
WASTE WAS
INVENTED BY
HUMANS

Nepal Infrastructure Summit 2024

Parallel Session 6 Waste Management

Keynote

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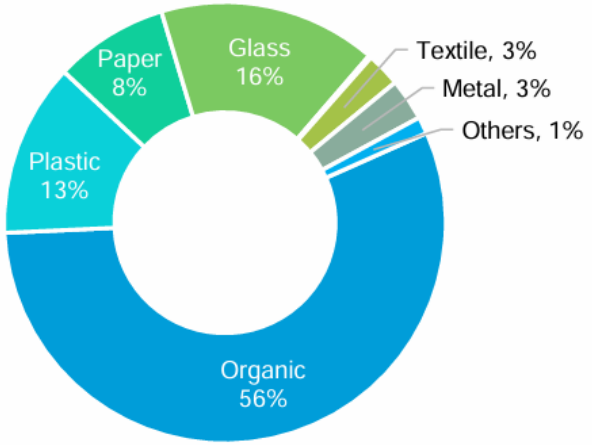
Current Status of Waste Management- Nepal

- Estimated that Urban Nepal generates **~4,900 tons** of Municipal Solid Waste daily and **~1.8 million tons** per annum
- The daily per capita waste generation **is ~0.30 kg** lower than the South Asian countries
- **6 /293** Urban Local bodies have constructed landfill sites- rest are open dumps -including riverside dumps and open burns
- Over **56%** of the waste is **organic-** primarily food and garden waste with a composting potential
- 37% of the waste is composed of easily recyclable materials like **plastics**, **glass**, and **paper**



Estimated waste characterization

Strategic assessment of solid waste management services and systems in Nepal-Policy Advisory Note (2020)

Common Challenges with Waste Management

- **High Organic Waste** yet there is limited infrastructure for composting
- **Inefficient Recycling** with no formal data on actual recycling rates and Informal sectors process up to 15% of the waste
- **Weak Policy Implementation:** The lack of enforcement in the Solid Waste Management Act limits formal recognition and regulation of informal workers
- **Public Awareness**: Low level of public awareness about waste segregation, recycling, and proper disposal practices
- **Regulatory Challenges:** Inadequate enforcement of waste management regulations and policies hampers efforts to improve waste management practices.

These challenges exist in every growing economy

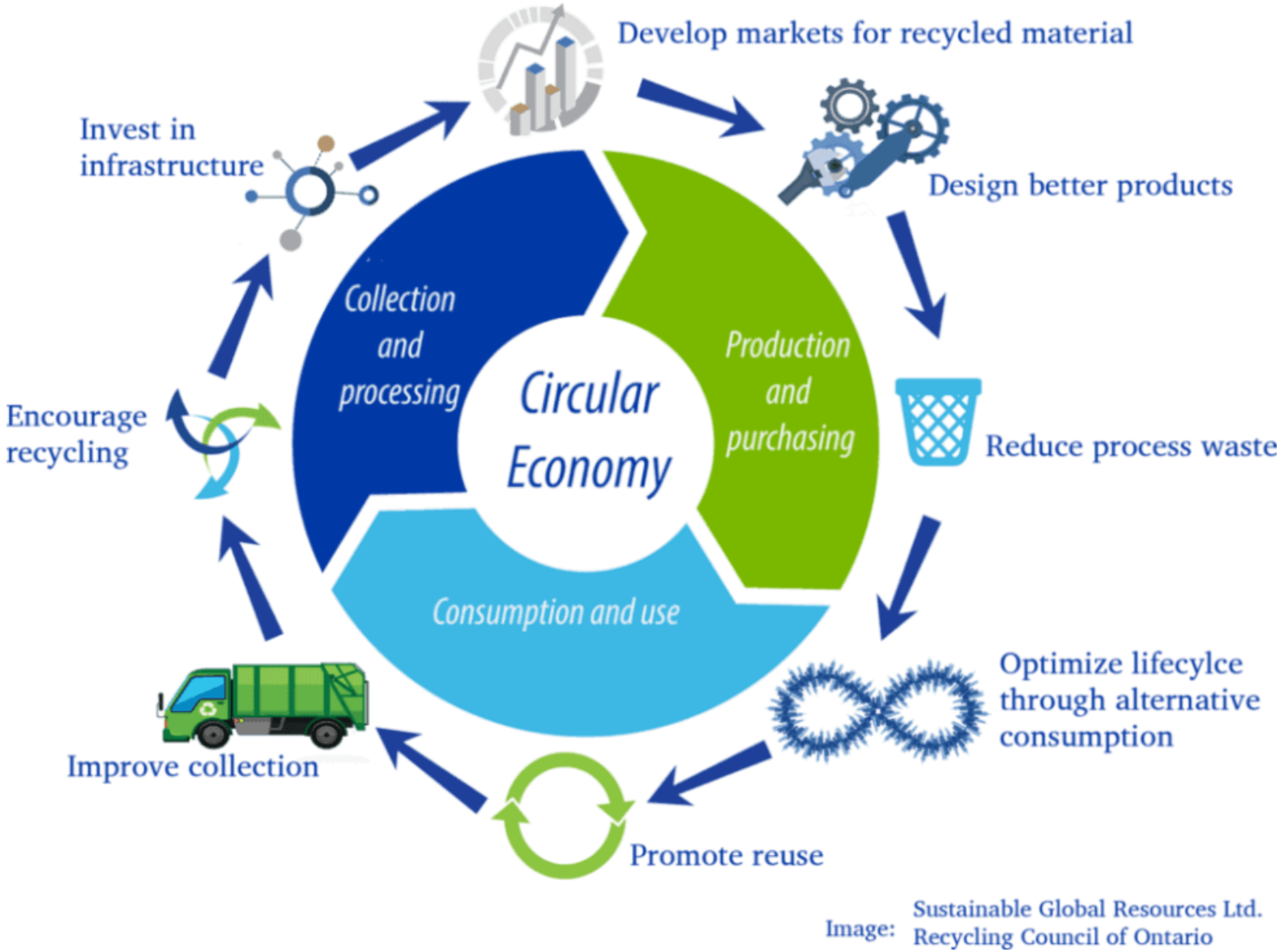


Image: Sustainable Global Resources Ltd.
Recycling Council of Ontario

To manage waste, we must think in the life cycle perspective

Understanding Circular Economy

… is a regenerative economic system which focuses on transitioning from 'take-make-dispose' models to 'take-make-use-regenerate' resource models.

… it aims to redesign the production and consumption systems.

… it is a new model for sustainable development and green economies.

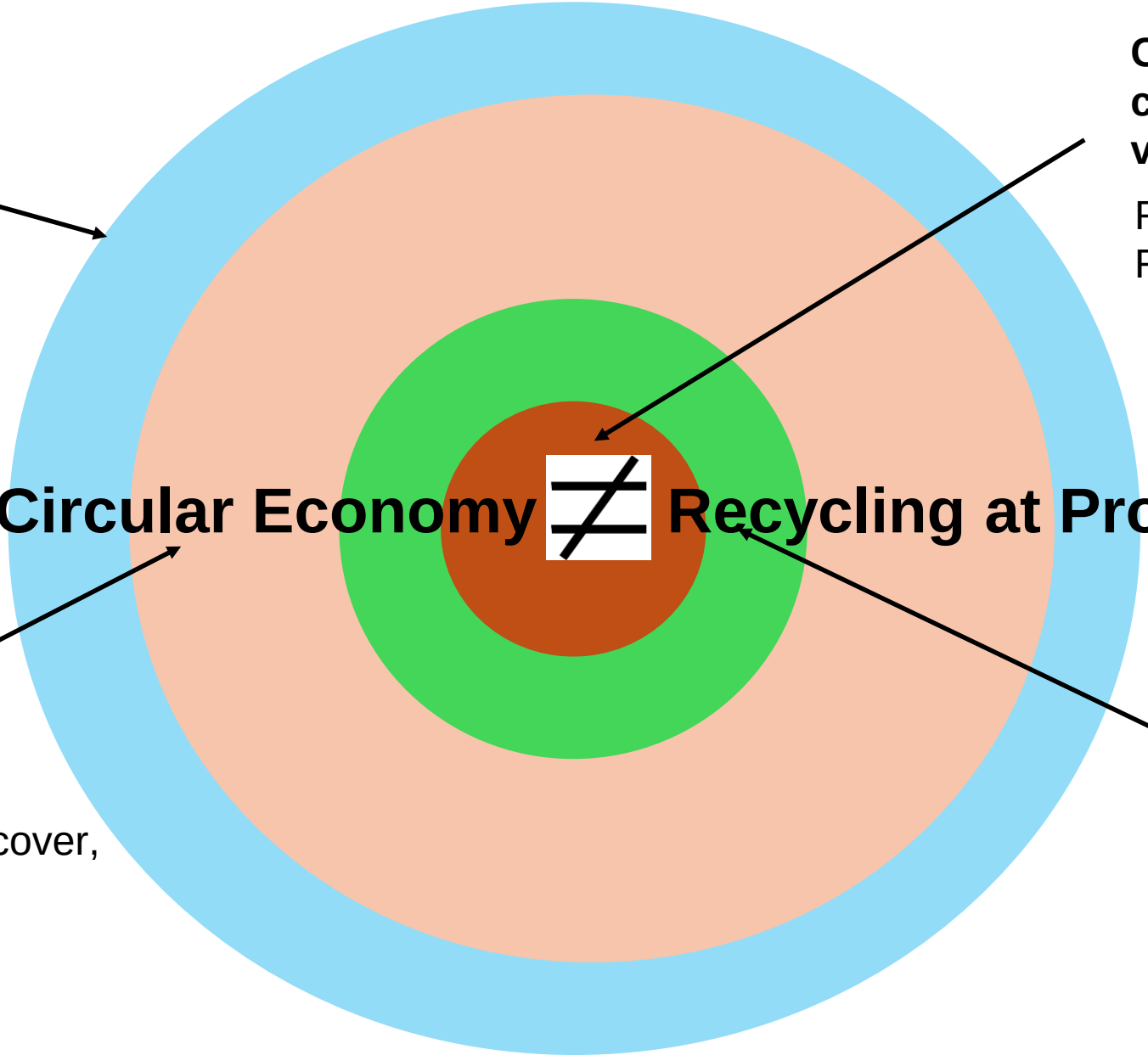
A circular economy reduces material use, redesigns materials and products to be less resource intensive, and recaptures "waste" as a resource to manufacture new materials and products.

Four Circles of Circular Economy

Transformative with innovation
Re-Design,
Rethink

Cutting down consumption of virgin resources

Refuse ,
Reduce, Reuse



Circular Economy ≠ Recycling at Project Level

Adding value with tech/ creating green jobs

Return , Recycle, Recover, Remanufacture

Extending product life

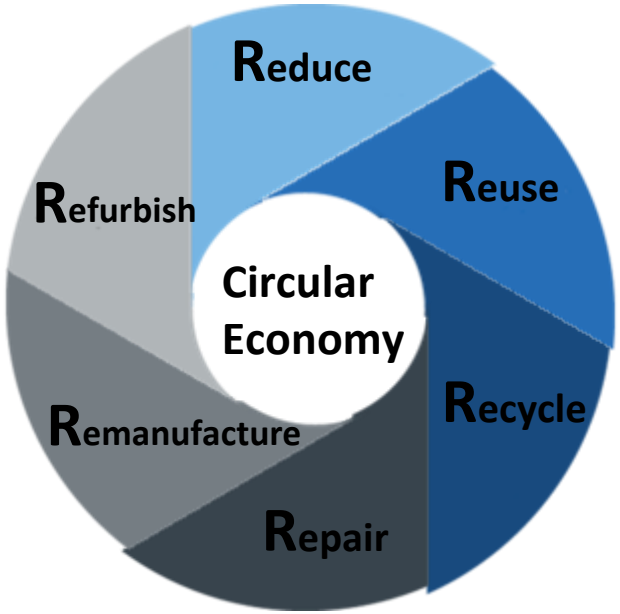
Repair, Refurbish, Renovate

Major waste streams with Circularity Potential

- Urban Mining of MSW
- Wastewater
- Agriculture waste
- Electronic waste
- Plastic waste
- Construction & Demolition waste
- End of Life Vehicles
- Solar Waste
- Textile waste
- Rubber Tyre waste
- Li ion batteries

Embracing the CE concept can be considered a panacea to the existing issues associated with solid waste management (SWM).

Circular Economy becomes a Selling Proposition



Informal

Internet of

Green

Employment

Enterprenuership

Innovation

Investment

Skilling

Practice Education

Technology

Business Models

Sustainable Development Goals

Urban Mining

700,000 tons of recycled rare metals are traded annually

In this model, businesses buy waste from landfills or get appointed by the governments on specific contracts to clear landfills by segregating and collecting all items that can be recycled/reused/remanufactured.

Urban mines are becoming more attractive to major nonferrous producers, because they contain larger amounts of rare metals than conventional mines and because conventional mining is growing more costly.

Biomining at Kumbakonam in India

- Kumbakonam Municipality implemented project under the **Design, Build, Finance, Own, and Operate concept.**
- Developed by company Zigma for clearing 1,31,250 cubic m^3 of municipal waste spread over 7.5 acres of land with a capacity to process **350 m^3 a day**.
- Concept involves the application of composting **bio cultures** on loose waste heaps, followed by conventional **aerobic windrows** on the site.
- The waste is then sterilised, stabilised, and readied for segregation using machinery to separate substances that are sent for recycling, re-using, or composting.
- Aggregates such as coconut shells, plastics, wood, rubber, glass, inert, and soil-enriching bio earth are collected. While coconut shells and wood are sold as fuel, rubber and glass are sent for recycling industries.
- Plastic is supplied to recycling plants and cement plants.
- The Swatch Bharat program in India supports biomining projects.

Plastic Roads in India

More than 15000 kms have “gobbled” plastic waste

Created employment for low-income groups

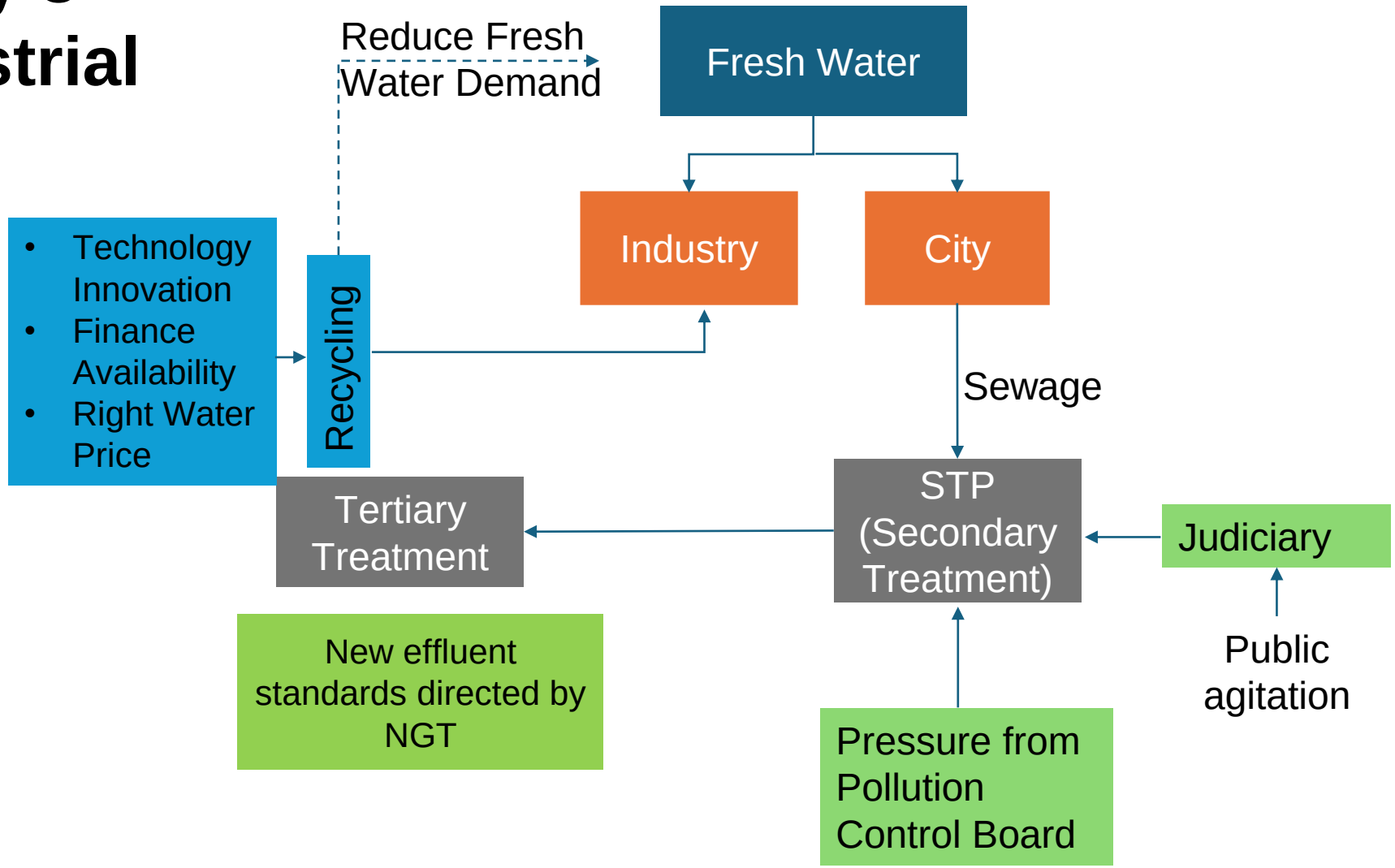
Driven by Policy
Directive by the Ministry of Road Transport and Highways

Plastic Waste in Paver Blocks

Recycling of City's Sewage for Industrial Use

Sewage Recycling Projects in Surat Municipal Corporation – 33% wastewater recycled to industries

ZLD systems at Tirupur Textile Industrial Cluster (Water and Salt Recovery)



Waste Pickers Associations

SWACH
A higher level of self-reliance

- Employment Generation
- Potential to Value Add through Extensions
- High rate of recycling
- Reduces burden to Urban Local Bodies

- Movement in Pune
- Collects ,sorts and segregates waste
- Waste pickers sell waste to scrap dealers to recover plastic

Timarpur Okhla WtE Plant

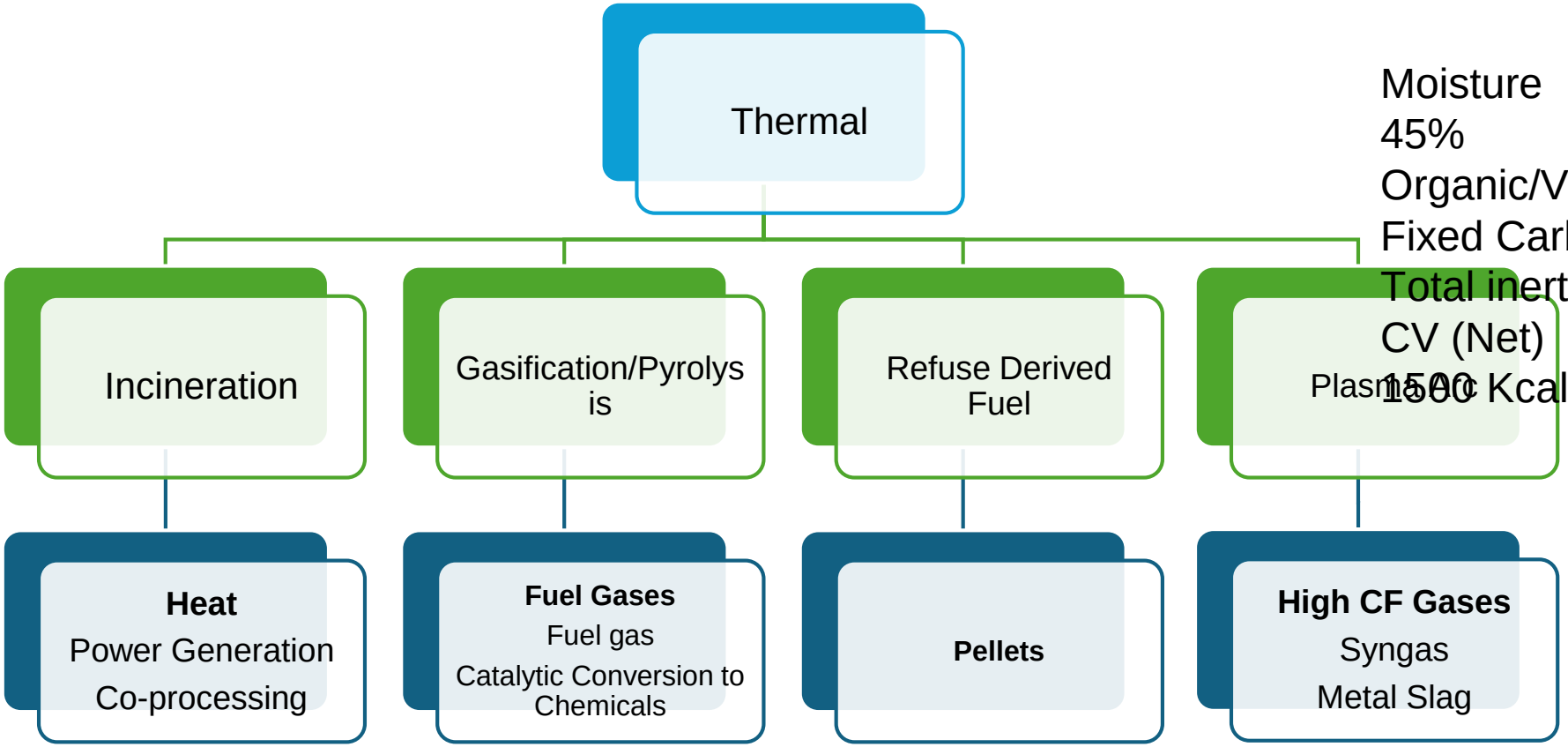
Key Aspects of the Timarpur-Okhla WtE Plant:

- **Capacity**: 1950 tons of MSW per day
- **Energy Output**: 23 MW
- **Technology**: Incineration technology to convert waste into energy, reducing waste volume by 90%.
- **Challenges Overcome**:
  - Opposition due to concerns over emissions, but with upgrades to air filtration systems, it now meets environmental standards.
  - Mixed waste without segregation

Success Factors:

- **Government Support:** Strong backing from local and central governments, including subsidies and waste supply guarantees.
- **Public-Private Partnership:** Collaboration between the New Delhi Municipal Council (NDMC) and private companies
- **Community Engagement**: Efforts were made to address local concerns about air pollution and engage the public in waste segregation efforts.

Available Technologies for Thermal Waste to Energy Conversion



Desirable range of waste characteristics:

Moisture	< 45%
Organic/VM	> 40%
Fixed Carbon	< 15%
Total inert	< 35%
CV (Net)	> 1500 Kcal/Kg

ReTuna Återbruksgalleria is a shopping mall in Sweden that sells only repaired or upcycled products

The trend is rising

Mission LiFE

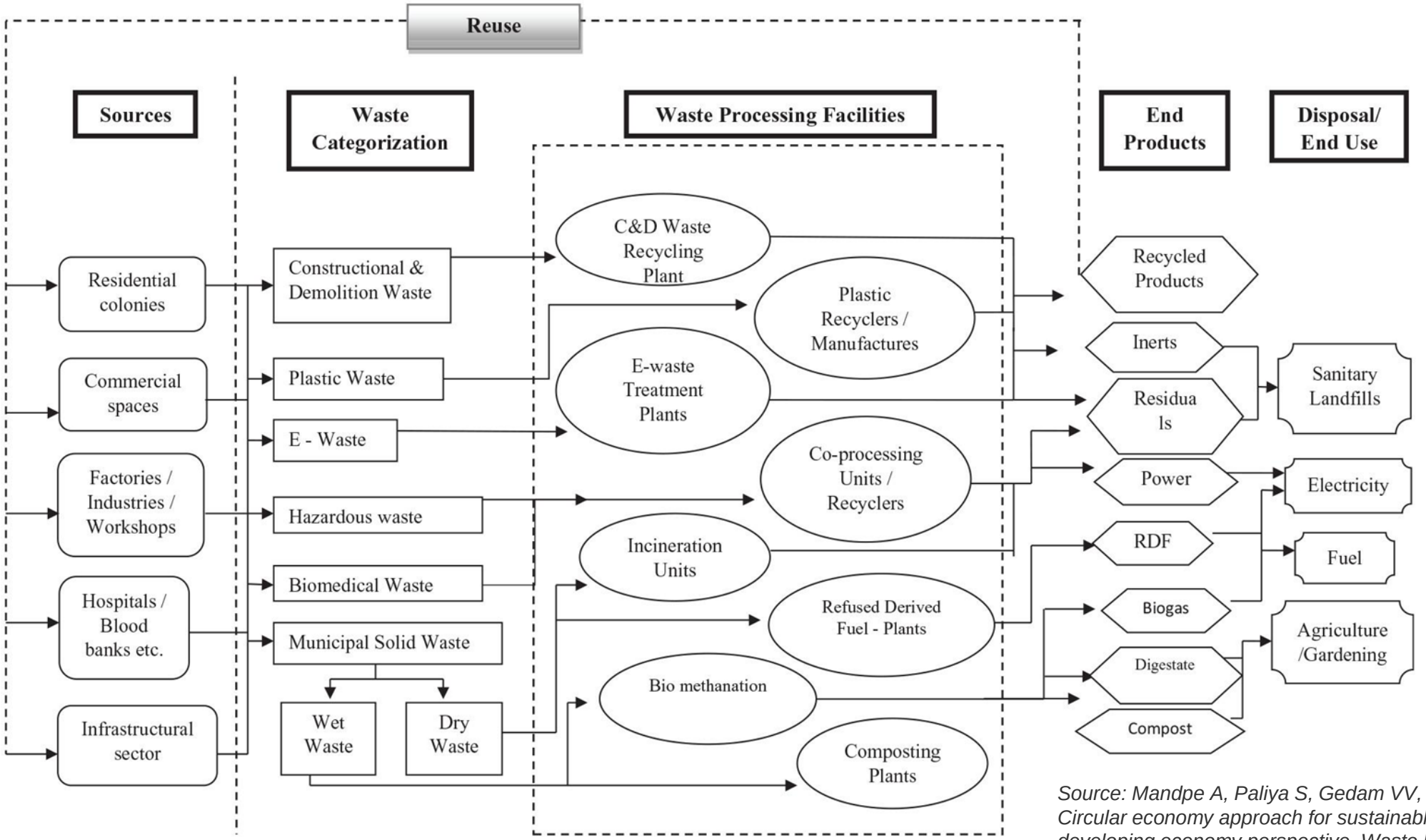
- At the 2021 UN Climate Change Conference (UNFCCC COP26), Hon'ble Prime Minister of India Shri Narendra Modi announced Mission LiFE, to bring individual behaviours at the forefront of the global climate action narrative.

- LiFE envisions **replacing the prevalent 'use-and-dispose' economy—governed by mindless and destructive consumption—with a circular economy, which would be defined by mindful and deliberate utilization.**
- The Mission intends to **nudge individuals to undertake simple acts in their daily lives** that can contribute significantly to climate change when embraced across the world.

LiFE
Lifestyle for Environment

- The Mission plans to create and nurture a global network of individuals, namely 'Pro-Planet People' (P3), who will have a shared commitment to adopt and promote environmentally friendly lifestyles.
- Through the P3 community, the Mission seeks to create an ecosystem that will reinforce and enable environmentally friendly behaviours to be self-sustainable.
- You can take a **21 day challenge pledge**

SWM plan embracing the CE approach and closing the loop: Suggestion for Nepal

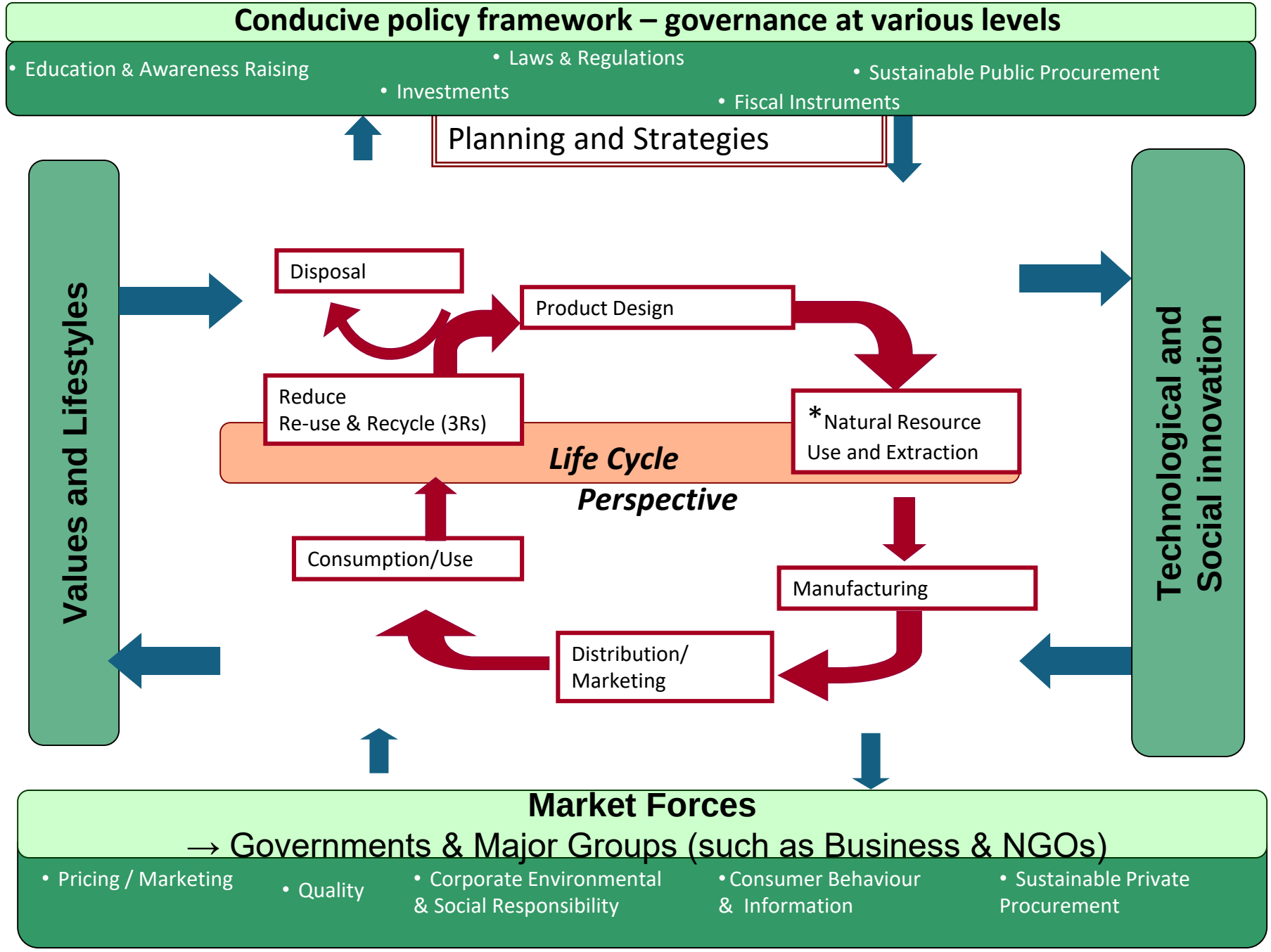


Source: Mandpe A, Paliya S, Gedam VV, Patel S, Tyagi L, Kumar S. Circular economy approach for sustainable solid waste management: A developing economy perspective. Waste Management & Research. 2023;41(3):499-511. doi:10.1177/0734242X221126718

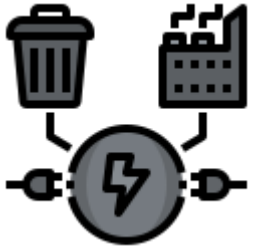
Strategies to Increase Waste Valorization

1. Promoting higher renewable energy generation and use through waste
2. Investment in common infrastructure and service provision to optimize resource use (e.g., steam networks)
3. Encouraging waste generators to create a symbiotic network and enabling waste and by-product exchange
4. Encouraging firms to integrate circular designs and use environmentally friendly technologies
5. Fostering establishment of recycling enterprises and sorting facilities providing services
6. Re-thinking business models for improved energy, water and waste management
7. Harnessing digital technologies to increase resource circularity and material exchange

Life Cycle Perspective Foundation of Circular Economy



Decarbonization Through Smart Waste Management



Waste-to-Energy (WtE)

Reduces GHG emissions by converting waste into energy, which can displace fossil fuel-based energy sources

Anaerobic Digestion

Cuts GHG emissions by converting organic waste into biogas. Prevents methane being released directly into the atmosphere from landfills

Waste Prevention

Reduces GHG emissions by minimizing the amount of waste generated in the first place

Recycling

Decreases GHG emissions by reducing the need for raw materials and energy-intensive processes to produce new products.

Composting

Lowers GHG emissions by breaking down organic waste into compost, which helps avoid methane emissions from landfills.

Waste economy should be viewed as *smart and sustainable material management*

It should lead to a *truly inclusive circular economy*

Its not only about technology, innovation, finance, policies and laws but it should rather be a people movement. *Such a transformation should be everybody's responsibility.*

'It's time to rethink what we consume and how we produce.'
We all have to be Future Ready

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