactly where we stand — and how far we still need to go.

The Promise of Circularity: A New Economic Paradigm



Moving beyond the extractive linear model, the circular economy offers a systems-level solution — one that redesigns the way value is created, preserved, and returned to productive use. This chapter examines what circularity means in practice and who is leading the charge.

What is a Circular Economy?

Core Principles

→ **Design Out Waste**

Products are designed from the outset to eliminate waste and pollution at every stage of their lifecycle.

→ **Keep Materials in Use**

Products, components, and materials are kept in circulation through reuse, repair, remanufacturing, and recycling.

→ **Regenerate Natural Systems**

The circular model actively enhances and restores natural capital rather than depleting it.

The EU's Ambition: Leading the Circular Transition

World Leadership by 2030

The European Union has set a bold ambition: to become the **global leader in the circular economy** by 2030. This encompasses binding targets, industrial policy, and regulatory reform across the entire value chain.

Single Market for secondary raw materials

The upcoming legislation will establish a **Single Market for secondary raw materials**, stimulate demand for recycled content, and create coherent cross-sector rules for circularity compliance.

Clean Industrial Deal

Circularity is embedded in the EU's broader industrial strategy — ensuring that decarbonization and resource efficiency go hand in hand across manufacturing, construction, and agriculture sectors.

Why This Gap Matters

The difference between 12% and 24% represents tens of billions of tons of material that could be kept in productive use rather than extracted anew or landfilled. Doubling the rate would significantly reduce the EU's dependence on imported raw materials, lower industrial greenhouse gas emissions, and create new green jobs across the recycling and remanufacturing sectors.

Tracking this rate accurately — through robust, standardized indicators — is essential to hold governments and industries accountable.

Closing the Loop

The circular economy is not merely about recycling — it is a fundamental redesign of the entire economic system. Production, consumption, reuse, repair, and recycling are all integrated into a seamless, regenerative cycle that eliminates the very concept of waste.



Measuring What Matters: Land and Waste Sustainability Indicators

You cannot manage what you cannot measure. This chapter dives into the core SDG indicators that track municipal solid waste, food systems, and land use — forming the empirical backbone of any credible circular economy strategy.



Indicator Definition

This indicator captures not just collection rates but also the quality of waste management — distinguishing between sanitary landfills, composting, recycling, and energy recovery versus open dumping.

Collection Rate

The proportion of MSW **collected** out of total waste generated in a city — a foundational measure of basic service delivery and infrastructure coverage.

Waste Flow Diagrams

Tracked through **Waste Flow Diagrams**, this metric maps how plastic moves through urban systems — from production to disposal — identifying where leakage into the environment occurs.

Waste Management Indicators

Indicators are broken down by **location**, **waste source**, **treatment type**, and **income level** to reveal inequalities in access to proper waste management across urban and peri-urban areas.

Global MSW Management: Where Cities Stand



Across the world, cities vary enormously in their capacity to collect and safely manage municipal solid waste. High-income cities in Europe and North America typically manage over 90% of their MSW in controlled facilities, while many cities in Sub-Saharan Africa and South Asia still struggle with collection rates below 50% — with significant open dumping and informal waste handling. Bridging this gap is central to achieving sustainable urbanization and protecting public health globally.

12.3.1(a) — Food Loss Index

Measures the share of agricultural production that **does not reach the retail stage**. This covers all post-harvest operations — storage, transport, processing, and distribution — up to but not including retail. It reflects inefficiencies in supply chain infrastructure and handling practices, particularly in low- and middle-income countries where cold chain and storage gaps are acute.

12.3.1(b) — Food Waste Index

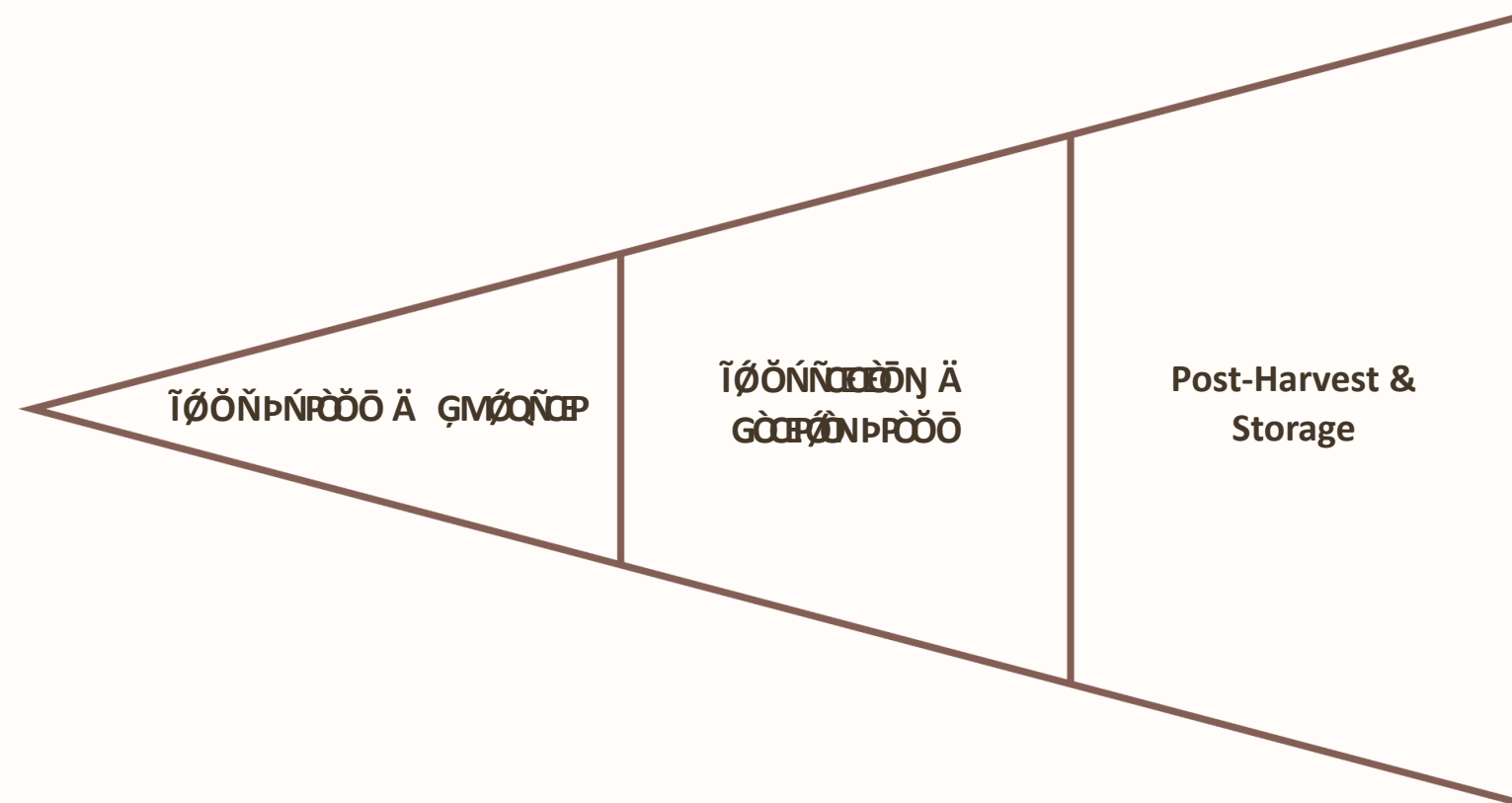
Focuses on food discarded at the **retail and consumer levels** — including supermarkets, food service outlets, and households. This component is especially prominent in high-income countries, where consumer behavior, over-purchasing, and retail standards contribute massively to preventable food waste and associated resource losses.



Why It's a Systemic Crisis

Approximately **one-third of all food produced globally** is lost or wasted each year — a staggering inefficiency with cascading consequences. The impacts span three dimensions:

- **Economic:** Trillions of dollars in wasted inputs — land, water, energy, and labor
- **Social:** Food loss and waste deepen food insecurity, as nutritious food is destroyed while millions go hungry
- **Environmental:** Food waste is responsible for ~8–10% of global greenhouse gas emissions, and drives unnecessary land and water use



Understanding where food loss and waste occur across the supply chain — from farm to fork — is essential to targeting interventions effectively. Different stages require different solutions, from infrastructure investment in low-income settings to behavior change campaigns in wealthier markets.

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As circular economy ambitions grow more sophisticated, so must the tools used to measure them. This chapter explores the next generation of indicators — from material footprint accounting to hazardous waste governance — that are shaping the future of sustainability assessment.



SDG 12.2.2 — Domestic Material Consumption

Measures the **total mass of materials directly used** within a national economy — raw materials extracted domestically plus imports, minus exports. Reported as total, per capita, and per GDP. DMC is the most widely reported material use indicator and forms the basis for tracking progress on SDG Target 12.2: sustainable management and efficient use of natural resources.

SDG 12.2.1 — Material Footprint

Tracks the **total raw material extraction** attributed to a country's final demand — including imports and exports. Reported as an absolute figure, per capita, and per unit of GDP. The material footprint reflects a nation's true resource consumption regardless of where production physically occurs, making it a more accurate accountability tool than production-based metrics alone.

From Data to Decisions: The Role of Indicator Dashboards

Sophisticated monitoring systems are transforming how policymakers, businesses, and civil society track circular economy progress. Real-time dashboards integrating material flow data, waste treatment statistics, and SDG reporting streams allow for dynamic, evidence-based decision-making. The European Environment Agency, Eurostat, and national statistical offices are investing heavily in digital infrastructure to make these indicators accessible, comparable, and actionable — moving sustainability from aspiration to measurable accountability.



The Transformative Power of Data: Building a Sustainable Future

Data is the engine of transformation. This final chapter brings together the imperative for action — showing how robust indicators, rigorously tracked and boldly acted upon, can chart a course to a resource-efficient, low-waste, and climate-neutral economy.

