



MICRO-CREDENTIAL

CIRCULAR ECONOMY FOR LAND AND WASTE MANAGEMENT

4.- Solid Waste Streams and Material Flows

*Municipal, agricultural, and industrial
waste*

CELWS-W04-V01



Co-funded by
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Municipal, Agricultural, and Industrial Waste



Municipal



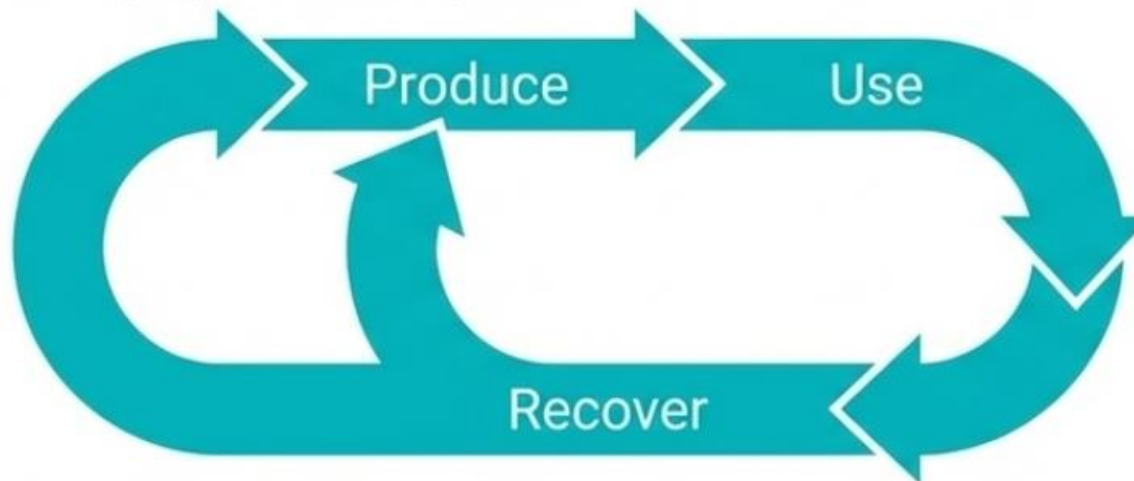
Agricultural



Industrial

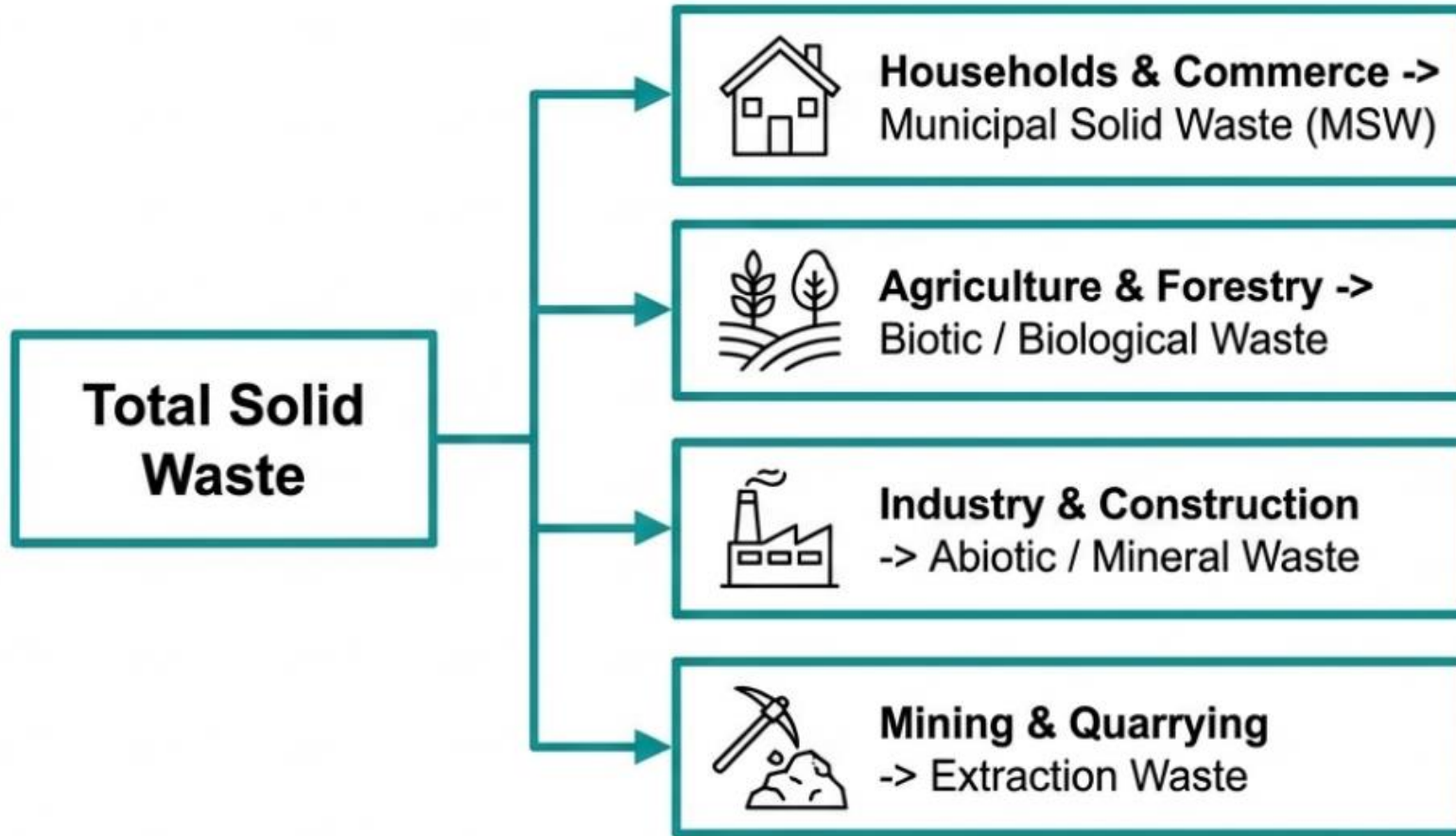


Linear Model: Resources are extracted for one-way consumption, ending in permanent disposal.



Circular Model: Systemic transition focusing on the active regeneration of natural systems and continuous resource looping.

Classification of Waste Streams: Origin



Classification of Waste Streams by Origin can occur on the industrial life are using industry important, factors, communities, and forestry of andologic networks had use of waste streams

Classification of Waste Streams: Composition and Potential

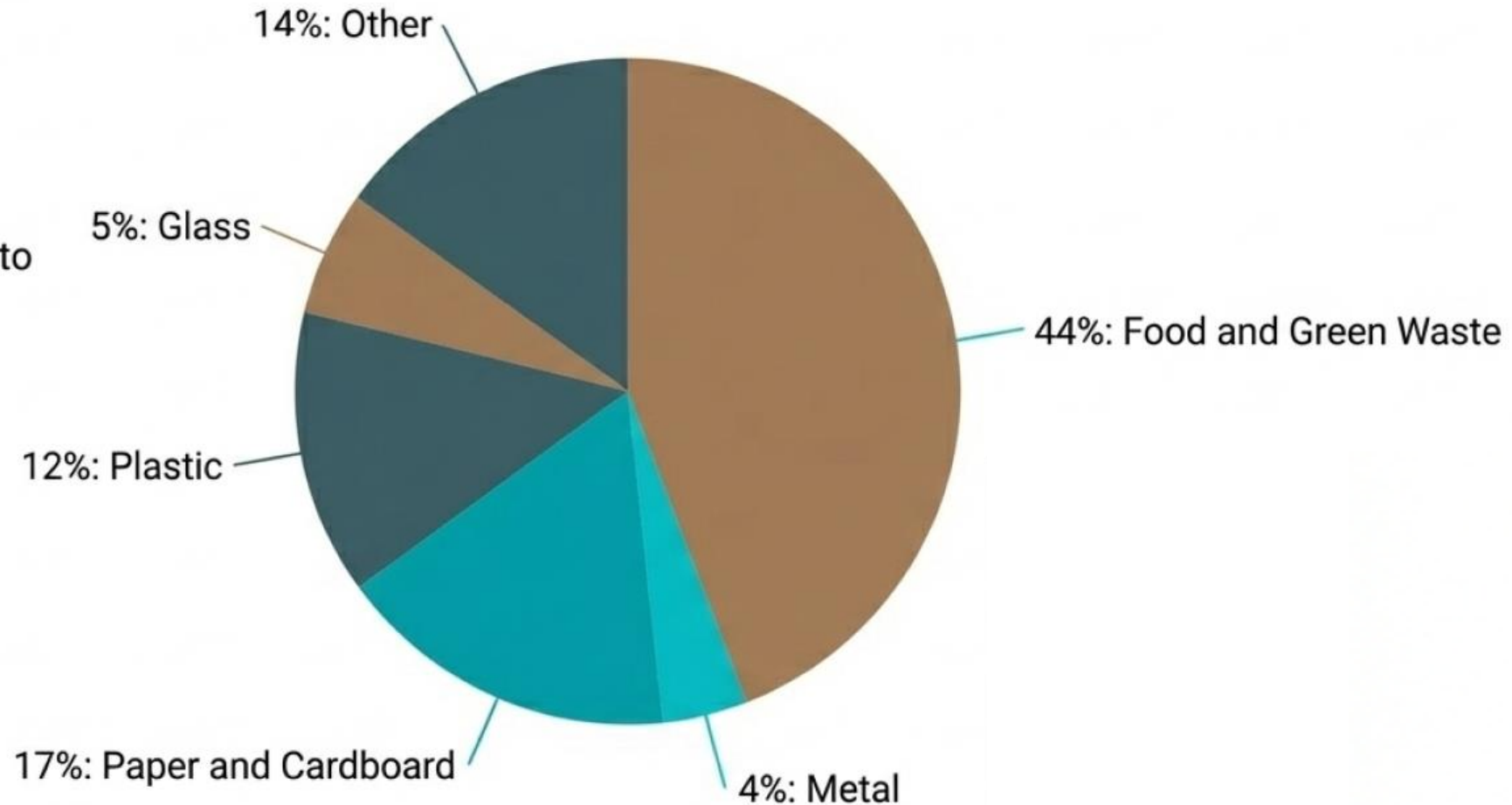
Hazardous (Toxic/Reactive)		
	Biotic (Biological origin)	Abiotic (Mineral/Fossil origin)
Non-hazardous	Food waste, agricultural crop residues.	Plastics, glass, inert construction rubble.
		Chemical solvents, heavy metals.

- **Current Scale:** 2.01 billion tonnes of MSW generated globally (2016).
- **The Epicenter:** Rapid urbanization shifts the burden. Asian cities are projected to generate 1.8 billion tonnes by 2025 (15% annual growth).
- **Definition:** Household and commerce waste. Highly visible, heterogeneous, and difficult to sort.



Composition of Municipal Waste

Nearly half of all global municipal waste is organic. This represents a massive, untapped biological nutrient stream currently lost to linear disposal.

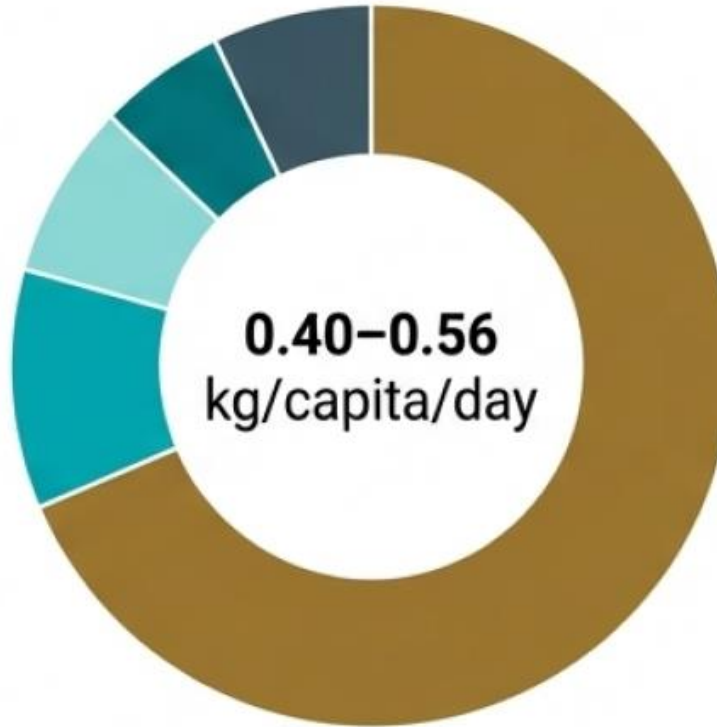


MSW in Different Economic Contexts

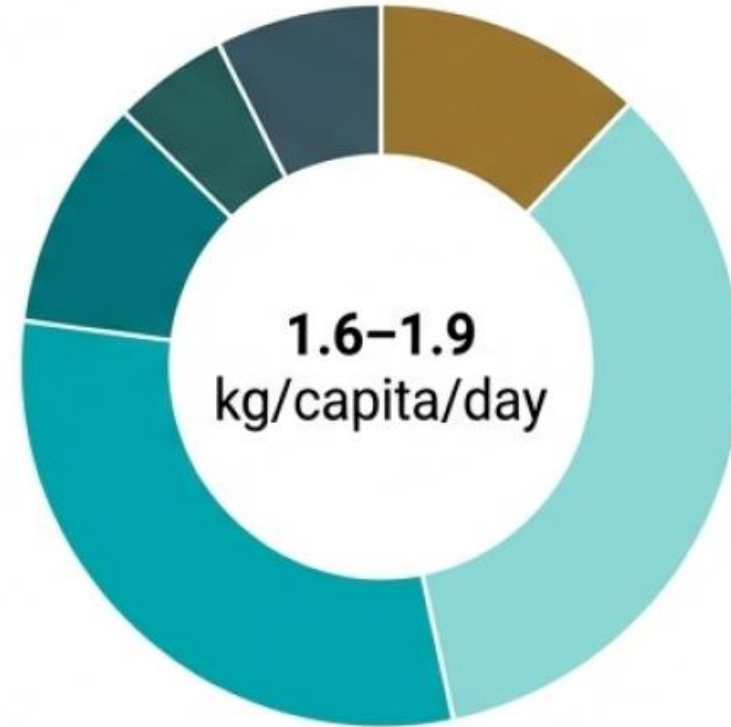
As income rises,
total waste
generation triples.

Composition shifts
from basic organic
food scraps to
complex,
multi-material
packaged goods
and plastics.

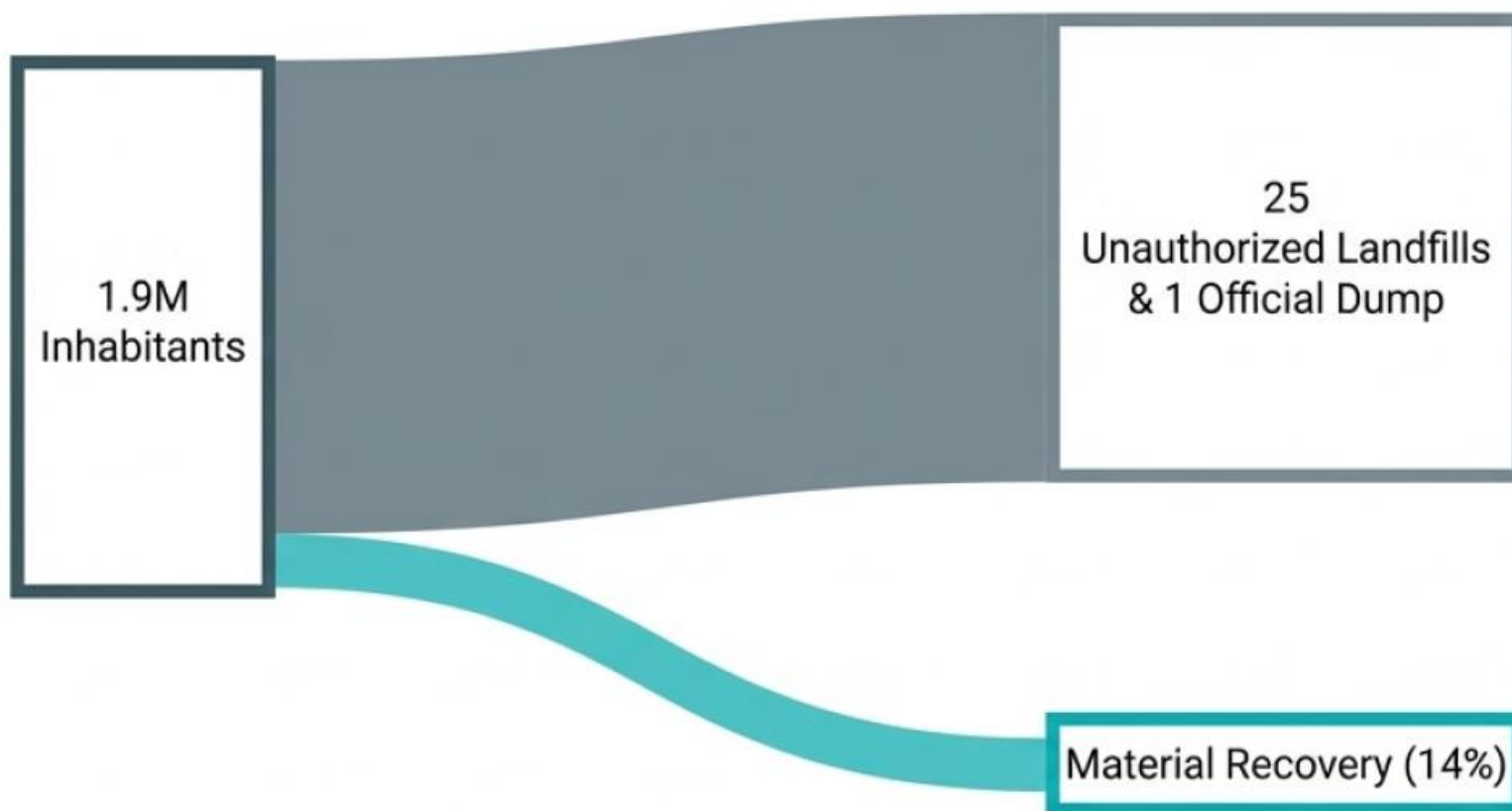
Low-Income



High-Income

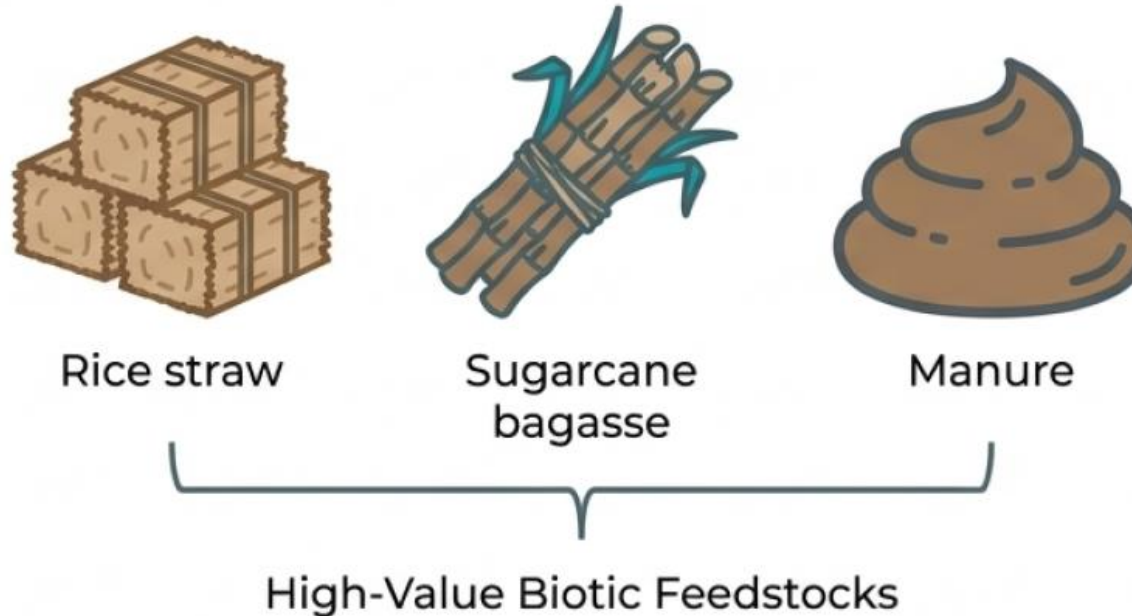


MSW Challenges in Central Asia



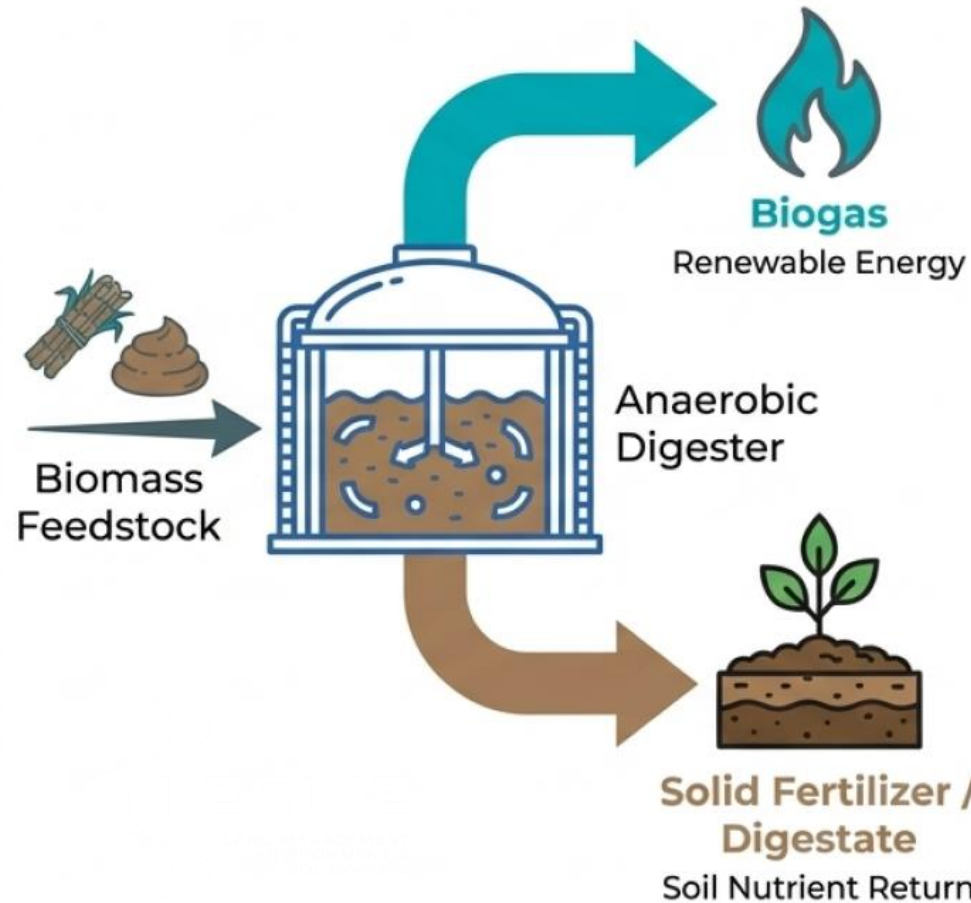
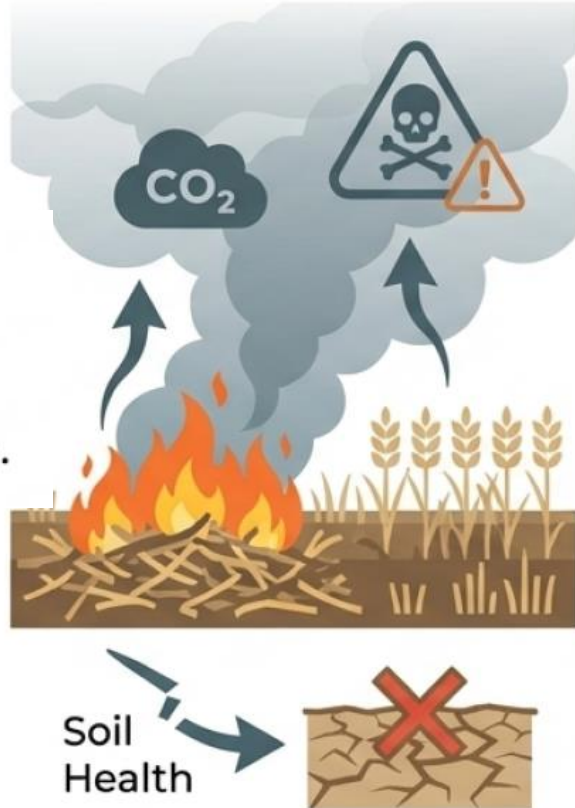
Generated by
cultivation, forestry,
and livestock rearing.

Unlike MSW,
agricultural waste is
highly homogenous
and entirely biotic,
making it the ideal
primary feedstock for
the circular bio-
economy.



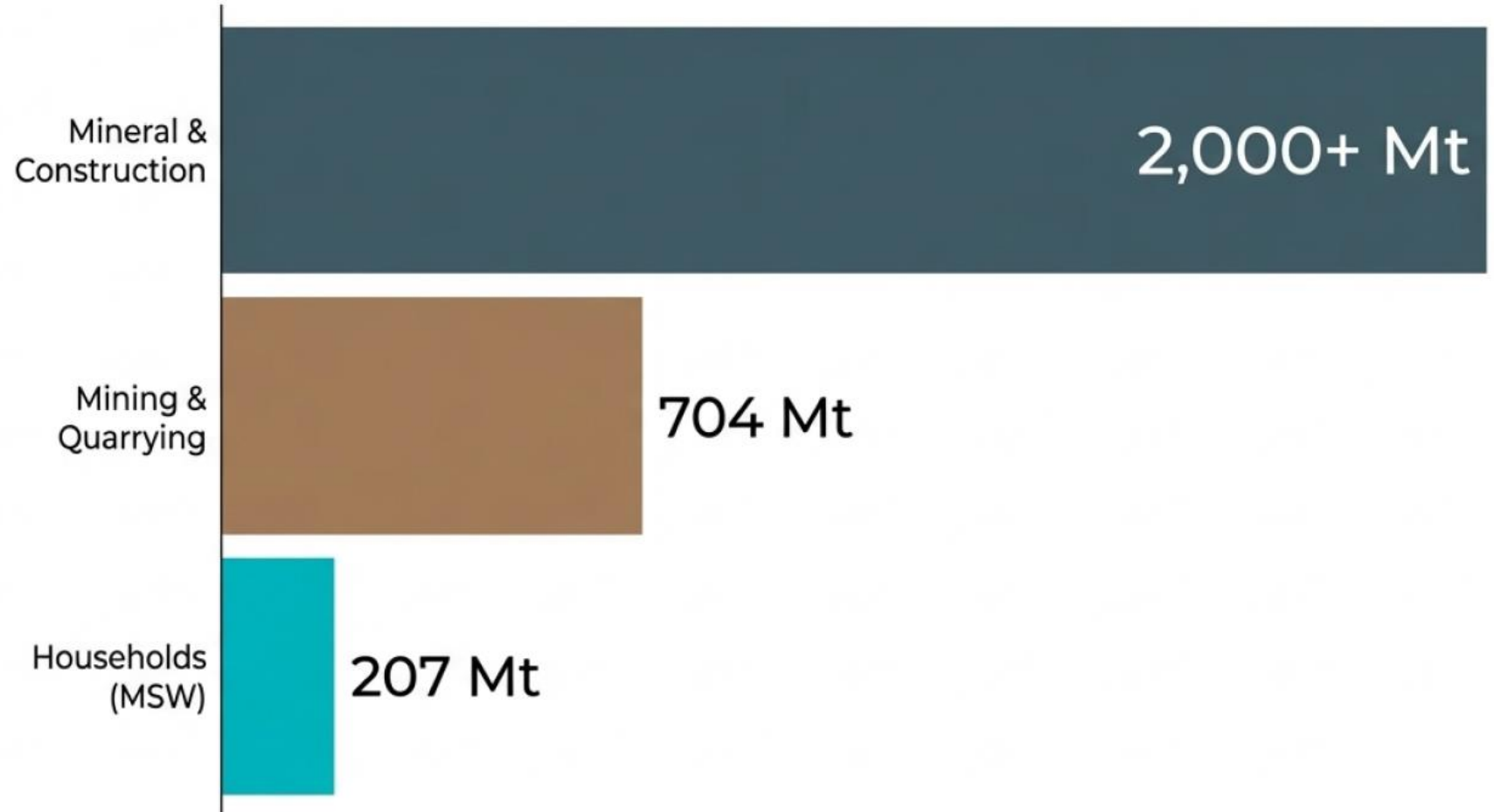
Agricultural Waste in Linear vs Circular Systems

Open burning of crop residues creates severe air pollution and destroys soil health.

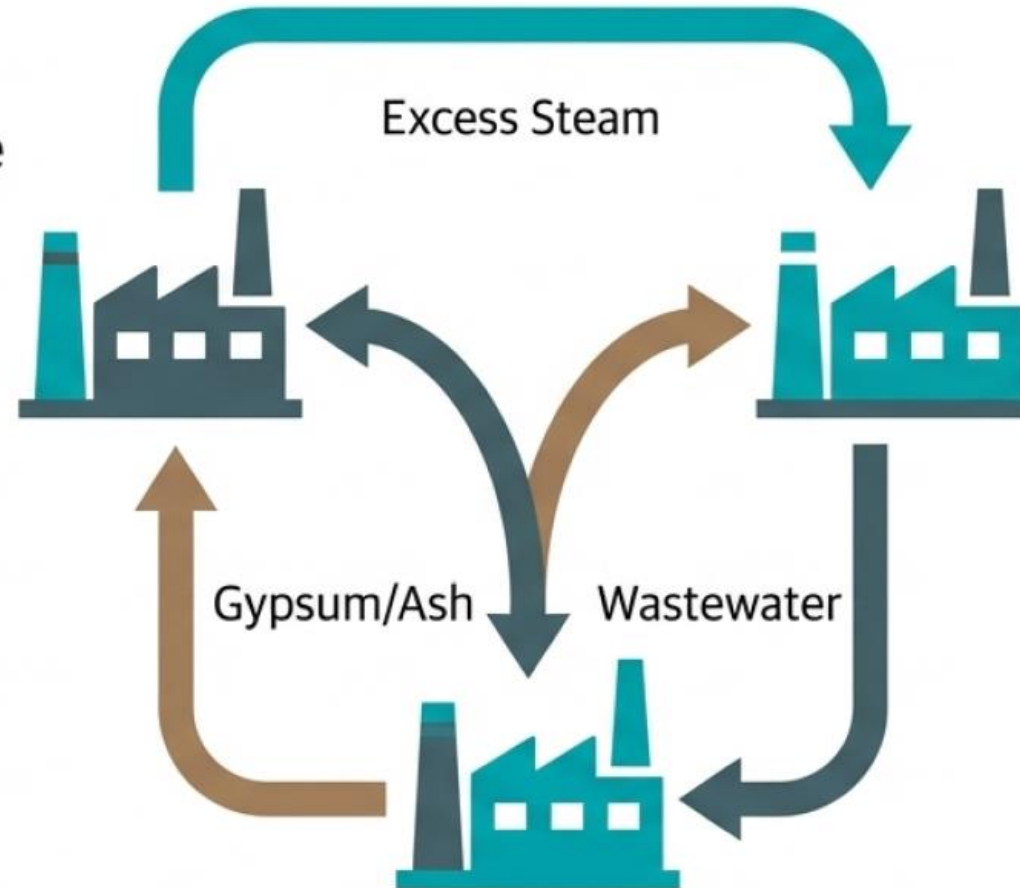


Circular systems capture this biomass to produce renewable energy and return critical nutrients to the land.

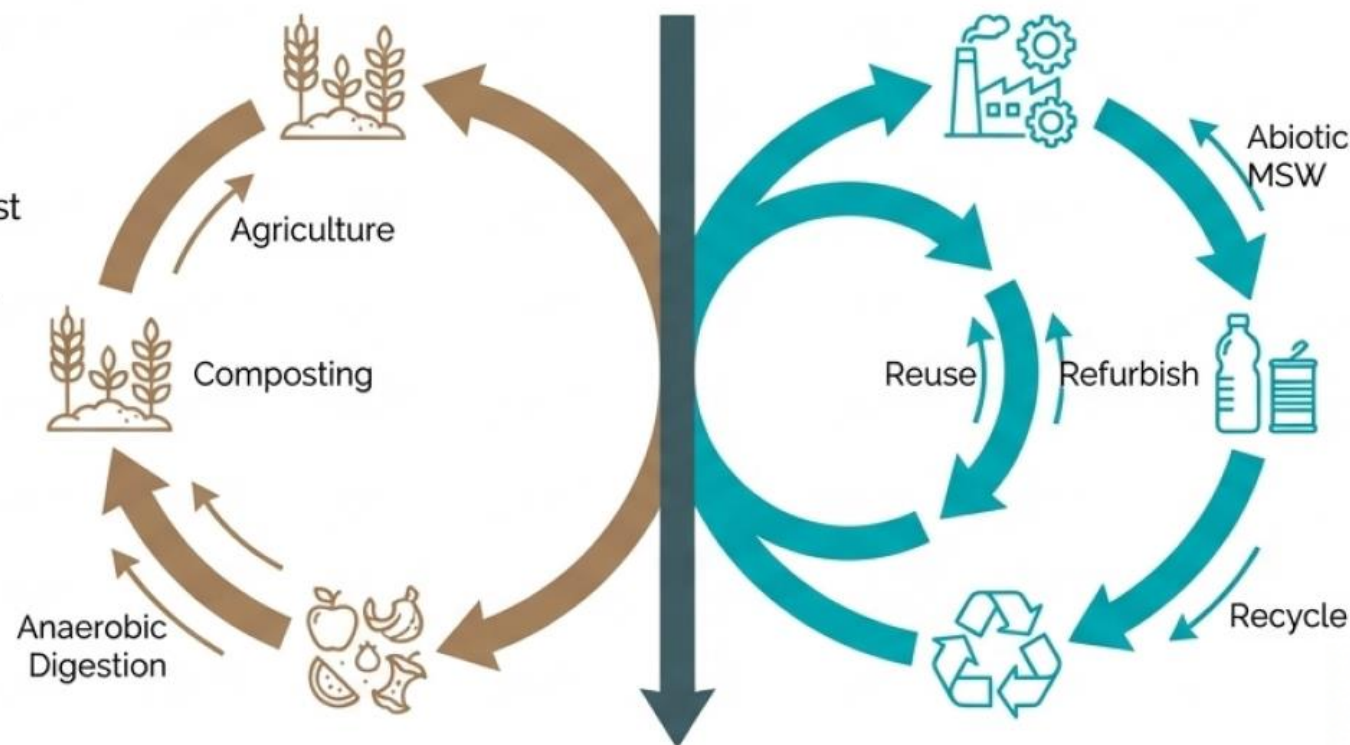
While municipal waste is highly visible to the public, construction, demolition, and industrial mining wastes account for the overwhelming majority of global material tonnage by a factor of ten.



- **The Concept:** The waste outputs of one industrial facility become the raw material inputs for another.
- **Almaty CE Goal:** 100% processing of ash generated by thermal power plants to produce new, marketable construction materials rather than stockpiling it.

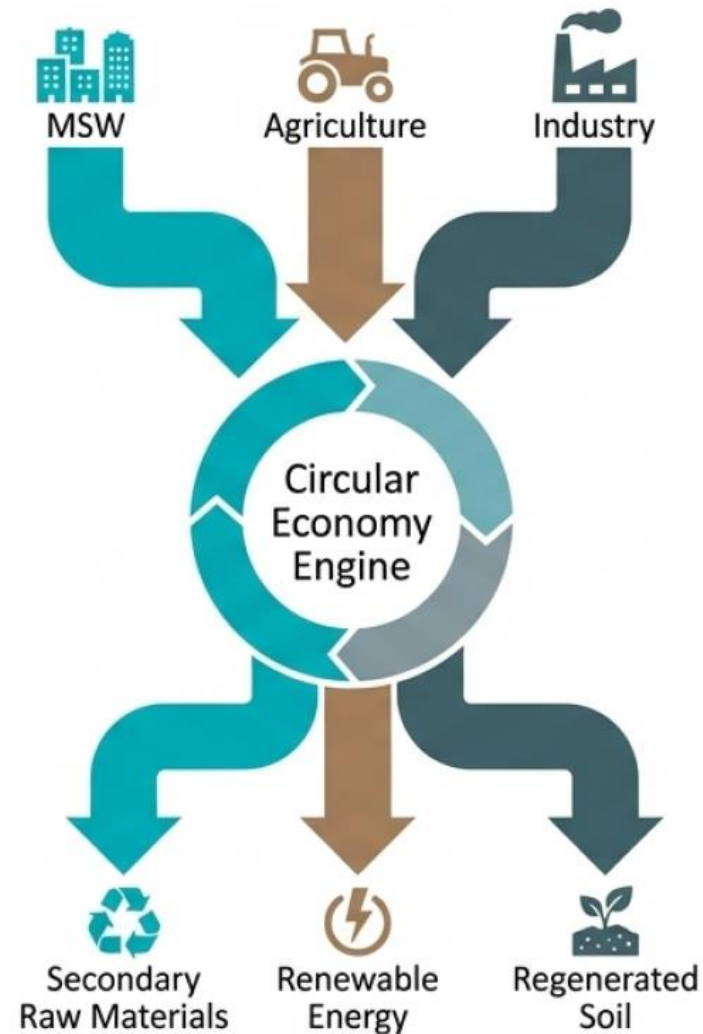


All waste streams fundamentally belong to one of two continuous loops. Biotic materials must safely return to the soil; abiotic materials must circulate continuously within industrial systems.



In a fully realized Circular Economy, “waste” ceases to exist.

Municipal, agricultural, and industrial discards are simply the starting feedstocks for the next generation of production.





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