



CII-ITC Centre of Excellence
for Sustainable Development



Confederation of Indian Industry

Circular Economy

A New Source of
Competitiveness

CEO's Guide on Circular Economy
& Competitiveness

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Contents

04

Circularity =
Competitiveness

06

Circular Economy
in An Emerging
Market

08

Basics of CE

12

Getting Started
with CE

16

Business Model
Strategies
and CE

22

Digital
Technologies
Accelerating CE

24

Policy Changes
Driving CE

26

CII's Work
on CE

27

Notes and
References

Foreword

We did not move from stones to metals because we were running out of stones. Electric vehicles were first invented in mid-nineteenth century and held speed record until early 1900. Then they gave way to ICE vehicles because of competitive pricing of fossil fuels, high cost, and low-charging range. Sun and wind as energy sources have been around before the existence of life on Earth.

The ecological case for circularity has been most compelling. The concept of the circular economy was first raised by David Pearce and Kerry Turner, two British environmental economists. They pointed out in their book, *Economics of Natural Resources and the Environment*, that the open-ended economy had no built-in tendency to recycle and effectively treated the environment as a waste “reservoir”. Human lifestyle based on a linear model is unsustainable due to high rates of consumption and disposal, far exceeding the regenerative capacity of natural ecosystems to sustain human lifestyles.

Central to this lifestyle has been the economics of partially accounting resource consumption and value-added at various stages, without putting a price on impacts of lifestyle on the larger ecosystem.

Advocates of a circular economy recommend rethinking the way products are designed to “endlessly” operate in a closed-loop supply chain, one that eliminates waste.

But for a circular economy, there has to be an economic case that strengthens the case for environmental sustainability. To mainstream circular economy, companies need a solid business case, favourable legislation, rewarding financial and consumer markets, and new business model strategies.

The economic case for circularity is gradually developing. With alarm bells ringing to arrest rapidly degrading ecological resources that threaten survival of human species, economics of resources is also undergoing gradual change. The economic viability of naturally available or man-made resources determine what goes into upgrading human lifestyles.

More sun and wind are being harnessed than ever before because they are now made economically competitive as compared to fossil fuels. This is despite having failed at most efforts to make fossil fuels economically uncompetitive by factoring the true-cost of fossil fuels.

The future is that of a circular economy. But for it to replace centuries old linear thinking CEOs must realise that it is in the interest of their own competitiveness.

1 Circularity = Competitiveness

The strongest business case for circular economy (CE) is competitiveness, benefits of which are realized in one's lifetime.

Competitiveness mainly rests on economics of resources or capital, and it could be enhanced in four areas.

Costs,
including
true costs

Material
security

Innovation
and design

Reduced
externalities

Areas of competitiveness	Types
Costs	Materials Regulatory compliance
Material security	Foreseen shortages Unforeseen shortages
Innovation and design	Materials Products – part or full Business models
Reduced externalities	True cost of products

Circular Economy (CE) helps in competitiveness by making a difference to materials use – type, quantity, procurement, logistics, processing, and post-use. As regulatory regimes upgrade to include Extended Producer Responsibility, the costs in post-use phases of products can be managed by moving up-stream in appropriately designing products in parts or in full. When true-cost accounting begins to seep into calculating price of products or costs of procurement, more ecologically compatible alternates will become economically compelling.

2 Circular Economy in an Emerging Market

CE has a strong case for businesses from emerging markets especially India.

Indian businesses are considered to **have high inputs costs** relative to other emerging markets, which affects their cost competitiveness, not just in international markets but also domestic markets. They lose out on domestic consumers because importing and selling foreign-made products is a profitable alternative. Causes of high costs are well-known, which include high costs of capital acquisition, inefficiencies in procurement and logistics – upstream and downstream, high as well as non-renewable energy costs. All this when more than 80 percent of the market is trapped in a low-mid-income segment, also mainly attributed to artificially constrained labour wages.

1.3 billion people in India are moving from sustenance to sustainability

This is reflected in increasing costs related to regulatory and social license to operate. Regulations in India are rapidly changing to include environmental and social externalities of doing business into the cost of business. Examples of such regulations are Extended Producer Responsibility (EPR) across different sectors, including the automotive and building sectors, carbon taxes, rehabilitation and relocation costs of project-affected people. Growing awareness among people of the adverse impacts on their lives is also keeping law-makers, law-keepers, and businesspeople on guard.

The other reason for Indian companies to start practicing circularity, is **material security**. Though India is the fifth largest economy in PPP terms and expected to be the third largest by 2050, after China and the US, it is still far behind in being the largest consumer of many materials. Also, being a late entrant in the global trade, India does not wield control over many sources of materials. For those that are being let off, financing is becoming increasingly difficult on grounds of environmental or commercial viability.

Finally, CE can help India avoid being locked into non-performing and stressed assets

Most of Indian infrastructure and consumption pattern is yet to be built and developed. Most Indians are out of the high resource consumption trap. But as their affordability and affluence increases, the cost for Indian companies to retrofit their lifestyles in a resource-constrained era will be far greater than the cost of developing solutions that are already circular in nature.

CE helps Indian CEOs manage costs of doing business in the short- to medium-term, as well as

prepare for a 1.5 billion consumers that graduate from sustenance to sustainability

3 Basics of CE

Main idea is to utilise raw material and resources in circular systems, also known as circular models.

CE is a **way of thinking** where the main idea is to utilise raw material and resources in circular systems, also known as circular models. It can be about expanding the life of a product, by repairing or refurbishing.

CE also **means to find business opportunities** for existing and new companies to work with circularity, for example, by taking back, renovating and selling the product or parts of the product again. It can also be about taking materials and/or components, and using them again, or about recycling material.

CE is also a **new economic paradigm** in which growth and development are decoupled from environmental impacts. The key steps in this paradigm are, "enhancing energy efficiency, increasing the percentage of renewable energy in the energy mix, and, organizing manufacturing along the lines of a materially-efficient, circular or performance-based economy. This is brought about by extending the value, minimizing waste, and maximizing the reuse and recycling of materials and resources." ¹

Features of CE

- products are designed for ease of recycling, reuse, disassembly and remanufacturing.
- a circularity in flow of materials, both technical and biological, is promoted within and beyond the product's value chains and after its useful life.
- emphasizes continuous innovation to extract maximum value from all resources being used: ideally, nothing is called a waste.
- products, services, and every instance of material usage are designed to remain in the value chain for the longest period possible.
- ideally, the total energy requirement in a circular economy would be met by renewable sources such as solar and wind.
- jobs created in the repair and maintenance sector, rather than new resource extraction since repair and refurbishment are dependent more on manpower than automation.

Systems thinking and application of Life Cycle Assessment as a tool are both, useful to take account of the complex pathways and connections, and consider environmental impacts at each step of the value chain.

PRINCIPLE

1

Preserve and enhance natural capital by controlling finite stocks and balancing renewable resource flows

PRINCIPLE

2

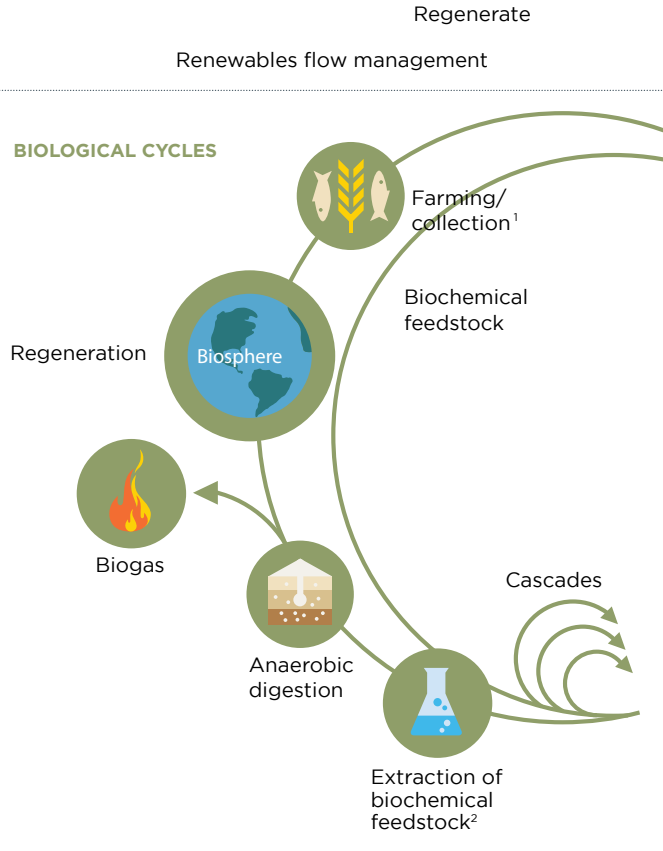
Optimise resource yields by circulating products, components and materials in use at the highest utility at all times in both technical and biological cycles

PRINCIPLE

3

Foster system effectiveness by revealing and designing out negative externalities

Figure 1: Outline of a Circular Economy



1. Hunting and fishing

2. Can take both post-harvest and post-consumer waste as an input

Source: Ellen MacArthur Foundation and McKinsey Center for Business and Environment; Adapted from Braungart & McDonough, Cradle to Cradle (C2C).

Renewables



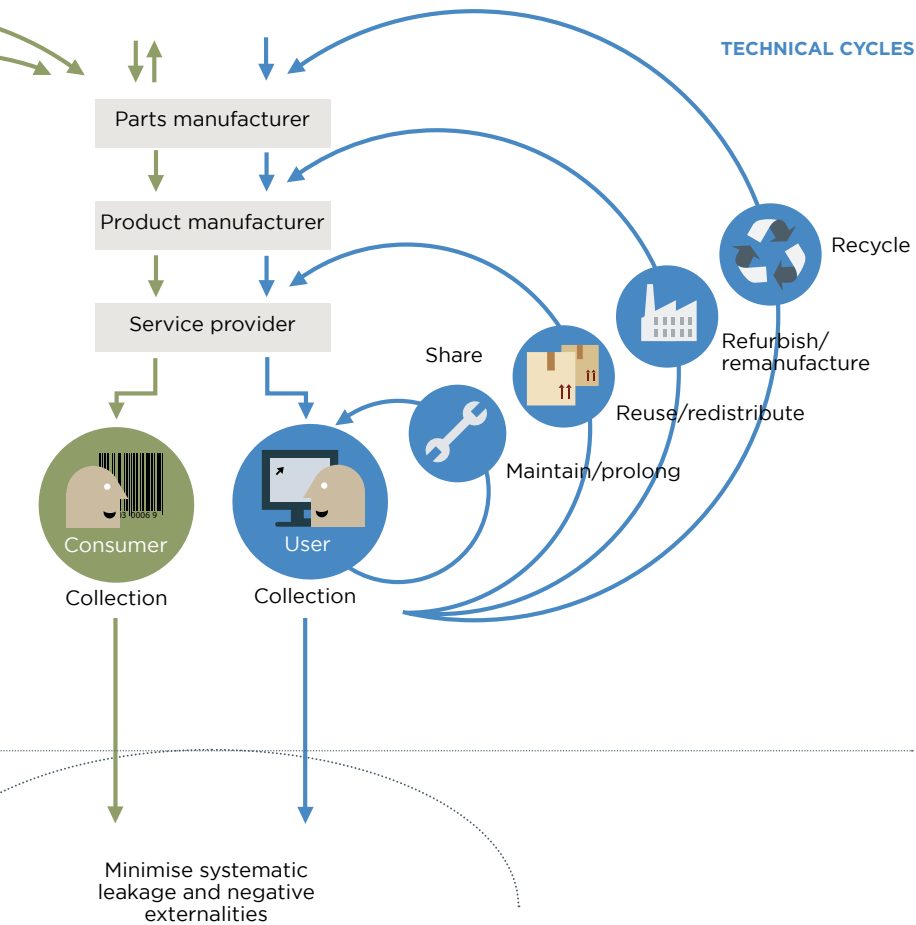
Finite materials

Substitute materials

Virtualise

Restore

Stock management



4 Getting Started with CE

Begin with a single-biggest driver for competitiveness. Avoid going around in circles.

The potential for advantages to business are aplenty in CE. To avoid going around in circles, begin with a single-biggest driver for competitiveness. Is it material security, is it bringing compliance costs related to EPR to zero? Having determined the driver, the journey for circularity will begin with the following specific action areas.

Put together an action plan and set goals



Create a cross-functional team to come up with a road map, composed of engineers, managers looking after finance, production, procurement, operations, design, research and development, manufacturing. Implementing the principles of circular economy will involve skills and contributions from across the factory or facility.



Analyse operations

Focus on the stream of input and output materials/resources (including wastes) relevant to the product being manufactured, and evaluate opportunities for disassembly, reuse (even by other businesses); consult R&D experts, innovate and optimize.ⁱⁱⁱ



Communicate and build capacities

Provide a working acquaintance via training programmes, of the principles and rationale for circular economy; also communicate how these are integral to the core activities of the organisation.ⁱⁱ

Evaluate options & shop for alternates and technologies



Circularity is a lot about working with alternate materials which might require different technology deployment. Depending on the need, one might have to deal with varying maturity of available options. Evaluate which one works in your context, and shop for alternates and technologies. For instance, one of the largest Indian metal manufacturers evaluated European and Chinese technologies of scrap recycling. They had assumed that Chinese option suited the Indian context. However, a visit to China for technology evaluation disproved their assumption, and they settled for European technology.^{iv}

Move outside the factory gates



Engage suppliers, clients and business partners all along the value chain. Collect and record data continuously, quantifying inputs and outputs (including waste), and explore opportunities for reduction of waste, reuse, refurbishment, remanufacture, redesign. Consider possibility of material flows and collaborations across sectors.^v

Broadly,

Social, technological and commercial research and innovation would be needed at all levels. Economists, and environmental and materials scientists would assess the ecological impacts, and costs and benefits of products.

Product design should be based on the potential for reuse: modular systems and standardized components would help to this end.^{vi}

Communication and information strategies are needed to raise awareness of manufacturers and the public about their responsibility for products throughout their service lives.

Companies would search for collaborative ventures even across the boundaries of their industry. Cross-organisational and inter-connected supply chains would help close the loop and could be facilitated by Industry 4.0 tools involving intelligent technical systems for mass production.^{vii viii}

Companies would invest in material science research and chemistry: whether feedstock is bio-based or synthetic in origin, there is huge potential for change and innovation. For a circular economy to succeed, excellence in metallurgical and chemical sciences is essential.

5 Business Model Strategies and CE

CE is being practiced, at least in parts.

Operating in a circular economy often requires redesigning new business models. Various typologies exist for classifying types of business models. After careful review, CII chose one put together by Dr Nancy Bocken at International Institute for Industrial Environmental Economics, Lund University, and Dr Conny Bakker, at TU Delft.^{ix} Bocken et al. (2016) classify six business model strategies into two broad categories, viz, slowing resource loops and closing resource loops.

CII uses Indian examples to populate the six business strategies to demonstrate that CE is being practiced in India, at least in parts.

1. Business model strategies for slowing loops

- a. **Access and performance model:** Providing the capability or services to satisfy user needs without needing to own physical products.

BlaBlaCar is a trusted community marketplace that connects drivers with empty seats to co-travellers looking for a ride. Over 12 million people use BlaBlaCar every quarter creating an entirely new, people-powered network. With a dedicated customer service, a state-of-the-art web and mobile platform, and a fast-growing community of users, BlaBlaCar is making travel social, money-saving and more efficient for millions of members.

Airbnb is an online hosting site for accommodation in cities across the world. People with extra rooms or living space can rent them out to travelers, tourists and earn money. It encourages efficient use of space and resources in a cost-effective manner.

Zoomcar is a car rental service based on a digital platform. Customers can rent cars by uploading license and making online rental payments. This provides the flexibility of enjoying the convenience of a car, without owning it. Ownership remains with the company, while customers use the service on a pay-per-use basis.^x

Michelin, a leading tire manufacturer, offers a tyre leasing service for fleet trucks. Truck fleet owners do not have to own tyres, and hence are freed of the responsibility of repair and maintenance.^{xi}

- b. **Extending product value:** Exploiting residual value of products – from manufacture, to consumers, and then back to manufacturing – or collection of products between distinct business entities.

Green by Goonj is an initiative by Goonj, an NGO working on using urban surplus materials to bridge gaps in demand and supply of infrastructure and amenities in rural India. Green by Goonj reuses and upcycles clothes and other materials to create lifestyle and rural products. It provides sustainable waste management solutions and livelihoods to numerous people.^{xii}

H&M Group recycles clothes and discarded textiles through various initiatives and tie-ups. Used clothes of any brand and in any condition can be donated, which are then recycled and blended into new fabric. This prevents textile from ending up in landfills and creates business opportunities.^{xiii}

Reboot Systems is a reverse engineering start-up based in Hyderabad. The company focusses on refurbishing used IT products such as desktops, laptops, mobility devices and peripherals.^{xiv}

- c. **Classic long-life model:** Business models focused on delivering long-product life, supported by design for durability and repair for instance

This is the most useful business model strategy in a value-conscious and low-income market such as India. Nokia India once made mobile phones which were designed for durability and repeated repair. Nokia significantly penetrated the low- to mid-value segments of mobile phones market in India. Pre-1991 era of controlled economy in India is dotted with many similar examples. Though one may argue that consumers didn't have the money to throw away durables, the entire repair economy for virtually everything from textiles to two-wheelers to transistors, ensured durability of products.

- d. **Encourage sufficiency:** Solutions that actively seek to reduce end-user consumption through principles such as durability, upgradability, service, warranties and reparability as well as a non-consumerist approach to marketing and sales (e.g. no sales commissions)

Godrej Interio, the furniture business of Godrej and Boyce is beginning to see the market potential by leveraging this business model strategy. Not only have they started various "green" certified product options, they also offer modular furniture designs that deliver more utility in different use-situations. Godrej also has built a brand value of product durability derived by making and selling furniture that lasts a couple of generations in a family.

2. Business model strategies for closing loops

- a. **Extending resource value:** exploiting the residual value of resources: collection and sourcing of otherwise “wasted” materials or resources to turn these into new forms of value.

Mahindra Accelo and MSTC Ltd. have jointly launched CERO, India’s maiden organised auto shredding venture and vehicle recycling unit. It will recycle specialized steels and other non-ferrous metals that are present in automobiles: the first Cero plant will be based in Delhi NCR.

In **Dalmia Cement Ltd**, wastes such as blast furnace slag from the steel industry and fly ash from thermal power plants are used to make cement. The company also uses incinerable waste as an alternative fuel. These initiatives have a positive impact on the bottom line and have helped reduce its carbon footprint from business operations by 36% from 1990 levels.

Novelis, an Aditya Birla Group company, is the world leader in aluminium recycling. With a minimum of 90 percent recycled aluminum, the Novelis evercan™ aluminum beverage can body sheet allows beverage companies to deliver soft drinks, beer and other popular beverages in a low-carbon footprint consumer package.

Banyan Nation based in Hyderabad, India, recycles plastic and produces high-grade plastic for usage in automobiles. Its proprietary plastic cleaning technology removes ink and other impurities. Banyan is one of the first companies in the country to use mobile, cloud and IoT to integrate thousands of informal sector last mile collectors into its supply chain to recover post-consumer as well as post-industrial plastic waste.

Multilayered plastic packaging is widely used for consumer products. Being difficult to recycle, most of these end up in landfills. To solve this issue, the packaging team of Tata Chemicals has worked with Dow Chemicals to develop a polyethylene (PE) based film that can be used to replace PET packaging, which is made of two different substrates. The single polymer structure of the developed PE film makes it easier to recycle, thus providing incentive for higher collection and segregation rates.

Dell offers a host of asset resale, recycling and takeback services for used electronics. It promotes recovery of valuable metals from used laptops, and prevents pollution due to disposal of e-waste.

- b. Industrial symbiosis:** A process-orientated solution, concerned with using residual outputs from one process and feedstock for another process, which benefits from geographical proximity of businesses.

In April 2017, the National Thermal Power Corporation (NTPC), invited expressions of interest for supplying 850-1000 tonnes of briquettes/pellets from paddy straw. NTPC would use these briquettes/pellets as secondary fuel in limited quantities in its coal-fired power plants to replace 5-10% of its daily coal consumption.^{xv}

Indian oil companies are investing in biofuel refineries to boost ethanol production from non-molasses sources. A \$200 million joint venture between Numaligarh Refinery Ltd. and Finnish technology firm Chempolis Oy will open in 2020 and crush bamboo to produce 60 million liters of ethanol and other products every year in northeastern state of Assam.^{xvi}

6 Digital Technologies Accelerating CE

Drawing on experience of working with businesses on elements of CE and through research in allied fields such as PaaS, industrial ecology and green supply chain, CII has grouped key technologies into three clusters:

Technology cluster	Specific technology
--------------------	---------------------

DATA COLLECTION	Radio Frequency Identification (RFID)
	Internet of Things (IoT)

DATA INTEGRATION	Relational Database Management Systems (RDBMS) and database handling systems
	Product Lifecycle Management (PLM) systems

DATA ANALYSIS	Machine learning (ML) & Artificial Intelligence (AI)
	Data analytics

Technology application

RFID helps track material flows to enable value recovery through the implementation of Re-strategies such as Reuse, Repair and Remanufacture.

In Closed Supply Chains, RFID facilitates the transition to closed-loop systems.

Connected or networked RFID systems help connect products tagged with an RFID chip to an information network, providing complete information about the product's life cycle to all connected partners.

IoT can collect information generated by sensors to connect partners across the value chain.

IoT also enhances management and analysis of data coming from various sources is routed through data-to-service process

RDBMS and data handling systems integrate huge volumes of information produced by heterogeneous data collection systems such as IoT, ERP and CRM systems.

PLM systems help integrate information across multiple life cycles and across various stakeholders in the value chain.

They enable monitoring of products and parts in multiple lifecycles, through product passport, i.e. a set of information about the components and materials that a product contains, and how they can be disassembled and recycled at the end of the product's useful life.

Potential of MI / AI for CE is at this stage under-explored. It is guesswork that for any economy to be circular will need to be serviced by MI/ AI.

Data analytics is seen as a viable approach to make use of information from various systems of record such as sensors and IoT, to enable better decision making.

In the context of the manufacturing industry, real time data analytics can enable decision making for adaptive calibration.

Data analytics could monitor processes of production and consumption, that eventually allow material flows to be closed easily.

Digital technologies play an important role in the transition towards a Circular Economy by optimizing forward material flows and enabling reverse material flows.

7 Policy Changes Driving CE

CEOs need to note that India's policy regime is warming up to circularity.

Policies and legislation in India, at present, are aligned to the prevalent linear model of production and consumption in which raw materials enter a factory and after use, by the consumer, are thrown away.

A conducive regulatory framework, including financial, tax-based incentives, can clear the path for CE. In India while no such overarching policy exists, there are indications of movement already, in the direction of circularity.

- The inclusion of a Rule on Extended Producer Responsibility as part of the Plastic Waste Management Rules, notified in March 2016, by the Ministry of Environment, Forests and Climate Change, has stirred action against single-use plastic in some Indian states. New uses for plastics could be generated, reducing the quantities landfilled. The Indian Prime Minister’s commitment to eliminate single-use plastic by 2022, is likely to add momentum to the regulatory follow-through.
- A notification issued in August 2018, by the Ministry of Road Transport and Highways seeks to amend the Motor Vehicles Act, 1989 and allow retro-fitting of a hybrid or an electric system on an existing vehicle. According to the notification, the retro-fitting will be divided into three categories and conform to the requirements of the Automotive Industry Standard 123. Moves such as these provide room for experimentation, stimulate innovation and create new knowledge.
- A discussion paper on the New Industrial Policy, 2017, refers to, “establishment of a circular economy” in a section titled, “Ensuring Sustainable and Responsible Industrialization” indicating a vision for the implementation of CE principles in industry.^{xvii}
- NITI Aayog’s Strategy Paper on Resource Efficiency has many elements of CE and has paved way for various parts of the Central and State governments to develop their pathways to resource efficiency with underlying principles of CE.

These illustrations are indicative of the potential of appropriate policy to nudge circular Indian economy. These are likely to have a far-reaching impact on the way companies will act and shape their products and may compel a return to the design table.

8 CII's Work on CE

- Business call to action; collective of business & its stakeholders
- Policy advocacy: message to lawmakers to make material changes / reforms
- International policy advocacy in processes such as G20/B20
- Business commitment to 6Rs -> monitoring & disclosures

Three verticals

based on the cluster of work / themes

Vertical 1

Structural reforms – taxation for CE, skills & jobs, other policy transformations

Vertical 2

Sector deep dive – transformational roadmaps, life-cycle thinking, tools & frameworks, counting & accounting

Vertical 3

Knowledge production – automated knowledge resource web & app platform; business case; CEO guidebook; lawmaker guidebook

Handholding & technical assistance

Life cycle thinking and analysis; CE innovation; CE design thinking

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CII-ITC Centre of Excellence for Sustainable Development is a not-for-profit, industry-led institution that helps business become sustainable organisations. It is on a mission to catalyse innovative ideas and solutions, in India, and globally, to enable business, and its stakeholders, in sustainable value creation. Its knowledge, action and recognition activities enable companies to be future ready, improve footprints profiles, and advocate policymakers and legislators to improve standards of sustainable business through domestic and global policy interventions.

CESD leverages its role of all-inclusive ecosystem player, partnering industry, government, and civil society. It has been a pioneer of environment management systems, biodiversity mapping, sustainability reporting, integrated reporting, and social & natural capital valuation in India, thus upgrading business in India to sustainable competitiveness.

With three locations in India, CESD operates across the country and has also been active in parts of South and South East Asia, Middle East, and Africa. It has held institutional partnerships and memberships of the United Nations Global Compact, Global Reporting Initiative, International Integrated Reporting Council, Carbon Disclosure Project, development agencies of Canada, the USA, the UK, and Germany.

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Confederation of Indian Industry

The Confederation of Indian Industry (CII) works to create and sustain an environment conducive to the development of India, partnering industry, Government, and civil society, through advisory and consultative processes.

CII is a non-government, not-for-profit, industry-led and industry-managed organization, playing a proactive role in India's development process. Founded in 1895, India's premier business association has around 9000 members, from the private as well as public sectors, including SMEs and MNCs, and an indirect membership of over 300,000 enterprises from around 265 national and regional sectoral industry bodies.

CII charts change by working closely with Government on policy issues, interfacing with thought leaders, and enhancing efficiency, competitiveness and business opportunities for industry through a range of specialized services and strategic global linkages. It also provides a platform for consensus-building and networking on key issues.

Extending its agenda beyond business, CII assists industry to identify and execute corporate citizenship programmes. Partnerships with civil society organizations carry forward corporate initiatives for integrated and inclusive development across diverse domains including affirmative action, healthcare, education, livelihood, diversity management, skill development, empowerment of women, and water, to name a few.

As a developmental institution working towards India's overall growth with a special focus on India@75 in 2022, the CII theme for 2018-19, **India RISE : Responsible. Inclusive. Sustainable.** Entrepreneurial emphasizes Industry's role in partnering Government to accelerate India's growth and development. The focus will be on key enablers such as job creation; skill development; financing growth; promoting next gen manufacturing; sustainability; corporate social responsibility and governance and transparency.

With 65 offices, including 9 Centres of Excellence, in India, and 10 overseas offices in Australia, China, Egypt, France, Germany, Singapore, South Africa, UAE, UK, and USA, as well as institutional partnerships with 355 counterpart organizations in 126 countries, CII serves as a reference point for Indian industry and the international business community.

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