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THE ENERGY AND RESOURCES INSTITUTE
Creating Innovative Solutions for a Sustainable Future

Circular Economy in West Bengal - *Unlocking Potential*

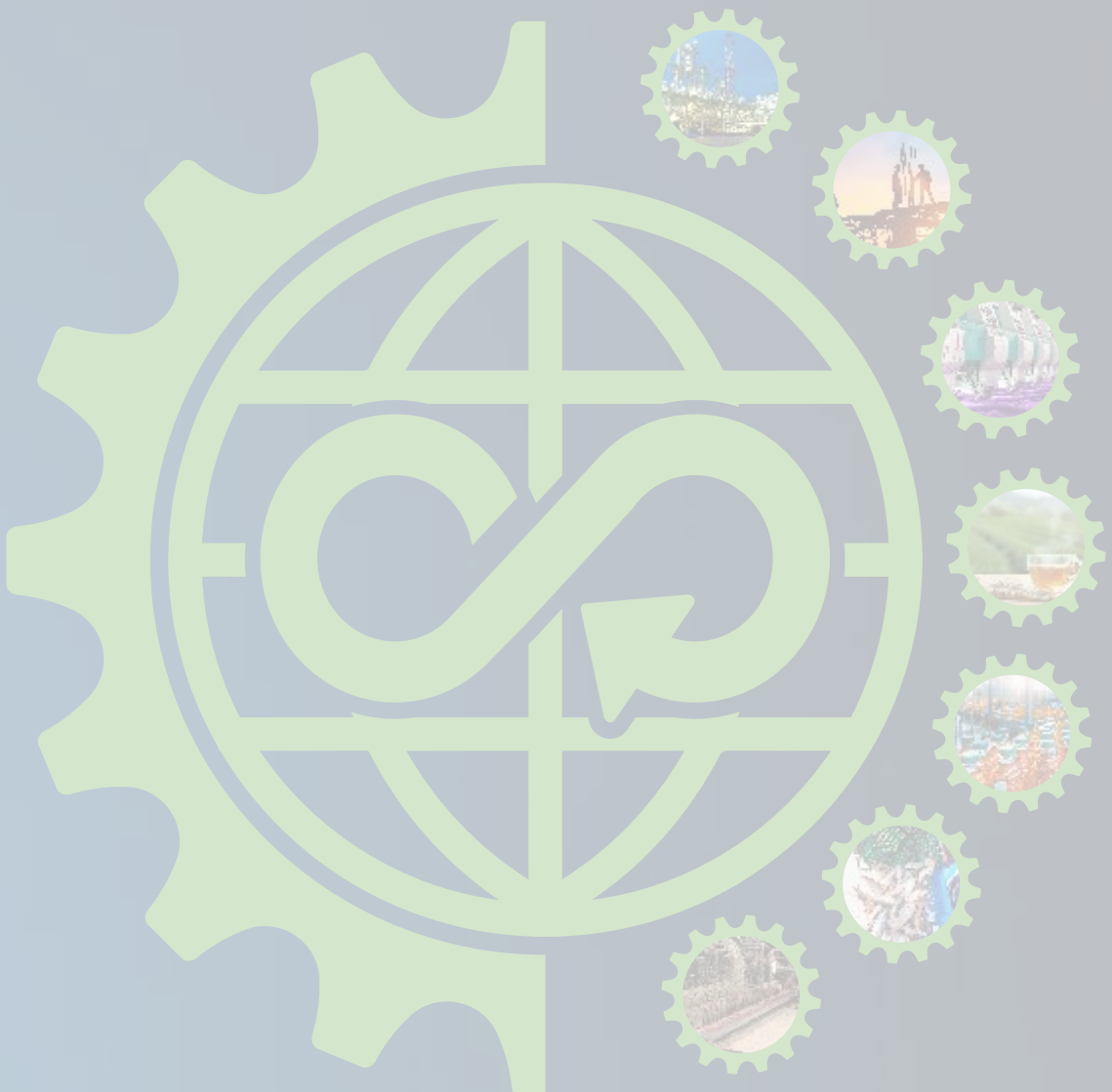


A white paper

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FOREWORD

The economic landscape across the globe is experiencing a transformative shift with an increasing emphasis on circularity and resilience. The transition to a circular economy is no longer a mere aspiration; it is a necessity for achieving sustainable economic growth and resource efficiency. This white paper on ***"Circular Economy in West Bengal: Unlocking Potential"***, developed jointly by the FICCI, Centre for Sustainability & and The Energy and Resources Institute (TERI) serves as a vital reference document to highlight the state's immense potential in adopting circular economy principles and to align its growth strategy with national and international sustainability targets.

FICCI takes immense pride in championing the circular economy agenda in India and globally for the last 8 years. Through Secretariat of the Resource Efficiency and Circular Economy Industry Coalition (RECEIC), announced under G20 India's Presidency, FICCI Centre for Sustainability Leadership, and a dedicated Committee on Environment, we have consistently led efforts to create an enabling ecosystem to expedite transition to circular economy.

TERI has been at the forefront of sustainability and climate action in our country for over five decades. Their commitment to fostering innovation and promoting sustainable development is reflected in every aspect of this collaborative effort. It brings its unparalleled expertise holistic approach to ensuring that the recommendations in this report are grounded in rigorous research and best practices.

West Bengal, with its vibrant industrial landscape, offers unique opportunities for embedding circular practices across key sectors such as Agriculture, Fisheries, and Allied Industries, Chemical and Petrochemicals, Jute, Infrastructure and Construction, Leather and Textile, Mining and Minerals, Municipal Solid Waste, Plastic and Tea.

This report not only identifies sectoral challenges but also presents innovative circular business models, policy recommendations, and strategies for skill development to support & accelerate this transition within the state.

FICCI and TERI, both of us view sustainability and circularity as integral to India's journey toward achieving economic resilience and climate goals. We strongly believe in building platform for collective action, harnessing global learnings, and unlocking private-sector potential in collaborative manner. As we continue to steer conversations and initiatives on circularity, we invite all stakeholders-government, industry, and civil society-to leverage this report as a roadmap for driving impactful change in West Bengal and beyond.

Jyoti Vij
Director General, FICCI

Dr. Vibha Dhawan
Director General, TERI



TABLE OF CONTENTS

Introduction **5**

Market Size and Potential for Circular Economy 7

Indian Regulatory and Policy Landscape 8

West Bengal State Level Perspectives **9**

Industrial Landscape & Economy 11

Circular Economy Enabling Policies & Programs 12

Circular Business Models **15**

Integrating Circular Economy in West Bengal **19**

Agriculture, Fisheries, and Allied Industries 21

Chemical and Petrochemicals 22

Jute 23

Infrastructure and Construction 24

Leather and Textile 25

Mining and Minerals 27

Municipal Solid Waste Management 28

Plastic and Packaging 29

Tea 30

Roadmap & Way Forward **33**

References **51**





INTRODUCTION

INTRODUCTION

India's ambitious journey towards a $5 trillion economy must be guided by a commitment to sustainability. This requires decoupling economic growth from resource consumption and environmental damage to foster a prosperous and equitable society. Achieving this necessitates a shift to a closed-loop system which revolutionizes material flows, mitigates negative externalities arising throughout lifecycle stages, and accumulation of waste out of different activities in economies unleashes negative externalities on economies. Such negative externalities not only pose serious threats to environment and ecology but also will ultimately be a threat to human existence. Mitigation of such threats of untreated and unprocessed wastes, facilitates the use of wastes in the mainstream economic framework. The goal is to implement systems where waste is no longer a burden but a valuable resource within the economic system.

The circular economy (CE) framework clearly indicates an economic system, which has objectives of reduction in wastes and consumption of resources (Vanessa Prieto-Sandoval, 2018). Globally, the transition to a circular economy could result in an additional **US$ 4.5 trillion** in global economic output by **2030** (World Economic Forum, 2019). Committing to the cause of sustainable and healthy way of life, Indian government launched the 'LiFE' (Lifestyle for Environment) movement, which encourages responsible consumption and environmental stewardship. By integrating the principles of the circular economy with the LiFE movement, India can effectively tackle climate change and promote more sustainable development.

Under India's G20 presidency, there has been a significant push recognizing the critical role of circular economy and implementation of extended producer responsibility (EPR) in achieving sustainable development. This led to the creation the Resource Efficiency and Circular Economy Industry Coalition (RECEIC) focusing on Enhancing Resource Efficiency and accelerating circular economy transition across sectors in collaborative manner.

Achieving circularity is aligned with India's international commitments, advancing 9 of the 17 United Nations Sustainable Development Goals (SDGs) and contributing to India's intended Nationally Determined Contribution (NDC) under the Paris Agreement. As part of its NDCs, India aims to reduce GDP emissions intensity by 45% from 2005 levels by 2030, marking a significant milestone toward its goal of achieving net-zero emissions by 2070 (MoEFCC, 2024).

SDG Linkages to Circular Economy



West Bengal, a state with a rich cultural heritage and a diverse industrial landscape, is uniquely positioned to embrace Circular Economy principles for sustainable development owing to its vibrant industrial base in sectors such as steel, cement, textiles, jute, and tea—many of which are resource-intensive and waste-generating—the state has the potential to lead India's circular transition. These industries presents an opportunity for the state to implement circular economy principles that reduce waste generation, enhance resource efficiency and drive sustainable practices within these sectors. The leadership of states like West Bengal will be pivotal in driving sustainable practices, fostering innovative circular business models, and creating resilient, inclusive futures for their people

Market Size and Potential for Circular Economy

As India progresses towards *Amrit Kaal* with robust growth in urbanization, manufacturing, and digitalization, the circular economy market in India is projected to reach a valuation of **USD 45 billion by 2030**, growing at a **CAGR of 15%** from 2023 (Economic Diplomacy Division, 2022). This growth is driven by increasing urbanization, government initiatives like the National Resource Efficiency Policy 2019, and the rising adoption of green technologies across industries. India could save $624 billion a year by 2050 if it adopts circular economy principles rather than following a conventional but more wasteful development path (UNCTAD, 2016).

In India, the recycling and waste management sector is projected to grow significantly, with an estimated market worth of USD 13.62 billion by 2025, reflecting a CAGR of 7.17% (Corpbiz, 2022). This growth highlights the urgent need for India to invest in the waste management industry for a sustainable economic growth while also enabling the country to address its environmental challenges.

Indian Regulatory and Policy Landscape

In the recent years, the Government of India (GoI) has considered and enacted various forms of environmental legislations and regulations at the national, state or local levels with respect to fostering sustainable practices particularly on the end-of-life-management. These initiatives address diverse waste streams, ensuring accountability and fostering CE principles. Key regulatory and policy measures are mentioned below:

The Environment (Protection) Act, 1986, issues specific directions and detailed guidelines on managing a wide range of waste streams such as municipal solid waste, E-waste, Plastic, Bio-medical, Hazardous and construction & demolition waste.

The Solid Waste Management Rules, 2016 outlines the requirements for managing municipal waste, including requirements for waste segregation at source and promotion of recycling. **The E-waste (Management) Rules, 2016, The Hazardous and Other Wastes (Management and transboundary Movement) Rules, 2016, and The Plastic Waste Management Rules, 2016,** have introduced the concept of **Extended Producer Responsibility (EPR).** The EPR framework holds producers, importers, and brand owners (PIBOs) accountable for managing post- consumer waste by assigning targets for reuse, recycling, and safe end-of-life disposal. The role of EPR in collection and recycling of end-of-life consumer products is increasingly identified for other goods as well like tyres, batteries waste oil, etc.

Strategic policies addressing key challenges have been rolled out in the recent past, such as the **National Resource Efficiency Policy, 2019,** which aims to reduce material consumption and boost material productivity. Under the **Swachh Bharat Mission,** Swachh Survekshan evaluates cities on their initiatives taken to adopt the principles of circular economy in urban management. **The Steel Scrap Recycling Policy, 2019** aims to develop a formal and scientific system for reuse of ferrous scrap and decongest Indian cities of End-of-life vehicles, thereby transforming the steel industry to be conducive to a circular economy.

Several committees have been constituted for development of Circular Economy (CE) and Action Plans for 11 waste categories (Li-ion batteries; E-waste; Toxic and hazardous industrial waste; Scrap metal (ferrous and non-ferrous); Tyre and Rubber; End of Life Vehicles; Gypsum, Used Oil, Municipal solid waste and Solar Panels) (MoEFCC, 2024)

Several states such as Delhi and Maharashtra, and Madhya Pradesh have implemented localized initiatives focused on waste management, enforcing of plastic ban, enhance material recovery and recycling and incentivizing businesses to adopt sustainable practices. Uttarakhand has launched a **Digital Deposit Refund System (DDRS)** requiring pilgrims to return used plastic packaging at dedicated collection centres operated by the state pollution control board. Madhya Pradesh and Punjab have leveraged **carbon finance** projects to generate additional revenue for ULBs and farmers. **The Green City Mission** by West Bengal government is aimed at improving waste management through segregation and sorting, conserving water resources, and transforming public areas through initiatives like switching to LED lighting from sodium vapour lamps.



WEST BENGAL STATE LEVEL PERSPECTIVES



WEST BENGAL STATE LEVEL PERSPECTIVES

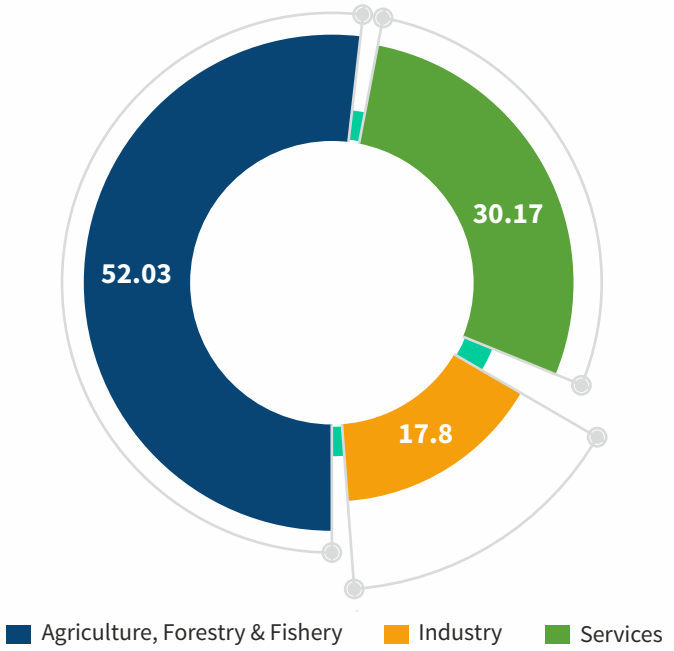
Industrial Landscape & Economy

West Bengal has enjoyed significant prosperity in commerce and trade due to its strategic location, abundant natural resources, skilled workforce, and conducive policies. These factors have not only strengthened the state's economy but also contributed to its growth by attracting prominent international and domestic companies across a wide range of sectors, including mining, tea, chemicals, textiles, leather, petrochemicals, and many others. The state is home to the second-largest number of MSME establishments and highest number of women owned MSME enterprises in India, with nearly 90 lakh entities employing approximately 1.35 crore people and generating a turnover of over 22,000 crores. (NABCONS)

The MSME sector has consistently played a crucial role in providing employment and boosting overall manufacturing output. Many MSMEs would stand to benefit from adopting improved equipment and technologies that would optimize fuel consumption and raw material use, lowering operational costs and further enhancing environmental performance. Switching to cleaner and efficient way of production will help improve the sector's regional and global competitiveness, secure value chains, reduce emissions and create green jobs.

West Bengal generates an estimated 14.5 million tonnes of solid waste annually (with a collection efficiency of 99%), there is substantial potential for enterprises focused on processing/composting organic waste, recycling plastics, and developing waste-to-energy technologies that can reduce waste volumes and promote resource recovery, leading to a cleaner environment and reduced pressure on landfills.

West Bengal Sectoral Share of GSVA (%) at Constant Price for the year 2023-24 (1st AE)



Source: Medium Term Fiscal Policy Statement & Fiscal Policy Strategy Statement for 2024-25 (Govt. of West Bengal, 2024)

Circular Economy Enabling Policies & Programs

West Bengal government has crafted policies and programs that support circularity and lay a strong foundation for resilient and prosperous social and economic growth.

The West Bengal New and Renewable Energy Manufacturing Promotion Policy, 2023 addresses a priority issues of clean energy transition by promoting and incentivizing large investments in renewable energy manufacturing units, thereby building a competitive ecosystem manufactures to effectively reduce costs of renewable power generation in the state. To reduce dependence on fossil fuels, the **West Bengal Ethanol Production Promotion Policy 2021** incentivizes the establishment of greenfield ethanol production units within the state. By encouraging the utilization of agricultural residues like rice straw and sugarcane bagasse as feedstock for ethanol production, the policy effectively minimizes the volume of agriculture waste generated.

The West Bengal Logistics Policy, 2023 outlines targeted interventions to streamline the logistics sector, promote green logistics, and enhance infrastructure. Key initiatives include developing multi- modal logistics parks, granting industry status, and boosting technology adoption. The policy also promoted greater open sourcing of power to improve energy efficiency across the grid and intended to develop a green rating system for the logistics infrastructure assets in the state.

The Tea tourism and Allied Business Policy was introduced in 2019 to promote eco-friendly tea tourism and allied business activities. As the vibrant tourism industry contributes to 12.9% of West Bengal's GDP[1], with due consideration the policy carefully weaves in ecological harmony with sustainable and inclusive economic development by way of effective utilization of vacant/ surplus land in tea gardens.

Additionally, programs by the **West Bengal Green Energy Development Corporation Ltd. (WBGEDCL)** and efforts by ULBs are driving efforts to improve waste segregation and recycling. As these efforts scale, there will be ample opportunities for businesses in waste management, renewable energy, and sustainable manufacturing to expand and thrive.

Waste Generation and Management data for FY 2022-23

Municipal Solid Waste		**E-waste**	
Total Generated in Tons Per Day (TPD)	13469	Total E-waste Generated Ton per Annum (TPA)	812.56
Door to Door Collection	99.84%	**Quantity of Material Recovered (TPA)**	
Source Segregation of waste	62.09%	Total	439.7
Total MSW Treated	3053	Copper Ingot	33.5
Total MSW Landfilled	1187	Other Metal	29.9
Existing Waste Processing Capacity(TPD)		Aluminum Ingot	58.4
a. Recycling	676	Brass	3.98
b. Composting	3029	Zinc	3.22
c. Biomethanation	17	Total Nos of Authorized E-Waste Dismantler	3 Dismantlers, 2 Dismantlers cum Recyclers
d. Waste to Energy	6.2		
Plastic Waste		**Legacy Waste Management**	
Total Generation by 128 ULBs (TPA)	2,94,789	Total Number of Dumpsites	123
Registered Recycling Unit	14	Quantity of Waste dumped at Dumpsites (Lakh Ton)	110.20
Registered Plastic Manufacturing Unit	2	Number of Dumpsites in which biomining has commenced	84
Compostable Plastic Manufacturing Unit	5		
Multilayered Manufacturing Unit	11		

Source: CPCB

[1] https://www.bengalglobalsummit.com/pdf/Harnessing_the_Tourism_Potential_of_Bengal.pdf

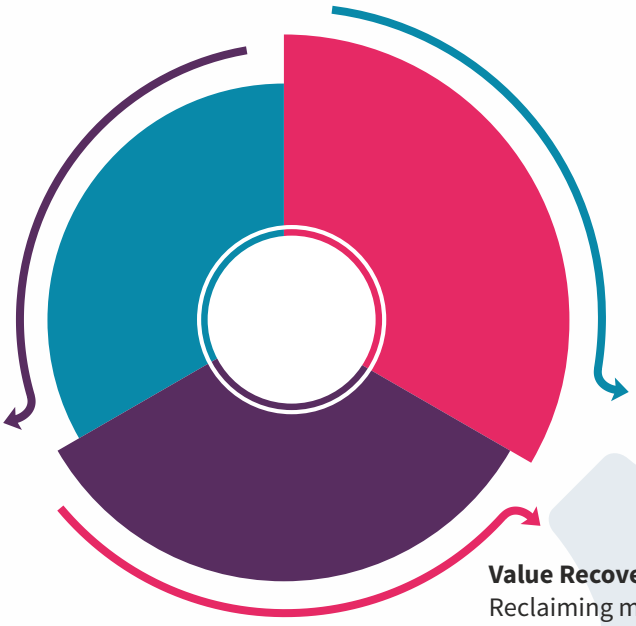



CIRCULAR
BUSINESS
MODELS

CIRCULAR BUSINESS MODELS

Globally, 45% of greenhouse gas emissions are related to the use of raw materials (Ellen McArthur Foundation, 2023). Circular business models address this challenge by minimizing raw materials consumption, reducing and extending product lifecycles. Circular economy business models are central to creating systems that would ultimately help in keeping materials, components and products in the close loop thus minimizing the need to disposal of unwanted materials. Circular loops are intentional organizational constructions between different parties, aimed at keeping products, components, and raw and processed materials (with various time horizons) in functional circulation. Within the loop, the same product is used several times, eventually becoming part of several loops, allowing multiple transactions throughout its lifecycle (Circulaire Maakindustrie, 2022)

Circular Business Strategies



Value Creation
Designing systems, products and processes that are inherently innovative and sustainable

Value Retention
Maximizing the utility of materials and products throughout their lifecycle

Value Recovery
Reclaiming materials, components and energy from products at the end of their life

Source: Study Team Analysis

This approach promotes sustainability, enhances resource efficiency, mitigates environmental degradation, reduces waste of valuable materials, and transforms opportunities into value-generating business models.

As businesses are choosing to incorporate the principles of circular economy into the core of their business practices, it is essential to identify a strategy tailored to suit individual's resources and capabilities.

Manufacturing Sector Transformation: Transformation through technological advancements and enhanced market preparedness for circular economy revolution.

Attracts Investment in Circular Business: Revenue generating and environmentally compatible business have great investment potential.

Waste Reduction and Management: The circular model optimizes the waste collection and maximize reprocessing systems in India, leading to more effective waste management.



New Industries for Circular Economy Adoption: Seizing opportunities to foster the emergence of new recovery and service industries, thereby driving market creation.

Meeting Energy and resource demand: Converting food waste, garden waste, and other hard-to-recycle dry waste into biogas and electricity, addressing resource demands.

Market Demand: The growing consumer awareness of sustainability and environmental issues is driving an increasing demand for eco-friendly and resource-efficient products.

Table 1: Circular Business Strategies and Potential Business Models

VALUE CREATION	Circular Inputs	**Design for Longevity**	Designing durable products with innovative construction methods and **modular** components, allowing for easy repair and replacement.
		Sustainable Raw Material	Using **high-quality, renewable and minimally toxic raw materials** to create long lasting products that are safe for human health and the environment.
		Advanced Production	**Production processes, strategies, and technology** that optimize raw material utilization and energy consumption would effectively reduce operational costs and promote waste minimization.
		Industrial Symbiosis	Facilitating industrial symbiosis though **by-products exchanges** between industries ensuring valuable materials are used in new production cycles promoting circular supply chains
		Shared Infrastructure	To maximize use and minimize individual costs
VALUE RETENTION	**Asset sharing**	**Digital Platforms**	Online platforms and marketplaces can facilitate sharing and swapping by connecting owners with users for improved access
	Product as a Service	**Renting or leasing**	The customer gains ownership of a product or asset for a specific period, after which the product is returned.
		Subscription-based	This allows for great flexibility for customers as they pay a recurring fee (monthly or annually) to use a product or service.
		Pay- per- Use	Provides the highest level of flexibility, where the customer pays as per the actual usage of the product (by the hour or energy used).
	Product use Extension	**Maintenance and repair**	Services aimed at keeping products in good condition by fixing, maintaining, and upgrading them as per requirement
		Reusing	Products, components, even packaging are reused multiple times for the same purpose or creating a parallel loop by identifying another purpose.
		Refurbishing	Used products are restored to like- new condition through repairs or upgrades allowing them to be resold, improving access to high quality products at a lower price point.
VALUE RECOVERY	**Material Recovery**	**Remanufacturing**	Used products to bring them back to like-new condition, both look and function wise.
		Recycling	Converting waste and end-of-life products back into reusable raw material.
	Nutrient Recovery	**Composting**	Utilizing biological process to break down organic waste (food scrap, agricultural wastes, and other biodegradable materials) to produce nutrient-rich compost and bio-active molecules.
	Energy Recovery	**Waste to Energy**	Converting waste materials into usable energy, such as electricity or heat, through methods like incineration or anaerobic digestion.
		Co-Processing	Using waste materials as energy sources in industrial processes, such as cement production, reduces the need for virgin resources.
		Bio- Methanation	Breaking down organic waste in anaerobic conditions to produce biogas, primarily composed of methane and Carbon Dioxide.

Source: Study Team Analysis



INTEGRATING CIRCULAR ECONOMY IN WEST BENGAL

CIRCULAR ECONOMY

Integrating Circular Economy in West Bengal

Agriculture, Fisheries, and Allied Industries

West Bengal, primarily an agrarian state, occupies just 2.7% of India's total geographical area while supporting nearly 8% of the national population. With 71.23 lakh farm families, 96% of whom are small and marginal farmers, agriculture forms the backbone of the state's economy. The net cropped area in West Bengal spans 52.05 lakh hectares, representing 68% of the state's geographical area and 92% of its arable land.[2]

In addition to agriculture, West Bengal excels in fisheries. The state has a 158-kilometer-long coastline and 5.45 lakh hectares of inland water-bodies, which support 76,981 fishing families. West Bengal leads the nation in fish production, yielding 1.5 million tonnes annually, including 1.26 million tonnes of inland fish.[3] This thriving aquaculture industry underscores the state's rich aquatic resources and its critical role in meeting the country's fish demand.

Value Creation: Adopt precision agriculture and organic farming to enhance productivity while promoting resource efficiency. Create additional value by developing by-products from agriculture and fisheries.

Value Retention: Extend the shelf life of products in the food processing and fisheries sectors through improved storage methods, innovative packaging solutions, and efficient cold-chain logistics.

Value Recovery: Implement waste-to-resource initiatives, such as composting agricultural residues and converting fishery by-products into value-added products like fishmeal or bioenergy. Discarded food and processing waste can be repurposed into valuable resources such as animal feed, bioplastics, or biofuels, contributing to a sustainable circular economy.

[2] https://wb.gov.in/departments-details.aspx?id=D170907140022669&page=Agriculture
[3] https://dof.gov.in/sites/default/files/2021-02/Final_Book.pdf

Recommendations

Circular Business Models	**Policy Actions**	**Funding and Support**
• Promote resource-efficient models like shared farming machinery, cooperative RE integrated cold storage, and farmer-producer organizations for collective value addition. • Adopt closed-loop systems that convert agricultural and fishery by-products into high-value products, reducing waste and increasing profitability.	• Develop state level standards and certifications for sustainable and circular practices in agriculture, food processing, and fisheries to ensure transparency and accountability. • Enhance access to platforms connecting farmers, food processors, and fisheries with premium markets and export opportunities for sustainably produced products.	• Provide training and skill development to help stakeholders adopt circular economy practices. • Facilitate the development of shared infrastructure, such as composting units, cold storage facilities, bio-refineries, and advanced waste-to-resource technologies, through public-private partnerships (PPPs).

Chemical and Petrochemicals

West Bengal's chemical and petrochemical industries, which are centered in Haldia, Kolkata, and Dankuni, are significant economic engines for the state. These companies manufacture vital chemicals, polymers, synthetic rubber, and fertilizers that serve a purpose in a range of sectors, such as agricultural, automotive, pharmaceutical, and packaging.

The chemical and petrochemical industries, being prominent in the sector, generate a variety of waste, including chemical waste, hazardous waste, wastewater, rubber waste, paint residues, and oil and refinery by-products. These wastes contribute by single-use processes and limit the potential for multiple uses within the business model. Despite the value it holds the sector misses the circular economy potential in terms of sustainability, waste management, and resource efficiency.

Note: Total Authorized Quantity of Hazardous Waste management in West Bengal (Metric Ton): **360327.** Out of **360327**, Hazardous waste which is recyclable is **78078** Ton per Annum and Utilizable is **176527** Ton per Annum.

A circular economy can transform the chemical and petrochemical sectors by reducing waste, improving resource efficiency, and promoting recycling. In West Bengal, key areas for adopting CE practices include:

Value Creation: Developing biodegradable products and bio-based chemicals as an alternative with using the same infrastructure can help reduce environmental pollution.

Value Retention: Resource Efficiency involves maximizing the reuse of by-products and strategies such as reusing tires, reusing industrial wastewater decreasing reliance on virgin raw materials and resources.

Value Recovery: Advanced recycling technologies for chemicals, tires, rubbers, and refinery by-products can help minimize waste and transform materials into valuable resources. Methods such as recycled paint and coatings, along with tire-to-tire recycling, are effective approaches for material recovery.

The sector can mitigate its environmental impact, and West Bengal can establish itself as an industry leader in environmentally friendly industrial processes by implementing these proposed strategies.

Recommendations

Circular Business Models	**Policy Actions**	**Funding and Support**
• Focusing on advance chemical recycling, nutrient recovery from industrial wastewater • Further Development of Bio-based chemicals contributing to a circular economy by utilizing renewable, biodegradable inputs, and reducing waste.	• To mandate the use of bio-based chemical alternatives. • Policy to ensure transparency regarding the chemicals that can be recycled in the product.	• Awareness programs targeted at communities and recyclers for capacity building, emphasizing the benefits of the Grant Funding Mechanism (GFM) and Risk Sharing Facility (RSF) to improve access to capital for waste management. • Public Private Partnership support in research in Construction of material recovery facility for different waste supply chain.

Jute

Jute, the golden fiber, boasts a long history and holds a prominent place in the nation's economy. The naturally derived fiber renowned for its high carbon assimilation capacity, exhibits exceptional versatility, with applications across packaging, textiles, and a growing range of eco-friendly products. Notably, 74% of composite jute mills are concentrated in West Bengal, underscoring its significance for the state. The 2023-24 Kharif season witnessed the production of 161.53 thousand bales of jute.[4]

As a net importer of Packtech products, particularly polyolefin woven sacks, dominate the domestic Packtech market (with jute being the second largest as of 2019-20), West Bengal has significant potential to increase its market share and reduce import dependency through regional cooperation. Jute industry also produces around 55 thousand tons of waste annually in the form of caddies which is being partially consumed as boiler fuel having very little commercial value.[5]

[4] https://www.jutecomm.gov.in/State_Wise_Production_of_Raw_Jute.html
[5] https://ijira.org.in/waste-utilization-for-circular/

The industry needs to leverage schemes such as the **Capital Subsidy for Acquisition of Plant and Machinery (CSAPM)** and the **Jute Raw Material Bank (JRMB)** to support the modernization and growth of the jute industry. These schemes can provide financial assistance for acquiring modern machinery, improving processing efficiency, and ensuring a stable supply of raw materials.

Value Creation: Expand "Jute Mark" certification scheme to build and improve customer trust in product origin and quality, particularly in export markets. Promote organic or agroforestry techniques in cultivation and adopt efficient shuttle-less loom technology.

Value Retention: Encourage the adoption of circular business models, such as product-as-a-service models for jute-based packaging solutions.

Value Recovery: Maximize waste utilization through end-of-life cellulose extraction before subjecting to nutrient or energy recovery methods.

Recommendations

		
Circular Business Models	**Policy Actions**	**Funding and Support**
• Platforms such as JUTE SMART for procurement of high-quality jute products from trusted manufacturers • Develop partnership for alternative uses of jute waste such as to remove color and organic compound in small scale wastewater treatment • Brand positioning to appeal to a broader customer base, especially younger generation	• Develop and implement adaptation strategies for the industry to cope with extreme weather events as a result of climate change impacting production. • Encourage jute cultivation as a climate change mitigation measure with ability to sequester up to 1.5 tons of carbon dioxide per hectare per year (IJIRA, 2024)	• Identify emerging export markets and enhance market access • Promote jute packaging products production using process waste • Spread awareness regarding government schemes and resources to improve production capacity and efficiency

Infrastructure and Construction

To achieve circularity in the construction sector, buildings and infrastructure need to be designed differently, prioritizing resource efficiency (energy, water and materials), durability, flexibility and easy dismantling, disassembly and re-use. Developers should be making consistent use of high-quality reusable, renewable, or recycled construction materials (Ellen MacArthur Foundation, 2016), that do not contain harmful chemicals or products.

By encouraging reuse and placing a strong emphasis on sustainable design, a circular economy has the potential to revolutionize the construction and infrastructure industries.

Value Creation: Incorporating sustainable, recycled, and bio-based, circular materials into projects, such as green buildings, helps contribute to the circular economy.

Value Retention: The focus is on designing buildings with their end-of-life cycle in mind, ensuring that materials can be easily separated and reused in future projects. This approach encompasses reusing, repurposing, refurbishing, and exploring options such as renting or leasing infrastructure materials to ensure their continued use.

Value Recovery: Circular Waste Management businesses specializing in selective demolition are enhancing the recovery of materials that would otherwise be discarded. Techniques such as reclaiming waste materials like steel, concrete, and glass, and repurposing them in new construction projects, are becoming more relevant.

With the expansion of its industrial sector and growing construction and infrastructure development, West Bengal should embrace sustainable circular construction design. By promoting circularity from the foundation, the state can create new business opportunities in material recovery and the reuse of materials.

Recommendations

Circular Business Models	**Policy Actions**	**Funding and Support**
• CBMs such as Green Building initiatives and the establishment of recycling units for construction and infrastructure waste, creating a market for green materials can stimulate demand for sustainable products.	• Mandating sustainable, reuse/recycle material in every new construction and along with financial support mechanisms like incentives for adopting circular design practices in the construction sector	• Organizations can receive financial assistance for brownfield projects through the Ministry of MSME's MSE SPICE plan, a remarkable initiative intended to empower MSEs to adopt sustainable practices through circular solutions. • PPP to support Research collaboration on material design based on West Bengal Landscape.

Leather and Textile

West Bengal is the hub of Leather Goods Exports from India, having about 50% share of total exports in this category. Out of the total 2020 tanneries in India, West Bengal has about 538 tanneries, which is 26.6% of the total. The consumption of chemicals in finished leather manufacturing is very high and

since domestic manufacturing is not adequate, India has to import these chemicals.[6] Textile sector is one of the oldest industries in Indian economy dating back several centuries. The State Government envisages developing West Bengal as a competitive textile hub by increasing its share from the current 6% to at least 12% in next few years.[7]

As sectors like leather and textile continue to grow rapidly, the production, consumption of raw materials, and waste generation are expected to rise significantly. By adopting a circular economy model, we can optimize resource utilization and develop a new economic model that emphasizes the importance of sustainable practices in managing these sectors.

Value Creation: Emphasis on creative design that prioritizes recycling, degradability, and reparability. Making leather or textile products that are simple to recycle, disassemble, and degrade is one way to do this. Unique textiles may be created by utilizing waste materials, such as banana stem fibers and agricultural waste.

Value Retention: A new value chain may be created by expanding online marketplaces or physical stores dedicated to reselling or upcycling old garments and leather goods. Technological developments for upcycling materials could minimize the amount of waste produced during production.

Value Recovery: Advancing recycling technologies for reclaiming materials from post-consumer textile and leather products can lessen the reliance on virgin materials. Additionally, recycling chemicals, dyes, and water through multiple cycles can help reduce the industry's water consumption.

Adopting the circular economy model, West Bengal can transition from a traditional hub to sustainable tradition hub of the country.

Recommendations

Circular Business Models	**Policy Actions**	**Funding and Support**
• Recycling Leather /textile • Development and expansion of Resale and Rental Marketplace • Innovation in Bio-waste -textile	• Mandating reusing and recovering of chemicals in textile and leather industries. • Introducing extended producer responsibility for leather and textile products.	• Funding for advance research on material recovering technologies. • PPP support in promotion of sustainable and degradable textile and leather products.

[6] https://wb.gov.in/business-leather-industry.aspx
[7] https://wb.gov.in/business-textile-industry.aspx

Mining and Minerals

In a rapidly evolving world, mining provides essential materials that are key towards developing technologies to adopt new energy solutions, build innovation products, and modern sustainable cities. West Bengal is 3rd largest state in India for mineral production accounting for about one-fifth of total mineral production, particularly coal, iron ore, and limestone. Coal accounts for 99% of extracted minerals of the state, which has 11% of the total national coal reserves.[8] The mining sector, while being a crucial industry to support growth, holds immense potential for change to reduce its environmental impact. Transition towards a circular economy to enhance resource efficiency and reduce waste both upstream and downstream. The ideal state of circularity for the mining sector would be a complete shift to secondary mining, focusing on re-extracting of metals and minerals already in the material loop.

The National Mineral Policy of 2019 calls for assessment of inter-generational equity in respect of each mineral, a disaggregated approach shall be adopted considering aspects like reserves/ resources and potential for reuse through recycling, which are relevant and suitable in the Indian context.[9] This begins with optimizing our primary mining practices to create more circular and less wasteful outcomes. Subsequently, growing urban stocks and demand for secondary metals may increase the opportunities for mining companies to contribute to increased global product circularity.

Value Creation: This can be exemplified through optimizing manpower utilization and operations to minimize or eliminate loss of materials and energy. Implementing advanced technologies for recycling metals from mining waste can significantly increase resource recovery rates. This model not only reduces operational costs but contributes to a sustainable supply chain by minimizing reliance on primary mining.

Value Retention: Introducing digital platforms to optimize resource management to improve tracking of materials and connecting different stakeholders in the supply chain. These platforms can help monitor material flows, enable by- products of mining (such as tailings), and facilitate sale of secondary materials.

Value Recovery: Establishing a market for secondary materials by deploying business models that emphasize value recovery through methods like urban mining, which has over the years been highly successful in maintaining a circularity in supply of metals like copper and aluminum reducing the need for virgin material extraction.

[8] https://wb.gov.in/business-mining-industry.aspx
[9] https://mines.gov.in/admin/storage/app/uploads/64352887bcfa41681205383.pdf

Recommendations

Circular Business Models	**Policy Actions**	**Funding and Support**
• Advanced production technologies to maximize material extraction efficiency in primary and secondary mining • Improved mechanisms to track material flows to develop supply chain and market for secondary materials.	• State level regulatory frameworks should be established to promote adoption of best available technology, boost practices such as urban mining, research into innovative recycling methods and encourage public reporting on sustainability metrics within the industry.	• Manufacturing and mining companies can collaborate with MSMEs to engage in recovering value of above ground metal stocks by sharing expertise, knowledge and infrastructure to set up a supply chain for a secondary market.

Municipal Solid Waste Management

West Bengal generates 13,469 tons of municipal solid waste daily, with an impressive collection efficiency of 99.84%, improving source segregation (currently 62.09%) could unlock a remarkable potential for valuable resource reuse and recovery. By embracing a circular economy model, there is great potential to recover materials and energy, which can significantly increase the waste treatment rate to over 80%, promoting sustainability and reducing landfill dependency.[10]

Adopting the circular economy model to reduce and manage West Bengal's municipal solid waste through policy guidelines and stakeholder participation will help societies live more sustainably.

Value Creation: Creative collection and segregation infrastructure generates new economic streams that support the expansion of the city's circular economy transition.

Value Retention: Recirculation of products and development of strong reverse logistic supply chain for providing Extended producer responsibility targets.

Value Recovery: Biogas plant, recycling, composting, horticultural waste composting and co-processing of material with high calorific value is an effective way to manage municipal solid waste.

In terms of volume, municipal solid waste is the most generated type of waste, and it contains a wealth of resources that can be recycled, converted into biogas, used to extract energy, and used as manure. A circular approach is an efficient way of converting this post consumer use resource material to its full potential and fulfilling our energy or recycled material demand.

[10] https://www.wbpcb.gov.in/files/Fr-07-2023-07-05-25AR_SWM_2022-2023.pdf

Recommendations

Circular Business Models	**Policy Actions**	**Funding and Support**
• Energy recovery from organic faction • Business for Conversion of tender Coconut or biomass into Charcoal / energy use • Co-processing non- recyclable waste and • Food waste/Garden Waste Composting	• Development of a fee structure based on the volume and type of waste generated, including categories such as dry, garden, bio-medical, inert, and food waste.	• Carbon Finance offers assistance to projects that make efforts to reduce and recycle MSW waste that ends up in landfills. • Businesses can benefit from GoI's subsidies for New Biogas/Bio-CNG plant and existing biogas units transitioning to CBG plant. • PPP contribution for setting up community composting units.

Plastic and Packaging

Since the 1950s, global plastic production has grown by an average of 9% per year and has increased significantly in the last two decades: half of all plastics ever manufactured were made in the last 15 years. Estimates indicate that approximately 8.3 billion tons of virgin plastics have been produced to date, which has resulted in 6.3 billion tons of plastic waste as of 2015. Of this waste, only 9% has been recycled and 12% incinerated, while 79% has accumulated in landfills or the natural environment. Despite increased global awareness of this issue, it has been predicted that the production of plastic will double again over the next two decades unless trends are reversed (Ellen MacArthur Foundation, 2017b).

West Bengal's **128** Urban Local Bodies (ULBs) generate approximately **294,789** tons of plastic waste annually. Managing these 2.9 lakh tons of plastic presents a significant opportunity for innovation. Businesses in the plastic and packaging sector are increasingly adopting circular economy principles, focusing on reducing plastic waste, improving recycling processes, and ensuring materials are reused sustainably.

Value Creation: West Bengal's Bhar clay teacup, the best substitute for plastic ones, ought to rule the nation's supply chain since it is made of biodegradable materials that decompose after use, lessening its adverse impacts on the environment. Innovation in Green Packaging should be the prime focus of the state with varied biodegradable raw material availability.

Value Retention: By developing a supply chain for reusable containers, reusable packaging promotes value retention and lessens the need for single-use plastic. Take-back programs, product specific waste segregation i.e. PET, PP, HDPE, LDPE, MLP and PVC, PS, and refill reverse logistics are efficient ways to do this.

Value Recovery: Recycling, downcycling, and upcycling different polymers prolongs the material's life and minimizes the need to extract fossil fuels. A state with a strong and sustainable recycling supply chain can promote economic development, environmental preservation, and the availability of recycled resources. Hard to recycle waste such as multilayer packaging, can be useful for energy recovery through waste-to energy plants or manufacturing into compressed boards replicating plywood.

The plastic and packaging sector is undergoing a transformation with the adoption of circular business models. These models aim to reduce waste, reuse materials, and enhance sustainability throughout the resource lifecycle.

Recommendations

Circular Business Models	**Policy Actions**	**Funding and Support**
• Business model for supplying polymer specific recycled plastic such as rPET, rLDPE, rPP, rHDPE, rMLP • Advancement in supply chain for Refill, Reuse products and Green Packaging	• Expanding (EPR) Plastic packaging scope to other plastics. • Introducing a customer deposit charge or refund deposit to encourage positive consumer behavior. • Policies regarding the plastics that can be recycled in the product.	• Plastic Credits and EPR plastic packaging credits provide financial assistance for material recovery. • Spice MSME supports funding for plastic recycling industries. • PPP Collaboration for shared Infrastructure for material recovery facility. • Provide support in Technology innovation and capacity building in plastic recovery and retention.

Tea

The tea industry is one of India's most important sectors, with India being the world's fourth-largest producer in the world and accounts for the highest tea consumption globally. Around 83% of the total tea produced in India is consumed by the domestic population.[11] West Bengal produced 391.07 Million Kgs of tea for the year 2023-24 as the second largest tea producing state in India.[12] The sector encompasses tea cultivation, processing, packaging, and consumption, and is integral to both the

[11] https://www.teaboard.gov.in/pdf/Executive_Summary_Tea_Consumption_20062018_pdf5940.pdf
[12] https://www.teaboard.gov.in/pdf/Production_2024_Jan_Feb_2023_24_Apr_Feb_pdf5513.pdf

economy and rural employment. However, like many agricultural industries, the tea sector is also a labour and resource intensive industry facing immense competition both nationally and globally. Transitioning to Circular Economy (CE) presents a significant opportunity to mitigate environmental impacts, create new economic opportunities through diversification of activities, while maintaining the legacy of high-quality tea production in the state.

Value Creation: Focus on standardizing the ethical production process and expanding into new global markets that are increasingly scrutinizing labour practices and sustainable production, by obtaining certifications such as Ethical Tea Partnership, USDA Organic, Fairtrade, etc.

Value Retention: Utilize vacant or surplus area avail on tea estates for tourism, animal husbandry, non- conventional energy resources, social infrastructure and services, in accordance with the **Tea Tourism and Allied Business policy, 2019.** Monitor and evaluate success of these ventures and develop strategies to scale them across the state with appropriate financial and non-financial support.

Value Recovery: Tea processing generates organic waste, including spent tea leaves and stalks, which can be converted into compost, biogas, or organic fertilizers, reducing the burden on landfills and creating value-added products. Establish systems for converting tea processing waste, such as spent leaves and stems, into value-added products like compost, fertilizers, or even biogas, ensuring that every by-product is utilized effectively.

Sector-Specific Recommendations:

Circular Business Models	**Policy Actions**	**Funding and Support**
• Product Lifecycle Management including sustainable production and distribution practices validated by international standards and certifications. • Asset sharing to utilize vacant areas in tea estates for tourism activities	• Develop policy measures to incentivize production of tea matching international fair trade and ethical sourcing standards • Support kill development among tea growing communities to diversify income streams	• Joint Ventures with tourism operators to implement tea tourism initiatives • Low interest loans



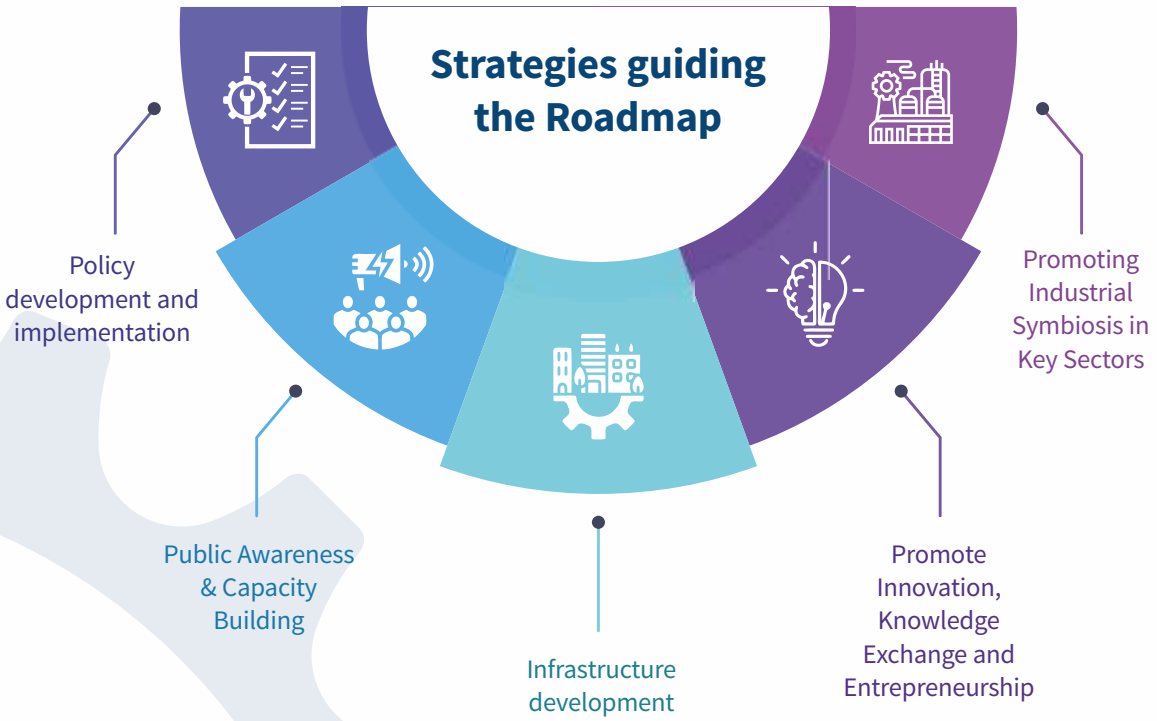


ROADMAP & WAY FORWARD

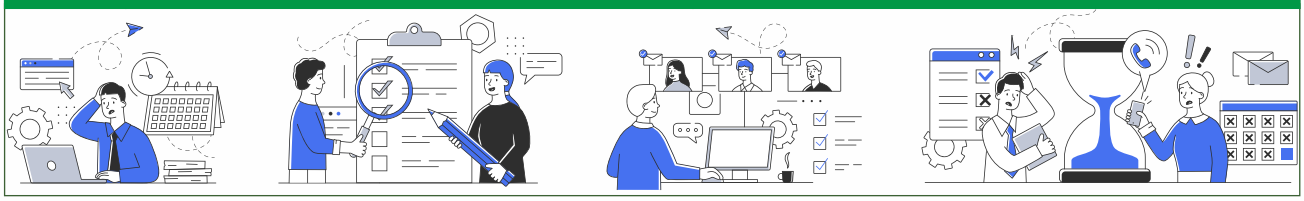
Roadmap & Way Forward

To create a multitude of opportunities for progress in the social, economic, and environmental dimensions, the adoption and integration of circular economy principles requires a systems thinking approach as well as extensive collaboration and cooperation from government stakeholders, citizens, industries, academia and other stakeholders.

This roadmap also provides strategies, interventions, and pilot program suggestions aimed at key stakeholders to assume ownership and accelerate the state's progress towards closing the material and resource loop. Crucial enablers including, clear policy and regulatory landscape, skill development, research and innovation, financial mechanisms, and community participation need to be addressed over short, medium, and long- term timeframes, with the goal of establishing West Bengal as a leader in effort to close material and resource loops.



Strategy	Implementation Plan	Expected Outcomes	Duration
Policy development and implementation	Develop a **West Bengal Circular Economy Policy,** integrating waste management, industrial sustainability, and resource efficiency	• A well-defined policy guiding waste management, industrial sustainability, and resource efficiency across sectors. • Effective Governance & Enforcement ensuring policy implementation, compliance, and monitoring • Strengthened EPR & Producer Accountability, driving responsible production and waste management • High level Action plan with specific focus areas and objectives with clear demarcation of responsibility and timelines • Identification of priority areas • Reduction in landfill waste, increased recycling rates, and optimized resource utilization across industries.	Short term (0-1 Yrs)
	Establish a **State-Level Circular Economy Task Force**		
	Enforce **Extended Producer Responsibility (EPR)** for implementation in sectors like plastics, e-waste, and textiles		
	Baseline study on waste management with focus on composition of waste streams including sources of waste, quantum, waste characteristics, composition etc.		
	Launch pilot programs based on the baseline findings		



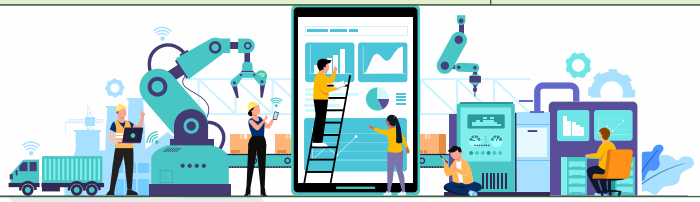
Strategy	Implementation Plan	Expected Outcomes	Duration
Public Awareness & Capacity Building	Conduct **awareness campaigns** in urban & rural areas on waste reduction, segregation, and recycling	• Increased Public Awareness and greater adoption of waste reduction, segregation, and recycling practices in urban and rural communities. • Higher engagement from citizens, businesses, and local bodies in sustainability initiatives. • Strengthened capabilities of municipal bodies, MSMEs, and industries to implement circular economy practices effectively. • Integration of circular economic concepts into academic curricula, producing industry-ready professionals.	Short term (0-1 yrs)
	Provide **training programs** for municipal bodies, MSMEs, and industries on circular practices		
	Introducing CE-focused curricula in **universities & technical institutions** working with institutions like IIT Kharagpur, Jadavpur University		



Strategy	Implementation Plan	Expected Outcomes	Duration
Infrastructure development	**A. Waste Management & Recycling Infrastructure** • **Material Recovery Facilities (MRFs):** Advanced waste sorting centres in major cities. • **Composting & Biogas Plants:** Organic waste processing hubs for food, fish, and agricultural waste. • **Plastic Recycling & Upcycling Units:** Facilities for processing PET, HDPE, and multi-layer plastics. • **E-Waste Collection & Processing Centres:** Safe dismantling and recovery of valuable metals. **B. Circular Industrial Parks & Eco-Industrial Zones** • **Circular Industrial Parks (CIPs):** Designated zones with common waste treatment and recycling facilities. • **Eco-Industrial Clusters:** Sustainable manufacturing hubs for leather, steel, cement, textiles, and petrochemicals. **C. Green Energy & Resource Recovery Infrastructure** • **Waste-to-Energy (WTE) Plants:** Conversion of municipal and industrial waste into electricity. • **Water Recycling & Reuse Plants:** Efficient water management for industries & urban centres	• State-wide waste collection, sorting, and recycling systems to minimize landfill dependency and improve resource recovery • 50% reduction in landfill waste through advanced recycling & resource recovery. • Creation of green jobs in circular economic sectors • Promote industrial symbiosis where waste from one industry becomes raw material for another, reducing environmental impact. • Boost to MSMEs & startups through CE business incubators. • Reduce reliance on fossil fuels and promote energy-efficient, renewable, and waste-to-energy solutions • Lower carbon footprint by integrating renewable energy into industries. • Stronger industrial sustainability with zero-waste & closed-loop manufacturing.	Short to Medium term (1-3 years)

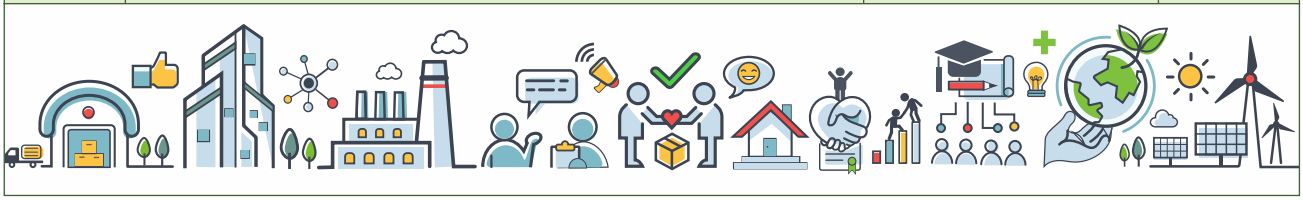


Strategy	Implementation Plan	Expected Outcomes	Duration
Promote Innovation, Knowledge Exchange and Entrepreneurship	**A. Innovation & Research Ecosystem** • Establish Circular Economy Innovation Hubs in partnership with IITs, IIMs, and research institutions to advance R&D in waste valorization, eco-design, and material recovery. • Provide grants, tax incentives, and low-interest loans for startups in sustainable packaging, recycling, fashion, and electronics repair. • Facilitate joint research to develop scalable circular solutions. **B. Knowledge Exchange & Best Practices** • Organize annual events to showcase new innovations, share best practices and solutions and foster cross-sector collaboration. • Develop open access digital platforms to disseminate case studies, research, and circular best practices to wider community. • Establish Centers of Excellence to provide technical guidance and business support. **C. Entrepreneurial & Business Support** • Organize state-level competitions to identify and support innovative circular business models. • Set up incubation centers in key industrial clusters to support commercialization of circular solutions, mentorship, networks, and market insights. • Enable funding through venture capital, impact investment, and government schemes. **D. Green Business Development** • Promote green business opportunities like repair and refurbishment, sustainable fashion, and recycling technologies, to help reduce waste and create new markets for circular products. • Encourage collaborations between government, industry, and academia to stimulate innovation and entrepreneurial ventures in circular economy sectors.	• Growth of startups and MSMEs in sectors such as sustainable packaging, recycling, and sustainable fashion, creating new business models. • Enhanced between industry and academia that result in real-world, scalable circular economy innovations. • Establish dynamic ecosystem for knowledge exchange, accelerating the adoption of circular economic practices across industries • Job creation through new entrepreneurial ventures in the green economy space. • More circular businesses will lead to sustainable, resource-efficient practices becoming the norm, promoting long-term economic resilience.	Medium to long Term (3-5 yrs)



Strategy	Implementation Plan	Expected Outcomes	Duration
Promoting Industrial Symbiosis in Key Sectors	**A. Circular Economy in Agriculture & Food Processing** **Key Regions:** • North Bengal (Tea, Fruits, Vegetables) • Sundarbans & Murshidabad (Fishery, Rice) • Burdwan, Hooghly (Paddy, Jute, Sugarcane) **Strategies:** • **Agri-Waste Utilization:** Convert rice husk, jute stalks, and tea residues into bio-based products. • **Composting & Biofertilizers:** Scale up organic waste composting for sustainable farming. • **Food Waste Reduction:** Promote post-harvest management, cold storage, and food waste upcycling. • **Water Recycling in Agriculture:** Implement wastewater treatment for irrigation. **B. Circular Economy in Industrial & Manufacturing Hubs** **Key Regions:** • **Durgapur, Asansol** (Steel, Foundry, Cement) • **Haldia, Kolkata** (Petrochemicals, Plastic Processing) • **Howrah, Serampore, Bantala** (Textiles, Leather) **Strategies:** • **Industrial Symbiosis:** One industry's waste becomes another's raw material. • **Waste Heat Recovery Systems:** Reduce energy consumption in steel & cement industries. • **Eco-Friendly Leather Processing:** Shift to vegetable tanning and chromium-free alternatives in Bantala Leather Hub. • **Circular Steel Production:** Promote scrap steel recycling & reuse of slag in road construction. • **Plastic Waste Management:** Implement Extended Producer Responsibility (EPR) and incentives for recycled plastics **C. Circular Economy in Textiles & Apparel** **Key Regions:** • Howrah, Serampore (Traditional Textiles, Garments) • Murshidabad (Silk Production) • Dhulian, South 24 Parganas (Jute Processing) **Strategies:** • Eco-Friendly Dyes & Water Recycling: Reduce pollution from textile industries. • Fabric Recycling & Upcycling: Promote reusing old textiles into new products. • Sustainable Fashion Business Models: Encourage second-hand clothing & rental fashion startups.	• Expansion of green jobs across multiple sectors, boosting livelihoods and industrial competitiveness. • Adoption of resource-efficient manufacturing, industrial symbiosis, and energy recovery, reducing operational costs. • Shift towards eco-friendly production, responsible sourcing, and sustainable procurement. • Strengthened knowledge-sharing, workforce skilling, and behavioral shifts toward sustainability. • Acceleration of research, green innovations, and new-age technologies in circular economy solutions. • Initiate Industry specific pilots involving group of industry, value chain partners for ground level impact	Short to Medium Term (1-3 years)

Strategy	Implementation Plan	Expected Outcomes	Duration
Promoting Industrial Symbiosis in Key Sectors	**D. Circular Economy in E-Waste & Plastic Management** **Key Locations:** • Kolkata, Howrah, Durgapur (IT & Electronics) • Haldia, Asansol (Plastic Manufacturing & Recycling) **Strategies:** • Formalize E-Waste Collection: Set up e-waste drop-off points across the state. • Plastic Reuse & Recycling: Promote biodegradable alternatives & plastic credit systems. • Eco-Innovation Grants: Encourage startups to develop solutions for plastic & e-waste management.		
	E. Circular Economy in Construction & Real Estate **Key Urban Centers:** • **Kolkata, Siliguri, Durgapur (Urban Development & Infrastructure)** **Strategies:** • **Recycled Construction Materials:** Promote usage of demolition waste, fly ash, and alternative cement. • **Green Buildings & Energy Efficiency:** Incentivize sustainable architecture practices. • **Urban Mining:** Extract valuable materials from demolished structures		Short term (0-1 yrs)



Way Forward

The strategies and approach outlines can support West Bengal in achieving a regenerative and circular economy. This requires dedicated efforts to develop, plan, and organize institutional, technological, and economic systems that can propel change throughout the value chain.

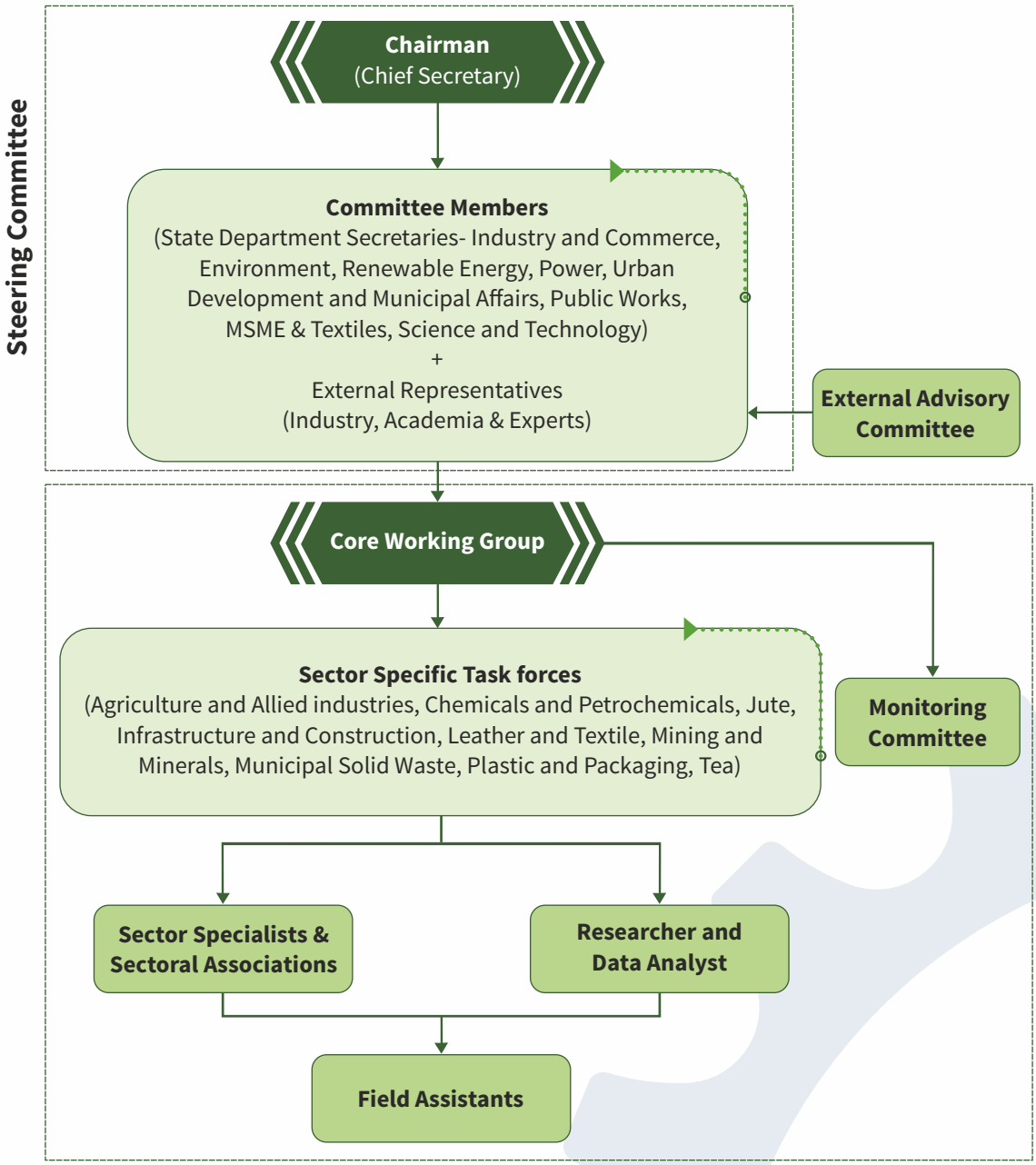
State Level Circular Economy Task Force

While the government is well- positioned to plan and oversee, collaboration is key. International organizations, think tanks, and academia must support and develop innovative solutions for emerging challenges. Businesses need to design products and take ownership for their lifecycles, and

communities must actively adopt mindful consumption patterns and embrace the principles of circular economy in their capacity.

To facilitate the transition a high level task force involving senior government functionaries, major industry and subject experts, can be set up to promote collaboration among value chains and technology use-cases. The objective is to develop a circular economy ecosystem, share investment best practices, map circularity project pipelines, and engage investors.

Proposed Government - Industry Committee Structure



Pilot Projects

As immediate actionable the State may consider implementing pilot projects to assess the feasibility of initiatives across various settings. Below are a few recommendations that West Bengal can adopt, focusing on key areas such as training and capacity building, revenue generation models, awareness campaigns, and fostering industrial symbiosis.

Pilot 1: Climate-Resilient Waste Management Infrastructure and Technologies

Objective:

This pilot program aims to equip urban local bodies (ULBs) in West Bengal with data-driven tools and interventions to reduce greenhouse gas (GHG) emissions and strengthen municipal waste management systems.

Proposed Activities:

- Conduct **Waste Diagnostics** to map Garbage Vulnerable Points (GVPs) and assess waste pathways, origins, and GHG emission baselines for selected pilot cities such as Kolkata, Howrah, and Durgapur.
- Develop and implement a **System Dynamics Model** and conduct a SWEET (Solid Waste Emission Estimation Tool) assessment to evaluate climate-waste linkages and alternative intervention scenarios.
- Test innovative waste management technologies such as, processing the organic fraction of municipal solid waste (OFMSW) using technologies like TERI's Enhanced Acidification and Methanation (TEAM) process.
- Strengthen **Material Recovery Facilities (MRFs)** by providing technical assistance to improve dry waste processing efficiency.
- Build a digital **Waste-Climate Dashboard** to enable real-time data monitoring, scenario analysis, and strategic planning by municipal officials.

Expected Outcomes:

- Comprehensive baseline data on waste-related GHG emissions for informed policymaking.
- Reduction in methane emissions through improved infrastructure and waste segregation, processing, and disposal practices.
- Enhanced capacity of municipal officials to address climate-waste challenges using advanced tools and dashboards.
- A scalable framework for replication in other cities and towns across West Bengal.

Pilot 2: Waste Clinics to Empower Municipal Officials

Objective:

To address waste management challenges faced by ULBs, this pilot proposes the establishment of *Waste Clinics* to diagnose issues contributing to methane emissions and inefficiencies in waste management systems. These workshops will provide technical assistance, capacity building, and actionable solutions tailored to the needs of cities and towns in West Bengal

Proposed Activities:

- Conduct **Waste Clinics** in key urban areas, starting with pilot cities such as Kolkata, Howrah, Durgapur, and Siliguri.
- Facilitate participatory workshops for municipal officials to discuss challenges and co-develop solutions using tools like SWEET and other monitoring technologies
- Provide technical assistance for developing city-specific waste management work plans resources to implement climate-resilient strategies.
- Build a digital knowledge repository of diagnostics, interventions, and case studies to enable cross-learning between ULBs.

Expected Outcomes:

- Enhanced capacity of municipal officials to address waste-related challenges using modern tools and technologies.
- Reduction in methane emissions through the implementation of climate-smart waste management strategies.
- Development of replicable work plans for other cities and towns in West Bengal.
- Strengthened institutional capability for long-term waste management planning.

Pilot 3: Behavioral Change and Community Based Interventions

Objective:

This pilot program aims to develop and implement low-carbon waste management solutions for bulk waste generators and residential areas in West Bengal, emphasizing source segregation, informal sector integration, and innovative community-driven initiatives.

Proposed Activities:

- Launch Behavioural Change Campaign targeting 50,000 households across selected pilot cities) to promote source segregation and recycling awareness.
- Conduct 25 training sessions on low-carbon waste management for ULB officials, private sector representatives, and informal waste workers.
- Implement a Barter for Waste Campaign allowing citizens to exchange PET bottles, cardboard, and other recyclables for essential items like groceries or household goods.
- Run a Green School/College Campaign to promote green initiatives in schools and colleges to instil responsible habits among young citizens.
- Establish decentralized composting units and biogas plants to manage organic waste in collaboration with bulk waste generators.

Expected Outcomes:

- Reduction in GHG emissions by promoting composting, biogas generation, and recycling of dry waste.
- Enhanced capacity of municipal officials and waste workers through training and incentives, improving integration of the informal sector into formal waste management systems.
- Active community participation in waste segregation and recycling through campaigns and educational programs.

Pilot 4: Advancing Industrial Symbiosis and Smart Resource Management in Industrial Hubs

Objective:

This pilot program aims to establish a framework for sustainable industrial symbiosis and smart resource management in key industrial areas. By leveraging waste reuse, resource efficiency, and smart technologies, the program seeks to reduce environmental impact, foster circular economic practices, and position the state as a leader in sustainable industrial innovation.

Proposed Activities:

- Select pilot locations such as Durgapur Industrial Area, Haldia Industrial Zone, or Kalyani Industrial Growth Centre and conduct Material Flow Analysis (MFA) to map waste streams, residuals, and reuse opportunities and direct inter-firm reuse of waste.
- Facilitate partnerships between industries in close geographic proximity to promote the reuse and recycling of waste streams
- Install smart biogas plants, Implement air quality monitoring systems, smart street lighting, and solar energy solutions to improve environmental sustainability.
- Develop a citizen app for industrial zone stakeholders to access unified digital platforms for seamless industrial governance, resource monitoring, and compliance tracking.
- Conduct workshops and training sessions for industries and local authorities on industrial symbiosis, resource recovery, and smart infrastructure operation.

Expected Outcomes:

- Significant reduction in waste sent to landfills by promoting inter-firm waste reuse.
- Reduced emissions through waste-to-energy initiatives and minimized dependency on virgin material production.
- Cost savings for industries through resource recovery and shared infrastructure.
- Creation of model industrial zones with cutting-edge technology for resource management and citizen engagement.
- Increased replicability of industrial symbiosis and smart systems across the state.

Pilot 5: Scaling up "Waste to Value" technologies

Objective:

This pilot proposes a scalable solution for the scientific disposal of the biowaste and sludge generated by sewage treatment plants (STPs). The program aims to implement co-digestion technologies to reduce waste-to-landfill, generate renewable energy, while exploring new funding and revenue streams.

Proposed Activities:

- Determine the volume of organic waste and STP sludge generated and their treatment capacities.
- Upgrade existing biogas facilities or establish new plants to handle co-digestion of organic waste and STP sludge
- Utilize biogas for municipal energy needs, such as powering fire stations or streetlights, and channel high-qaulity organic manure for use in agriculture or city landscaping projects.
- Train local workers, especially women, to operate the biogas plants efficiently.

Expected Outcomes: (For a 2 TPD Biomethanation plant)

- 200 units of renewable electricity generated per day (100% biogas fed engine)
- 140+ carbon credits generated in the first year
- Revenue generated from the sale of manure, with 50–60 kg produced daily.
- Livelihood generation through employment of 4 people for operation and maintenance of plant.
- Scientific disposal of organic waste and sludge of STP plant



About FICCI Centre for Sustainability Leadership

The Centre for Sustainability Leadership is a transformative initiative by the Federation of Indian Chambers of Commerce & Industry (FICCI), launched in June 2023. Its Founding Members Hindustan Unilever Limited (HUL) and The Hongkong and Shanghai Banking Corporation Limited (HSBC) strengthen its commitment to sustainability leadership.

The Centre is designed to drive climate action in alignment with India's net-zero ambitions, in line with the government's Panchamrit framework.

The Centre's objective is to accelerate the sustainability journey of corporate India-spanning small and medium enterprises (SMEs), startups, and large corporates. By acting as a catalyst for change, the Centre aims to institutionalize sustainability practices across industries, facilitating the adoption of climate solutions that promote sustainable consumption, circular economy, and climate technology innovations.

In alignment with the Government's Mission LiFE mantra, the Centre is committed to encouraging businesses to embrace sustainable practices. The goal is to inspire companies to adopt pathways that drive sustainable production, consumption, and lifestyles while actively contributing to the fight against climate change.

Through its various initiatives, it promotes decarbonization, green entrepreneurship, and nature-based solutions. Recognizing the crucial role of SMEs in the economy, it fosters inclusive and sustainable practices amongst India's SMEs, ensuring their integration into global value chains.

Supported by its Knowledge Partner, ECube Investment Advisors, the Centre highlights cutting-edge climate technologies from India's start-up ecosystem, advancing circular economy principles and sustainable consumption patterns. Its bespoke training programs and workshops equip businesses with the tools to navigate the complexities of sustainability and help companies meet Environmental, Social, and Governance (ESG) reporting requirements. Through its outreach initiatives, the Centre showcases global best practices and emerging policies. The Centre's thought leadership is geared to address challenges being faced by industry, offering targeted interventions for technology adoption, and facilitating access to finance.

For more information, please get in touch with us via email sustainability@ficci.com.

Acknowledgments

FICCI Team

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Thought capital of FICCI on Circular Economy



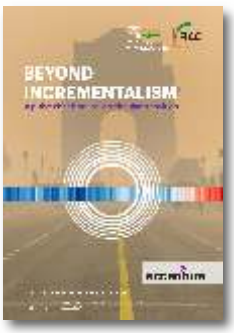
2018
Accelerating India's Circular Economy Shift



2019
Making Plastics Circular



2020
Strategies for Sustainable Plastic Packaging in India



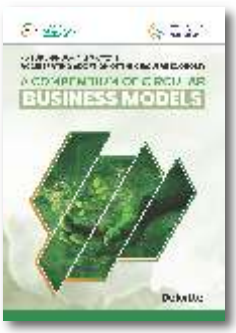
2021
Beyond Incrementalism- A Pulse check on India's Circular Transition



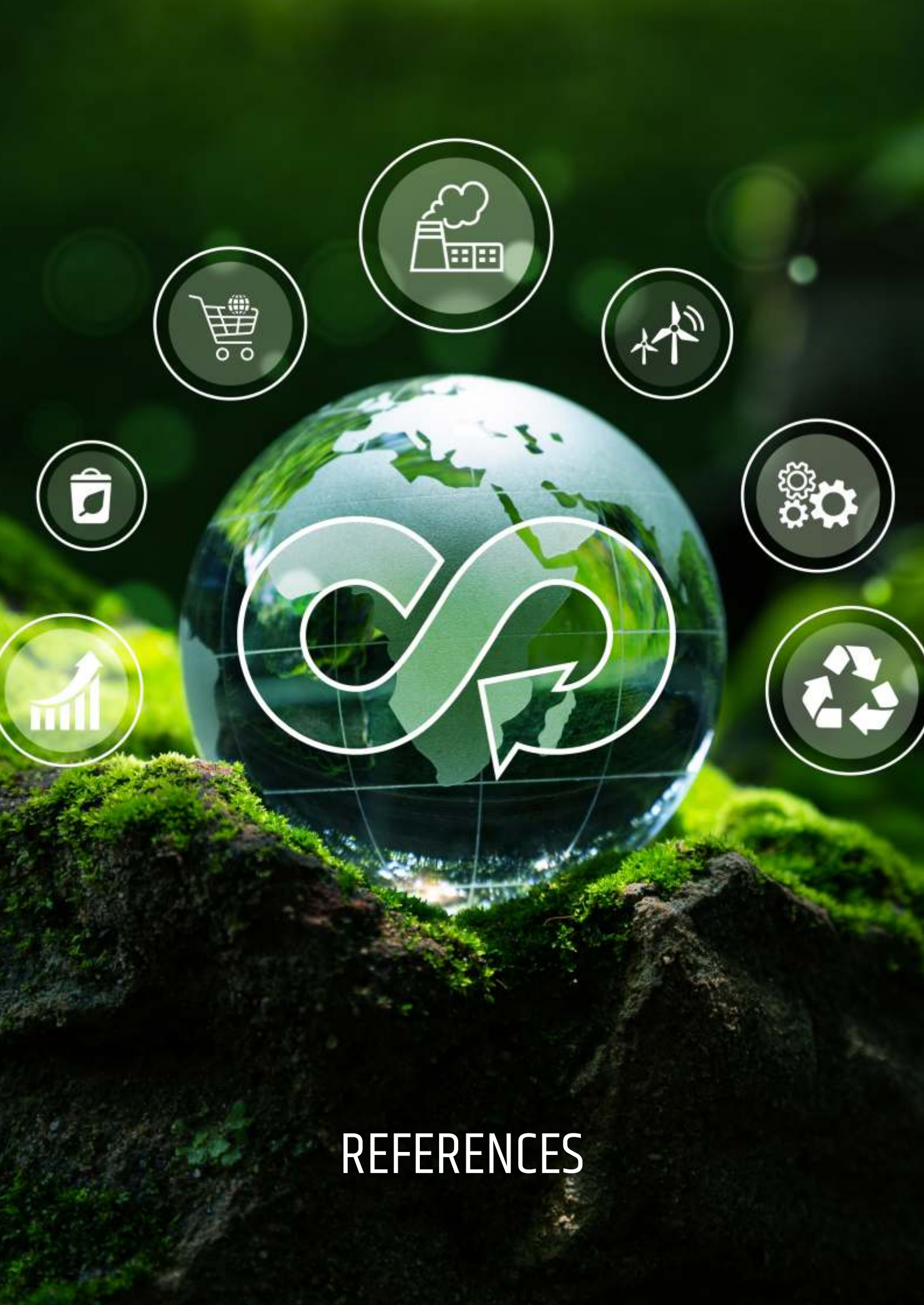
2022
Approaches for Measuring India's Circular Economy Transition



2023
National Circularity Measurement Framework- FMCG & Automotive sector



2024
RECEIC Compendium on Circular Business Models



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