



National Circular Economy Framework

----- Roadmap for a Sustainable & Resilient India -----

First Edition | November 2023

Acknowledgement

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It is hoped that this framework will serve as a valuable resource for the Indian Environmental Sector, contributing significantly to the promotion of a Circular Economy in India.

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अजय के. सुद भारत सरकार के प्रमुख वैज्ञानिक सलाहकार



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MESSAGE

I extend my heartfelt congratulations to the CII for the successful development and launch of the inaugural edition of the National Circular Economy Framework (NCEF). The NCEF represents a significant milestone, embodying a comprehensive approach towards key materials pivotal to the circular economy in our country.

This framework is poised to strengthen the waste management system in India by identifying and validating innovative technology solutions and models, ultimately working towards achieving a zero landfill and zero waste nation. In alignment with the vision of the Government of India, this framework addresses various waste management domains, including technology demonstrations, community engagement, and serves as a comprehensive reference for all stakeholders, such as urban local bodies, government departments, technology companies, investors, and citizens seeking information on best practices.

It is crucial to emphasize that the Circular Economy, with its focus on the efficient use and reuse of resources and zero landfill of waste, resonates with our aspirations for a prosperous and equitable society while safeguarding the environment. The recent G20 declaration further underscores the pivotal role of the circular economy in achieving sustainable development, culminating in the launch of the Resource Efficiency and Circular Economy Industry Coalition (RECEIC). The National Circular Economy Framework (NCEF) aligns with the visionary goals set forth by the Hon'ble Prime Minister and the G20 declaration.

I commend the CII National Task Force on Waste to Worth for its initiatives on plastics, construction materials, electrical and electronic goods, as well as the dry and wet fractions of mixed municipal waste. This reflects development in understanding of the diverse challenges associated with these materials within the Indian context. The NCEF, with its emphasis on these critical areas, will undoubtedly serve as a foundational guide for industries and policymakers alike, fostering a circular economy that is both economically viable and environmentally sustainable.

I look forward to witness the envisaged impact of the National Circular Economy Framework on India's industrial landscape.

(Ajay K. Sood)

Dated: 28th November, 2023

Foreword from the **Chairman and Co-Chair**

Dear Members and Stakeholders.

We are delighted to share with you this expression of our shared commitment to fostering a Circular Economy in India, leveraging the nation's vast potential and rich cultural heritage of reduce, reuse, recycle, and recover. As a resource-intensive economy with a rapidly growing population, India can lead the way in decoupling economic growth from resource consumption and environmental harm by mainstreaming these principles.

The Circular Economy, emphasizing the efficient use and reuse of resources, aligns with our goals for a prosperous and equitable society while safeguarding the environment. This concept goes beyond mere recycling, contributing to waste reduction, resource security, and climate change mitigation.

The recent G20 declaration further underscores the critical role of the Circular Economy in achieving sustainable development, launching the Resource Efficiency and Circular Economy Industry Coalition (RECEIC). To propel this momentum, as a part of this framework, we recommend the establishment of the National Circular Economy Framework (NCEF), aligning with the vision set forth by the Hon'ble Prime Minister and the G20 declaration.

This framework focuses on sustainable green growth, transitioning from a linear economy to one that extends product life and minimizes waste, presenting opportunities for economic and industrial renewal. We are dedicated to supporting innovative Circular Economy projects that design out waste throughout the value chain; and contribute to environmental, social, and economic benefits.

As we move forward, the formation of a Stakeholder Board by CII will play a pivotal role in providing advisory services, facilitating networking, and connecting stakeholders for collaborative initiatives. Leveraging Cll's unparalleled reach into India Inc, we have been able to bring together a group of eminent subject matter experts and industry leaders to help guide and draft this framework.

The outlined objectives, including promoting a common understanding, raising awareness, and developing mechanisms for progress evaluation, aim to ensure a robust policy framework that supports and harmonizes Circular Economy projects. The policy will promote an integrated approach that will draw forth technological and design innovations that will redirect the markets towards responsible consumption.

Together, let us advance on this transformative journey toward a Circular Economy, working collaboratively to achieve our targets, reduce transition costs, and structure sustainable financing for a resilient and sustainable India.





Masood Mallick Chairman – Cll Task Force on Waste to Worth

Mr. Hrishit Shroff Co-chair – CII Task Force on Waste to Worth

Foreword from the **Director General, Cll**



Mr. Chandrajit Banerjee Director General, Cll

India is on a path of accelerated growth and Indian Industry has always been proponent of a philosophy of "Responsible Growth" where circularity, sustainability and mitigation of environmental challenges have been priority considerations.

The 1st edition of the CII National Circular Economy Framework (NCEF) reflects CII's endeavour towards promoting sustainability and circularity in waste management practices by industry. The CII National Task Force on Waste to Worth gives a special focus to waste management and handling, and the release of the NCEF represents one of its transformational initiatives under the "CII Waste to Worth Movement".

The NCEF a milestone, particularly in its comprehensive approach towards key materials critical to the Circular Economy. The focused attention on (i) plastics, (ii) construction materials, (iii) electrical and electronic wastes, and (iv) dry and wet fractions of mixed municipal waste highlights an understanding of the diverse challenges associated with these materials in the Indian context. Plastics, given their widespread use and environmental impact, demand urgent and innovative solutions. The inclusion of construction materials acknowledges the significant role this sector plays in resource consumption. Similarly, addressing the complexities of electrical and electronic goods showcases a forward-looking approach, considering the rapid technological advancements in our society. Lastly, the management of mixed municipal waste fractions, both dry and wet, underscores the need for a holistic waste management strategy.

CII's commitment to these key materials aligns seamlessly with the broader goals of advancing sustainability and resource efficiency in India. The CII National Circular Economy Framework, with its emphasis on these critical areas, will undoubtedly serve as a foundational guide for enterprises and policymakers alike, fostering a Circular Economy that is both economically viable and environmentally sustainable.

As we navigate the challenges of environmental uncertainties and climate changes, the CII National Circular Economy Framework stands as a promising guideline for creating a sustainable and resilient future.

Executive Summary: Advancing Circular Economy in India

India, a resource-intensive economy with a large and rapidly growing population, possesses immense potential to be a leader in the Circular Economy, thereby fostering sustainable growth and a more prosperous and equitable society. The Circular Economy goes beyond resource efficiency and recycling, and its adoption helps reduce waste, conserve resources, and mitigate climate change. Moving toward a Circular Economy helps meet India's NDC targets, UNSDGs, LiFE goals etc.

The recent G20 declaration highlights its critical role, leading to the formation of Resource Efficiency and Circular Economy Industry Coalition (RECEIC). To propel this momentum, a National Circular Economy Framework (NCEF) is proposed as an industry intiative. NCEF strives to provide a framework for developing new business models that aim to increase the value, use, and life of materials, products, and assets, and to design out waste from production and consumption.

The NCEF is divided into two parts. Part 1 establishes a comprehensive framework applicable to all focus materials: outlining the objectives; presenting the selection criteria for focus materials based on the extent of usage, environmental impact, and resource value potential; elaborating upon the enabling principles for implementation of NCEF focusing on prevention, upcycling, recycling, and energy recovery; setting up of the targets; and presenting the key strategies for implementation including policies and measures for effective implementation; and the processes for monitoring and evaluation.

Part 2 of the NCEF provides material-specific Circular Economy action plan(s) built upon the principles and strategies outlined in Part 1. This initial edition of the NCEF concentrates on plastics, construction materials, electrical and electronic goods, and the dry and wet fractions of mixed municipal waste. These materials were selected due to their significant potential for waste reduction, resource conservation, and environmental protection. As the NCEF matures and gains traction, material-specific action plans will be developed for a wider range of focus materials.

The key objectives of the NCEF include:

- Champion the Circular Economy through a life cycle assessment approach. •
- to drive collaboration, innovation, and action.
- Promote circular solutions for focus materials across various industries and value chains. •
- financing models, to empower partners and stakeholders.
- for Circular Economy initiatives.

This document serves as a concise guide for India's transition to a Circular Economy, emphasizing collaboration, awareness, and targeted actions for a sustainable and prosperous future.

Promote a shared understanding of the Circular Economy's principles, challenges, and opportunities

Develop targets for Circular Economy collaboration, including cost reduction strategies and sustainable

Establish a monitoring and evaluation mechanism to track progress and facilitate policy harmonization

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National **Circular Economy** Framework



Chaptei Significance of **Circular Economy for India**

1.1. Introduction

India, a resource-intensive economy with a large and rapidly growing population, has the potential to be a leader in the Circular Economy, given its rich cultural heritage of reuse, reduction, and repair. By promoting Circular Economy principles, India can decouple economic growth from resource consumption and environmental damage. This can lead to a more prosperous and equitable society, while also safeguarding the natural environment for future generations.

Circularity refers to the circular flow and efficient use and reuse of resources, materials, and products. The Circular Economy concept is gaining momentum as consumption and resource utilization increase to serve India's fastgrowing population with rising standards of living. The Circular Economy goes beyond resource efficiency and recycling, and its adoption helps reduce waste, conserve resources, and mitigate climate change, contributing to a more sustainable future for India.

Moving toward a Circular Economy helps meet the country's Nationally Determined Contribution (NDC) targets for reducing greenhouse gas emissions, United Nations Sustainable the Circular Economy. Development Goals (UNSDGs) commitments to responsible consumption and production, The economic model based on circularity aims

and the Mission Lifestyle for Environment (LiFE)'s goal of encouraging individuals to adopt environmentally conscious lifestyles. Even the G20 declaration held on September 9-10, 2023, at New Delhi agreed on the critical role played by the Circular Economy, extended producer responsibility, and resource efficiency in achieving sustainable development and launched the Resource Efficiency and Circular Economy Industry Coalition (RECEIC). The declaration committed to enhancing environmentally sound waste management, substantially reducing waste generation by 2030, and highlighting the importance of zero-waste initiatives.

To spur the momentum, there is a requirement for a framework that enables the achievement of the vision and mission enumerated by the Hon'ble Prime Minister and the G20 declaration. This framework must become an enabler for partners, especially industries, the business community, and public and private investors, so that the economic model becomes more lucrative and sustainable. This document is an attempt to present a welldefined National Circular Economy Framework (NCEF) to accelerate economic growth through

to focus on sustainable green growth, moving from a consumption and disposal-based linear economy to a system that extends the life of products and materials and minimises waste so that it has many environmental, climate, social and economic benefits. The aim is to increase lending to innovative Circular Economy projects that systematically design out waste, extend the life of assets and close material loops. The Circular Economy is also an opportunity for economic and industrial renewal with a corresponding increase in investments.

The document strives to provide a framework for developing new business models that aim to increase the value, use, and life of materials, products, and assets, and to design out waste from production and consumption. The document also aims to provide a broad framework for targets to be achieved, scale, and timeline for certain sectors, with an emphasis on the trade-off between new and recycled products from these identified sectors. These sectors are high-volume sectors that are expected to contribute high value in terms of both circularity and economy. These sectors are namely: Construction and Demolition Waste, E-waste, Plastic Waste, and Dry and Wet Municipal Solid Waste.

National Circular Economy Framework 15 Cll aims to form a Stakeholder Board in the coming days that will provide advisory services, be active in networking and sharing best practices, connect stakeholders, and facilitate access to finance for Circular Economy projects. In light of this, this document aims to:

> Outline the CII (industries) vision to spur the Circular Economy with a focus on life cycle assessment.

- 2. Promote a common understanding of the Circular Economy, as well as its challenges and opportunities, among project partners, with a focus on encouraging collaborative innovations, technology development, and on ground actions;
- 3. Raise awareness about circular solutions among project promoters and other stakeholders for sectors such as construction and demolition waste, electronic waste, plastic waste, and dry and wet municipal solid waste, and collaborate across sectors and value chains.
- Develop a mechanism for recordkeeping that helps evaluate the monitoring of 4 progress. The objective is to have a proper policy framework that is ready for review and is updated. This will help to facilitate and harmonize due diligence and reporting related to Circular Economy projects with project partners.
- 5. Develop targets for partners and stakeholders engaged in collaborating to contribute to the Circular Economy by suggesting methods to reduce the cost of transition to circularity and structuring project pipelines to ensure sustainable financing.

The following sections will explore the linear and Circular Economy in more detail, highlighting the key differences between the two models, the importance of circularity for India, and the benefits of transitioning to a Circular Economy.

1.2. Linear Economy

a. What is Linear Economy?

The linear economy is an economic system that operates on a "take-make-waste" model. In this system, raw materials and resources are extracted from the environment to manufacture products. These products are then consumed and eventually discarded as waste at the end of their lifecycle. This approach is considered unsustainable as it assumes that resources are abundant and can be continuously extracted without significant consequences. However, as the demand for goods and services continues to rise, this linear model leads to resource depletion, environmental degradation, biodiversity loss, and a growing waste problem. Figure 1-1 presents different stages of linear economy:











The linear economy is characterized by the following stages:

- Resource Extraction: The first stage of the linear economy involves the extraction of a wide range of resources from the natural world, including fossil fuels, minerals, and trees from forests etc. through different processes such as mining, logging etc. Extraction of resources is foundational to the production of goods and services. Extraction of resources can have a number of negative impacts on the environment, including habitat destruction, deforestation, air and water pollution etc.
- Transformation (Production and Distribution): The transformation of resources into products is the second stage of the linear economy. This stage involves the processing of raw materials into finished goods. This spans everything from the manufacturing of automobiles, textiles, and electronics to the production of food that sustains populations worldwide. The transformation of resources into products can also have a number of negative impacts on the environment, including greenhouse gas emissions, waste generation etc.
- Consumption: The consumption of products is the third and most important stage of the linear economy, as it drives economic growth and sustains the demand for goods and services. The transformed products are consumed by individuals, businesses, and institutions etc. However, this unidirectional flow of consumption poses significant challenges for sustainability.
- **Disposal:** Disposal is the last stage of the linear economy. Products are disposed of upon reaching the end of their lifespan. The waste typically ends up in dumpsites, in scientific landfills or disposed of through incineration. This step, often seen as the conclusion of a product's journey, marks the termination of its utility in the linear economy. The disposal of waste, especially non-biodegradable materials, poses significant environmental challenges.

b. Negative Environmental and Social Impacts Associated with Linear Economy

The linear economy causes a wide range of negative impacts, both on the environment and society at large. Some of the negative impacts are as listed below:

- **Resource Depletion:** Continuous demand for resources places immense pressure on the natural world, leading to the depletion of finite natural resources such as fossil fuels, metals, minerals, and timber. The unsustainable rate at which these resources are extracted far exceeds the rate of their formation, leading to depletion of resources. As resources become scarce, the price of goods and services is likely to increase, making them unaffordable for people on low income.
- Habitat Destruction and Deforestation: The clearing of land for mining and other resource extraction activities destroy habitats for plants and animals. Also, the logging of trees for timber and other products lead to deforestation. Habitat destruction and deforestation lead to loss of biodiversity, climate change, soil erosion etc.
- Pollution: Pollution is caused at all stages of the linear economy, from resource extraction, including mining, to the manufacturing of products, their transportation, and their disposal after their useful life. These activities emit pollutants into the air, soil, and water, resulting in air pollution, water contamination, and the degradation of ecosystems.
- Waste Generation: As products reach the end of their lifecycle, they are discarded as waste, marking the termination of their utility. Waste gets generated during the resource extraction and manufacturing of products such as metal scrap, hazardous waste etc. The waste ends up in landfills, incinerators, or even in dumpsites or natural environments, contributing to environmental degradation.
- Increased Inequality: The linear economy tends to widen social inequality. The wealthy, who typically consume more resources and produce more waste, create a cycle of environmental injustice, as marginalized communities often bear the brunt of the negative impacts associated with resource extraction, pollution, and waste disposal. For example, the mining of coal and other minerals often takes place in tribal areas, where people are exposed to high levels of air and water pollution, which can lead to health problems such as respiratory issues. Similarly, most dumpsites or waste disposal sites are located near poor and marginalized communities, who are exposed to harmful pollutants from waste.



1.3. Circular Economy



a. What is Circular Economy?

A Circular Economy is an economic system that aims to reduce waste and pollution by keeping products and materials in use for as long as possible. It is a closed-loop system that minimizes the use of virgin resources and maximizes the reuse and recycling of materials. The Circular Economy takes a holistic approach to economic development, considering the environmental and social impacts of all economic activities. In a fully Circular Economy, waste is minimized by designing products and industrial processes so that resources are kept in use in a perpetual flow, and by ensuring that unavoidable waste or residues are recycled or recovered.

The Circular Economy is characterized by the following:

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Reduce: The central idea of the Circular Economy is to reduce both resource consumption and waste production. This foundation encourages a shift towards a more mindful utilization of resources, thereby mitigating the impact on the environment.



Reuse: The principle 'reuse' promotes usage of products and materials for as long as possible. This curbs the need for incessant production thereby minimizes resource extraction and manufacturing.



Repair: In the Circular Economy, the practice of repair takes precedence over replacement. This not only extends the utility of products but also leads to a culture of resourcefulness and sustainability, countering the prevalent throwaway culture.



Remanufacture: The concept of remanufacture breathes new life into used materials. Through this process, products are recreated from discarded components, demonstrating the profound potential for regeneration within our existing resources.



Upcycle: Upcycling is a process of transforming waste materials or products into new materials or objects of higher quality or value. It is a key principle of the Circular Economy, which aims to keep resources in use for as long as possible and to minimize waste.



Recycle: Recycling process entails the conversion of materials into new products, ensuring that resources are continually utilized rather than consigned to landfills or incineration.

b. The CONCEPT of Circular Economy

The Ellen MacArthur Foundation has described system aims at maximising the use of pure, nontoxic materials and products designed to be the Circular Economy in a diagram shown in Figure 1-2, which comprises two cycles: a biological easily maintained, reused, repaired or refurbished cycle, in which residues are returned to nature to extend their useful life, and later to be easily after use, and a technical cycle, where products, disassembled and recycled into new products, components or materials are designed and with minimization of wastage at all stages of the marketed to minimize wastage. Such a circular extraction-production-consumption cycle.



Figure 1: The Ellen MacArthur Circular Economy Diagram

This circular way of producing and consuming as follows: new products and assets are designed disconnects economic growth from the extraction and produced in a way that reduces virgin material and consumption of materials. As such, a Circular consumption and waste generation; new business Economy offers a way to hedge future resource and models and strategies are applied that optimize material supply chain risks for companies and increase capacity utilisation and extend the useful life of their resilience to decreasing supplies and increasing products and assets; and resource and material loops price uncertainty and volatility. This will reduce are closed through recycling of end-of-life products resource dependency, spur innovation and increase and materials. It is a system that can help to conserve competitiveness. resources, reduce pollution, and create a more equitable society. Figure 1-3 below presents how to In summary, the Circular Economy can be defined mainstream/implement Circular Economy.



Figure 1-3: Implementation of Circular Economy

c. Positive Impacts Associated with Circular Economy:

The Circular Economy has the potential to have a number of positive impacts, including:

- **Reduced Environmental Impact:** As the Circular Economy aims to keep resources in use for as long as possible, the need for extraction of resources and disposal of waste gets minimized. This helps reduce greenhouse gas emissions, pollution, and waste.
- Increased Resource Efficiency: The Circular Economy can help to conserve resources by reducing our reliance on virgin materials. This is because the Circular Economy encourages the reuse, repair, and recycling of materials.
- **Economic Growth:** The Circular Economy opens up jobs and business opportunities, as it requires new technologies and business models to be developed.
- **Social Benefits:** The Circular Economy can help to create a more just and equitable society. This is because the Circular Economy can create jobs for people from marginalized groups and can help to reduce environmental inequality.

Circular Economy helps reduce our ecological footprint, create new jobs, and build a more sustainable future.

1.4. Linear Economy Vs. Circular Economy

Unlike linear economy, the Circular Economy considers the entire lifecycle of a product, from its creation to its eventual disposal or reuse. Circular Economy prioritizes resource efficiency, reuse, remanufacturing, refurbishing, recycling etc., with an aim to break free from the unsustainable linear pattern. Table 1-1 below presents the key differences between linear economy and Circular Economy.

Feature	Linear Economy	Circular Economy
Approach	Take-make-waste	Reduce-reuse-recycle
Resource use	Resources are extracted, used, and disposed of as waste.	Resources are kept in use for as long as possible, extracting the maximum value from them while in use, then recovering and regenerating products and materials at the end of their service life.
Waste generation	High levels of waste are generated.	Waste generation is minimized.
Pollution	Pollution is generated throughout the lifecycle of products.	Pollution is minimized through the use of cleaner technologies and processes.
Economic model	Based on the sale of goods.	Based on the provision of services.
Sustainability Perspective	Short-term gains	Long-term resilience

The Circular Economy contributes to the achievement of multiple SDGs by virtue of minimizing waste generation and pollution, creating new jobs and businesses, and reducing the usage of resources.



1.5. Importance of Circular Economy for India

India, being a resource-intensive economy, with limited access to natural resources such as water, land, and minerals, need to transition to Circular Economy to reduce its reliance on new resources by promoting the reuse and recycling of materials. India can take advantage of all the benefits that Circular Economy can bring, including job creation, economic growth, reduction in pollution, improvement in public health and well-being etc. This section presents the importance of Circular Economy for India.

a. Circularity in Indian Culture: Traditions and Values

Circularity in Indian culture is deeply rooted in its traditions and values. For centuries, Indians have practiced sustainable living and resource conservation, guided by their beliefs and customs. Some of the key principles of circularity that are embedded in Indian culture include:

- Respect for Nature: Indian culture teaches us to respect and cherish nature. This is reflected in traditional practices such as worshiping trees and rivers, and celebrating festivals such as Vasant Panchami and Chhath Puja, which are dedicated to nature. This respect for nature translates into a commitment to protecting and preserving the environment, which is essential for a Circular Economy.
- R Minimalism: Indian culture emphasizes simplicity and minimalism. This is reflected in traditional practices such as yoga and meditation, which teach us to focus on the essentials and let go of unnecessary possessions. This minimalist lifestyle helps to reduce waste and consumption, which is another key principle of a Circular Economy.
- Sharing and Community: Indian culture is known for its strong sense of community ((25)) <u>é</u>gé and sharing. This is reflected in traditional practices such as joint families, community kitchens, and religious festivals. This culture of sharing helps to reduce waste and promote the reuse of resources.

Here are some specific examples of circular practices in Indian culture:



Agriculture: Traditional Indian agriculture is based on sustainable practices such as crop rotation, utilization of cow dung as fertilizer etc. These practices help to improve soil health, reduce water consumption, and minimize waste.

- Food: Leftover rice and lentils are used to make other dishes such as khichdi and upma. Also, food scraps are used to make compost or animal feed.
- Textiles: Indians have traditionally worn clothing made from natural fibers, such as cotton and wool. These fibers are durable and can be reused and recycled multiple times.



Crafts: Indian crafts are known for their use of recycled and upcycled materials. For example, artisans often use discarded fabrics, paper, and metal to create new products such as bags, and home decor.



Reuse of Products: Many products, such as glass bottles and plastic containers, are reused either for their intended purpose or for some other purpose, until the product reaches its absolute end of life.

Despite the many strengths of Indian culture in terms of circularity, there are also some challenges that need to be addressed. For example, there is a growing trend of consumerism and overconsumption in India. By reviving and modernizing these traditional practices, India can build a more sustainable and resilient future.

India's Lifestyle for Environment (LiFE) initiative, a global mass movement launched by Prime Minister Narendra Modi, aims to nudge individual and community behavioural change to tackle the climate crisis and protect the environment. LiFE is inspired by India's traditional practices and values, which emphasize sustainability and harmony with nature. The initiative is based on the following principles:

Mindful And Deliberate Utilization:

LiFE encourages individuals to be mindful of their LiFE aims to create a community of "pro-planet consumption and to use resources deliberately. people" who are committed to living sustainable This can be done by adopting simple practices lifestyles. This community can work together to such as reducing waste, recycling, and using raise awareness of environmental issues and to energy-efficient appliances. promote sustainable practices.

Mission LiFE intends to influence the demand and supply dynamics and the the long-term vision of Mission LiFE is to trigger shifts in large-scale industrial and government policies that can support both sustainable consumption and production.

c. LiFE Themes

Mission LiFE seeks to channel the efforts of individuals and communities into a global mass movement of positive behavioural change. There are seven themes in Mission LiFE, as presented in Figure 1-3 below:



Pro-Planet People:

d. How Circular Economy Can Support LiFE Initiative?

The Circular Economy can support the LiFE initiative in a number of ways. For example, it can help to:





Reduce waste generation

The Circular Economy focuses on reducing waste generation at the source. This can be done by designing products for durability and repairability, by encouraging and consumers to reuse and recycle products. This aligns with the LiFE principle of mindful and deliberate utilization of resources.



Promote sustainable consumption

The Circular Economy promotes sustainable consumption by shifting the focus from product ownership to product access. This can be done through business models such as product-as-a-service and leasing. This aligns with the LiFE principle of pro-planet people, as it encourages consumers to make choices that are good for the environment.

Circular Economy The creates new jobs and businesses in sectors such as recycling, repair, and refurbishment. This aligns with the LiFE principle of LiFE, not just live, as it shows that sustainable living can be compatible with economic growth and prosperity.

Create new jobs and businesses

1.6. Imperative for National Circular Economy Framework in India

India, the world's third-largest energy consumer, is facing a growing resource dilemma. With a rapidly expanding population, urbanization, and industrial growth, the country's resource consumption is projected to soar in the coming decades, putting immense pressure on both domestic resources and the environment. This increasing resource intensity, if left unchecked, could have far-reaching economic, environmental, and social consequences.

India's import dependence for critical resources is a cause for concern. The country relies heavily on imports to meet its demand for essential resources, including:

- Lithium: India imports nearly 100% of its lithium, a crucial component in electric vehicle batteries. •
- **Cobalt:** India imports 90% of its cobalt, another essential mineral for high-performance batteries.
- Nickel: India imports 80% of its nickel, a critical component in stainless steel production. •
- Crude Oil: Over 80% of India's crude oil demand is met through imports.
- Coking Coal: India imports 70% of its coking coal, essential for steelmaking.
- Copper: India imports 50% of its copper, a vital material for electrical wiring and construction.



At the same time, India's resource consumption is projected to grow exponentially between now and 2075. By 2075, India's energy demand is expected to increase by 150-200%, driven by rising incomes, infrastructure development, and a growing middle class. Similarly, the demand for metals is anticipated to surge by 300%, while the demand for non-metallic minerals is expected to double.

The increased mining and resource extraction associated with India's growing consumption will have significant environmental and carbon footprint related consequences. Mining activities contribute to deforestation, habitat destruction, air and water pollution, and soil degradation. Additionally, the processing and transportation of resources release greenhouse gases, exacerbating climate change.

Circular Economy offers a compelling solution to India's resource dilemma. By adopting circular practices, India can minimize resource extraction, maximize resource utilization, and extend resource life through reuse, repair, and recycling. This transition towards a Circular Economy can bring about substantial economic, environmental, and social benefits:

Economic Value Creation:

Circular Economy practices can create new jobs and businesses in resource recovery, remanufacturing, and sustainable product design, fostering economic growth and innovation.

Estimated job creation potential: 10 million jobs by 2050.

Projected economic value: \$2 trillion by 2050.

Carbon Emission Reduction:

By reducing resource extraction and waste generation, Circular Economy can significantly lower India's carbon footprint, contributing to climate change mitigation efforts.

Potential carbon emission reduction: 40% by 2050.

Contribution to climate goals:

Aligns with India's commitment to reducing emissions by 30-35% by 2030.



India's resource dilemma demands a paradigm shift in resource management. Circular Economy offers a transformative approach that can address the challenges of import dependence, environmental impact, and resource scarcity while creating economic opportunities, fostering sustainable development, and aligning with India's vision of Atmanirbhar Bharat. By embracing circularity, India can secure a future of resource abundance, environmental sustainability, and economic prosperity.

Environmental Preservation:

Circular Economy can minimize environmental damage by reducing the need for new resource extraction, preventing pollution, and conserving natural ecosystems.

Reduced waste generation: 50% reduction in waste generation by 2050.

Water conservation: 20% reduction in water consumption by 2050.

Biodiversity protection:

Preservation of natural habitats and ecosystems.

Reduced Import Dependence and Resource Security:

Circular Economy can enhance India's resource security by reducing the need for imports and promoting domestic resource efficiency.

Considering the imperative for Circular Economy, NITI Aayog, in consultation with the Ministry of Environment and Forest and Climate Change, identified 11 areas to facilitate transitioning from linear to Circular Economy and to give an impetus to India's Aatma Nirbhar Bharat Abhiyaan. The identified areas include:

	COPUE TAL	
Municipal Solid Waste and Liquid Waste	Scrap Metal (ferrous and non-ferrous)	Lithium Ion (Li-ion) Batteries
Tyre and Rubber Recycling	Gypsum Waste	End-of-life Vehicles (ELVs)
Electronic Waste	Toxic and Hazardous Industrial Waste	Used Oil Waste (generated from tools and machines)
Agriculture Waste	Solar Panels	



In addition to the above, the following factors also act as key enablers/catalysts for Circular Economy:

Technological Development And Advancement:

Every day, there is a change in technology that spurs the development of IoT and big data tools. This is a big boost and enabler for the spur of Circular Economy business models. These models can enable the reuse and remanufacturing of resources, and bring in innovation in tracking products or materials during their life cycle to enable extended use/life and maintain the highest possible value. With the advancement in production, material science, manufacturing, and artificial intelligence, the reuse, design, and manufacturing capabilities can bring about drastic changes in circularity and its business model.

Urbanisation:

India is urbanizing at a rate of 1.5% per year, with approximately one-third of the population living in cities as of 2021. This trend is expected to continue, with an estimated 40-41% of the population living in urban areas by 2030. Urbanization presents both circularity opportunities and challenges for India.

These states have a number of factors in place that make them conducive to the Circular Economy, including:





Large Populations:

These states have large populations, which means there is a large market for recycled products and services.

Strong Industrial Bases: These states have strong industrial bases. which generate a lot of waste.

This waste can be converted into valuable resources through the Circular Economy.





Government Support:

These states have governments that are supportive of the Circular Economy. They have introduced policies and regulations that support the development of the Circular Economy.



Existing Infrastructure:

These states have existing infrastructure that can be used to support the Circular Economy. For example, they have waste management systems and recycling facilities.

Here are some specific examples of Circular Economy initiatives that are being implemented in different states in India:

- Maharashtra Plastic Waste Management Rules, 2018, which require all producers and brand owners of plastic products to collect and recycle their products.
- Gujarat Industrial Policy, 2020, which provides incentives to businesses that adopt circular practices.
- Tamil Nadu Green Building Policy, 2014, which mandates the use of recycled materials in the construction of new buildings.
- Karnataka State Policy on Solid Waste Management, 2012, which promotes waste reduction, reuse, and recycling.
- Andhra Pradesh State Policy on Renewable Energy, 2015, which promotes the use of recycled materials in the generation of renewable energy.
- Telangana State Industrial Policy, 2015, which provides incentives to businesses that adopt circular practices.
- Haryana State Waste Management Rules, 2019, which require all generators of waste to segregate and dispose of their waste in a sustainable manner.
- Rajasthan State Plastic Waste Management Rules, 2019, which require all producers and brand owners of plastic products to collect and recycle their products.
- Uttar Pradesh State Waste Management Rules, 2019, which require all generators of waste to segregate and dispose of their waste in a sustainable manner.
- Madhya Pradesh State Plastic Waste Management Rules, 2019, which require all producers and brand owners of plastic products to collect and recycle their products.
- West Bengal State Plastic Waste Management Rules, 2019, which require all producers and brand owners of plastic products to collect and recycle their products.

1.7. Challenges for Transition to Circular Economy

Here are some of the challenges that need to be addressed in order to transition to a Circular Economy:

- Lack Of Awareness: Many businesses and consumers are not aware of the Circular Economy or its benefits.
- Lack Of Infrastructure And Investment: The infrastructure needed to support a Circular Economy, such as recycling and composting facilities, is not yet in place in many places. Also, there is limited investment in new technologies for product design, manufacturing, and repair.
- Regulatory/Policy Barriers: Some government policies can discourage businesses from adopting Circular Economy practices.

Despite the challenges, the transition to a Circular Economy is well underway. Several businesses and governments are already implementing Circular Economy principles, and as its adoption spreads, its benefits will become more evident. A well-defined National Circular Economy Framework is essential to accelerate this transition.

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2.1. Introduction

National Circular Economy Framework (NCEF) provides a clear and consistent vision for the transition to a Circular Economy. This can help to align the efforts of government, businesses, and the society towards common goals. There are many compelling reasons to introduce a framework on Circular Economy at a national level to reap a wide range of economic, environmental, and social benefits.

The NCEF attempts to provide key strategies to overcome the challenges such as:

(a) lack of markets for recycled products;

(b) lack of awareness and understanding of the Circular Economy concept;

(c) lack of infrastructure for waste collection, sorting, and recycling etc.

The National Circular Economy Framework is a roadmap for India to transition to a more sustainable and developed economy. By implementing the framework, India can reduce waste, increase resource efficiency, and create a more sustainable future.

2.2. Objectives of NCEF

The NCEF is a roadmap for India to transition to a more sustainable economy. By implementing the framework, India can reduce waste, increase resource efficiency, and create a more sustainable future for its citizens. The National Circular Economy Framework (NCEF) helps: (a) reduce reliance on imported resources; (b) decouple economic growth from resource consumption; (c) reduce resource consumption and pollution; (d) enhance resource security; (e) reduce costs and improve competitiveness; [f] attract investments; [f] enhance public health; [g] create job opportunities.

2.3. Focus Materials

Focusing on key materials for the initial implementation of the National Circular Economy Framework [NCEF] is essential before expanding the scope to include more materials in the near future. The materials listed below present significant scale of resource value opportunity and have a higher environmental impact. Addressing these materials can yield substantial benefits in terms of waste reduction, resource conservation, and environmental protection:

Plastics Construction Materials



Electrical and Electronic Goods

Moving forward, additional materials can be incorporated within this framework to enhance emphasis.

2.4. Principles

The NCEF is based on the following four principles - Prevention, Upcycling, Recycling, and Energy Recovery, as detailed below:



Prevention: The first priority is to prevent waste from being generated in the first place. This can be done through product design, reuse, repair, refurbishing and remanufacturing.

Products should be designed to be durable, reusable, reparable, refurbishing and remanufacturing-friendly. This can be done by using high-quality materials, designing for modularity, and making it easy to disassemble and repair products.

Reuse

Products should be reused whenever possible. This can be done through product-as-a-service models, rental and sharing schemes etc.

Repair, Refurbishing, And Remanufacturing





Mixed Municipal Waste - Wet Fraction

Product Design And Life Extension

Products should be repaired, refurbished, and

remanufactured whenever possible. This can be done by

making spare parts and repair manuals available, and by

providing financial incentives for repair and refurbishment.



A A

Upcycling: Waste should be upcycled whenever possible. This means converting waste into new products of higher value. For example, plastic waste can be upcycled into new plastic products, or food waste can be upcycled into compost or animal feed.

Recycling: Waste should be recycled whenever possible. This means converting waste back into materials that can be used to make new products. For example, paper waste can be recycled into new paper products, and metal waste can be recycled into new metal products.

 (\mathfrak{F})

Energy Recovery: Waste that cannot be recycled or upcycled should be used to generate energy. This can be done by burning waste to generate electricity, or by converting waste to biogas. Energy recovery can help to reduce the amount of waste that is sent to landfills and incinerators; However, it is important to note that energy recovery is not a substitute for prevention, reuse, and upcycling, as it still generates some pollution and greenhouse gas emissions.

The ultimate goal of the Circular Economy is to achieve zero waste. This means that no waste is sent to landfills or incinerators. This can be achieved through a combination of the above principles.



Choice of Application of Principle(s)

'Retained Value' is a measure of the value that is retained in a product or material after it has been used. It is calculated as the percentage of the original value of the product or material that is still present after it has been used. The retained value of products and materials varies depending on the product or material and the method used to extend its life. In general, reuse, repair, refurbishment, and remanufacture have a higher retained value than recycling. The choice of right method (reuse, repair, refurbish etc.) shall be the one that will extend the life of the product or material while maximizing the retained value.

2.5. Targets

Targets provide a clear roadmap for all the stakeholders to work towards specific goals in the transition to a Circular Economy. They establish a shared vision and direction for sustainable economic development, providing a basis for measuring the effectiveness of the policies and other measures. By setting targets, stakeholders are held accountable for their contribution, encouraging long-term planning and strategic thinking.

NCEF intends to set targets for India to reduce waste, increase resource efficiency, and create a more sustainable economy. The respective chapter in Part 2 of the NCEF [Circular Economy Action Plan for Focus Materials) defines targets for each focus material. Both guantitative and gualitative targets are set for each focus material, and these targets are periodically reviewed and adjusted to reflect evolving circumstances and emerging opportunities. The list of possible targets is presented below:

- Reduction in use of virgin materials
- Reduction in waste generation at source
- Increase in the proportion of products desig •
- Increase in recycling/resource recovery rate
- Extended Producer Responsibility (EPR) targe
- Circular procurement targets (for government
- Creation of new jobs and businesses

•

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- Development and implementation of policie .
- Promotion of innovation in Circular Economy
- Creation of supportive ecosystem, including
- Community engagement and education

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nt agencies and large corporations)
es/regulations to support Circular Economy.
v technologies and business models.
access to finance and infrastructure.

2.6. Key Strategies for Implementation - Policies and Measures

The successful implementation of the NCEF in India requires a multi-dimensional approach that engages all stakeholders, drives innovation, and aligns policies and regulations. By employing these key strategies, India can forge a path towards a more sustainable, efficient, and resilient Circular Economy, ultimately benefiting both the environment and the economy. The following key strategies are proposed for successful implementation of NCEF across various sectors:



Regulations: The government could strengthen existing regulations or introduce new regulations that require businesses to adopt Circular Economy practices such as reduction of waste, increase of resource efficiency etc.

- Incentives: The government could provide incentives to businesses that adopt Circular ₹) 1.2 Economy practices (tax breaks, subsidies, and/ or grants etc.). The incentives can be financial, non-financial, and regulatory incentives.
- A. Public Awareness: The government could raise public awareness of the Circular Economy and \square the benefits of adopting Circular Economy practices. This could be done through education campaigns, workshops, and other outreach activities.
- R Investment in Research and Development: The government can either invest or facilitate investments in R&D to develop and deploy innovative technologies and solutions that support circularity. It shall provide incentives for businesses and start-ups to innovate in areas like recycling, renewable energy, and sustainable materials.
 - Promotion of Public-Private Partnerships (PPPs): PPPs can play an important role in accelerating the transition to a Circular Economy. By bringing together the resources, expertise, and innovation of both the public and private sectors, PPPs can help to develop and implement Circular Economy solutions at scale.

Circular Economy Knowledge Network: The network can serve as a platform for sharing knowledge and best practices, facilitating collaboration and innovation, and building capacity. The network can host regular events, develop and maintain a knowledge base, facilitate formation of working groups and partnerships etc.

Circular Economy Parks: Circular Economy parks, also known as eco-industrial parks or resource recovery parks, may be established in different parts of the country. The Circular Economy parks are designated areas designed to promote resource efficiency and waste reduction through collaborative efforts among businesses and other stakeholders. These parks provide a physical infrastructure and supportive environment for businesses to adopt Circular Economy principles, such as: industrial symbiosis, circular supply chain management, waste valorization, access to shared infrastructure etc.



Institutional Framework: National Circular Economy Authority (NCEA) may be established different industries and agencies, reform the regulations to make them more conducive to the Circular Economy, invest in research and development etc.



To ensure the successful implementation of NCEF, the above key strategies must be employed across various sectors and stakeholders. Chapter 4 presents each of the above key strategies in detail.

2.7. Monitoring And Evaluation

Monitoring involves collecting data on the implementation of the NCEF and its impacts. The data shall be collected regularly and should be disaggregated by the focus material, sector, region, and other relevant criteria. Evaluation involves analysing the data to assess the progress of the framework, identify challenges, and make recommendations for improvement, based on clear and transparent criteria.

A robust Monitoring and Evaluation (M&E) system (including regular reporting on key performance indicators and outcomes for each focus material) needs to be implemented to track the progress of NCEF. M&E can be conducted by the government, professional organizations, academia etc. It is important to ensure that all stakeholders are involved in the M&E process, so that the data collected is comprehensive and representative.

The data collected for M&E can be used to: (a) track progress towards the 'targets' set by the NCEF for each of the focus material; (b) identify challenges and areas for improvement; (c) inform decisionmaking about the implementation of the framework; and (d) communicate the progress and impacts of the framework to different stakeholders. Based on the outcome of the M&E, the NCEF may be revised to reflect evolving circumstances and emerging opportunities. M&E is very critical to ensure that the NCEF is successful in achieving its goals and objectives.

2.8. Next Steps

It is important to take the following steps to ensure the NCEF remains relevant and effective in the long term, and that it is able to adapt to changing circumstances:

- Revision of NCEF: The NCEF shall be revised periodically to reflect evolving circumstances and made.
- Stakeholder Engagement: Multi-stakeholder engagement shall be carried out regularly to address the key challenges identified in implementing the NCEF and achieving its objectives.
- economic development.

References:



emerging opportunities based on learnings from M&E, stakeholder engagement, tracking global trends, and identifying emerging technologies and solutions. Also, the scope of NCEF shall be expanded from time to time to cover new focus materials based on the learnings and the progress

Integration Of Circular Economy Into Other Policies And Programs: Efforts shall be put in place to align the Circular Economy with other national priorities, such as climate change mitigation or

Circular Transition Indicators V3.0 Metrics for business, by business by World Business Council for

Chapter 3 Implementation of NCEF -**Enabling Principles**

3.1. Introduction

The NCEF helps India transition from linear economy to Circular Economy by providing a roadmap for conservation of resources, reduction in reliance on virgin materials, reduction in waste and ecological footprint, creation of jobs and more equitable society. The successful implementation of an NCEF requires a number of enabling principles, which are the foundation on which the framework is built.

The four enabling principles for implementation of the NCEF are: Prevention, Upcycling, Recycling, and Energy Recovery. These four principles can be spearhead at a faster pace only when government and companies rethink not only their use of resources but also to redesign and adopt new business models based on dematerialization, longevity, refurbishment, remanufacturing, capacity sharing, and increased reuse and recycling. Reference is often made to three circular business model categories, each of which focuses on a different phase of the value chain: (a) the design and manufacturing phase; (b) the use phase; and (c) the value recovery phase. These different business models can be illustrated in what is called a Value Hill, shown in Figure 3-1.





Figure 3-1: Circular Economy business models in the Value Hill2 Elisa Achterberg, Jeroen Hinfelaar, Nancy Bocken, "The Value Hill Business Model Tool: identifying gaps and opportunities in a circular network" (2016)

3.2. Prevention

Prevention is the most important principle of the Circular Economy as the first priority is to prevent waste from being generated. This can be achieved through: (a) product design and life extension; (b) reuse; and (c) repair, refurbishing and remanufacturing. This mainly comes from optimal use models. It focuses on the development of existing or new products and processes that seek to optimize circularity. Products are designed to last longer and/or be easy to maintain, repair, upgrade, refurbish, remanufacture, or recycle. Additionally, new materials are developed and/or sourced, e.g., bio-based, less resource-intensive, or fully recyclable. The risks related to financing such innovations do not differ much from financing other innovation or Research, Development, and Innovation (RDI) projects.

a. Product Design and Life Extension:

Products should be designed to be durable, reusable, and reparable. This means using high-quality materials, designing products with fewer parts, and making it easy for consumers to repair products if they break. Here are some means through which life extension can be achieved.



Strategic Material Selection: Selection of materials should be done consciously during the design phase with priority to the materials with minimal environmental impact and a high potential for circularity.



Design For Disassembly And Repair: Products should be designed in a way that makes them easy to disassemble and repair. This will make it easier to extend their lifespan and to recycle their components.



Use Of Recycled Materials: Products should be made using recycled materials whenever possible. This will help to reduce the demand for virgin materials.



Durability: Products should be designed to be durable and to last for a long time. This will help to reduce the need for replacement and to minimize waste.



Modular Design: Products should be designed in a modular way so that components can be easily replaced or upgraded. This will help to extend their lifespan and to make them more adaptable to changing needs.



Efficiency: Products should be designed to be efficient in their use of resources. This will help to reduce the environmental impact of their production and use.



Reusability: Products should be designed to be reused or upcycled at the end of their lifespan. This will help to reduce the amount of waste that is generated.



Extended Warranty and Repair Services: Products should come with extended warranty to ensure they remain functional during their intended lifespan.

Product design and life extension are crucial aspects of Circular Economy implementation. By incentivizing eco-design principles such as modularity, standardized components, and durability, manufacturers can create products that are easier to repair, reuse, and recycle. Extended Producer Responsibility (EPR) schemes can further encourage manufacturers to take responsibility for the endof-life management of their products, driving innovation in sustainable design. Additionally, public procurement policies can prioritize products with longer lifespans, sending a clear signal to the market about the demand for durable goods.



b. Reuse

In the context of Circular Economy, Reuse refers to the practice of extending the lifespan of products and materials without significantly altering their form or function. This involves finding new uses for items that would otherwise be discarded, thereby reducing waste generation and conserving resources. Reuse plays a crucial role in minimizing the need for new resource extraction and processing, contributing to environmental protection and sustainable development.

The primary components of reuse in Circular Economy include:

 Product Design for Reusability: Incorporating design principles that enhance product reusability is essential to extend product lifespans and facilitate reuse. This involves:

Durability: Designing products using durable materials and construction methods to withstand repeated use and extended lifespans.

Standardization: Adopting standardized components and interfaces to allow for easy compatibility and interchangeability, facilitating reuse across different products or models.

Modularity: Employing modular designs that allow for easy disassembly, repair, and replacement of individual components, enabling upgrades or adaptations without discarding the entire product.

basis. This involves:

Platform Development: Establishing online or physical platforms that connect product owners with potential renters or borrowers, facilitating access to shared products.

Rental Infrastructure: Creating a network of rental centers or drop-off locations to ensure convenient access and handling of rented products.

Maintenance and Repair: Providing maintenance and repair services to ensure the continued functionality and guality of rented products, extending their lifespan.

• Second-hand Markets and Product Donation Programs: Developing vibrant second-hand reuse. This involves:

Marketplaces and Platforms: Establishing online or physical marketplaces for buying and selling second-hand products, providing a centralized hub for reuse transactions.

Donation Networks: Creating networks of charities or non-profit organizations that collect and redistribute donated products to those in need, giving them a second life.



Product Sharing and Rental Services: Promoting product sharing and rental services can significantly reduce individual ownership and encourage the utilization of products on a temporary

markets and promoting product donation programs can provide alternative avenues for product

Product Certification and Quality Control: Implementing quality control measures and certification programs to ensure the safety and reliability of secondhand products, fostering consumer confidence in reuse.

Consumer Awareness and Education: Raising public awareness about the benefits of reuse and

educating consumers on proper product care and maintenance practices are essential to promote

Awareness Campaigns: Launching campaigns that highlight the environmental and economic

Product Care Guides: Providing practical tips on product care, maintenance, and repair

Sustainable Consumption Education: Integrating education on sustainable consumption



Repair Centers and Workshops: Creating a network of repair centers and workshops equipped with the necessary tools, equipment, and expertise to handle a wide range of repair needs.

Training and Certification Programs: Developing and implementing training and certification programs for repair technicians, ensuring a skilled workforce capable of performing highquality repairs.

Accessibility and Convenience: Providing convenient access to repair services through strategically located repair centers, mobile repair options, and online support platforms.

Spare Parts Availability and Supply Chains: Ensuring the availability of quality spare parts and maintaining a reliable supply chain are essential for effective repair and refurbishment. This involves:

Inventory Management: Maintaining adequate inventories of spare parts to meet repair needs, considering product lifespans and repair frequency.

Reverse Logistics and Part Recovery: Implementing reverse logistics systems to collect and recover used parts from discarded products, providing a source of spare parts for refurbishment.

Partnerships with Manufacturers: Collaborating with manufacturers to ensure access to original spare parts and technical support, enabling high-quality repairs.

 Consumer Awareness and Education: Raising public awareness about the benefits of repair and refurbishment and educating consumers on proper product care and maintenance practices are essential to promote these practices. This includes:

Awareness Campaigns: Launching campaigns that highlight the environmental and economic advantages of repair, emphasizing its role in extending product lifespans and reducing waste.

Repair Guides and Tutorials: Providing accessible repair guides, tutorials, and online resources to empower consumers with the knowledge and skills to conduct basic repairs themselves.

Right-to-Repair Advocacy: Supporting right-to-repair initiatives that advocate for accessible repair information, parts availability, and fair repair practices.

Standardized Components: Employing standardized components and interfaces to ensure compatibility with available repair parts and service providers, reducing the complexity of repairs.

User-Friendly Repair Manuals: Providing clear and accessible repair manuals with detailed instructions, schematics, and troubleshooting guides, empowering users and repair technicians to conduct repairs effectively.

Repair Infrastructure and Service Networks: Establishing a robust repair infrastructure and network of skilled repair technicians is crucial to support repair and refurbishment activities. This involves:

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reuse. This includes:



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and access to individual components, simplifying repairs and replacements.

used products to their original condition. Remanufacturing involves disassembling used products and then reassembling them using new or recycled parts. Repair, refurbishing, and remanufacturing are

Repair involves fixing broken products so that they can be used again. Refurbishing involves restoring

all valuable strategies for extending the lifespan of products. By providing access to affordable and skilled repair services, ensuring the availability of spare parts and components, and offering training and certification programs for repair technicians, governments can support the growth of the repair

sector.

advantages of reuse, promoting a mindful consumption mindset.

c. Repair, Refurbishing, and Remanufacturing

techniques to extend product lifespans and prevent premature disposal.

practices, including reuse, into school curricula and community programs.

The primary components of repair and refurbishment in Circular Economy, include:

Product Design for Repairability: Incorporating design principles that enhance product repairability is essential to facilitate repair and refurbishment. This involves:

Modular Design: Designing products with modular construction, allowing for easy disassembly

3.3. Upcycling

Upcycling is a sustainable design and waste reduction practice that involves taking discarded or unused items and transforming them into products of higher value or quality. Unlike recycling, which often involves breaking down materials to create new ones, upcycling focuses on creatively reusing existing materials without significant alteration. This can help to create new products and business models. Redesigning products for other uses can also be a valuable upcycling strategy. By designing products for disassembly and recyclability, manufacturers can make it easier for materials to be recovered and used in new products. Examples of upcycling include: turning used tires into playground equipment, turning old clothes into new bags, turning broken glass into jewellery, turning old shipping containers into restaurants etc.

Key aspects of upcycling include:



Creativity: Upcycling involves innovative thinking and creative approaches to repurpose materials in unexpected ways.

Value Addition: The goal is to enhance the value or quality of the original item, creating something new and often more valuable than the sum of its parts.



Resource Efficiency: Upcycling reduces waste by utilizing existing materials, contributing to a more sustainable and environmentally friendly approach to consumption.

Several upcycling approaches and examples are highly relevant for India, given the country's diverse culture, resource availability, and environmental challenges, as presented below:



Textile Upcycling:

Example: Transforming old saris or textile scraps into unique garments, accessories, or home decor items.

Relevance: India has a rich textile heritage, and upcycling textiles aligns with sustainable fashion practices.



Waste-to-Art Programs:

Example: Creating artwork or decorative pieces from discarded materials, such as plastic bottles, paper, or metal scraps.

Relevance: India has a vibrant art and craft tradition, and waste-to-art initiatives can tap into this cultural aspect while promoting sustainability.

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Upcycled Construction Materials:

Example: Using reclaimed wood or repurposed metal for construction projects, like furniture or building components.

Relevance: Upcycling in construction aligns with India's growing infrastructure needs and can contribute to sustainable building practices.

Packaging Upcycling:

Example: Designing packaging materials from upcycled cardboard or biodegradable materials.

Relevance: With a growing concern about plastic waste, upcycled packaging aligns with India's push for sustainable packaging solutions.



Upcycled Fashion:

Example: Repurposing old fabrics or garm

Relevance: India is a major player in the fashion a fitting approach to reduce textile



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Upcycled Furniture and Home Goods:

Example: Crafting furniture or home decor

Relevance: India has a strong tradition of a the growing interest in sustainable and arti

E-Waste Upcycling:

Example: Extracting valuable materials fr components or devices.

Relevance: India faces challenges with easpect of minimizing environmental impact

Food Waste Upcycling:

Example: Converting food waste into com

Relevance: With a significant population supports sustainable farming practices.

Upcycling in Agriculture:

Example: Using agricultural waste for conirrigation systems.

Relevance: Agriculture is a major sector resource efficiency.

Collaborative Upcycling Hubs:



Example: Establishing collaborative space resources and ideas for upcycling projects

Relevance: Encourages community enga Economy.

These approaches leverage India's cultural, economic, and environmental context, providing sustainable solutions to address waste challenges and contribute to the Circular Economy.



ents to create new, stylish clothing items.			
e textile and fashion industry, making upcycled waste.			
r items from discarded or surplus materials.			
craftsmanship, and upcycled furniture aligns with isanal products.			
rom electronic waste to create new electronic			
waste management, making upcycling a crucial ct.			
npost or biogas for energy.			
engaged in agriculture, upcycling food waste			
omposting or creating innovative solutions for			
in India, and upcycling practices can enhance			
ces where artisans and innovators can share 5.			
gement and supports the growth of a Circular			

3.4. Recycling

Recycling is a critical component of the Circular Economy, as it allows materials to be recovered from waste and used to create new products. Recycling is the process of converting waste materials into new materials, which can be done through a variety of mechanical, chemical, and biological processes. This helps to reduce the need for virgin materials and conserve natural resources.

Key components of a 'Recycling Ecosystem' include:

- Collection and Segregation: The first step in recycling is the efficient collection and segregation 15A ÓŌŌ of waste materials. This involves establishing effective waste collection systems, educating the public on proper waste segregation at the source, and incentivizing waste pickers to collect and segregate waste effectively. A well-organized waste collection and segregation system ensures a steady supply of quality recyclable materials for further processing.
 - Sorting and Pre-processing: Once collected, recyclable materials undergo sorting and preprocessing to prepare them for further processing. This involves separating different types of materials, removing contaminants, and cleaning the materials to meet the specifications of downstream recycling facilities. Effective sorting and pre-processing are essential for producing high-quality recycled materials that can be used in manufacturing new products.
- Material Processing and Recycling: Material processing involves breaking down the sorted and pre-processed recyclable materials into their basic components or transforming them into usable forms. This may include shredding, melting, or chemically treating the materials to prepare them for recycling. The specific processing methods depend on the type of material being recycled.
- Manufacturing and Product Design: Recycled materials are used as feedstock in the manufacturing of new products, replacing virgin resources and reducing the environmental impact associated with resource extraction and processing. Product design plays a crucial role in maximizing the use of recycled materials and ensuring the recyclability of products at the end of their lifespan.
 - Extended Producer Responsibility (EPR): EPR schemes can also play a key role in promoting recycling. By holding manufacturers accountable for the recycling of their products, EPR schemes can provide funding for recycling programs and encourage manufacturers to design products that are easier to recycle. Additionally, targets for recycled content in products can help to create demand for recycled materials.
- Market Development And Demand Creation: Market development encompasses a range of G. strategies aimed at increasing the demand for recycled materials and expanding the market for recycled-content products. This involves initiatives such as: supporting businesses that utilize recycled materials through financial incentives, tax breaks etc.; investing in recycling infrastructure; and promoting research and development for innovative recycling technologies. Demand creation focuses on educating consumers about the benefits of recycled products and encouraging them to make environmentally conscious purchasing decisions. This involves strategies such as: public awareness campaigns; eco-labeling and certifications; retailer partnerships etc.



3.5. Energy Recovery

In the context of Circular Economy, energy recovery refers to the process of extracting and utilizing energy from waste materials that would otherwise be disposed of in landfills or incinerated. This involves converting waste into usable forms of energy, such as electricity, heat, or biofuels, thereby reducing the reliance on fossil fuels and minimizing greenhouse gas emissions. Energy recovery plays a crucial role in transitioning towards a more sustainable and resource-efficient economy.

The primary components of energy recovery in Circular Economy include:

three main groups:

Incineration: Incineration involves burning waste derived fuels at high temperatures to generate heat and steam, which can be used to produce electricity or provide district heating.

Anaerobic Digestion: Anaerobic digestion breaks down organic waste in the absence of oxygen, producing biogas, a methane-rich fuel that can be used for electricity generation or transportation.

Gasification: Gasification converts waste into a combustible gas called syngas, which can be used to generate electricity or produce synthetic fuels.

etc.



Waste-to-Energy (WTE) Technologies: A diverse range of waste-to-energy (WTE) technologies exist, each with its own advantages and limitations. These technologies can be categorized into

Advanced Fuel Production Technologies: Promising technologies such as 'torrefaction' are available to produce high energy density solid fuels from waste/biomass. Torrefaction is a thermochemical process (typically conducted at 200 to 350 oC in an inert atmosphere) that converts waste into a solid fuel with improved properties, including higher energy density, reduced moisture content, and improved grindability. The solid fuel generated from torrefaction can be used in a variety of applications including co-firing in coal-fired power plants, direct combustion in biomass boilers



- Energy Recovery In The Form Of Solid/Liquid Or Gaseous Fuels: Energy can be recovered from waste in the form of solid, liquid, or gaseous fuels. Plastics to diesel, green coal from refuse derived fuel, compressed biogas from landfills, biochar from pyrolysis plants, syngas from gasification etc. are different examples of energy recovered from waste.
- Waste Pre-Processing And Stream Management: Effective waste pre-processing and stream • management are essential to optimize energy recovery processes and increase the energy density of waste derived fuels. This involves:

Waste Segregation: Separating different types of waste materials to ensure optimal processing and prevent contamination.

Waste Characterization: Analyzing the composition and calorific value of waste streams to determine the most suitable energy recovery technology.

Waste Preparation: Pre-treating waste materials to remove contaminants, adjust moisture content, improve processing efficiency.

Energy Conversion and Utilization: The energy extracted from waste through WTE technologies • can be utilized in various ways:

Electricity Generation: Waste-derived energy can be converted into electricity using turbines or generators, providing a renewable source of power.

Biofuel Production: Waste-derived biogas or syngas can be processed into biofuels, such as biomethane or methanol, offering alternatives to fossil-based fuels for transportation and industrial applications.

Emissions Control and Environmental Protection: Energy recovery processes must incorporate effective emissions control measures to minimize the environmental impact. This involves:

Flue Gas Treatment: Flue gas treatment systems remove pollutants and particulates from combustion exhaust, preventing air pollution.

Wastewater Treatment: Wastewater generated during WTE processes is treated to remove contaminants and prevent water pollution.

Continuous Monitoring and Compliance: Continuous monitoring of emissions and adherence to environmental regulations ensure responsible energy recovery practices.

 Policy and Regulatory Framework: Supportive policies and regulations play a critical role in promoting energy recovery and ensuring its sustainability. This includes:

Feedstock Tariffs and Incentives: Providing financial incentives for the use of waste materials as feedstock for energy recovery, encouraging the adoption of this technology.

Regulatory Standards and Emission Limits: Establishing clear regulatory standards and emission limits for WTE facilities to protect environmental quality.

Research and Development Funding: Investing in research and development to improve energy recovery technologies, enhance efficiency, and reduce environmental impacts.

By effectively implementing these components, energy recovery can play a significant role in transitioning India towards a Circular Economy, reducing waste disposal, minimizing reliance on fossil fuels, and promoting sustainable energy production.

3.6. Landfilling (Common Disposal Facility)

While the goal of Circular Economy is to minimize waste and maximize resource efficiency, there will always be some material (or fraction of the material) that reaches the end of its life cycle and require disposal. In instances where materials cannot undergo reuse, repair, upcycling, recycling, or are unsuitable for energy recovery, a responsible approach is essential.

Common Disposal Facilities, particularly landfills, are the end-of-the-pipe choice for disposal of such residues. Landfilling ensures the materials are disposed of in a safe and environmentally responsible manner. However, given that landfills are perpetual, robust environmental controls and long-term geotechnical stability are key considerations. With advancements in technologies facilitating reuse, recycling, and resource recovery, the necessity for landfill disposal gets minimized.

Heat Production: Waste heat generated during energy recovery processes can be used for district heating systems, providing warmth to buildings and reducing reliance on fossil fuels.

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The NCEF provides a roadmap for making the transition to a Circular Economy, which is essential for addressing the challenges of climate change, resource scarcity, and pollution. The implementation of an NCEF requires a number of key strategies, including: regulations, incentives, public awareness, investment in R&D, public-private partnerships etc. This chapter discusses each of these key strategies in detail and provide examples of how they can be implemented in practice. By implementing the key strategies discussed in this chapter, India can create the conditions necessary for a successful transition to a Circular Economy.





4.1. Policy and Regulations

Policy interventions play a critical role in supporting the transition to a Circular Economy. These interventions include regulatory standards, design requirements, tax reforms, extended producer responsibility, tax reforms, public awareness etc. Figure 1-1 below presents the key policy interventions at each stage which can play a critical role in supporting the transition to a Circular Economy.

Figure 1-1: Policy Interventions to Support Circular Economy



Source: 'Policy Levers for a Low-Carbon Circular Economy' by Circle Economy, Nov 2017



Regulations are an important tool for implementing a national Circular Economy framework. Regulations establish clear and standardized guidelines for industries, businesses, and individuals to follow in their pursuit of Circular Economy practices. This provides a common framework for sustainable operations.

For example, the National Resource Efficiency Policy (NREP), launched in 2019, is a comprehensive policy that aims to promote sustainable production and consumption patterns, enhance resource efficiency, and reduce the environmental impact of economic activities. The NREP includes measures to encourage the adoption of circular business models, such as product-as-a-service, leasing, and sharing, and promotes the use of recycled materials.

Strengthening existing regulations and introducing new regulations will help transition to a Circular Economy. A few potential regulations are listed below:

a. An overview of existing policies and regulations

There are several existing policies in India that support Circular Economy across various lifestyle stages, namely - resource extraction, design, production/manufacturing, consumption, and end-oflife. The key policies are listed below for each lifestyle stage.

Resource Extraction:

- National Mining Policy, 2008:
 - 0 New draft 2018
 - 0 Zero-waste mining
 - 0
- Steel Policy, 2017:

0

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- 0 Increase in extraction rates 0
- National Mineral Policy, 2019

Design

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- National Housing and Habitat Policy, 2007
 - construction methods
- National Design Policy, 2007
 - Design Mark (I Mark)
- E-Waste (Management and Handling) Rules, 2016
 - 0 electronics equipment
- Ecomark issued by the Bureau of Indian Standards

Production/Manufacturing:

• Make in India, 2014:

0

- National Manufacturing Policy, 2012:
 - Use of clean and efficient technology 0

Upgradation of mining technology for efficient extraction

Higher efficiency to reduce environmental impacts

Ecological design standards for building components, materials and

Eco-friendliness, ecology and sustainability as key criteria for the India

Restricts usage of certain hazardous substances in electrical and

Increase in energy and water efficiency and pollution control technologies through Technology Acquisition and Development Fund (TADF)



Consumption:

No comprehensive legislation for (green) public procurement; however, guided

by other central legislations, e.g.

- Contract Act 1872 0
- Sale of Goods Act 1930 0
- Prevention of Corruption Act 1988 0
- 0 Arbitration and Conciliation Act 1996
- Task Force on Sustainable Public Procurement set up by Ministry of Finance in 2018

End of Life

- Clean India Mission (Swach Bharat):
 - Overarching programme for sanitation and waste management 0
- Legislations protecting the environment, human health and ensuring sound management of waste streams, in part incorporating on Extended Producer **Responsibility (EPR):**
 - Solid Waste Management Rules, 2016 0
 - 0 E-waste Management & Handling Rules, 2016
 - Plastic Waste Management Rules, 2016 0
 - Batteries (Management and Handling) Rules, 2001 (and subsequent 0 amendments)
 - Construction and Demolition Waste Management and Handling Rules, 0 2016 (no EPR)
 - Steel Scrap Recycling Policy, 2019 (no EPR) 0

b. Strengthening Of Existing Regulations



Extended Producer Responsibility (EPR) Schemes: EPR schemes require producers to be responsible for the end-of-life management of their products. This encourages design for durability, reparability, and recyclability, ultimately reducing waste generation. The existing scope of EPR may be expanded to may other sectors, in a phase-wise manner.



Green Credits: The list of eligible activities under green credits program may be revised periodically to include all the Circular Economy initiatives by different businesses.

Ban On Single-Use Products: The scope of existing ban on single-use plastics may be revised periodically to include more items under the ban. In addition, materials other than plastics, which are considered single-use products, may also be phased out or banned.



Waste Management Rules: In addition to the existing rules related to municipal solid waste, hazardous waste, e-waste, plastic waste etc., new rules may be introduced to cover a wide range of waste categories (waste tyres, agricultural waste etc.).



c. Introduction Of New Regulations



Recycled Content Mandates: Recycled content mandates require products to contain a certain percentage of recycled materials. This can help to increase the demand for recycled materials and create markets for them



Prevention Of Greenwashing: New regulation(s) may be introduced to combat greenwashing, where businesses falsely claim to be environmentally responsible. The regulations should ensure accurate and transparent reporting, ensuring that businesses back their claims with real initiatives/actions.



Product Design Standards: Product design standards in India can be strengthened to require products to be designed for durability, reparability, and recyclability. In addition, 'eco-design' requirements can be set to require products to be designed to minimize their environmental impact throughout their life cycle.





products to fail prematurely.

The above list of regulations is only an indicative list to present an overview of different possibilities. New regulations may be introduced in consultation with different stakeholders, such as government agencies, industry associations, and environmental groups, with a common goal of achieving a Circular Economy.



Public Procurement Policies: Public procurement policies in India can be changed to give preference to products and services that are circular in design and production.

Reporting on Circular Economy Performance: Businesses may be mandated to report on their Circular Economy performance in a detailed manner. The existing reporting frameworks such as 'Business Responsibility and Sustainability Report (BRSR)' may be amended to include a section on Circular Economy performance.

Regulations To Prevent Planned Obsolescence: The government could introduce regulations to prevent planned obsolescence, which is the practice of designing

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4.2. Incentives To Businesses

a. Financial Incentives



- The Ellen MacArthur Foundation's "A New Plastics of the problem of plastic pollution and to promote
- The European Commission's "Circular Economy Action Plan" includes a number of measures to launching social media campaigns.
- The United Kingdom's "Circular Economy Strategy" includes a number of measures to raise public products and services and launching public education campaigns.

These are just a few examples of the many ways that public awareness can be raised for the Circular Economy. By working together, governments, businesses, and non-profit organizations can create a more informed and engaged public, which is essential for the successful transition to a Circular Economy.

b. Integration Of 'Circularity' Concept In School Curriculum

Introducing circularity in the school curriculum is important for a number of reasons. It will help students to understand the challenges of climate change, resource scarcity, and pollution, and how the Circular Economy can help to address these challenges. Also, the curriculum on circularity will prepare students for the future of work, as the Circular Economy is creating new jobs and opportunities in a variety of sectors. It will empower students to make a difference by making informed choices about the products they buy and the way they live. By learning about circularity in school, students will develop the values and practices they need to live sustainably.

4.4. Investment In Research And Development For Circular Economy

Investment in R&D for Circular Economy is essential for the transition to a more sustainable future. By investing in R&D, governments, businesses, and academia can help to develop the technologies and practices that support the Circular Economy and the solutions needed to reduce waste and pollution, improve resource efficiency, and create new economic opportunities.

By prioritizing R&D, India can position itself at the forefront of the global Circular Economy movement towards a more resource-efficient and environmentally conscious economy. Some of the areas where R&D investment is needed to support the transition to a Circular Economy in India include:



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Product Design: R&D should facilitate design of products with modular components that can be easily replaced and design of appliances with built-in diagnostic tools that make it easier to identify and fix problems. R&D should also make 'material substitution' opportunities available to replace harmful raw materials with eco-friendly raw materials. R&D should also look into opportunities such as '3D-Printing' to reduce waste and minimize cost.

New Materials And Technologies: Development of new materials and technologies can be used to create products that are more durable, repairable, and recyclable. Examples include self-healing materials, new recycling technologies etc. Also, development of new materials and coatings that are more resistant to corrosion, wear, and abrasion could extend the life of products such as cars, appliances, and tools.

Tax breaks and subsidies: Governments can offer tax breaks or subsidies to businesses that TAX invest in Circular Economy practices, such as developing new upcycling technologies, using recycled materials in their products, or offering repair and reuse programs.

(₹) Grants and loans: Governments can provide grants or loans to businesses to help them T S implement Circular Economy initiatives.

Loan guarantees: Governments can provide loan guarantees to businesses to reduce their ₹ risk of borrowing money to invest in Circular Economy projects.

b. Non-Financial Incentives

Public Procurement: Governments can give preference to businesses that offer Circular Economy products and services when making public purchases.

- Awards And Recognition: Governments can give awards or recognition to businesses that are leading the way in promoting the Circular Economy.
- Technical Assistance And Training: Governments can provide technical assistance and training to businesses to help them implement Circular Economy practices.

4.3. Public Awareness On Circular Economy

a. Public Education Campaigns By Government And The Businesses

Public awareness is essential for the successful transition to a Circular Economy. The public needs to understand the importance of the Circular Economy, the benefits it offers, and the role they can play in making it happen. There are a number of ways to raise public awareness of the Circular Economy. Here are a few examples:



- Community Events: Community events, such as festivals and fairs, can be used to raise ကြီး awareness of the Circular Economy and promote Circular Economy businesses and products.
 - Social Media: Social media platforms can be used to share information about the Circular Economy and to engage with the public on this issue.

Partnerships: Governments, businesses, and non-profit organizations can partner together to raise public awareness of the Circular Economy. These partnerships can help to reach a wider audience and to deliver more effective messaging.

In addition to these general awareness-raising activities, it is also important to target specific audiences with tailored messages. For example, businesses need to understand the economic benefits of the Circular Economy, while consumers need to understand the environmental and social benefits. Here are some specific examples of public awareness campaigns and initiatives that are promoting the Circular Economy around the world:

Economy" initiative is working to raise awareness
te the transition to a Circular Economy for plastics.

raise public awareness of the Circular Economy, such as developing educational materials and

awareness of the Circular Economy, such as working with businesses to develop Circular Economy



Utilization Of Digital Technologies: R&D shall be carried to make best use of readily available technologies including artificial intelligence, internet of things, block chain etc. to enable Circular Economy through multiple means.



Industrial Symbiosis Opportunities: R&D initiatives may focus on opportunities for industrial symbiosis, where one industry's by-products or waste can be used by another industry. For example, slag from copper industry can be used as aggregate in construction industry.



Expanding The Range Of Materials For Recycling: R&D shall focus on developing technologies to extract as much resource as possible from different waste streams and enable a wide range of materials fit for recycling. In addition, R&D shall also focus on improving the quality of recycled materials.



Circular Business Models: R&D should support the exploration and implementation of circular business models, including product-as-a-service, sharing platforms, and closed-loop supply chains, which prioritize resource efficiency and waste reduction.



Development Of Markets For Recycled Products: R&D should focus on technological advancements to produce high-quality recycled products that are comparable to virgin products in terms of performance and cost. R&D should identify different means to develop sustainable markets for recycled products through various means such as product certification programs, recycled content mandates, environmental awareness etc.

4.5. Promotion Of Public-Private Partnerships For Circular Economy

Public Private Partnerships (PPPs) are partnerships between the public and private sectors to achieve common goals. PPPs can play an important role in promoting the Circular Economy by bringing together the resources, expertise, and innovation of both sectors. There are a number of ways that PPPs can be used to support the Circular Economy. PPPs can be used to:

- Develop and implement Circular Economy infrastructure and technologies •
- Promote research and development of Circular Economy solutions •
- Provide financial support for Circular Economy projects •
- Raise awareness of the Circular Economy and its benefits •

PPPs can play a significant role in accelerating the transition to a Circular Economy. By working together, the public and private sectors can develop and implement the solutions needed to create a more sustainable future. Here are some of the benefits of PPPs for the Circular Economy:



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Increased Investment: PPPs can help to increase investment in Circular Economy projects. This is because PPPs can bring together the resources of both the public and private sectors.

Accelerated Innovation: PPPs can help to accelerate innovation in the Circular Economy. This is because PPPs can bring together the expertise of both the public and private sectors.



Shared Risk: PPPs can help to share the risk of Circular Economy projects. This is because the public and private sectors can share the costs and benefits of these projects.



Increased Public Awareness: PPPs can help to increase public awareness of the Circular Economy and its benefits. This is because PPPs can involve a wide range of stakeholders, including businesses, governments, and non-governmental organizations.

Here are some examples of PPPs that are supporting the Circular Economy around the world:

- to reduce waste by 20% in the Netherlands.
- Circular Cities and Regions Initiative.



In China, the Chinese government has launched a number of PPP initiatives to support the Circular Economy. For example, the government has partnered with businesses to develop Circular Economy industrial parks and to promote the use of recycled materials in the construction industry.



In the Netherlands, the Circular Economy Covenant is a PPP between the government and businesses to reduce waste and increase the use of recycled materials. The Covenant has helped

In the United Kingdom, the Ellen MacArthur Foundation's Circular Economy 100 is a global network of businesses, governments, and other organizations working to accelerate the transition to a Circular Economy. The network has helped to develop a number of PPP projects, such as the

4.6. Circular Economy Knowledge Network

The government could create a knowledge network to share information and best practices on Circular Economy. The knowledge network (hosted by a not-for-profit industry led organization such as CII) should act as a platform for sharing knowledge and best practices on the Circular Economy. It could bring together stakeholders from different sectors, including government, business, academia, and civil society, to collaborate on the development and implementation of Circular Economy solutions. The knowledge network could enable Circular Economy in India in multiple ways, some of which are mentioned below:



Innovation In The Circular Economy: The network could provide a platform for businesses and researchers to share ideas and collaborate on the development of new Circular Economy technologies and solutions. This would help to accelerate the pace of innovation in the Circular Economy.



Capacity Building And Training: The network could provide training and capacity building opportunities to policymakers, businesses, and other stakeholders on the Circular Economy. This can help to ensure that they have the skills and knowledge they need to develop and implement Circular Economy policies and programs.



Development Of Skilled Workforce: The network could provide training and education programs to help workers develop the skills they need to work in the Circular Economy. This would help to create a pool of skilled workers that businesses can draw from as they transition to a Circular Economy.



Development Of New Markets For Recycled Materials And Circular Products: The network could help to raise awareness of the benefits of using recycled materials and circular products. This could help to create new markets for these materials and products.



Partner With Other Knowledge Networks: The network could partner with other Circular Economy knowledge networks across the globe to share knowledge and resources on the Circular Economy.



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Regular Events And Workshops: The network could organize regular events and workshops to bring together stakeholders from different sectors to learn from each other and to collaborate on Circular Economy projects.

Awareness On Circular Economy: The network could raise awareness on Circular Economy through various means including: conducting workshops at educational institutions; developing and disseminating educational resources such as reports, infographics, and videos; sharing educational content on social media etc.



Policy Advocacy: The network, composed of members from different stakeholder groups, could leverage learnings from workshops, knowledge sharing sessions, and other knowledge networks across the globe to identify the need for revision of existing policies or for creation of new ones to accelerate the transition to a Circular Economy. The network could engage with policymakers to advocate for Circular Economy policies and programs by providing inputs on the development and implementation of different policies and programs.



4.7. Circular Economy Parks

Circular Economy parks, also known as eco-industrial parks or resource recovery parks, may be established in different parts of the country. The Circular Economy parks are designated areas designed to promote resource efficiency and waste reduction through collaborative efforts among businesses and other stakeholders. These parks provide a physical infrastructure and supportive environment for businesses to adopt Circular Economy principles, such as:

- Industrial Symbiosis: Fostering synergies between industries to exchange waste, byproducts, or energy resources, reducing the need for external inputs and minimizing disposal.
- reliance on virgin materials.
- valuable resources, creating new economic opportunities and reducing environmental impact.

Circular Economy parks offer a range of benefits to businesses, including:

- Cost Savings: By reducing resource consumption, waste disposal costs, and energy expenses, businesses can improve their profitability and sustainability.
- plants, recycling centers, or renewable energy sources, which can reduce individual capital investments and operational costs.
- collaboration, knowledge exchange, and the development of innovative solutions.
- Regulatory Support and Incentives: Governments often provide incentives, such as tax breaks or • practices.

Examples of Circular Economy parks around the world include:

- Kalundborg Symbiosis in Denmark: This renowned eco-industrial park has operated for over 50 waste and energy streams.
- Eco-Industrial Park of As Pontes in Spain: This park focuses on the valorization of waste from the • pulp and paper industry, turning it into valuable products such as biofuel and biofertilizers.
- Circular Economy Park of the Eastern Metropolitan Region in Thailand: This park aims to reduce including food processing, electronics, and construction.
- Some Of The Upcoming Circular Parks In India Include: The 'Industrial Symbiosis Hub' being Corporation (MIDC) at Talegaon, Maharashtra etc.

Circular Supply Chain Management: Promoting closed-loop systems where products are designed for disassembly, reuse, or remanufacturing, extending their lifespan and reducing

Waste Valorization: Investing in technologies and processes to transform waste streams into

Access to Shared Infrastructure: Parks often provide shared facilities, such as waste treatment

Knowledge Sharing and Collaboration: The proximity of businesses within a park facilitates

subsidies, to businesses operating in Circular Economy parks, encouraging adoption of sustainable

years, showcasing successful examples of industrial symbiosis, with multiple industries exchanging

waste generation and promote resource recovery in the region, involving various industries,

developed by the National Industrial Corridor Development Corporation (NICDC) at Tuticorin, Tamil Nadu, The Circular Economy Park being developed by the Maharashtra Industrial Development

4.8. Institutional Framework

- To create an improved institutional framework around enabling the Circular Economy at scale in India. the following areas of focus are proposed:
- Establish A Clear Vision And Roadmap For The Circular Economy: This should be done through a • consultative process that involves all stakeholders, including government, businesses, academia, and civil society.
- Identify And Address Key Institutional Gaps: This may include things like establishing new • institutions, reforming existing ones, and improving coordination between different agencies.
- Invest In Capacity Building: This is needed to ensure that all stakeholders have the knowledge • and skills necessary to implement the Circular Economy.
- Create A Supportive Environment For Innovation: This could include things like providing funding • for research and development, and creating tax breaks for businesses that develop new circular technologies and business models.

Here are some specific steps that can be taken:

- Establish a National Circular Economy Authority (NCEA): The NCEA would be responsible for • developing and implementing the national Circular Economy strategy. It would also coordinate the activities of different ministries and agencies, and provide support to businesses and other stakeholders.
- Reform The Existing Regulatory Framework: The current regulatory framework is not conducive • to the Circular Economy. For example, there are no extended producer responsibility schemes in place for most products. The NCEA should work with other ministries and agencies to reform the regulatory framework and make it more supportive of the Circular Economy.
- Invest In Research And Development: The NCEA should invest in research and development • of new circular technologies and business models. This could be done through public-private partnerships or by providing grants to academia and businesses.
- Create A Circular Economy Fund: The government should establish a Circular Economy fund to • provide financial support to businesses that are developing and implementing circular practices. This fund could be used to provide loans, grants, and tax breaks to businesses.
- Develop A National Circular Economy Curriculum: The NCEA should work with the Ministry of • Education to develop a national Circular Economy curriculum for schools and universities. This will help to ensure that all students learn about the Circular Economy and its importance.

By taking these steps, we can create an improved institutional framework that will enable the Circular Economy to thrive in India.

The structure of a National Circular Economy Authority (NCEA) for India could be as follows:

- Governing Body: The governing body would be responsible for setting the overall direction of • the NCEA and overseeing its implementation. It would be composed of representatives from government, businesses, academia, and civil society.
- Executive Committee: The executive committee would be responsible for implementing the • decisions of the governing body and managing the day-to-day operations of the NCEA. It would be composed of technical experts and representatives from key stakeholders.

- subject matter experts from government, businesses, academia, and civil society.
- support to the NCEA. It would be composed of permanent staff and seconded staff from government and other stakeholders.

The NCEA could be structured as an autonomous body under the Ministry of Environment, Forest and Climate Change. This would give it the independence and flexibility required to carry out its mandate effectively.

The NCEA would have a number of functions, including:

- Developing and implementing the national Circular Economy strategy.
- Coordinating the activities of different ministries and agencies on the Circular Economy. •
- Providing support to businesses and other stakeholders in implementing the Circular Economy.
- Promoting research and development on the Circular Economy. •
- Raising awareness and understanding of the Circular Economy.

The NCEA would play a vital role in enabling the transition to a Circular Economy in India. By providing a central platform for coordination and collaboration, and by providing support to businesses and other stakeholders, the NCEA can help to accelerate the adoption of circular practices across all sectors of the economy.

In addition to the above, the NCEA could also have the following functions:

- Developing and implementing standards for recycled materials and products. This would help to ensure that recycled materials and products meet the required quality standards.
- Providing financial incentives to businesses that adopt circular practices. This could be done through tax breaks, grants, or other forms of financial support.
- Promoting the development of Circular Economy infrastructure. This could be done by providing infrastructure that is needed to support the Circular Economy.
- Regulating the use of resources and the disposal of waste. This would help to ensure that resources are used efficiently and that waste is disposed of in a sustainable manner.

The NCEA could, therefore, play a pivotal role in mainstreaming the Circular Economy in India.

In addition to the above, it is also important to ensure that the institutional framework is inclusive and equitable. This means that all stakeholders, including marginalized communities, should have a voice in the development and implementation of the Circular Economy strategy. It is also important to ensure that the benefits of the Circular Economy are shared equitably. By creating an improved institutional framework that is inclusive and equitable, we can ensure that the Circular Economy is a success for all of India.

References:

- Policy Levers for a Low-Carbon Circular Economy' by Circle Economy, Nov 2017
- Union Resource Efficiency Initiative (EU-REI)

Technical Committees: The technical committees would be responsible for providing technical expertise to the NCEA on specific aspects of the Circular Economy. They would be composed of

Secretariat: The secretariat would be responsible for providing administrative and technical

funding for the construction of waste management facilities, recycling plants, and other

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Circular Economy Action Plan for Focus Materials



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Chapter Circular Economy **Action Plan for Focus Materials**

1.1. Introduction

The NCEF shall be implemented in a phase-wise manner following a targeted and strategic approach to accelerate the transition to a Circular Economy. The following materials have been identified for the initial implementation of the NCEF considering their widespread usage, environmental footprint, and the significant scale of resource value opportunity. Focusing on these materials can yield substantial benefits in terms of waste reduction, resource conservation, and environmental protection.



This first edition of the NCEF focuses on the above materials. As the NCEF progresses and gains momentum, a broader range of focus materials shall be included in the next phase based on learnings, feedback, and insights gained from the implementation of initial phase. This approach broadens the scope of circular interventions and maximizes the benefits of resource efficiency across various sectors of the economy.

1.2. Key Elements Of A Circular Economy Framework For Each **Focus Material**

Considering the unique characteristics of each focus material, a tailored approach is necessary for each focus material to effectively implement the NCEF. Within the NCEF's comprehensive structure, each focus material has a dedicated chapter that provides a detailed exploration and strategic roadmap for implementing the framework for that particular focus material, addressing the unique challenges and opportunities. Each such chapter delves into various aspects, providing a nuanced understanding of how to navigate the complexities of sustainable resource management. The recommended content to be covered in the chapters for each focus material includes:



Environmental And Economic Footprint: Environmental impact of the focus material, including resource depletion, water consumption, greenhouse gas emissions, impact on biodiversity etc. shall be presented. In addition, economic costs associated with the production, consumption, and disposal of the focus material shall be presented.





Present Recycling And Recovery Rates: Assessment of the current recycling and recovery rates for the focus material in India shall be presented, along with identification of reasons for low recycling and recovery rates, such as lack of infrastructure, technological limitations, or market barriers.



Importance Of Circular Economy (For The Focus Material): The potential of Circular Economy principles to transform the focus material into valuable resources shall be presented, with emphasis on environmental, social, and economic benefits.



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Adoption Of Enabling Principles: The successful implementation of the NCEF needs the following enabling principles: Prevention, Upcycling, Recycling, Energy Recovery. Opportunities for Circular Economy that each of these enabling principles offer shall be presented.

accountability.

Key Strategies for Promoting Circular Economy: Identification of different strategies for promoting the Circular Economy practices shall be presented along with action plans and roadmaps to implement the strategies effectively. Resources and support systems necessary to ensure the success of these strategies shall also be presented.



Monitoring and Evaluation: A robust monitoring and evaluation framework to track progress towards Circular Economy goals for the focus material shall be proposed to collect and analyze data to keep track of the progress towards 'targets', challenges and areas for improvement etc. Responsible parties for monitoring and evaluation shall be clearly identified.

innovative solutions and approaches that can be adapted to the Indian context.



Targets: Ambitious yet achievable targets shall be established considering the views of industry experts and other stakeholders, available technologies, market potential etc. Clear timelines shall be set for achieving these targets to provide direction and

Case Studies: Successful case studies from around the world that demonstrate effective Circular Economy practices for the focus material shall be presented, showcasing the



2.2. Environmental and Economic Footprint

Plastic pollution in India has both significant environmental and economic footprints.

Environmental Footprint:

Chaptei **Circular Economy Action Plan for Plastics**

2.1. Introduction

A Circular Economy in plastics refers to an approach aimed at reducing the environmental impact of plastics by keeping plastic materials and products in circulation for as long as possible, minimizing waste, and maximizing resource efficiency. This concept is based on the principles of the broader Circular Economy, which seeks to decouple economic growth from resource consumption and environmental degradation.





a. Marine Pollution

India's extensive coastline and numerous rivers make it particularly susceptible to plastic pollution. Plastic waste often ends up in water bodies, causing harm to marine ecosystems. It can harm marine life through ingestion and entanglement and disrupt the food chain.

b. Land Pollution

Plastic litter on land can take hundreds of years to decompose, leading to unsightly and longlasting environmental pollution. It affects terrestrial ecosystems, wildlife, and can even leach harmful chemicals into the soil.

Economic Footprint:

a. Cleanup Costs:

for other essential services.



b. Health Costs:

The health costs associated with plastic pollution are significant. Pollution from burning plastic and exposure to harmful chemicals can lead to health issues, increasing the economic burden on the healthcare system.

c. Tourism Impact:

The unsightly plastic pollution can negatively affect India's tourism industry. Reduced tourist inflow can result in economic losses for communities and businesses that depend on tourism.



d. Impact on Agriculture:

Plastic pollution can impact agricultural lands, affecting crop productivity. The presence of microplastics in soil and water can lead to reduced soil fertility and damage to the agricultural sector.



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e. Loss of Biodiversity:

The environmental impacts of plastic pollution can lead to a loss of biodiversity, which can affect various economic sectors, including fisheries, forestry, and agriculture.

f. Economic Opportunities Lost:

Inefficient plastic waste management means the country misses opportunities in recycling, waste-to-energy technologies, and the production of eco-friendly alternatives to plastic. Developing a Circular Economy for plastics could create jobs and stimulate economic growth.





c. Air Pollution

When plastic waste is burned, it releases toxic chemicals and greenhouse gases into the atmosphere, contributing to air pollution and climate change.

The government and various organizations incur substantial costs for cleaning up plastic waste from public spaces, rivers, and oceans. These resources could be better utilized

India has recognized the significance of plastic pollution and has taken steps to address it. Initiatives like the Swachh Bharat Abhiyan and bans on single-use plastics in some states are aimed at mitigating the environmental and economic impacts of plastic pollution. However, tackling this complex issue requires sustained efforts, including better waste management, awareness campaigns, and the development of sustainable alternatives to plastics.

2.3. Present Recycling and Recovery Rates

According to data available on the Central Pollution Control Board's website, India generated a total of 4.12 million tons of plastic waste in the 2020-21 fiscal year. As per the CPCB's Extended Producer Responsibility portal for plastic waste, 3.07 million tons of plastic waste were reported for the 2022-23 period.

Unfortunately, less than 30% of the plastic waste in India is recycled as per the report "Innovation in Plastics – The Potential and Possibilities" by Marico Foundation, Indian Institute of Sciences and Praxis Global Alliance.



2.4. Importance of Circular Economy for Plastics

As the global battle against marine litter and plastic pollution intensifies, it becomes imperative to view this issue through the unique perspective of a densely populated and rapidly advancing economy such as India's. While the average citizen in India may not be primarily preoccupied with the entry of plastics into our oceans, they are definitely conscious of the tangible consequences of single-use plastics obstructing drainage systems, resulting in flooding and the potential for widespread diseases.

2.5. Adoption of Enabling Principles for Circular Economy A. Prevention

Preventing the introduction of new plastics into the environment can be achieved through the adoption of one of the following approaches:

× Eliminate

Plastics have become deeply ingrained in our lives over the past five decades. While plastic bans have Plastics have become deeply ingrained in our lives over the past five decades. While plastic bans have been introduced in various Indian states with varying degrees of success, it is essential for brands to reconsider their strategies and redesign products for packaging without plastic. This transition should occur gradually. For instance, Apple has committed to completely eliminate plastic from its packaging by 2030.

Reuse

Consider the example of large water dispensing jars when discussing reusability. Various startups across India are pioneering commercial models that promote the reuse of food containers in collaboration with food delivery companies. Employing technology to facilitate the reverse supply chain is crucial in promoting reusability.

Replace

Careful consideration is needed in the process of replacement to avoid inadvertently increasing the environmental footprint. For instance, the shift from glass bottles to PET containers for carbonated beverages in the 1980s and 1990s was driven by factors such as weight reduction, ease of transport, and reduced damage. Brands should selectively explore replacing plastic with glass in local markets.

Refill

The refilling model relies on replenishing bottles or containers owned by the consumer, either at their doorstep or at a centralized refilling facility. Similar to reusability, Indian startups are experimenting with refilling business models. Building customer awareness and ensuring userfriendly systems are of utmost importance when scaling up refilling initiatives.



B. Upcycling

There is a growing urgency for all plastic packaging to be either recyclable or compostable. Design is once again a pivotal factor, as brands are willing to eschew excess labels and multiple colors while still maintaining their brand's visual appeal on the packaging. In Europe, Deposit Refund Systems have seen successful implementation. However, in a country like India, where over 90% of PET is collected and recycled by the informal sector, challenging-to-collect and recycle flexible and multilayer plastics may not be the best fit for a Deposit Refund Scheme. Instead, we may witness innovation through the use of app-based DRS, encouraging users to deposit various types of plastic waste at designated bins or collection points.

To ensure the success of upcycling or bottle-to-bottle recycling, it is crucial to enhance sourcelevel segregation, establish larger and more automated material recovery facilities, and increase the number of bottle-to-bottle recycling facilities. This will guarantee the production of bottles from postconsumer recyclates with minimal impurities.

The Food Safety and Standards Authority of India (FSSAI) has already issued guidelines for bottleto-bottle recycling of beverage containers. Companies like PepsiCo and Coca-Cola have already initiated collaborations with recyclers to create their first batches of PET bottles using 100% recycled plastic.

C. Recycling

For several decades, plastic recycling in India has primarily been an unorganized and informal industry. It's common to come across numerous plastic recycling operations in makeshift settlements throughout Indian cities, where both pre and post-consumer plastic waste are transformed into low-value products. Many of these recycling units operate without regulation, making it challenging to establish a clear record of the materials flowing in and out of these facilities.

The recycling of hard-to-process plastics often results in downcycling, where they are transformed into low-value items like roofing materials, furniture boards, benches, and flowerpots. While the intent behind these initiatives is positive, their economic viability and scalability can be questionable.

With the growing acceptance of Extended Producer Responsibility (EPR) in India, there has been an increase in recycling capacity across various types of polymers. EPR regulations mandate that these recyclers demonstrate material traceability and adhere to ethical recycling practices. This shift towards regulated recycling practices is expected to enhance the sustainability and accountability of the plastic recycling industry in India.

D. Energy Recovery

Co-processing or incineration of co-mingled plastic waste in cement kilns or waste-to-energy plants is a widely accepted method used to manage plastic waste in India. This method has its advantages and disadvantages, and it's important to consider the environmental and social implications.



- Energy Generation: Co-processing plastic waste in cement kilns or waste-to-energy plants can recover some of the energy content in the plastics, which can be used for electricity or heat generation. This can help reduce the reliance on fossil fuels for energy production.
- 2. Waste Diversion: It diverts plastic waste from dumpsites and landfills, reducing the environmental burden associated with these disposal methods.
- Volume Reduction: Incineration reduces the volume of plastic waste significantly, which can help save space in landfills and reduce transportation costs.
- 4. Controlled Emissions: Modern wasteto-energy facilities are designed with advanced emission control technologies to minimize the release of harmful pollutants into the atmosphere.

Co-processing or incineration of plastic waste can be a practical solution for managing plastic waste when other methods like recycling are not feasible in a country like India. However, it is not a sustainable long-term solution, as it does not promote a Circular Economy and can have negative environmental and health impacts. Reducing plastic waste at the source, promoting recycling, and exploring alternative materials are more sustainable approaches to tackling the plastic waste problem.

Disadvantages 🗼

- Greenhouse Gas Emissions: The incineration of plastics can release carbon dioxide (CO2) and other greenhouse gases, contributing to climate change. This is in contrast to more circular and sustainable approaches to plastic waste management.
- Air Pollution: While emissions can be controlled, the process can release pollutants and toxins, such as dioxins and furans, which can have negative health effects if not properly managed.
- 3. Non-Circular Approach: Co-processing and incineration are linear methods, meaning they do not promote the recycling and reuse of plastics, which are more circular approaches that help reduce the production of new plastics.
- Resource Depletion: Burning plastics in waste-to-energy plants means that the valuable resources contained in the plastics are lost, and they cannot be recovered or reused in the future.
- 5. Plastic Type Matters: The environmental impact of incinerating plastic waste can vary depending on the type of plastic being burned, with some plastics producing more harmful emissions than others.

2.6. Adoption of Key Strategies for Promoting Circular Economy

Promoting a Circular Economy in plastics is crucial for reducing waste, conserving resources, and minimizing environmental impacts. Here are some key strategies to promote a Circular Economy in plastics:

- 1. Design for Recyclability: Encourage the design of plastic products and packaging that are easy to recycle. This includes using mono-materials and avoiding complex, mixed materials that are difficult to separate and recycle. For example, Coke currently uses HDPE material for PET bottle caps while Pepsi uses PP material. Standardizing the cap material would simplify PET bottle recycling and eliminate the need for polymer sorting to separate PP and HDPE. As other example, decomposable material may be used as a wrapper on the water bottles instead of PVC film.
- 2. Extended Producer Responsibility (EPR): India has taken a lead among developing countries in implementing EPR for plastic waste. With a country of the size of India, it is important to monitor the implementation of EPR continuously and closely.
- 3. Tax Incentives: The current GST structure for plastic products disincentivizes the use of recycled materials. For instance, virgin plastic material incurs an 18% GST, but when this material is converted into scrap and further processed into granules, another 18% GST is levied on these granules, effectively resulting in double taxation. Previously, chips were subject to a 5% GST and reprocessed granules to an 18% GST. However, the current GST structure imposes an 18% GST on both.
- 4. Recycling Infrastructure: Invest in and expand recycling infrastructure, including collection systems, sorting facilities, and recycling plants. This ensures that plastics collected for recycling can be effectively processed and turned into new products.
- Bottle-To-Bottle Recycling: Promote the use of recycled plastics in manufacturing new products. 5. This helps create a closed-loop system, reducing the need for virgin plastic production.
- 6. Consumer Education: Raise awareness and educate consumers about the importance of recycling and proper disposal of plastics. Make recycling easy and accessible to the public.
- 7. Innovative Recycling Technologies: Support research and development of innovative recycling technologies, such as chemical recycling and advanced sorting techniques, to improve plastic recycling efficiency.
- 8. Plastic Bans and Regulations: Enact regulations and bans on single-use plastics or non-recyclable plastics to reduce their production and use. Use of alternate materials must also be promoted at the same time to change user behaviour patterns.
- 9. Market Demand: Encourage businesses and industries to use recycled plastics in their products. The Government of India has created such incentives under the EPR scheme. This must be followed through religiously by all stakeholders.
- 10. Circular Business Models: Encourage businesses to adopt circular business models, such as leasing or take-back programs, which promote reuse and recycling of products rather than disposal.
- 11. Collaboration: Foster collaboration among central government, state governments, producers, recyclers, and waste management organizations to create a unified approach to tackling plastic waste. This includes setting common recycling and sustainability goals.
- 12. Consumer Behaviour Change: Promote behaviour changes among consumers to reduce plastic consumption, opt for reusable alternatives, and make sustainable choices.



- effective and environmentally friendly.
- 14. Waste-to-Energy Alternatives: Explore waste-to-energy methods that minimize the environmental impact of incinerating plastics, such as energy recovery and emissions reduction technologies.
- 15. Monitoring and Reporting: Establish transparent and standardized reporting mechanisms to track progress in plastic recycling and reduction efforts.
- 16. International Collaboration: Recognize that plastic waste is a global issue and work with plastics.

Promoting a Circular Economy in plastics requires a holistic approach involving governments, industries, consumers, and innovators. It aims to minimize waste, reduce resource consumption, and mitigate the environmental impact of plastic production and disposal.

2.7. Targets

• • • •	Proposed Target	Timeline for Achievement		
5.NO.		2025	2030	
1.	Reduction in utilization of virgin plastics (%) compared to 2022	5	10	
2.	Expand the list of SUP materials banned to enhance the percentage of total plastic waste covered under SUP ban (%) Basis for target: The share of plastic used for the banned single-use plastic products is less than 2%-3% of the total plastic waste generated in India, the industry estimates. https://scroll.in/article/1034134/three- months-in-indias-ban-on-single-use-plastic-has-flopped	6	10	
3.	Percentage of plastic packaging to be effectively recycled [%]			
	Basis for target: The proposed target is in line with the India Plastics Pact targets to 2030.	20	30	
4.	Increase the collection and recycling of plastic waste [% of plastic waste generated] Basis for target: India recycles only 30 per cent of 3.4 MT plastic waste generated annually https://economictimes.indiatimes.com/news/india/india-recycles- only-30-per-cent-of-3-4-mt-plastic-waste-generated-annually- report/articleshow/96918352.cms	75	90	
5.	Increased consumption of plastics in construction as a substitute to conventional construction materials [%]	2	4	
6.	Average recycled content across all plastics packaging (%). Basis for target: The proposed target is in line with the India Plastics Pact targets to 2030.	15	25	
7.	Percentage of plastic packaging to be reusable, recyclable, or compostable [%] Basis for target: The proposed target is in line with the India Plastics Pact targets to 2030.	50	100	

13. Research and Innovation: Invest in research and development to find alternative materials to traditional plastics and explore ways to make biodegradable or compostable plastics more

international partners to develop consistent standards and guidelines for a Circular Economy in

2.8. Monitoring and Evaluation

India has established a robust foundation for Extended Producer Responsibility (EPR). To ensure stringent oversight of EPR implementation, the Indian government should consider adopting the Producer Responsibility Organization (PRO) model. This approach, as demonstrated in numerous countries, allows PROs to consolidate the compliance objectives of brand owners. PROs, in a legal capacity, undertake the responsibility of scrutinizing and assessing recyclers, facilitating the transition of post-consumer plastic waste by brands, and fulfilling EPR commitments.

Furthermore, PROs, essentially associations of brands, actively engage in raising consumer awareness and contribute to the monitoring and reporting of the reduction of plastic litter in India's streets and water bodies. This approach offers a holistic solution to enhance the effectiveness of EPR in the country.

2.9. Case Studies

- Coca-cola launches the first 100% recycled PET water bottle 1 https://www.recyclingtoday.com/news/coca-cola-india-launches-rpet-bottle/
- Refillable startup refilling detergent and cleaning liquids at customer doorsteps using a 2. subscription model https://www.indiatimes.com/news/india/refillable-mumbai-startupoffering-refilling-homecare-liquids-at-doorstep-575115.html
- 3. InfinityBox – startup supplying reusable food containers, working closely with food delivery apps - https://thoughtforfood.org/content-hub/the-end-of-single-use-packaging/
- Banyan Nation recycling HDPE to be supplied for making new bottles for shampoos and 4 lubricants - https://www.forbesindia.com/article/leadership-awards-2023/banyan-nationclimate-warriors-chipping-away-at-indias-plastic-problem/84261/1

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- 2. CPCB's Extended Producer Responsibility Portal for Plastic Waste https://eprplastic.cpcb.gov.in/#/plastic/home
- 3. https://innovation-in-plastics-report.s3.ap-south-1.amazonaws.com/Innovation_in_Plastics.pdf
- https://eprplastic.cpcb.gov.in/#/plastic/home/main_dashboard 4.
- 5. https://www.apple.com/in/environment/
- https://fssai.gov.in/upload/advisories/2022/01/61e7acd01a850Direction_Recycled_Plastics_19_01_2022.pdf 6.
- https://gstcouncil.gov.in/sites/default/files/Agenda/37-meeting/Detailed%20Agenda%20Note%20-%2037th%20 7. GSTCM%20-%20Volume%203.pdf
- https://scroll.in/article/1034134/three-months-in-indias-ban-on-single-use-plastic-has-flopped 8
- https://economictimes.indiatimes.com/news/india/india-recycles-only-30-per-cent-of-3-4-mt-plastic-waste-9. generated-annually-report/articleshow/96918352.cms

10. https://www.indiaplasticspact.org/roadmap/



3.1. Introduction

On the positive side construction industry strategies: Reduce, Reuse, Recycle and Recover. holds great economic significance for our To address the negative environmental impact of country, however on the converse side it also C&DW, many countries are adopting legislative has a significant environmental impact due to measures and raising awareness to encourage its extensive excavation, sand mining, gravel the reduction of such waste. quarrying and the consequent generation of waste during excavation, demolition and construction activity. has set a target to process all solid waste,

The Indian Government's Swachh Bharat Mission including C&DW in major cities and towns. The The concept of Circular Economy for C&D Ministry of Urban Development has urged all waste has also gained significant attention in states to establish recycling facilities for C&DW in recent years, as an alternative to the traditional all cities and towns with populations exceeding 1 linear natural resource consumption model. This million. The need of the hour is for debris to be approach focuses on reducing waste through the recycled and reused as recycled aggregates for implementation of universally accepted four main partial or total substitution of natural aggregates.





3.2. Environmental and Economic Footprint



Recycled aggregate [RA] can eliminate the waste disposal problem and reduce the cost of concrete. It is becoming increasingly popular as a construction material due to its benefits from both material and structural perspectives. Its use, which involves recycling and repurposing C&DW, is promoting sustainable development within the construction industry. Using RA in construction is a sustainable practice with multiple benefits for the industry. Recycling also reduces energy consumption since it requires less energy to produce recycled materials than mined aggregate. It further reduces the waste that ends up in landfills, thus conserving space and avoiding the need for landfills. In addition to these benefits, the use of RA helps to reduce emissions, making it an environmentally responsible option that aligns with sustainability goals. Overall, the use of recycled aggregates is a sustainable solution that benefits both the environment and the construction industry.

3.3. Present Recycling and Recovery Rates

The recycling rates in US and Australia are estimated to be 60 to 70% of the generated C&DW. Compare this to the unofficial estimates of about 2 to 3% in our country. The generation in a random sample of Indian cities is as given below as per a study conducted by BMTPC.

Figure: C&D waste generation in various Indian cities (TPD) (BMTPC, 2018, CPCB, 2017).



3.4. Importance of Circular Economy

To promote sustainability in the construction industry, it is important to focus on maximizing the recycling of waste generated from construction, demolition, and excavation activities.

These contribute to the Circular Economy in the following ways:

- By the production of RA of high quality and value, which serve as a substitute for mined material in various construction applications, including concrete and precast products.
- The dry waste component of MSW, known as Refuse Derived Fuel (RDF), is separated from inert of making paver blocks, bricks, aggregate, etc.





materials such as street sweeping waste, drainage silt, stones, etc. The RDF is further utilised as boiler in-feed for thermal generation of electricity which leads to residual materials such as bottom ash and fly ash. The inert materials and residue are ultimately dumped at the landfill site designated by the respective Municipal Corporation. Inert materials and the bottom ash are in the nature of Construction and Demolition (C&D) Waste and can be further utilised for the purposes

- Ensuring the ability to meet the demand for RA from a sustainable source which is renewable.
- Ensuring supply in areas where natural reserves of sand are diminishing
- Minimising transport costs for the aggregates as recycled materials are typically produced closer to urban centres.

As the construction industry continues to grow, it is important to explore new ways of building that are both economically and environmentally sustainable. Recycled aggregates are one promising solution to this challenge.





Recycled Aggregate

Recycled Sand

3.5. Adoption of Enabling Principles for Circular Economy

A broader policy push on enabling principles is necessary to alter market dynamics to foster greater uptake of recycled products from C&DW, including efforts to safeguard recycled product quality and financial viability. Once a mature market develops for such recycled products, there will be less need for financial incentives.

Implementation:

- Preferential Public Procurement policies such as those in Delhi should be circulated by the ministry in their capacity development efforts with guidance on how they can be adapted.
- Ministry may guide state agencies such as PWD, R&B, S&WB to adopt preferential Public Procurement policies in a time-bound manner.
- State government should direct PWD for inclusion of various recycled products from C&DW in their Schedule of Rates.
- Buy-back of recycled paver blocks, bricks, etc. that is made from the inert materials of MSW and bottom ash from the boiler of MSW WTE Plants. The aggregate can also be procured by the Roads and Buildings (R&B) Department for the purposes of construction of roads.

- Pre-processing and segregation of MSW at WTE which is not of fertiliser grade and can be utilised procured by the Municipal Corporations for eart
- Ministry to engage with BIS to investigate further prospects for ISI certification of several categorie
- MoHUA to engage with BIS for increased inclusion Building Code.
- MoHUA to engage with Indian Roads Congress f
- MoHUA to engage with Ministry of Finance to ex
- MoHUA to engage with green building rating scl greater range of products made from C&D waster
- MoHUA may make necessary arrangements for developing que that involve reliable and transparent third-party assessment.

3.6. Targets

S.No.	Proposed Target		Timeline for Achievement	
			2030	
1.	Usage of secondary materials/recycled content in new building construction (%) Basis for target: In line with the recommendations made in the document 'Circular Economy in Municipal Solid and Liquid Waste' by Ministry of Housing and Urban Affairs [https://mohua.gov.in/pdf/627b8318adf18Circular-Economy-in-waste- management-FINAL.pdf]	10	20	
2.	Usage of secondary materials/recycled content in roads and highways (%) Basis for target: In line with the recommendations made in the document 'Circular Economy in Municipal Solid and Liquid Waste' by Ministry of Housing and Urban Affairs [https://mohua.gov.in/pdf/627b8318adf18Circular-Economy-in-waste- management-FINAL.pdf]	20	40	
3.	Reduce the generation of C&D waste by promoting more sustainable construction practices [%].	2	4	
4.	Increase in collection & recycling of C&D waste [%] Basis for Target: "India manages to recover and recycle only about 1 per cent of its construction and demolition (C&D) waste, says new CSE analysis" https:// www.cseindia.org/india-manages-to-recover-and-recycle-only-about-1-per- cent-of-its-construction-and-demolition-10326	20	40	
5.	Introduce EPR for producers of construction materials with targets (%)	15	25	
6.	Circular procurement targets (for government agencies and large corporations) in %.	10	20	

facilities also leads to organic waste as an output d as compost soil enhancer. The same can also be th-filling and utilisation in the municipal gardens.
r development/amendment of standards and the es of products made from C&DW.
n of recycled products in revisions of the National
or increased adoption of RA as granular sub base.
xplore GST rebates on recycled bound products.
hemes such as GRIHA and IGBC for inclusion of a e into their certification schemes.
developing quality checks of recycled products

3.7. Adoption of Key Strategies for Promoting Circular Economy

C&D Waste Governance in India:

The overarching rules for C&D waste management in India are called the Construction & Demolition Waste Management Rules, 2016. The governance of C&DW was made clear to all stakeholders - from the respective urban local body (ULB) down to the average urban resident by the Solid Waste Management Rules (2016). After the Municipal Solid Wastes (Management and Handling) Rules, 2000 which encompassed all waste streams under one umbrella, the 2016 Rules were a welcome change when C&DW was recognised as a separate solid waste stream. They distinguish between different waste streams and create specific rules for handling each one of them. For the record apart from C&D Waste we also have specific rules for plastic, hazardous Waste, e-waste and biomedical waste.

The following loop holes need overhaul to make the C&D rules effective.

- Most state governments are yet to come out with this policy document. This needs to be
 urgently taken up. While the Centre sets the overarching Rules, the State creates the framework
 for implementation through policy and infrastructure, it is important to note that in C&D waste
 governance, the Urban Local Body (ULB) is a key stakeholder
- Only in a few Indian cities there are recycling facilities (about 15 Nos). Need is to have these in all million plus cities. Even in cities which have recycling facilities the secondary collections points where bulk generators / citizens can deposit waste are barely functional.
- Only in case of Delhi there is a mandate for the procurement (10-20%) of recycled materials for government projects. The advisory regarding the uptake of C&D recycled products was published in 2015 followed by an order for the same in 2016. It mandates a minimum 2% use for building works, 10% use in roadworks, and 5% use in non-structural applications, even for private individuals. The order necessitates modifications in existing bye-laws to enforce this at the time of building plan approval. Such rules need implementation in other cities as well.
- The Town and Country Planning bodies should ensure the incorporation of the recycling infrastructure into the land use plan of the state.

Here is what is can be considered for inclusion in the policy

- 1. Lack of Focus on Reuse: The Rules currently treat disposal and it some extent recycling as the best practice, whereas the principles of Circular Economy stipulate a higher focus on reuse and reduce. This is the focus area of developed countries, but in India, where there is a robust used material economy, there is still a need to legitimise and promote it through policy.
- 2. C&D Waste Transport: The first mile connectivity (FMC) in C&D waste transport is currently in the hands of the unorganised sector. These leads to leakages in the system and the waste ends up in unauthorised dump sites. C&D waste transport requires a coordinated effort between the generator, the appropriate vehicles (small to big tippers, as per the location in the project site) and the recycler. So, collection remains a major challenge and the city administrators remain on tenterhooks as to where the next dump would get created.
- **3. Exclusion of Demolition Contractors:** While the actual work of demolition and thus C&DW waste generation is carried out by demolishers, a standard demolition protocol is missing. This means a gap between the recycler and the generator.

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3.8. Monitoring and Evaluation

This responsibility of monitoring and evaluation lies with the Urban Local Body. Their duties cover the following aspects

1. Issue Detailed Directions:

How C&D waste will be handled within its jurisdiction involved in the activity and disposal after completion

2. Establish Collection Facilities:

Planning for proper collection and handling of waste they are regularly removed when full, using their ow

3. Arrange Transport Till Processing:

Shall get the collected waste transported to approthrough their own resources or by appointing privat

4. Sanction Waste Management Plans:

Examine and sanction waste management plans with building plan.

5. Maintain Waste Database:

Keep track of the generation of C&D waste within annually updated.

6. Setup of C&D Waste Processing Facility:

Shall devise appropriate measures in consultation wi waste generated including processing facility and fo manner.

7. Conduct IEC Activities:

Shall raise awareness about the waste stream thro societies, and its own website.

8. Provide Incentives:

Shall make provision for giving incentives for use of m activity. Salvaging, processing and or recycling prefe

9. Standards Making Bodies:

While a lot is stated about how important it is that C&D waste is recycled, it would fall flat if no one uses it. To address this aspect, the Rules have allocated responsivity to the following bodies:

- Bureau of Indian Standards (BIS)
- Indian Road Congress (IRC)



Their duties as per the Rules are "preparation of code of practices and standards for use of recycled

n. Chalk out stages, methodology and equipment n of C&D processing.
e by placing appropriate containers, and ensuring In resources, or by appointing private operators.
opriate sites for processing and disposal either te operators.
thin one month from the date of approval of the
n its jurisdiction and maintain a database that is
ith expert institutions for the management of C&D or using the recycled products in the best possible
ough collaboration with expert institutions, civil
naterial made out of C&D waste in the construction erably in situ for large demolitions.

materials and products of construction and demolition waste in respect of construction activities". In 2016, BIS came out with the IS 383:2016 which gave legitimacy to the use of Recycled Aggregates (RA) and Recycled Concrete Aggregates (RCA) in construction for lower grades of concrete and PCC. Later in 2017, the Indian Road Congress released the IRC:121-2017 or the 'Guidelines for Use of Construction and Demolition Waste in Road Sector' that specified standards pertaining to the construction of roads and embankments using the C&DW recycled materials.

Lacunae in the responsibilities and reporting Structure of the Administrators:

The C&D Waste Management Rules 2016 are a good start identifying the key stakeholders and their responsibilities pertaining to C&D waste management. However, the Rules need to percolate and reach the city administration levels. Only during the annual Swacch Survekshan of these cities is some activity seen to meet the obligatory requirement by hook or crook to garner points.

All cities need to have an enforceable policy document for C&D Waste Management. There has to be an order mandating the uptake of products made with recycled C&D waste. Without this mandatory usage and incentives, the recycled material and pre- cast products do not have an easy outlet.

Enforcement of waste management plans at the building plan sanctioning stage, and establishment of secondary collection facilities. This would arrest the leakages in the collection system.

Without enforceable policy and appropriate policy instruments in place, citizens do not benefit from these capital-intensive amenities.

GST i.e. 18% is imposed on recycled products, making them equal to products made from mined aggregate compared to conventional products. There is needs to be concession on this to promote recycled material and products.

Policy and governance are related but distinct concepts. While policy creates guidelines to regulate behaviour, actions, and decision-making within a context, governance involves the executionmanagement of the policy.

The drawback of the C&D Waste Management Rules 2016 is not the policy, but rather its governance. In specific, the enforcement. The purpose of enforcement is to ensure that individuals or entities comply with the policies and face consequences if they fail to do so. However, without incentives or appropriate penalties in place, the C&D Waste Management Rules (2016) to date, remain at a guideline level, without the much-required enforceability in most Indian cities.

3.9. Case Studies

Green Aggregates: "Green aggregates" is a term used to describe construction materials that are environmentally friendly and sustainable. These materials are designed to reduce the impact of the built edifice on the environment by utilizing materials that are recycled rather than relying solely on the finite resources. Using green aggregates reduces the carbon footprint of construction projects, which can significantly impact the environment. Green aggregates produced from C&DW can be used in a variety of construction applications, such as:



- Soil improvements thru enhanced weathering techniques of atmospheric CO2 sequestration •
- Substitute material for mined aggregate in concrete / PCC •
- Precast product manufacturing: CC Blocks / Bricks / Pavers/Tiles

The process of producing "green aggregates" typically involves the following steps:

	Collection And Sorting: The waste is col dumpsites. It is then sorted according to
	Crushing: The sorted feedstock is crush crushers and impact or cone crushers.
	Screening: The crushed material is screen that may have been missed during the sc
	Washing: The crushed and screened ma or contaminants.
	Sizing: The material is sized according to
	Quality Control: The recycled aggrega relevant standards.
к†я +⊡+ к↓¥	Distribution: The recycled aggregates are plants ready to be used in new construct

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- Order: Use of Recycled Products from C&D Waste, (2 5.
- Indian Standard Coarse and Fine Aggregate for Conc 6.
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llected from construction/ demolition and legacy their fraction type.
hed into smaller pieces in two stages using jaw
ned to remove any debris, such as wood or metal, orting process.
aterial is washed to remove any remaining debris
the desired use, such as coarse or fine aggregate.
ates are tested for quality and compliance with
re then despatched to construction sites and RMC tion projects.

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Circular Economy Action Plan for Electrical and Electronic Goods

4.1. Introduction

The Circular Economy Action Plan for Electrical and Electronic Goods is a comprehensive initiative aimed at revolutionizing the way we produce, consume, and manage electronic products. This forward-thinking plan is designed to address the escalating challenges posed by the rapid growth of the electrical and electronic industry, including resource depletion, e-waste accumulation, and environmental degradation.

At its core, this action plan promotes a paradigm shift from the traditional linear "take-make-dispose" model to a circular approach, which emphasizes sustainability, resource efficiency, and waste reduction. It encompasses a wide range of strategies and measures to optimize the entire lifecycle of electrical and electronic goods, from design and production to use, repair, and end-of-life management.

Key objectives of the Circular Economy Action Plan for Electrical and Electronic Goods include:

- Encouraging manufacturers to create products that are built to last and can be easily repaired, thereby extending their lifespan, and reducing the need for frequent replacements.
- Encouraging the reuse and refurbishment of electronic devices, diverting them from landfills and reducing the demand for new products.
- Implementing efficient and environmentally friendly recycling processes to recover valuable materials from discarded electronic goods, reducing the environmental impact associated with resource extraction.
- Encouraging the use of sustainable and recyclable materials in the production of electronic goods, as well as exploring innovative technologies for material recovery.
- Implementing policies that hold manufacturers accountable for the entire lifecycle of their products, thereby incentivizing them to adopt more sustainable practices.
- Raising public awareness about the benefits of a Circular Economy for electrical and electronic goods and providing consumers with information on responsible consumption and disposal practices.
- Collaborating with global partners to establish common standards and best practices for the sustainable management of electrical and electronic goods.

4.2. Environmental and Economic Footprint

The environmental and economic footprint of Electrical and Electronic Goods (EEGs) refers to the impacts these products have on both the environment and the economy throughout their entire lifecycle, from raw material extraction to manufacturing, use, and eventual disposal.

Environmental Footprint

- The extraction of raw materials (metals, minerals, plastics, etc.) for manufacturing electronic goods contributes to resource depletion. This includes metals like gold, silver, and rare earth elements, which can have significant environmental consequences.
- The production of electronic goods requires substantial energy inputs, both in the manufacturing process and during their use. This includes energy-intensive processes like smelting metals, semiconductor fabrication, and electricity consumption during product operation.
- The production, transportation, and use of electronic goods result in greenhouse gas emissions. This includes emissions from manufacturing facilities, as well as those generated during energy production to power the devices.
- Improper disposal of electronic waste is a significant environmental concern. Many electronic devices end up in landfills, where they can release harmful chemicals and contribute to soil and water pollution.
- Electronics often contain hazardous substances like lead, mercury, cadmium, and brominated flame retardants. When not properly managed, these substances can leach into the environment, posing risks to human health and wildlife.



Economic Footprint

- Manufacturing electronic goods involves various costs, including labor, raw materials, energy, • and facility expenses. The complexity and precision required in production can make this industry capital-intensive.
- The EEG industry invests heavily in research and development to drive innovation. This leads to • technological advancements, which in turn contribute to economic growth and job creation.
- The production, distribution, and servicing of EEGs create employment opportunities. This includes jobs in manufacturing, design, engineering, sales, and customer support.
- The electrical and electronic industry represents a significant portion of many countries' economies. For some nations, exports of electronic goods contribute significantly to their trade balance and overall economic stability.
- Improper disposal of electronic waste can result in significant environmental cleanup costs, which can burden both the public and private sectors.

4.3. Present Recycling and Recovery Rates

India, like many countries, has been working to improve the recycling and recovery rates for EEGs due to the environmental and economic benefits associated with responsible e-waste management.

As of 2021:

- Formal recycling rate in India is estimated at 10% 20%
- Formal recovery rate in India is estimated at 80% to 95%

Data from:

- www.cseindia.org •
- www.toxicslink.org ٠

4.4. Importance for Circular Economy

The Circular Economy is of paramount importance for electrical and electronic goods [EEGs] due to a multitude of economic, environmental, and social benefits it offers. Here are some key reasons why the Circular Economy is crucial for EEGs:

- EEGs rely on a wide range of raw materials, including metals, plastics, and rare earth elements. A • Circular Economy promotes resource efficiency by minimizing waste and maximizing the lifespan of these materials through practices like repair, refurbishment, and recycling.
- The disposal of electronic waste (e-waste) poses significant environmental and health risks. A • Circular Economy aims to minimize waste generation by encouraging responsible consumption, reuse, and proper recycling of EEGs, thus mitigating the negative impacts of e-waste.
- The production of electronic goods is energy intensive. A Circular Economy promotes energy . efficiency through strategies like remanufacturing and refurbishment, reducing the overall energy footprint associated with the manufacturing and disposal of EEGs.



- creation and stimulate innovation in the sector.
- of more sustainable and efficient EEGs.
- Designing products for durability and repairability extends their lifespan. This not only reduces the • frequency of replacements but also enhances the value proposition for consumers.
- A Circular Economy encourages consumers to make informed choices about their This empowers consumers to become active participants in sustainable consumption.
- By minimizing resource extraction, reducing pollution, and lowering energy consumption, conservation efforts.
- Many regions and countries are implementing strict regulations regarding e-waste legal repercussions.
- Embracing a Circular Economy for EEGs aligns with broader global sustainability goals, Responsible Consumption and Production.

4.5. Adoption of Key Strategies for Promoting Circular Economy

Promoting a Circular Economy for electrical and electronic goods is crucial for sustainable resource management and reducing environmental impact. Here are some key strategies that can be adopted:

Product Design for Durability and Disassembly

- Design products to last longer by using high-quality materials and robust construction.
- Incorporate modular design principles to allow for easy repair and upgrade. •
- Design for disassembly to facilitate the separation of components for recycling or reuse.

Extended Producer Responsibility (EPR) (partially implemented)

Implement EPR policies, which make manufacturers responsible for the end-of-life disposal of

Take-back and Recycling Programs

- Establish collection and recycling programs to ensure that end-of-life products are properly managed.
- Provide convenient drop-off points or pick-up services for consumers.

Material Efficiency and Recycling

- Promote the use of recycled materials in the manufacturing process.
- Implement technologies for efficient extraction and processing of critical raw materials from discarded electronics.

The Circular Economy for EEGs presents economic opportunities through various stages of the product lifecycle, including design, repair, remanufacturing, and recycling. This can lead to job

Embracing circular practices encourages innovation in product design, materials selection, and recycling technologies. This drives technological advancement and promotes the development

purchases and to consider factors like product durability, repairability, and recyclability.

a Circular Economy for EEGs contributes to overall environmental preservation and

management and sustainable production practices. Adhering to Circular Economy principles helps businesses comply with these regulations and avoid potential fines or

such as the United Nations Sustainable Development Goals (SDGs), particularly Goal 12:

their products. This encourages them to design products with recyclability and reusability in mind.

Remanufacturing and Refurbishment

- Encourage remanufacturing and refurbishment of electronic goods to extend their lifespan. ٠
- Develop standards and quality controls for remanufactured products. •

Digital Product Passports and Tracking

• Implement digital tracking systems to provide detailed information about a product's lifecycle, including materials used, manufacturing processes, and maintenance history.

Change in definition of Bulk Consumer: In Rules 2022/2016, Bulk Consumers responsibility is very limited, there is no mention of Annual filings for a bulk consumer. And definition of Bulk Consumer needs to be Redefined.

- Current definition: Bulk Consumer means any Entity which has used at least "1000" units of • Electrical & Electronic equipment listed in schedule I, at any Point in the particular Financial Year and incudes e-retailer.
- Proposed: Bulk Consumers means any Entity which has used at least "200" units of Electrical & electronic equipment either listed or not listed in schedule I.

Annual Filings for Bulk Consumer should be made Mandatory and He should be made responsible for disposing hi material to an Authorized recycler.

In addition, Bulk Consumers (especially in IT sector) who use more than "200" Units per year Should be registered in portal and details pertaining to E-waste disposal should be made mandatorily uploaded.

Revision in Incentivization of Refurbishing: Current 2022 Rules have Brought in incentivization of Refurbishing by Adding only 75% of deferred Quantity to the producers of total 100%. However, this is too small for a Producer to take a step towards refurbishing his product. This should be made at least 50% to make it effective.

Utilization of Informal Sector: Role of Informal sector should be effectively used to develop a strategic collection mechanism instead of completely avoiding them from E-waste business.

Rating of Recyclers: Current E-waste Management Practice is not identifying best compliant Recyclers in country, where these Recyclers setup an advanced technology system but were treated same and compete with a normal dismantler for pricing. A mechanism to rate recyclers may be introduced. Government Should recognize these companies as Grade 1, 2, 3 recyclers & should enforce other dismantlers & Recyclers to send their material who cannot fully process their material.

Environment Compensation: Current Environment compensation only concentrates on a Producer who fails to complete his target. Strict environmental compensations should also be extended to Bulk consumers who doesn't dispose his E-waste responsibly.

Due Diligence on Recyclers: CPCB should perform a due diligence on existing recyclers & identify few good recyclers & should enforce all government organizations, institutions, colleges and universities to dispose them to the listed recyclers.



Incentives for Circular Design:

Introduce financial incentives for electronics manufacturers adopting circular design principles, encouraging the industry to embrace sustainable practices. These can include:

- а. sustainable practices.
- b. exclusive market opportunities.
- С. healthy competition within the industry.

Research and Innovation Funding:

Allocate research and innovation funds to support the development of environmentally friendly technologies and processes in the electronics sector, promoting circularity through innovation. These may include:

- а. reduction.
- b. **Collaborative Research Centers:** Establish collaborative research centers where such initiatives.
- с. electronics industry, promoting creative solutions.

Collaborative Initiatives:

Facilitate collaboration among industry stakeholders, government bodies, and NGOs to create a holistic approach to circularity, fostering a collective responsibility for sustainable practices in the electronics industry. These may include:

a. circularity.



Tax Rebates: Provide tax rebates or reduced tax rates for electronic manufacturers incorporating circular design principles in their products, encouraging them to adopt

Green Certification: Introduce a certification system that rewards companies adhering to circular design standards, granting them access to government contracts or

Public Recognition: Establish awards or recognition programs for companies showcasing excellence in circular design, enhancing their public image and fostering

Grants for Sustainable Technologies: Allocate government grants to electronics companies investing in research and development of sustainable technologies, especially those focusing on material innovation, energy efficiency, and waste

industry experts, academic institutions, and government agencies work together to advance sustainable practices in the electronics sector, with dedicated funding for

Innovation Challenges: Organize innovation challenges with cash prizes or funding opportunities for projects that address specific environmental challenges in the

Industry Roundtables: Facilitate regular industry-wide roundtable discussions involving manufacturers, government representatives, and environmental organizations to share best practices, address challenges, and collectively set industry-wide goals for

- Joint Awareness Campaigns: Collaborate with NGOs and industry associations b. to launch joint awareness campaigns educating consumers about the environmental impact of electronics and promoting responsible consumption.
- Resource Sharing Platforms: Create platforms where companies can share insights, С. resources, and successful case studies related to circular practices, fostering a collaborative environment for sustainable development.

4.6. Targets

S.No.	Proposed Target	Timeline for Achievement	
		2025	2030
1.	Achieve recycling rate for electronic waste in India by encouraging responsible disposal and recovery of valuable materials [%]	40	90
2.	Ensure compliance with EPR regulations among electronics manufacturers, promoting accountability for the entire product life cycle (% compliance)	80	100
3.	Percentage of products designed with interchangeable and upgradeable parts by establishing standards for modular components in electronic devices.	40	70
4.	Extraction of critical materials like rare earth metals from end-of-life electronics [%]	50	80

4.7. Monitoring and Evaluation

Monitoring and evaluating the implementation of Circular Economy practices for electrical and electronic goods is essential to assess progress, identify areas for improvement, and ensure the effectiveness of initiatives. Here are steps and considerations for monitoring and evaluation:

- Define specific, measurable indicators to track progress towards Circular Economy goals. Examples • include recycling rates, product lifespan, material efficiency, and reuse rates.
- Establish a robust data collection system to gather relevant information. This may include data on . product lifecycle stages, recycling rates, material usage, and economic impacts.
- Regularly report on progress to stakeholders, including government agencies, industry associations, • and the public.
- Conduct Life Cycle Assessment- LCAs to assess the environmental impacts of electrical and ٠ electronic products throughout their entire lifecycle, from raw material extraction to end-of-life disposal.
- Monitor and evaluate the transparency of supply chains, ensuring that materials are sourced ۲ responsibly and that production processes adhere to circular principles.
- Implement digital product passports or tracking systems to provide detailed information about ۲ a product's lifecycle. This can help in monitoring product origins, materials used, and end-of-life pathways.



- Track the flow of electronic waste from collection with recycling regulations and assess the effective
- Evaluate the economic benefits of Circular Econo • through material recovery, and the developmen
- Assess the social benefits of Circular Economy in recycling facilities, community engagement, and
- Engage with stakeholders, including consumers, to gather feedback on Circular Economy initiativ
- Monitor compliance with existing regulations incentives designed to promote circularity.
- Track the adoption of innovative technologies electrical and electronic goods industry.
- Document and share successful case studies and of Circular Economy initiatives.
- Conduct regular assessments and reviews to strategies as needed.
- Compare the performance of Circular Econom goods sector to industry benchmarks and globa
- corrective actions to enhance the effectiveness of Circular Economy strategies.

4.8. Case Studies

Case studies of Circular Economy practices in the electrical and electronic goods industry:

Fairphone

Fairphone is a Dutch company that produces smartphones with an emphasis on ethical sourcing, longevity, and repairability.

• Circular Practices: Fairphone designs its products with modularity in mind, making it easier to impact/long-lasting-design/

Apple's Liam Robot:

Apple is a multinational technology company known for its iPhones, iPads, and other electronic products.

 Circular Practices: Apple developed the Liam robot, which is designed to disassemble old iPhones Sept2016.pdf

on to recycling or disposal. Monitor compliance veness of take-back programs.
omy practices, including job creation, cost savings It of new markets for recycled materials.
itiatives, such as improved working conditions in d consumer awareness.
manufacturers, NGOs, and government agencies, res and identify areas for improvement. and evaluate the effectiveness of policies and
s and practices that promote circularity in the
best practices to showcase the positive impacts
measure progress against set KPIs and adjust
ny initiatives within the electrical and electronic al standards.

Use the monitoring and evaluation results to identify areas for improvement and implement

replace individual components like the battery or camera. They also actively work to source conflict-free minerals and promote fair labor practices. Link: https://www.fairphone.com/en/

to recover valuable materials. This allows for the recycling and reuse of components, reducing the need for raw materials. Link: https://www.apple.com/environment/pdf/Liam_white_paper_

Dell's Closed-Loop Recycling:

Dell is a global technology company that manufactures and sells computers, laptops, and other electronics.

Circular Practices: Dell has established a closed-loop recycling system where it takes back used electronics and uses the materials to manufacture new products. This minimizes the need for virgin materials. Link: https://www.dell.com/learn/vg/en/vgcorp1/corp-comm/closed-looprecycled-content

Renault's Electric Vehicle (EV) Battery Recycling:

Renault is a multinational automobile manufacturer.

Circular Practices: Renault is working on projects to repurpose or recycle used EV batteries. This includes finding ways to use retired EV batteries for energy storage in various applications. Link: https://www.renaultgroup.com/en/news-on-air/news/the-circular-economy-of-the-electricvehicle-battery/

IKEA's Buy Back and Resell Program:

IKEA is a Swedish multinational company known for its furniture and home goods.

Circular Practices: IKEA launched a program that allows customers to return used furniture, • including electronic goods like lamps and chargers, in exchange for store credit. The returned items are refurbished and resold. Link:https://www.ikea.com/gb/en/customer-service/services/ buy-back/#:~:text=With%20Buyback%20%26%20Resell%2C%20you%20sell,gives%20it%20 a%20new%20home.

Sony's Take-Back and Recycling Program:

Sony is a Japanese multinational conglomerate known for its consumer electronics.

Circular Practices: Sony has established take-back and recycling programs for its products, ensuring responsible disposal and recycling of electronic waste. Link:https://www.sony. co.in/microsite/environment-policy/ewaste/#:~:text=Sony%20ensure%20that%20 e%2Dwaste,telephones(Mobile)%20for%20recycling.

Circular Electronics Initiative in the Netherlands:

The Netherlands has a national initiative focused on promoting circular practices in the electronics sector.

Circular Practices: This initiative involves collaboration between government agencies, manufacturers, and stakeholders to develop and implement strategies for sustainable design, recycling, and reuse of electronic products. Link: https://www.government.nl/topics/circulareconomy/accelerating-the-transition-to-a-circular-economy

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5.1. Introduction

The management of municipal waste is a critical environmental challenge facing India, a nation with a rapidly growing population and urbanization. With an increasing urban lifestyle and consumption patterns, the generation of mixed municipal waste, including dry fractions, has been on the rise. This poses significant environmental and resource management concerns. In response to these challenges, India has been working on developing a Circular Economy Action Plan specifically aimed at addressing the management of dry fractions of mixed municipal waste.

Understanding Mixed Municipal Waste - Dry Fraction: Mixed municipal waste refers to the collection of various waste materials generated from households, institutions, and commercial establishments. Dry fractions are components of this waste that do not decompose easily and typically include materials such as plastics, metals, glass, and paper. The management of dry fractions is of paramount importance due to its environmental impact, as improper disposal leads to pollution and depletion of resources.

The Need for a Circular Economy Approach: A Circular Economy is an alternative to the traditional linear economy, which follows the "take, make, dispose" model. In a Circular Economy, resources are kept in use for as long as possible, and waste and pollution are minimized. Such an approach is not only environmentally friendly but also economically advantageous, as it reduces the pressure on natural resources and promotes sustainability.

Challenges and Opportunities: India's Circular Economy Action Plan for Mixed Municipal Waste – Dry Fraction aims to address several challenges:

- Lack of Infrastructure: One of the primary challenges is the lack of proper infrastructure for waste systems to efficiently manage dry fractions.
- Awareness and Behavior Change: There is a need to create awareness and encourage responsible for changing people's behavior.
- Technological Advancements: The plan focuses on leveraging technology for efficient sorting and are being explored.
- Economic Incentives: Developing economic incentives for the private sector, such as tax benefits • plan.









segregation and recycling. India is working to enhance its waste collection and segregation

waste disposal practices among citizens. Public engagement and education campaigns are crucial

recycling of dry fractions. Innovations in waste-to-energy technologies and recycling methods

and subsidies, to invest in recycling and waste management facilities is an essential aspect of the

Lack of source segregation, use of non-recyclable material, filler materials in textile and mixing of soil, debris etc. makes dry waste highly heterogenous. Soil and debris affect wet waste and its

- Conversion of dry waste in to any useful resource requires comprehensive and extensive level of • processing. The processing is completely based on mechanical processes and equipment.
- Nature of waste, lack of economics and heterogeneity of waste makes conversion of dry waste • in to any resource is improbable. Lack of economics makes investment in to robust equipment almost impossible.

Policy Framework: The Circular Economy Action Plan for Mixed Municipal Waste - Dry Fraction in India is guided by a comprehensive policy framework that incorporates the principles of a Circular Economy. This includes regulations for waste segregation at source, extended producer responsibility, product design standards, and the establishment of recycling and resource recovery centers.

The Way Forward: India's commitment to implementing a Circular Economy Action Plan for Mixed Municipal Waste – Dry Fraction is a significant step towards addressing the environmental challenges posed by increasing urbanization and consumption. By promoting responsible waste management, recycling, and resource conservation, this initiative not only supports environmental sustainability but also presents economic opportunities and job creation.

In conclusion, India's Circular Economy Action Plan for Mixed Municipal Waste – Dry Fraction is a holistic approach to manage the challenges posed by urban waste generation. It showcases the nation's dedication to embracing Circular Economy principles, fostering sustainable practices, and creating a cleaner and more resource-efficient future.

5.2. Environmental and Economic Footprint

The implementation of a Circular Economy Action Plan for Mixed Municipal Waste - Dry Fraction in India could have a profound impact on both the environment and the economy. Here's an analysis of its potential environmental and economic footprints in the Indian context:

Environmental Footprint:



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Waste Reduction: Implementing the Circular Economy Action Plan will significantly reduce the amount of dry fraction municipal waste ending up in landfills. This reduction will lead to lower greenhouse gas emissions and a decreased environmental burden associated with waste disposal.

Resource Conservation: By promoting recycling, reusing, and upcycling of materials in the dry fraction waste stream, this plan will help conserve valuable resources like metals, plastics, and paper. This, in turn, reduces the need for virgin resource extraction and energy-intensive manufacturing processes.

Air and Water Quality: A reduction in waste going to landfills and the adoption of cleaner waste management practices will lead to improved air quality and a decrease in pollution. It will also help mitigate the leaching of contaminants into groundwater, leading to improved water quality.



Energy Savings: Recycling and reusing materials generally require less energy than producing new products from raw materials. As a result, the plan will contribute to energy savings and a reduced carbon footprint.

Reduced Pollution: Diverting dry fraction waste from landfills will decrease the leaching of harmful chemicals into the soil and water, contributing to cleaner ecosystems and less harm to wildlife.

Circular Supply Chains: Encouraging the circular use of materials in the dry fraction waste stream /ŵ\ will lead to shorter supply chains, reducing transportation-related emissions and associated **\$_\$** environmental impacts.

- GO Biodiversity and Ecosystem Benefits: As waste-related pollution decreases, local ecosystems R and wildlife can benefit from reduced contamination and habitat degradation.
- Public Health: Improved waste management and reduced pollution can lead to improved public 8:8 8:4 8:0 health, reducing the incidence of diseases related to environmental contamination.



Economic Footprint:



Job Creation: The Circular Economy Action Plan has the potential to create jobs in various sectors, including recycling, waste management, remanufacturing, and sustainable product design. This can address unemployment and contribute to economic growth.

Entrepreneurship: Encouraging entrepreneurship in recycling and upcycling businesses can stimulate local economies and provide opportunities for small and medium-sized enterprises to thrive.

Resource Efficiency: Adopting a Circular Economy approach can increase resource efficiency, reduce costs, and improve competitiveness for businesses. This can lead to longterm cost savings and bolster the Indian economy.



Innovation: The plan can drive innovation in waste management technologies, recycling processes, and circular supply chains. It may lead to the development of new, innovative solutions and products, potentially driving economic expansion.

Export Opportunities: India can tap into international markets for recycled and upcycled products, increasing exports and foreign exchange earnings.



attractions.

In conclusion, the Circular Economy for mixed municipal waste - dry fraction in India has the potential to deliver significant environmental and economic benefits. It can address pressing environmental issues, conserve resources, create jobs, and stimulate innovation and entrepreneurship. The success of this plan will depend on effective implementation, government policies, public awareness, and private sector engagement.

5.3. Present Recycling and Recovery Rates

Dry waste consists of recyclables such as plastic, India generates 70 million metrics of municipal paper, cardboard, metals, glass, rubber, nonsolid wastes. Out of it, only 20% is recycled and recyclables and other combustible. It is the most the rest ends up in landfills and oceans affecting valued waste stream in municipal solid waste humans, and marine life, along with destroying owing to high economic value of its components, the environment. This necessitates a solid waste especially recyclables. Rapid urbanization management system in place. and economic growth have led to changing consumption patterns. Economic prosperity has It is estimated that waste management in India is potentially a \$15 billion industry. Out of the entire also resulted in increase in potential value of recyclable fractions necessitating the adoption waste produced in India, 25% are dry waste components that can be recycled. of Circular Economy principles for resource recovery.

This recyclable waste, dumped into landfills due According to the ministry of environment, forest, to a lack of proper collection and infrastructure, and climate change, under the government of can be reused as raw material. If it is properly India, India is the fifth-largest economy in the segregated and processed further, it can be a world. The nation generates approximately 62 highly lucrative source of revenue generating. million tons of waste with an average annual Heterogeneity of waste also makes conversion growth rate of 4%. It is also found that currently, difficult from dry waste to any useful resource.



Sustainable Tourism: A cleaner environment and better waste management can contribute to a boost in sustainable tourism, providing economic benefits to regions with tourist India also generates about two million tonnes (MT) of e-waste annually, which makes plastics and electronics two key components of waste generation. However, these waste generation components, alongside solid waste, have a huge potential to be capitalised into channels of high revenue generation. Similarly, in 2020, 81 billion worth of paper waste and paper pulp was imported to India. On the other hand, only 20% of paper waste is being collected, segregated, and recycled rest goes to landfills. The same applies to glass and metal waste.

It is high time we shift our focus towards gaining increasing utility from waste generation. Every industry is aiming to enhance its profit margins.

This can be accomplished in one of two ways: either by raising the selling price or lowering the cost of manufacturing. Since it is difficult to raise prices due to severe competition, many industries are focusing on cost reduction. The cost of raw materials used to make items accounts for a large component of the total cost of manufacturing. If minimised, the production cost can be radically reduced. This is where recyclable waste, sometimes known as "scrap" or reprocessed material, comes in. The processed waste is comparatively cheaper than new raw material, therefore if it is used in a proportional amount, guality can be maintained while costs are reduced. As a result, the demand for reprocessed recyclable waste is steadily expanding.

DRY WASTE COMPOSITION





Considering India's massive domestic needs due to growing population and economic advancement, resource offsetting measures are required to reduce environmental pollution and climate change effects.

These twin challenges of dry waste management and growing resource requirements can be converted into an opportunity. Dry waste management using circularity principles can help India decouple its growth from consumption of primary resources and materials, thus ensuring efficient resource recovery from dry waste. India currently generates approximately 1.45 Lakh metric tonnes of solid waste, 35% of which is dry waste. Thanks to India's informal sector, a majority of the plastic waste is recycled. India can take inspiration from countries with high recycling rates: Germany [66.1%], Singapore [60.6%], South Korea [59.0%] and further improve its resource recovery and recycling.

Challenges in Other Dry Waste Components (Non-Plastic)

- Processing of Tetra Pak: Commonly used compound packaging such as Tetra Pak comprises its recycling difficult and cost intensive.
- resulting in loss of valuable metal resources.
- Issues In Recycling Of Glass And Ceramic Waste: Approximately 45% of glass is recycled in India. • of communication between cities and the glass recycling industry.
- Segregated Collection And Processing Of Textile Waste: A McArthur Report estimates that and recycling system for textiles.
- in landfills.
- Localized Processing Facilities For Thermocol: Thermocol [Expanded polystyrene] finds wide for the construction and decorating industry due to its insulating properties and light weight. density and high volume resulting in limited processing/recycling.

three recyclable components i.e. 75% paper, 20% polyethylene and 5% aluminium thereby making

Segregation Of Metals And Unscientific Recycling By Informal Sector: Contamination of metals with bio-degradable waste is a critical matter of concern due to toxicity of metals. Though segregation of metals from other waste streams is relatively easy due to high density of metals. small metal scraps are often lost due to inefficient segregated waste collection and waste tracking,

Risks of injuries and issue of breakages while handling glass and ceramics makes it less attractive to recyclers and handlers. Though glass segregated by colours has an established market, yet lack of segregation and availability of glass is neither reported nor is there an established mechanism

globally the production of clothes has doubled in the last 15 years while the time duration for which clothing is worn before it is thrown away has fallen by approximately 40% leading to more textile waste. The Indian Textiles industry in India reports that more than 1 million tons of textiles are discarded every year, with most of this coming from household sources. While the industry has a recycling potential of 50%, at present only 25% is being recycled/ reused. Even though ageold circular (reuse and refurbish) barter system still exists in small towns, there is limited collection

Processing Of Tyres And Rubber: With the growth of automobile sector, the tyre industry is also arowing fast. It is estimated that India currently produces about 6.50.000 tyres and discards 2.75.000 every day, generating over a million tonnes of ELTs [End of Life Tyres] each year. Currently, there is no tracking of discarded tyres and monitoring of their disposal across India. Though retreading of tyres by unorganized sector is a common practice, a large portion of the scrap tyres are dumped

scale application as packaging goods (especially electronic goods) and is an excellent material Though it is a technically recyclable material, its transportation is a challenge due to its ultra-low

- Recycling Of Coconut Waste: With 72% of world's production in India and coconut's role in • Indian culture, it is an important waste component. In recent years, due to increased demand for recycling, coconut shells are being segregated and shredded by informal workers. But in smaller and remote cities segregation, transportation and logistics cost of coconut waste act as significant barrier for coconut recycling.
- Collection And Processing Of Human Hair Waste: Despite a large-scale economy running around human hair, there is limited scientific management of human hair waste. The collection system is often limited to large generators of hair waste like large temple complexes, whereas small units generating hair waste such as salons, beauty parlours, etc. are not connected to the collection system. The efficient and environmentally safe utilization of human hair also requires appropriate technologies for different uses of hair waste.

5.4. Importance of Circular Economy for Mixed Municipal Waste (Dry Fraction)

India's economic growth is essential for its people especially the economically weaker section, the growth of middle class with its aspirations and growing urbanisation will lead to growth in waste. This aspect needs to be accepted before identifying solutions. India needs solutions designed to cater to its requirements

The adoption of Circular Economy requires a shift in approach - a shift from linear – take - make-waste model to a full multi-life-cycle circular model. According to a KPMG study, the savings from Circular Economy in India are estimated at US\$ 624 billion in year 2050, for the current development trend. To move towards a Circular Economy in dry waste, the design and material aspect related to production must be addressed. Recycling is a crucial part of the Circular Economy, but the goal of "true recycling" is that of converting the waste resource back to its original form, without sacrificing quality or integrity in the process. The recycled material should be at par with what was originally created using virgin raw material, for true circularity.

Material recycling facilities can play significant role in making dry waste management circular. If implemented, material recycling facilities can help improve recovery from ₹5,187 crores/annum to ₹17,023 crores/annum by 2025 thus adding ₹11,836 crores to economy per annum. MRFs will also help to generate employment of 40 Lakh person-days during construction of MRFs and ~80 Lakh persondays in perpetuity for operations & maintenance of these facilities.

Contribution to Climate Change Mitigation The waste sector (including dry waste) accounts for 3.7% of India's total national level GHG emissions. Whilst the aggregate contribution may be insignificant when compared to sectors like land energy or land use change, waste sector emissions have risen at a compound annual growth rate (CAGR) of 4.2% during 2005-2015. The GHG emissions per tonne of solid waste disposed have also increased by 2.7 times, rising from 85 kg of CO2 per tonne of solid waste disposed during 1954-60 to 227 kg of CO2 per tonne of solid waste disposed during 2005-2015. Hence scientific waste management can play an important role in mitigation of GHG emissions.

Applying circularity principles in dry waste management can help India achieve its GHG emissions reduction commitments faster. For example, if 'refill' bottle designs and models were to be applied to all bottles in cosmetics, personal care as well as home cleaning, packaging and transport savings would represent an 80-85% reduction in GHG emissions compared to today's traditional single-use bottles.



The importance of a Circular Economy approach for mixed municipal waste, specifically the dry fraction, cannot be overstated. Here are key reasons why it is crucial:

- and production.
- economic viability.
- carbon emissions.
- technologies and sustainable product design.
- benefiting both the environment and public health.
- Sustainable Consumption: A Circular Economy encourages consumers to make more sustainable practices.
- Less Environmental Damage: The extraction of raw materials, such as mining and deforestation, Economy minimizes the negative impacts of resource extraction.
- Resilience in Resource Scarcity: As global resources become scarcer and more expensive, a • longer lifecycles. This resilience to resource scarcity is vital for long-term sustainability.
- Local and Global Sustainability: A Circular Economy approach contributes to both local and management.
- Regulators need to simultaneously build capacity to adapt to the dynamic nature of sustainability and facilitate towards environment protection rather than regulate with a stick.



Responsible packaging, production, reusability, and a credible refurbishment of various equipment for use in affordable economies of India is the need of the hour. This will not only adhere to Circular Economy principles but also fulfil the aspirations of people.

Resource Conservation: Mixed municipal waste, including dry fraction waste, contains valuable resources such as metals, plastics, paper, and glass. Adopting a Circular Economy approach ensures that these resources are reused, recycled, or upcycled, reducing the demand for virgin materials. This conserves natural resources and reduces the environmental impact of extraction

Waste Reduction: A Circular Economy approach minimizes waste generation by emphasizing the reduction of waste at the source by minimizing packaging, reuse of products, recycling of materials and refurbishment of various materials. This reduces the burden on landfills and incineration, which can lead to lower greenhouse gas emissions, reduced pollution, and less strain on local ecosystems. Reduction in waste generation will be a challenge for a growing economy of India; policy makers need to guide enterprises to manufacture sustainably in India with the most innovative and advanced technology. India will always provide the scale and volume for

Climate Change Mitigation: By reducing the energy-intensive processes associated with the production of new materials, recycling and reusing materials from mixed municipal waste can lead to significant energy savings. This, in turn, contributes to mitigating climate change by lowering

Economic Opportunities: Circular Economy practices create economic opportunities. Recycling, remanufacturing, and waste management industries generate jobs and stimulate entrepreneurship.

These industries can contribute to economic growth and foster innovation in waste management

Reduction in Pollution: A Circular Economy approach can significantly reduce the release of pollutants into the environment. This includes a reduction in leachate from landfills, the release of harmful chemicals, and the contamination of soil and water. This leads to cleaner air and water.

choices, such as buying products made from recycled materials or choosing products designed for longevity and repairability. This helps shift consumer behaviour towards more sustainable

often leads to severe environmental damage. By using existing materials more efficiently, a Circular

Circular Economy ensures that existing resources are used efficiently and that products have

global sustainability by reducing waste-related environmental issues and improving resource

India's rapid adoption of a digital economy is a case study for the global economy and it needs to • be leveraged to reduce waste. Retail sector with use of AI and digitisation can leverage the scale to identify people's daily needs and establish a supply chain fulfilling those needs.



Segregated combustible fraction of waste and its use as alternative fuel for cement industry of • power generation in waste to energy needs to be deployed on a case to case basis.

In conclusion, the adoption of a Circular Economy for mixed municipal waste, especially the dry fraction, is critical for reducing waste, conserving resources, mitigating climate change, and promoting economic growth. It represents a holistic and sustainable approach to waste management that benefits both the environment and the economy while contributing to a more sustainable and resilient future.

5.5. Adoption of Key Strategies for Promoting Circular Economy

Promoting a Circular Economy for mixed municipal waste, particularly the dry fraction, requires a combination of key strategies. These strategies aim to maximize resource efficiency, reduce waste, and minimize the environmental impact. Here are some key strategies for promoting a Circular Economy for mixed municipal waste - dry fraction:

1. Waste Segregation and Collection:

- Implement effective waste segregation systems to separate dry fraction waste from other waste • streams like organic or hazardous waste.
- Ensure efficient collection processes that are designed to prevent contamination of recyclable • materials.

2. Public Awareness and Education:

- Educate the public about the importance of waste reduction, recycling, and the Circular Economy. •
- Promote responsible waste disposal and recycling practices at the community level. •

3. Extended Producer Responsibility (EPR):

- Establish EPR programs that hold manufacturers and producers responsible for the entire life cycle • of their products, from production to disposal.
- Encourage manufacturers to design products for easy recycling and reuse. •

4. Innovative Recycling Technologies:

- Invest in state-of-the-art recycling technologies to efficiently process dry fraction waste materials. •
- Support the development of innovative recycling methods for materials that are traditionally • challenging to recycle.

5. Resource Recovery Facilities:

- Develop resource recovery facilities that extract valuable materials, such as metals and plastics, • from mixed municipal waste.
- Use advanced sorting and separation technologies to recover as much recyclable material as ٠ possible.

6. Circular Design and Product Innovation:

- Encourage product manufacturers to design products for longevity, repairability, and recyclability. •
- Promote the use of eco-friendly and sustainable materials in product manufacturing. •

7. Economic Incentives:

- Implement economic incentives, such as deposit-return schemes, to encourage the return and • recycling of dry waste.
- Offer tax breaks or subsidies to businesses that invest in Circular Economy practices. •
- Imposing additional tax provisions to control waste generation & dumping. •

Region	Average user fee in selected cities (US\$/year, as reported in data)
East Asia and Pacific	46
Europe and Central Asia	83
Latin America and the Caribbean	80
Middle East and North Africa	55
South Asia	34
Sub-Saharan Africa	10-40
*World bank estimates	

8. Collaboration and Partnerships:

- Foster collaboration between government agencies, municipalities, businesses, and community organizations to create a coordinated approach to Circular Economy initiatives.
- Form partnerships with waste management companies and recycling facilities to ensure effective collection and processing of dry fraction waste.

9. Regulatory Framework:

- Establish and enforce regulations that mandate the responsible disposal, recycling, and recovery of materials from mixed municipal waste.
- Set recycling targets and standards for both public and private sectors.
- innovative and advanced technology.
- Waste characterisation is a must for all urban centres; for this a dedicated waste management • waste
- waste. Rights of sale of by products should be with the operator.
- Each project should have third party or independent consultants preferably institutions such as Anna University, EPTRI, NEERI, EIL etc.
- Clear and non-deviating methodology for compliance, for example traceability and transparency of use of by products to be established by CPCB.
- Mandatory clauses in tenders with regards to production of RDF from SCF along with type of RDF to be produced with range of specifications to be provided such as size, moisture and ash.
- In case of tenders with RDF production as the major way of managing dry waste, cement industry to be included as part of pre-bid meetings to ensure RDF offtake.
- Cement industry to provide clear quality specifications along with uniform process of sample preparation and testing of RDF.
- Use of rail and sea for movement of RDF with support from railways in terms of lowest freight classification for RDF use
- No incentive or penalisation for waste management or cement companies for production of right quality of RDF or usage of RDF.
- Government tenders can mandate cement offtake from cement companies which are more • green w.r.t to use of Alternative Fuel
- Transparency with reference to TSR achieved by cement companies and contribution of RDF to the TSR.

Policy makers need to guide producers in order to manufacture sustainable products with

corporation is imperative to analyse and deployment of technologies for management of dry

Tenders should be designed with detailed process description for processing of each fraction of

10. Research and Innovation:

- Invest in research and development to find new ways to recycle and upcycle dry fraction waste • materials.
- Support academic and industrial research in waste reduction and resource recovery. •

11. Monitoring and Reporting:

- Implement a robust monitoring and reporting system to track progress in waste reduction and Circular Economy practices.
- Use data and metrics to measure the environmental and economic impact of these strategies. •

12. Consumer Engagement:

- Engage consumers in the Circular Economy process by providing information on the environmental • benefits of recycling and purchasing recycled products.
- Encourage individuals to make conscious choices that support a Circular Economy, such as buying ٠ recycled products and reducing single-use items.

13. Promotion Of Projects Producing RDF:

- Projects producing RDF (including Grade I, II, and III as per Ministry of Housing and Urban Affairs (MOHUA)'s "Guidelines on Usage of Refuse Derived Fuel in Various Industries" present the standards for RDF for utilisation in waste to energy plants and cement industry duly confirmed by Cement Manufacturing Association.
- RDF grades I and II can be used for direct co-processing in cement kilns while RDF grade III can be • use used for co-processing directly or after processing with other waste materials in cement kiln.
- All projects producing RDF of any grade (grade I, II, or III) shall be promoted to maximize the gainful utilization of dry fraction of the municipal waste.

Promoting a Circular Economy for mixed municipal waste - dry fraction is a multifaceted effort that requires cooperation between government, industry, and the public. These strategies, when implemented effectively, can lead to significant reductions in waste, resource conservation, and economic opportunities.

5.6. Targets

India may set a target for Municipal waste to be achieved by 2025,2030 & 2035 and to benefit from the maximum environmental and resource-saving benefits. Effective measures shall be taken to ensure that the targets are attained.

India shall prepare a Circular Economy monitoring framework, aimed at better tracking progress in the transition to a Circular Economy. As a result, we can establish the directive for 'early warning' mechanism to track progress toward the targets and alert States/UT's when additional efforts are required.

ation (%) g Material	Timeli Achiev 2025 50	ne for ement 2030
ation (%) g Material	2025 50	2030
ation (%) g Material	50	75
g Material		/5
waste	40	60
o increase	15	30
	60	100
ations (%): n the dry ucers take	50	100
all installed	250	400
ckaging to n %]	15	25
	increase ations (%): the dry ucers take Il installed kaging to n %)	 increase 15 60 ations (%): the dry licers take 50 ill installed 250 ckaging to 15

Additional targets for 2025 onwards (to be discussed and mentioned) is mentioned below:

	2025 (%)	2030 (%)	2035 (%)
Municipal waste Recycling			
Packing waste Recycling			
Paper & cardboard packaging			
Municipal waste landfill			
WTE Incineration Projects Operational			
WTE Biogas Projects Operational			

Recently, the European Union has carried out Member state Assessment in 2023 to identify which member States are at risk of not meeting the 2025 municipal and packaging waste recycling targets and the 2035 landfilling target and it was found that;

- from households and businesses) and packaging waste for 2025.
- Recommendations for addressing tactical issues for improving existing projects and lay the foundation for better projects:
 - waste
 - band of the actual cost. Any bid beyond the band width will be considered speculative and rejected.

9 Member States were on track to meet the main recycling targets for municipal waste (coming

 18 Member States were at risk of missing one or more targets. The Commission has presented recommendations and makes available financial and technical support to these Member States.

O Industrial and commercial waste collection (Non-hazardous) to be initiated by Industrial development corporations and create separate facilities for the same on the lines of hazardous

• Tipping fees should be worked out before a project and bidding to be done within a price

- BOOT projects with VGF and tipping fees are the most viable business model. VGF can only Ο be given to projects which adhere to tender conditions.
- Equipment imported for waste management need to be exempted from duty or manufacturing of non-IP parts in India in a given time frame like in case of FDI in retails which mandates certain percentage sourcing in India
- Waste management projects and operators to be exempted from GST or one time GST on 0 equipment as equipment can be reused for different projects.
- Stronger EPR regime with dialogue and engagement of waste management operators. Ο
- EPR service fees and ULB paying tipping fee for MSW management cannot cross subsidise Ο each other.
- Plastic collection and segregation a more complicated and process oriented- task which \bigcirc requires more capex and opex.
- EPR to be extended to other streams of dry waste such as textile, glass, textile etc.

India can also establish a committee/ mechanism for determining the target and continuously monitoring the Recycling and waste to Energy threshold to provide timely alert and guidance regarding the same. It will be a positive and supportive approach towards meeting the target in due course of time.

5.7. Monitoring and Evaluation

Monitoring and evaluation are crucial components of any Circular Economy program for mixed municipal waste, particularly the dry fraction. These processes help assess the effectiveness of initiatives, measure progress, identify areas for improvement, and ensure that Circular Economy goals are met. Here are some key steps and considerations for monitoring and evaluating a Circular Economy program for mixed municipal waste - dry fraction:

1. Define Clear Objectives:

Begin by establishing clear and specific objectives for the Circular Economy program. What are you trying to achieve in terms of waste reduction, resource recovery, and environmental impact reduction?

2. Develop Key Performance Indicators (KPIs):

Identify the KPIs that will help you measure progress toward your objectives. These may include waste diversion rates, recycling rates, resource recovery rates, energy savings, carbon emissions reductions, and economic benefits.

3. Baseline Assessment:

Conduct a baseline assessment to understand the current state of waste generation, recycling, and resource recovery for the dry fraction. This will provide a benchmark against which progress can be measured.

4. Data Collection:

Implement a comprehensive data collection system to gather relevant information on waste generation, recycling rates, resource recovery, energy consumption, and other pertinent data. This



data can be collected from waste management facilities, recycling centers, and relevant government agencies.

5. Regular Reporting: Establish a reporting system to regularly collect and analyze data. Reports should be generated at regular intervals, such as monthly or annually, and shared with stakeholders and the public to enhance transparency. 6. Stakeholder Engagement: Involve all relevant stakeholders, including government agencies, waste management companies, recycling facilities, businesses, and the public, in the monitoring and evaluation process. Their insights can be invaluable in assessing the program's effectiveness. 7. Environmental and Economic Impact Assessment: Conduct assessments to determine the environmental benefits of the program, such as reductions in greenhouse gas emissions, landfill usage, and water pollution. Also, assess the economic impact in terms of job creation, cost savings, and market development for recycled materials. 8. Target Achievement: Regularly review progress toward the defined objectives and KPIs. Determine if the program is meeting its goals and if adjustments are necessary. 9. Periodic Audits: Conduct independent audits to verify the accuracy of data and compliance with recycling and resource recovery regulations and standards. **10. Continuous Improvement:** Use the monitoring and evaluation findings to drive continuous improvement. Identify areas where the program can be enhanced, and adjust strategies accordingly. 11. Public Communication: Share the results and impact of the Circular Economy program with the public and stakeholders to build support and awareness. Transparency is key to maintaining public trust. 12. Policy Adjustments / Updating: If the evaluation reveals that certain policies or practices are not achieving the desired outcomes, consider making dynamic policy adjustments to align with Circular Economy goals. 13. Knowledge Sharing: Share best practices and lessons learned from the monitoring and evaluation process with other regions or countries looking to implement similar programs.

Incorporating monitoring and evaluation into the Circular Economy program for mixed municipal waste - dry fraction is essential for tracking progress, ensuring accountability, and driving effective resource management. It allows for data-driven decision-making and the optimization of Circular Economy practices to maximize environmental and economic benefits.

5.8. Case Studies

Several case studies highlight successful initiatives and strategies for implementing a Circular Economy for mixed municipal waste, particularly the dry fraction. These examples demonstrate how various regions and organizations have effectively managed and repurposed waste to reduce environmental impact and generate economic value. Here are a few notable case studies:

1. San Francisco, California, USA: Zero Waste Program

San Francisco has made significant progress in its Zero Waste program, which includes recycling and resource recovery for mixed municipal waste. By implementing comprehensive waste segregation, composting, and recycling programs, the city has achieved a diversion rate of over 80% of its waste from landfills. The Dry Fraction, which includes materials like plastics and metals, is a significant focus of their recycling efforts. This program has not only reduced waste in landfills but has also created jobs in recycling and composting industries.

2. Amsterdam, Netherlands: Metropolitan Region Amsterdam (MRA)

The MRA has launched a Circular Economy program for mixed municipal waste that focuses on maximizing resource recovery. They employ state-of-the-art waste sorting and recycling facilities to separate valuable materials from mixed waste streams. This approach has significantly reduced the waste going to landfills and incineration. The recovered materials are then used for new product manufacturing, promoting a Circular Economy in the region.

3. Ljubljana, Slovenia: Zero Waste Ljubljana

Ljubljana, the capital of Slovenia, has made remarkable progress in waste reduction and recycling through its Zero Waste Ljubljana initiative. They have embraced source separation, efficient waste collection systems, and innovative recycling technologies to reduce waste and improve recycling rates. The city diverts a significant portion of its dry fraction waste from landfills and incineration, promoting Circular Economy practices.

4. Japan: 3R (Reduce, Reuse, Recycle) Initiatives

Japan has a long history of implementing 3R initiatives that prioritize reducing waste, reusing materials, and recycling. They have developed advanced technologies for sorting, separating, and recycling mixed municipal waste, including the dry fraction. These efforts have reduced the environmental impact of waste management and have enabled Japan to recover valuable resources from waste streams.

5. São Paulo, Brazil: Circular Economy for Dry Fraction

São Paulo has initiated a Circular Economy program focusing on dry fraction waste. Through partnerships with recycling centers and innovative technologies, the city has improved the recycling of materials like plastics, metals, and paper. By recovering these materials and integrating them into local manufacturing processes, São Paulo is reducing waste and conserving resources.

6. European Union (EU): Circular Economy Package

The EU has introduced a Circular Economy Package with ambitious waste management targets, including diversion of dry fraction waste from landfills. This policy framework encourages member states to prioritize recycling and resource recovery, promoting a circular approach to waste



management across Europe.

These case studies showcase diverse approaches to managing mixed municipal waste, emphasizing the dry fraction, and transitioning towards a Circular Economy. They demonstrate that effective waste separation, recycling technologies, public awareness, and innovative policies can lead to significant waste reduction, resource recovery, and environmental benefits while creating economic opportunities.

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6.2. Circularity and Potential Wet Waste Utilization

- Encourage businesses and producers, especially waste by promoting responsible consumption a
- Implement measures to reduce food waste, such food preservation techniques.
- Advocate for decentralized management of we areas with lower population equivalents can be
- Promote the following strategies for improved w
 - Incentivize home composting by offe a. property tax incentives, as exemplifie
 - b. Link industrial consents and fees to th production.
 - Introduce a waste cess similar to wat C. proceeds allocated to support solid
- Enforce an expired packaged food take-back po • local Municipal Solid Waste facilities. This policy with solid waste and provides a valuable resource
- In 2023, India has the potential to generate 21, Biogas (CBG) from wet waste.
- This quantity of CBG has the capacity to replace representing a significant step towards energy in

6.3. Gaps in Policy, Regulation, Inf Incentives

- The absence of a standards enforcement authority has resulted in sporadic design implementation and the dissemination of misleading data, which has been a primary factor contributing to the failure of these projects.
- In order to create a level playing field, all Integrated Solid Waste Management (ISWM) projects specific technical performance parameters.
- It is imperative that all projects incorporate a detailed and standardized Key Performance Indicator (KPI) system for a comprehensive month-on-month performance evaluation.
- Every project should engage third-party or independent consultants, preferably institutions with a proven track record such as Anna University, EPTRI, NEERI, and EIL.
- and adherence to established guidelines.
- Each state should establish a waste management corporation with the following responsibilities: • a. Developing environmental infrastructure, similar to an Industrial Development Corporation.
 - b. Implementing the Hybrid Annuity Model (HAM) for municipal waste management, akin to sewage treatment, effluent treatment, and road construction.



6.1. Current Scenario in Wet Waste Management

In accordance with the 'Implementation of Solid Waste Management Rules, 2016,' which were released in June 2022, the Annual Report for 2020-21 reveals that in India, 26% of waste remains unaccounted for, and 27% ultimately ends up in landfills. This report highlights a concerning statistic: although nearly 100% of the daily waste is collected, only 47% of the 70,973 metric tons generated each day receive proper treatment.

- Urban areas in India produce approximately 42.0 million tons of municipal solid waste on an • annual basis, equivalent to 1.15 lakh metric tons per day (TPD). Of this total, 83,378 TPD is generated within 423 Class-I cities.
- The collective generation of wet waste, which includes kitchen waste, ranges from 51,000 to ٠ 55,000 metric tons per day, and this quantity is steadily increasing at a rate of 4.5% per year.
- The waste generated in the 423 Class-I cities constitutes 72.5% of the total daily waste generation • and necessitates immediate attention.
- Municipal solid waste comprises 30% to 55% biodegradable (organic) matter, 40% to 55% inert • matter, and 5% to 15% recyclables. The composition of waste varies depending on the size of the city, the season, and the income group.



bulk generators, to reduce the generation of wet nd production practices.
as improved meal planning, portion control, and
et waste, recognizing that source segregation in more efficient.
vet waste management: ering benefits to individual homeowners through ed by the Pune Municipal Corporation. ne utilization of wet waste for biogas or compost
er cess, as outlined in the Water Act, with the waste management projects.
blicy, which requires arrangements for disposal at prevents the mixing of the wet fraction of waste ce for biogas production.
,000 metric tons per day (TPD) of Compressed
e imports of 200,000 barrels of crude oil per day, ndependence and sustainability.
rastructure, and Financial

bidding processes should include a clear definition of the technology to be employed, as well as Operational-level dispute resolution should be conducted by regulatory bodies to ensure fairness

- c. Requiring all Urban Local Bodies (ULBs) to pass resolutions delegating environmental infrastructure development, operation, and maintenance work to the waste management corporation, facilitated by the Environment Protection Act, 1986.
- d. Discouraging and disqualifying speculative bidding that undermines compliance with established regulations.
- e. Ensuring the implementation of Supreme Court directives regarding the appointment of technically qualified Member Secretaries and Chairpersons from the field of environmental science.
- f. Staffing waste management corporations with personnel possessing a diverse mix of technical, commercial, and legal backgrounds.
- g. Introducing a Landfill Tax to incentivize ULBs to promote waste processing and enhance waste segregation practices.

6.4. Open policy

- Municipal corporations, as the legal owners of waste, still rely on a crude tender awarding process • that emphasizes the L1 criteria, diluting the guality of project delivery and failing to enforce published biogas standards. This approach has led to the development of substandard projects in the past, resulting in large-scale project failures and eroding confidence among financial institutions in the sector.
- Concessionaires should be empowered to collect waste management fees from users and impose penalties for non-collection of waste from users when waste is not segregated at the source. Establishing escrow accounts for waste management collection fees with transparent governance between concessionaires and project proponents is essential.
- The commingling of biogas into natural gas pipelines, along with the introduction of a last-mile • connectivity subsidy scheme, is currently in progress but experiencing delays.
- A stringent directive should be issued to Oil Marketing Companies (OMCs) to replace a minimum of 1% of fossil fuels with renewable alternatives in the current year, with a scaling target of 5% by 2027. However, this initiative lacks strong support to address the availability of wet waste.
- The SATAT policy for the offtake of Compressed Biogas (CBG) and its dispensing at fuel stations is only partially developed.
- The SATAT policy provides a minimum purchase guarantee for CBG producers but it does not explicitly define the liability for non-compliance with offtake quantities.
- Offtake is presently allowed only in City Gas Distribution (CGD) networked pipelines and not in • the GAIL main feeder line.
- The pipeline network is still incomplete across the country, posing challenges for project locations. ٠
- While there is a financial incentive offering a basic price and an 80% share in the market price, it is ٠ crucial to establish guarantees for offtake and supply.
- Banks are hesitant to support this industry due to past failures. To encourage financing for such . initiatives, they should be covered under a central government-backed insurance program. The requirement for collaterals and personal mortgages often discourages project developers.



6.5. Technology options and Business Models

- The most effective business model for wet waste processing comprises a single-party ownership encompass the following steps:
- Efficient collection and transportation of waste.
- Implementation of a fully automated waste segregation system. technologies:
 - a. Utilization of biogas for wet waste.
 - b. Composting for garden waste.
 - coded trucks to enhance waste segregation accountability.
- Mandating a uniform design for all states is crucial for the success of this approach. The Central Public Health and Environmental Engineering Organization (CPHEEO).
- The project's financials should incorporate Viability Gap Funding (VGF) and tipping fees as integral components. Any discrepancies in royalty payments from vendors should be discouraged
- Making ICW collection a mandated Key Performance Indicator (KPI) for concessionaires, with a evaluation.

6.6. Recommendations and Opportunities

- To prevent disputes and ensure performance, it is imperative to mandate comprehensive projects that encompass waste collection through to processing.
- Tipping fees should be determined prior to initiating a project, and the bidding process should will be considered speculative and rejected.
- The promotion of advanced global technologies for biogas production, such as high-rate fermentation and landfill gas recovery, is crucial.
- Build-Operate-Own-Transfer (BOOT) projects, supported by Viability Gap Funding (VGF) and tipping fees, represent the most sustainable and viable business model.
- City planning should designate specific land parcels within urban areas, similar to Sewage Treatment Plants (STPs), for the establishment of waste processing facilities.
- window clearance system.



reports.

and operation structure, with responsibility for all aspects of the process. This model should

Establishment of an integrated waste-to-energy treatment facility employing the following

c. Segregation and collection of all Industrial and Commercial Waste (ICW) using distinct, color-

Pollution Control Board (CPCB) can issue technical guidelines in collaboration with the Central

direct link to local tax collection from establishments, ensures accountability and performance

adhere to a predefined price range that aligns with the actual cost. Bids falling outside this range Streamlining project licensing and compliance processes should be achieved through a single-Encourage a national-level carbon credit exchange platform for the trading of carbon emission • The Government of India should take the lead in establishing five Municipal Solid Waste (MSW) projects fully funded by them, showcasing a range of technologies in various cities. These projects should feature state-of-the-art biogas plants, serving as model facilities for others to emulate.

6.7. Data Driven Policies

Streamlined data collection and centralized management are essential. Regulators should actively engage in assessing compliance through this data, which can then drive process and strategy adjustments.

6.8. Information, Education, and Communication

Leveraging CSR funds for environmental awareness and promoting waste segregation, with a more targeted and purposeful allocation of these funds.

6.9. Targets

Leveraging CSR funds for environmental awareness and promoting waste segregation, with a more targeted and purposeful allocation of these funds.

S.No.	Proposed Target	Timeline for Achievement	
			2030
1	Increase the percentage of households practicing source segregation (%)	50	75
2	Percentage of source segregated organic fraction (SSOF) to be processed through biomethanization etc. [%]	60	100
3	Reduction in percentage of wet waste sent to landfills or open dumps [%]	50	100
4	Eliminate open dumps (% elimination)	50	100
5	Number of dumpsites/landfills equipped with landfill gas capture and CBG production units	40	60
6	Mandate for fertilizer units to utilize compost in their production process (% of compost)	7.5	12
7	Setting up of min. 200 TPD biomethanization plants in all the ULBs exceeding 1 million population (~75 cities)	25	75
8	Generation of ~ 2 million tons of CBG by 2030	0.7	2.0

References:

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As India strategizes for the next 25 years to India@100, Indian industry must scale the competitiveness ladder to drive growth. It must also internalize the tenets of sustainability and climate action and accelerate its globalisation journey for leadership in a changing world. The role played by Indian industry will be central to the country's progress and success as a nation. CII, with the Theme for 2023-24 as 'Towards a Competitive and Sustainable India@100: Growth, Inclusiveness, Globalisation, Building Trust' has prioritized 6 action themes that will catalyze the journey of the country towards the vision of India@100.

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