MOBIUS FOUNDATION

ICE & SDGs

CIRCULAR ECONOMY *simplified*

WHAT, WHY & WHO?

Global Institute for Circular Economy and Sustainable Development Goals

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ABOUT THE PROJECT

IMPLEMENTATION OF CIRCULAR ECONOMY

TRAINING OF TRAINERS ON CIRCULAR ECONOMY

Circular Economy is the latest sustainability paradigm that is restorative and regenerative by design. It aims to keep products, components and materials at their highest utility and value. It helps in 'closing the loop' by refurbishing, recycling, re-using, circular design, reform and re-value for the benefit of our societies, environment and the economy. To facilitate the transition from linear to circular economy, the project, 'Training of Trainers on Circular Economy (ToTCE) project is conceptualised by the Global Institute for Circular Economy and Sustainable Development Goals **(ICE&SDGs)** and co-funded by ICE&SDGs and Mobius Foundation, India.

The project aims to develop the vision, mission, mindset, thought leadership and skill set for much-needed transition from linear to circular economy.

These ToTCE training programmes are designed to provide insights on how to align, design and implement circular economy using the PDCA Model and the Six Sigma Approach. The Training of Trainers on Circular Economy (ToTCE) project targets to build capacity of the education sector and small and medium scale enterprises implement circular economy model and leverage the Environmental, Social, Governance and Economic benefit (ESGe) out of the strategic implementation of circular business models.

PURPOSE OF AWARENESS BOOK on 'CIRCULAR ECONOMY : WHAT, WHY AND HOW?'

The purpose of this book is to sensitise and educate the students, SMEs, businesses, organisations, conglomerates, government officials, and all readers, interested in learning and understanding the subject.

CHAPTER-1

CIRCULAR ECONOMY - WHAT, WHY, HOW?

A circular economy is an economic system that tackles global challenges like climate change, biodiversity loss, waste, and pollution. According to UNIDO, The circular economy is a new way of creating value, and ultimately prosperity. It works by extending product lifespan through improved design and servicing, and relocating waste from the end of the supply chain to the beginning—in effect, using resources more efficiently by using them over and over, not only once (*UNIDO, Circular Economy).*

More than a 100 billion tons of resources enters the economy every year. This is sourced from metals, minerals and fossil fuels, plants and animals. The use of resources has tripled since 1970 and could double again by 2050 if business continues as usual. According to the World Resources Institute (WRI), we would need 1.5 Earths to sustainably support our current resource use.

In 2019, over 92 billion tonnes of materials were extracted and processed, contributing to about half of global CO2 emissions. The resulting waste – including plastics, textiles, food, electronics and more – is taking its toll on the environment and human health. According to The Circularity Gap report 2020, the world is only 8.6% circular.

The earth has survived five mass extinctions and will survive futures scenarios as well. Climate change, circular economy, resource efficiency and similar concepts are not about saving our earth. They majorly focus on saving our resources and using it judiciously. It's about the smart use of limited resources and requires extraordinary capabilities to manage a highly fragile planet, dependent on natural resources for our survival.

Circular economy is not about waste management or recycling only. It's about changing the operating system of how the world runs. It's about the fundamental shift of thinking, behaviour and consumption patterns. One of the key aspects of a circular economy is that it requires collaboration and cooperation from individuals, SMEs, organisations, the government and corporations, to achieve the world we want for our survival and for our next generations.

A circular economy is a systemic approach to economic development by a regenerative design and aims to gradually decouple growth from the consumption of finite resources.

1.1 Principles of Circular Economy:

1.1.1. Design-out Waste and pollution

- Sustainable material selection
- Standardised components
- Designed-to-last products
- Design for easy end-of-life sorting and separation
- Design that facilitates reuse, recycling and cascading of product or material

- Design-for-manufacturing criteria that considers possible useful applications of by-products and wastes

1.1.2. Keep Products & Materials in Use

- Innovative and profitable business models
- Leasing, renting, reusing, recycling, refurbishment
- Initiatives from leading brands with significant market share and capabilities to inspire other players.

1.1.3. Regenerate Natural Systems

- Cascading and final return of materials to the soil or back into the industrial production system
- Cost-efficient, better-quality collection and treatment systems
- Effective segmentation of end-of-life products
- Decreasing leakage of materials out of the system

Circular economy is the opposite of our current linear model of 'Take - Make – Dispose', which inevitably leads to declination of natural resources and the increase pollution and waste.

1.2 Schools of Thought on the Circular Economy

Cradle to Cradle Approach: This approach by Michael Braungart and Bill McDonough suggests that 'all material involved in industrial and commercial processes are to be nutrients'. Cradle to Cradle (C2C) is about seeing garbage as an eternal resource and doing the right thing from the beginning. In practical terms, C2C requires products to be designed in such a way to ensure that all materials can be classified into one of two cyclical systems:

i. Biological Cycle
ii. Technology cycle

Visit short video on: https://youtu.be/4jORau0V62c

Performance Economy: This approach by Walter Stahel and Genevieve Reday suggests the importance of **selling services, rather than products.** The focus is **on the maintenance and exploitation of stock** (mainly manufactured capital) rather than linear or circular flows of materials or energy.

Biomimicry: This concept by Janine Benyus suggests takes its inspiration from nature. It shares the approach to follow nature for innovation and design - **nature as model, nature as measure, nature as mentor. Biomimetics** or **biomimicry** is the emulation of the models, systems, and elements of nature for the purpose of solving complex human problems.

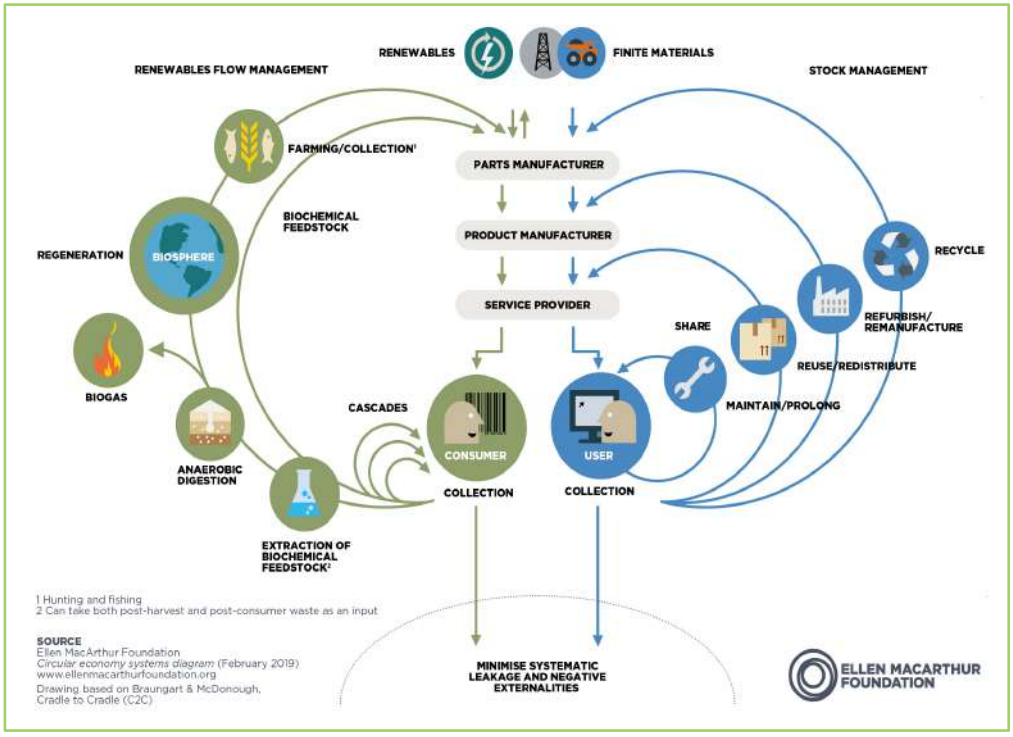
Industrial Ecology: Industrial ecology (IE) is the study of industrial systems that operate more like natural ecosystems. Industrial ecology is concerned with the shifting of industrial process from linear (open loop) systems, in which resource and capital investments move through the system to become waste, to a closed loop system where wastes can become inputs for new processes.

Blue Economy: An approach by Gunter Pauli encourages **better stewardship of our ocean** or 'blue' resources'. It is a term in economics relating to the exploitation, preservation and regeneration of the marine environment.the term is generally used in the scope of International development when describing a sustainable development approach to coastal resources.

Circular Economy, MacArthur Foundation: Circular economy is defined as systems solution framework that tackles global challenges like climate change, biodiversity loss, waste and pollution. It suggests that a circular economy seeks to rebuild capital (financial, through manufacturing process, human, social or natural) to ensure enhanced flows of goods and services.

The system diagram (given below) illustrates the continuous flow of technical and biological materials through the 'value circle'.

Figure 1: System diagram for flow of materials through the 'value circle



Source: Ellen MacArthur Foundation: Circular economy Systems Diagram (2019)

The circular economy is a model of production and consumption, involving sharing, leasing, reusing, repairing, refurbishing and recycling existing materials and products for as long as possible. In this way, the life cycle of a products is extended significantly.

In practice, it implies reducing waste to a minimum. This means that when a product reaches the end of its life, its materials are kept within the economy wherever, and however possible. These then can be productively used again and again, creating further value.

This is a departure from the traditional, linear economic model, which is based on a take-make-consume-throw away pattern. This model relies on large quantities of cheap, easily accessible materials and energy.

Figure 2: Circular economy - key components

Moving towards a more circular economy could deliver benefits such as reducing pressure on the environment, improving the security of the supply of raw materials, increasing competitiveness, stimulating innovation, boosting economic growth and creating jobs.

Source: Circular Economy, European Union

Michiel Schwarz, a Sustainist Lexicon said that:

"In the end, the term 'circularity' may just be one way to make us aware that we need a more encompassing, integrated and restorative sustainability path that includes people as much as technology and nature."

CHAPTER-2

DIFFERENTIATING BETWEEN ZERO-WASTE AND THE CIRCULAR ECONOMY

While zero-waste and circular economy, both have similar goals towards sustainability, greenhouse gas emission (GHG) reductions, and climate change are different models that complement each other in various ways.

The key differences are described below:

ZERO-WASTE	CIRCULAR ECONOMY
Zero-waste is a **set of principles** that guide us towards a goal	Circular economy **is a model that provides a systematic framework** and a means towards the zero-waste goal
Conservation of all resources	**Circularity** of resources, so that raw materials remain in the supply chain
Design to **minimize waste**. Keeping **waste out of the environment**	**Restorative and regenerative** by design. Striving to **regenerate the environment**
Recover as many resources as possible by rethink/redesign, reduce, reuse, recycle/compost, material recovery, residuals management and waste-to-energy, in that **zero-waste hierarchy**	**Principles:** Designing out waste and pollution, keeping products and materials in use for the entire lifespan, and regenerating natural systems
Eliminating waste through reduction, reuse, recycling and waste-to-energy disposal. **Minimize** landfilling and incineration	Ensuring that the **waste that does occur is of as high a quality** as possible so natural resources can be reused
Company following Zero-waste is limited to making processes more efficient and diverting from landfill through recycling and reuse.	**Company following Circular Economy** will take their waste back for reuse/ remanufacturing, or dedicate recycling systems in place that redirected these resources back into the loop.

Michael Braungart, author of 'Cradle to Cradle: Remaking the Way We Make Things', said:

"What most people see in their garbage cans is just the tip of the material iceberg; the product itself contains on average only 5% of the raw materials involved in the process of making and delivering it."

CHAPTER-3
APPLYING CIRCULAR ECONOMY APPROACHES

Many companies are developing ingenious ways to reduce, reuse and recycle their materials. The circular economy concept is applicable to all industries, products and services that are open to innovation and creativity in their models and systems.

It's not realistic for a single person or a family to develop their own circular economy. It is when entities can come together that make up essential parts of the system and have an important role to play that new business models can be advanced towards more circular approaches.

3.1 Key Strategies

Some key strategies that enable the application of the circular economy are:

- **Changing the Idea of Ownership:** Resource intensive production companies, that have customer facing roles, need to rethink ownership to implement 'take back schemes' and meet policy compliances. *For eg.,* instead of selling their products, such circular companies sell their rental services. This strategy is similar to the 'subscription model-leasing' and 'pay-per-use' variants and being offered by some electronic product manufacturing companies.
- **Reverse Logistics:** This strategy is a key building block of a circular economy model. However, one of the main challenges in retrieving sold products is in persuading the customer to return it.
- **Product Designing:** The designers can apply various circular economy principles during the process of designing the product. The product design aim to prevent the negative impact on environment and society, and aim to remain circular.
- **Secondary Resource Recovery to Close The Loop:** The system can be designed and established to help businesses & conglomerates to monitor the resources recovered from their waste. Recovered resources aim to be integrated back into the system, for use as raw material. *For eg.,* The circular economy model for electronics sector, named as *METAL-PRINT,* innovated by *Sanshodhan, India* and is recognised as Highly Commended The Circulars 2019, by World Economic Forum, Davos.

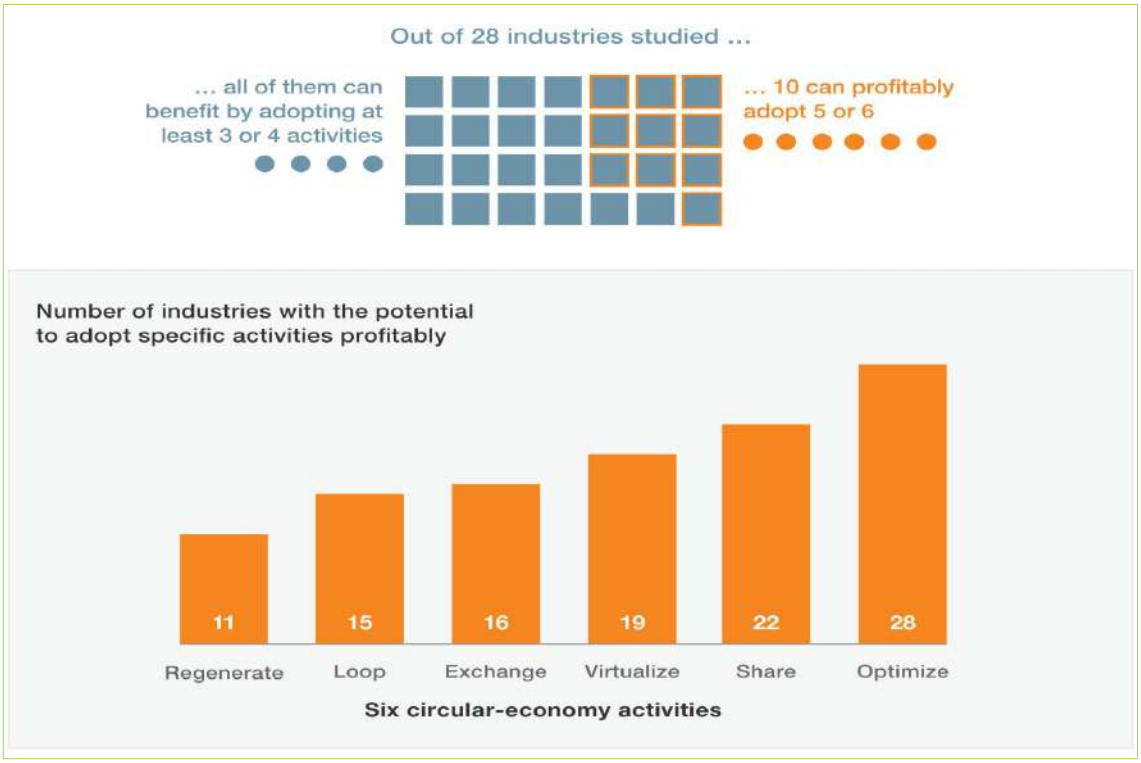
3.2 Disruption in Industry Using Circular Economy Models

We are seeing 'disruptions' led by various industries using the circular economy models. According to a study by McKinsey & Company, six circular economy activities have the potential to improve performance and reduce the costs for a number of industries (see diagram below). The study assessed 28 industries showing the adopting of three to four of six potential circular-economy activities/ strategies. These are:

1. Shifting to renewable energy and materials **[Regenerate]**
2. Promoting the sharing of products or otherwise prolonging product life spans through maintenance and design **[Share]**
3. Improving product efficiency and removing waste from supply chains **[Optimize]**
4. Keeping components and materials in "closed loops" through remanufacturing and recycling **[Loop]**

5. Delivering goods and services virtually **[Virtualize]** and
6. Replacing old materials with advanced renewable ones or applying new technologies such as 3-D printing **[Exchange]**

Figure 3: Six circular economy activities that have the potential to improve performance and reduce costs for industries



Source: Growth within: A circular economy vision for a competitive Europe, Ellen MacArthur Foundation and McKinsey Centre for Business and Environment, June 2015

3.3 CASE STUDIES

3.3.1. Electronics Industry:

Some of the best examples of circular economy implemented in the electronics industry are:

Modular phones by *Fairphones*, HYLA lighting as service by *Phillips; V*acuum cleaner as service by *Phillips;* turning old printer cartridges and soft plastics into roads by *'Close the loop'; O*nline mobile phone reuse and recycling service by *Mazuma;* leasing washing machine for a monthly fee by *Bundles;* Sourcing e-waste for recycling, from E-Waste Exchange Platform, *Sanshodhan: An E-Waste Exchange;* Metal-Print, for mapping material recovery & use as raw material, by *Sanshodhan,* India.

3.3.2. Plastic Industry:

Some examples of circularity in the plastics industry are:

- Adidas sold 1 million shoes made out of ocean plastic last year – each pair of shoes reuses 11 plastic bottles.

- Starbucks sponsored a challenge aimed at revolutionising the paper coffee cup, designed one that is completely compostable.
- Brainform initiated the reuse and recycling of garment hangers.
- Various recycling units are making board out of waste plastic. Such board can be used for making various products, like affordable housing, table and bench and more.

3.3.3. Fashion industry:

A few strategies by the fashion industry include, increasing clothing use, using safe and renewable materials, taking back old clothes and turning them into new, to name a few.

Platform for enhancing the reuse of cloths, are also emerging in urban areas.

Hemp, banana fibres and similar material is being used by various businesses to produce environment friendly, and carbon efficient cloths.

3.3.4. Food industry:

Some strategies for the implementation of the circular economy in the food industry are:

- **Sourcing food grown re-generatively and locally:** making most of the food, design and market healthier food products, enabling zero-waste dining.
- Using food waste to produce vermicompost.
- Use natural material for packaging.
- For dining / social gatherings, use the utensils made with natural products, for eg. bank leaves, Areca leaves, bamboo straw etc.

3.3.5. Examples From Other Sectors:

- Lenzing Group initiative: Derive botanic products from renewable sources and process it with unique resource-conserving technologies.
- The use of Cambrian Innovation to treat contaminated wastewater from industrial processes.
- DyeCoo undertakes waterless cloth dyeing.
- Packaging material produced from mycelium, aiming to replace styrofoam and polystyrene insulation.

CHAPTER 4
BENEFITS FROM THE CIRCULAR ECONOMY

The implementation of the circular economy has various benefits for all sectors. Each sector can have specific benefits, and these can be understood through a detailed analysis of sectors and actions taken to implement circular economy approaches.

Some of the key benefits are listed below:

4.1 Environmental Benefits

- **Reduced Pressure on The Environment:** Implementing circular economy development pathways could significantly reduce carbon dioxide emissions within a given timespan. This helps address climate change and resulting natural disasters. A leading example seen in the United Kingdom (UK), where it is projected that GHG emissions could reduce by 7.4 million tonnes per year by keeping organic waste out of landfills.
- **Primary Material Consumption:** A reduction of primary material consumption by 32% can happen by 2030, if the circular economy is implemented in sectors. Examples of primary material use include, car and construction materials, real estate land, synthetic fertilisers, pesticides, agricultural water use and energy.
- **Land Productivity and Soil Health:** Recovering nitrogen, phosphorous and potassium from food, animal and human waste streams globally could contribute nearly 2.7 times the nutrients contained within the volumes of chemical fertiliser currently used.
- **Natural Resource Conservation:** Implementation of circular economy enables natural resource conservation, maintaining ecosystems and mitigating damage to resources that result due to industrialisation.

4.2 Economic Benefits

- **Financial Savings:** The continued and safe use of natural resources offers an alternative that can yield up to $4.5 trillion in economic benefits by 2030 and an additional 0.5% of gross domestic product (GDP) value (weforum.org)
- **Raising Living Standards:** Transitioning to a circular economy could create a net increase of 6 million jobs by 2030. Published sources showcase that- Up to 700,000 jobs will be created by 2030 in the European Union (EU) alone (IISD, May2020).
- **Material Cost-Saving:** Cost savings of ~ USD 700 billion globally for fast moving consumer goods and an annual cost saving potential of up to USD 630 billion for complex medium lived products was projected in the UK. (World Economic Forum - on FMCG sector)

4.3 Industry Benefits

- The circular economy enables creation of new profit opportunities, and creates a shift for industries to emerge as green industries. Some examples are:
    - Extended producer responsibility (EPR) compliance, for aggregation and recycling

    - Product re-marketers facilitating longer use or higher utilisation
    - Parts or component remanufacturing,
    - Product refurbishment
- Reduce cost due to less requirement of virgin metals and materials,
- Increasing competitiveness
- Stimulating innovation
- Reducing exposure to raw material prices and increasing resilience
- Circular economy models can reduce threat to supply chains
- Stronger customers relationships, interaction and loyalty, with circular economy models like:
    - Rentals or leasing contracts,
    - Long term relationships as the number of touch points increases over product lifetime,
    - Gain unique insights into customer usage patterns resulting in improved products, better service and greater customer satisfaction.

4.4 Consumer Benefits

- **Improved Living Conditions:** Implementation of circular economy enable's improved living conditions and associated health impacts. For example:
    - **Health Care Cost:** Shifting to a circular food system could lower the healthcare costs associated with pesticide use by USD550 billion globally.
    - **Pollution:** There would also be significant reductions of antimicrobial resistance, air pollution, water contamination and food borne diseases.
    - **Liveable Cities:** It is estimated that a circular economy for food, catalysed by cities, could save 290,000 lives otherwise lost to outdoor air pollution per year, by 2050.

- **Improved Quality of Products**: More durable products with increase in quality of life, higher convenience by avoiding hassles associated with repairs and returns are expected with the implementation of the circular economy.

  A shared economy is great example of circular economy to 'save money'. For example, high-end washing machines could be leased instead of sold. With this, customers would (financially) save roughly a third per wash.

CHAPTER-5

CIRCULAR ECONOMY: CLIMATE CHANGE, SDGs AND ESG

5.1 Circular Economy and Climate Change

Circular economy provides multidimensional benefits. More importantly, it helps to conserve natural resources and prevent pollution and related climatic impacts. *For eg.* Metal, machine or electronic waste recycling and resource recovery can bring down the pressure mining, natural resources (like-Lithium, Cobalt, Aluminium etc.) and simultaneously can prevent greenhouse gas emissions that otherwise happen due to mining, transportation and refining of such metals.
Implementation of circular economy need strategic shift and behavioural change.

Strategic Shift

- Circular economy strategies that reduce the use of resources can cut global greenhouse gas emissions by 39% (22.8 billion tons) and play a crucial role in averting the dangerous impacts of climate change.
- Utilizing existing solutions like **replacing plastic** with other materials, d**esigning plastics so that they can be more easily recycled,** and scaling up collection and recycling could reduce the flow of plastic waste into the ocean by 80% in 20 years – a shift that would be enormously beneficial for human health and biodiversity.

Behavioural Change: Changing consumption patterns is crucial change but have huge potential to reduce GHG emissions. For example, if the average number of times a garment is worn is doubled, greenhouse gas emissions from the textiles industry would be lowered by 44%.

5.2 Circular Economy and Sustainable Development Goals (SDGs)

The **Sustainable Development Goals (SDGs)** have been described as "the blueprint to achieve a better and more sustainable future for all" by 2030.

The 2030 Agenda for Sustainable Development, adopted by all United Nations Member States in 2015, provides a shared blueprint for peace and prosperity for people and the planet, now and into the future. At its heart are the 17 Sustainable Development Goals (SDGs), which are an urgent call for action by all countries - developed and developing - in a global partnership.

The seventeen goals and associated 169 targets are increasingly being adopted by both public and private sector actors across the globe, as a framework for organising and pursuing sustainability initiatives.

Circular Economy contributes to various SDGs. Details are provided herewith.

SDG 6– Clean Water and Sanitation: CE practices such as small-scale water purification, sustainable sanitization, waste water treatment, water reuse and recycling, nutrient recovery, biogas systems etc. can help increase access to safe drinking water and equitable sanitation, reduce pollution and improve water quality.

SDG 7 – Affordable and Clean Energy: Renewable energy systems, incl. small-scale biomass technologies and 2nd generation biofuels, energy (heat) recovery and improved utilisation in industrial systems (e.g. industrial symbiosis) all contribute to this goal.

SDG 8 – Decent Work and Economic Growth: New circular business models are a major potential source of increased resource effectiveness and efficiency, waste valorisation and green jobs. Various other studies have found CE implementation to be a multi-trillion Euro opportunity globally, with annual net-benefit of EUR 1.8 trillion in the EU alone by 2030.

SDG- 11: Access to Water and Sanitation, Making Cities Inclusive

SDG-6 ensures access to water and sanitation, for all and SDG-11 focuses on making cities inclusive, safe resilient and sustainable. By improving housing conditions in informal settlements these, benefits of these SDGs are directly or indirectly related with SDG-12.

SDG-12: Sustainable Production and Consumption: CE practices are all about decoupling economic activity from resource use and associated environmental and social impacts, which is also very much at the heart of this goal. Importantly, this goal is an important enabler for achieving most of the other SDGs [5], making the indirect impact of CE practices even more profound.
The circular economy concept enables contribution towards SDG-12. By pushing SDG-12 via the implementation of circular economy solutions, progress on other social, environmental and economic SDGs can also be achieved.

SDG 15 – Life on Land: At the core of CE practices is the aim to restore natural capital. This involves adopting sustainable and regenerative agricultural and agroforestry practices that embrace and protect biodiversity and returning biological material back to soils as nutrients – practices which are fundamental for restoring terrestrial ecosystems.

5.3 Circular Economy and Environment-Social-Governance (ESG) Impact

Environmental Social Governance (ESG) is a set of standards for evaluating corporate management of integrating social and environmental issues into business strategies. These standards are used by potential investors seeking socially and environmentally sustainable companies to invest in.

Circular Economy and ESG are Attracting Investors and Businesses.

Striving to minimise waste and seeing materials through to the end of its lifecycle (as a useful resource) is a major shift in the way our economy works. This can be both a smart move for businesses and make enormous strides towards achieving zero-waste societies.

A future of climate change related disasters and increased social issues comes with all sorts of risks such as, the risk of depleted resources, risk of supply chain breakdown, risk of an unhealthy or uneducated workforce, risk of reputational damage in a society of consumers who increasingly demand that companies reflect responsible values. In short, the proliferation of ESG is essentially a sign that investors and corporations are realising environmental destruction and inequality are bad for business.

ESG seeks to solve this issue by ensuring transparent, sustainable business practices that can be measured and reported, moving the burden of the ‘sustainable choice’ away from the consumer, employee, investor, or other stakeholder and back into the hands of the producer—or more succinctly, the waste creator.

CHAPTER-6

KEY PLAYERS FOR CIRCULAR ECONOMY: WHO CAN DO WHAT?

Everyone have a role to play, for transition from linear to circular economy. Key players are keen to know what *they* can do and *how,* to transition from linear to circular economy. Understanding this aspect can yield significant results such as, the reduction of greenhouse gas (GHG) emissions, prevention of pollution, enable resource efficiency, enhancing recycling and contributing to resource recovery and more.

'Who can do what? ': Details of the chart below.

WHO	WHAT
Individuals	• Positive behavioural change towards source segregation of dry and wet waste. • Consume Less. Enable efficient use of natural resources. • Saying 'NO' to plastic and harmful packaging. • Carry Your Own Bag, for Shopping. • Educate your kids, to live in environment friendly manner, from the age of 2.5/ 3years, • Take Responsibility. Use the slogan, like one given by ICE&SDGs, India - **'Meri Dharti Ki Safai - Meri Zimmedari, Mere Apno Ki Zindagi Ke Liye'.** *(This sentence is in Hindi language, written in English').* • Take responsibility for getting your recyclable waste, recycled, • Understand a fact of life - *'The existence of we the human beings is temporary. We shall take care of our next generations. Let's leave the EARTH, as we received from our parents and grandparents'.* • LIVE GREEN. CARE FOR GENERATIONS TO COME.
Society	• Develop green communities and spaces • Collaborating to enable and enhance recycling • Refrain from using plastic • Address our rate of consumption • Start from 'Segregate The Waste', at community level, • Organize awareness campaign in your society, • Educate kids in your society, • Take a step - 'Channelize Your Recyclable Waste To The Respective Recycler'.

Industry Clusters and Conglomerates	• Design good quality products, that can stay in use, for a long time. • Create industry specific circular economy roadmaps • Develop circular economy business models • Enable technological innovation to make circular economy possible and viable • Implement green procurement • Ensure greening the supply chain. OEMs can support SMEs for transition to green processes, for reducing virgin resource, consumption, promote the use fo recycled resources and reduction of carbon footprint, • Enhance the use of secondary resources, • Implement ESG Mapping Tools to map and monitor their impact • Practice lean manufacturing • The management of the company shall strategise to turn ZERO WASTE and step ahead to transform themselves as 'Circular Business'. • Conglomerates and MNCs shall strategise to implement 'Digital Circular Economy Models' as it enables top management for informed decision making, making it flexible to scale with ease. • Industry clusters /SME cluster shall develop 'Circular Economy Platform' at the cluster level. Waste of one company can be the resource for other company. Such strategies can enable the effective management of industry cluster and can enable SEMs to achieve additional financial benefits, • Industry associations shall develop a system to disseminate right messages about circular economy - to their member industries. • Circular economy platform can be developed for industry clusters, for easy implementation of circular models. • JOIN, Circular Electronics Alliance (CEA), Sanshodhan, for circular economy in electronic and electrical equipment sector. • Join International Alliance on Circular Economy and SDGs (IAoCE&SDGs) by ICE&SDGs, India, for circular design, circular models and advisory services.

Government	• Design Circular Cities. / Enable the ecosystem for transition from linear to circular cities. • Design quality standard for all the resource intensive, high impact products and mandate its implementation. For eg. Life span of mobile should be 6-8 years; Life span of solar panels shall be 10-12 years. • Create awareness and source segregation. **This is most important strategy to reduce recurring investment on waste management,** • Enable, create awareness and equip ULBs to practice circular economy, • Use digital platforms to monitor and manage the waste effectively and earn through 'Extended Producer Responsibility Compliance' (EPR) schemes that can create win-win for governments, industries and city administration, • Invest, to make circular economy financially viable for ULBs • Develop and Implement circular economy policy, • Coordination between the central government, state government, city governance is the key for effective implementation of circular economy policy, • Invest in green infrastructure and technology, • Provide subsidies on secondary resources and green products, • Provide state land to establish recycling units in every industry cluster. It can be implemented in PPP model/GOCO model, ensuring joint ownership between State Government/City administration and private player (to operate the unit). • Implement waste management policies, industry & investment trade policy. This will enable the implementation of circular economy. • Join International Alliance on Circular Economy and SDGs (IAoCE&SDGs) by ICE&SDGs, India, for circular design, circular models and advisory services.
Educational Institutions	• Create Systemic Change in organisations and institutions • Develop and implement effective circular economy models. Practice it at your organisation. • Use effective tools like PDCA Model to implement and IEC framework (by ICE&SDGs) to sustain the circular economy practices at your organisation, • Develop and implement circular economy school curriculum, educate children and provide practical knowledge, • Develop 'Environment Protection' as an attitude for the next generations • Mainstream 'Circular Economy'. • Enable the students to build their career in sustainability and circular economy space.

CHAPTER-7

IS THE TRANSITION TO CIRCULAR ECONOMY POSSIBLE?

The chapter shares about the possibilities of transition from linear economy to circular economy. Some examples and case study given here showcase the needs, requirements and steps taken by business leaders, for transition from linear to circular economy.

Case Study 1: Tata Motors Prolife - Creating Additional Income from Existing Products and Processes

Tata Motors Limited, a USD $42 billion organisation, is a leading automobile manufacturer practicing sustainability and the spirit of 'giving back to society' as a core philosophy.

One of the company's highly successful circular economy initiatives is **Tata Prolife**, a pioneering aftermarket product support strategy for Tata Motors' customers. The use of Tata Motors Prolife aggregate ensures original equipment-like-performance of the vehicles even after the first life cycle. Tata Motors' Prolife business has a wide variety of reconditioned products, from engine long blocks, gear boxes, turbo chargers and air compressors, electrical components such as starter motors and alternators. Tata prolife business reconditions about 23,000 equivalent engines in a year. Such initiative enable circular economy, prevent GHG emissions and motivate the consumer to reuse the vehicle to the maximum extent.

Case Study 2: Tech-Based Circular Economy Model for Metal Resource Recovery: METAL-PRINT™

In 2018, *Sanshodhan: An E-Waste Exchange* designed a tech-based circularly economy model for the e-waste management sector. Sanshodhan's innovative design used industry4.0 technologies to aggregate, recycle, and map metal resource recovery. This is named as METAL-PRINT™. METAL-PRINT™ showcase the metal consumption footprint and recovery footprint, of user corporate / conglomerate.

Innovation by Sanshodhan enable businesses to map their METAL-PRINT™ and achieve additional financial benefits. The design is useful for electronic and electrical (EEE) consumer companies and for the EEE producer companies, those mandated for extended producer responsibility (EPR) compliance.

This tech-based circular economy design is not restricted to e-waste, but applicable to plastic, automobile, and textile sectors too.

Currently, *Sanshodhan An E-Waste Exchange* is on the expert committee for circular economy at NITI Aayog, Government of India. Sanshodhan represented India at international forum such as the United Nations (UN-SPBF), served UNIDO, Europe & SAARC Countries and provides advisory services to the various business and governments.

The company achieved global recognition as the winner of the Global SDG Challenge by Responsible Finance & Investment, United Kingdom and DDCAP Abu Dhabi. Their innovative circular economy model design - METAL-PRINT™ , the digital circular economy model by Sanshodhan, was recognised as Highly Commended The Circulars 2019, by World Economic Forum, Davos in 2019.

Case Study 3: Redefining Waste Through a Resource Innovation Campus, Phoenix, USA

The Vision: The city of Phoenix in the USA aims to achieve zero-waste by 2050. This, despite the Arizona law prohibiting mandated recycling. The city hopes to improve its diversion rate of waste to landfill from 20% in 2013 to 40% by 2020. Through a physical innovation campus, the city aspires to promote public-private partnerships to help achieve this goal and support local economic growth.

The Team: The project is developed by the Public Works Department and supported by the Arizona State University. Several businesses and non-profits have had an active role in developing emerging products and technologies.

The Approach: The Public Works Department and Community and Economic Development Department identified public and private partnerships as an integral component to changing the way the city and its residents view discarded materials and meet the diversion goal.

The 20-hectare Resource Innovation Campus was established adjacent to the city's landfill and waste processing facilities, inviting businesses of all sizes to make better use of the waste materials of the city. This includes the opportunity to set up re-manufacturing processes on the site of the city's waste disposal, to creating new products that can be reinjected into the local economy.

The Campus supports research and development, and in particular through a business incubator. This led to a variety of initiatives and businesses, including a state-of-the-art city compost facility, that aims to reduce the volume of waste being sent to landfill.

Achievements

- The city's waste diversion rate increased to 30% and on track for projected increase of 40%. Carbon emissions and air pollutants have also reduced, including NOx, which is a major contributor to ozone in the area.
- Palm fronds have been manufactured into livestock feed materials, creating 12 new jobs and generating an estimated $10 million USD in sales annually.
- The advanced gas capture and control system on the city's active landfill has avoided 2,300 metric tonnes of CO2e, since it opened in 2006.
- The technology solutions incubator has created 26 full time jobs, 4 part time jobs, 19 internships, raised US$1.345 million capital, generated $3.15 million in revenue, launched 10 products and filed 2 patents

Challenges

- **Accessing Reliable Data:** Public Works staff needed reliable data on materials in the waste stream and its economic value, which was difficult to get. The city issued a 'Call For Innovators' to address this issue and received more than 100 responses from around the globe.

- **Cost of Awareness Activities:** The city is partnering with the Recycle-Bank to educate residents on the city's waste and recycling programmes.

Case Study 4: Upcycling Plastic Waste, India

Upcycling Plastic Waste for construction of roads, is an innovative way by which the Government of India is striving to address the challenges of rural road development. Under PMGSY, plastic waste is being used as an alternative material for road construction.

Under the Pradhan Mantri Gram Sadhak Yojana (PMGSY), or the Prime Minister's Rural Road Program, several state-level agencies have utilised plastic waste as alternative road construction materials in various ways. This, however, is still on a pilot basis.

It is expected that India will not only reduce the amount of plastic waste that goes to its landfills or incinerators, but also benefit from more efficient rural road development.

Case Study 5: Waste to Wealth: Tokyo 2020 Medal Project

The Tokyo Medal Project launched in 2017 and was implemented for two years (2019). The project aimed to collect enough recycled waste to produce the medals for the 2020 Olympics. The campaign called to the public to donate obsolete electronic devices for recycling to mould medals for the Olympics.

This was a landmark recycling initiative that ensured that each medal has been moulded entirely from metal extracted from recycled consumer electronics. It was a part of Japan's goal of making the 2020 Olympics the 'most environmentally friendly and sustainable Games so far,' under the purview of the International Olympic Committee (IOC) .

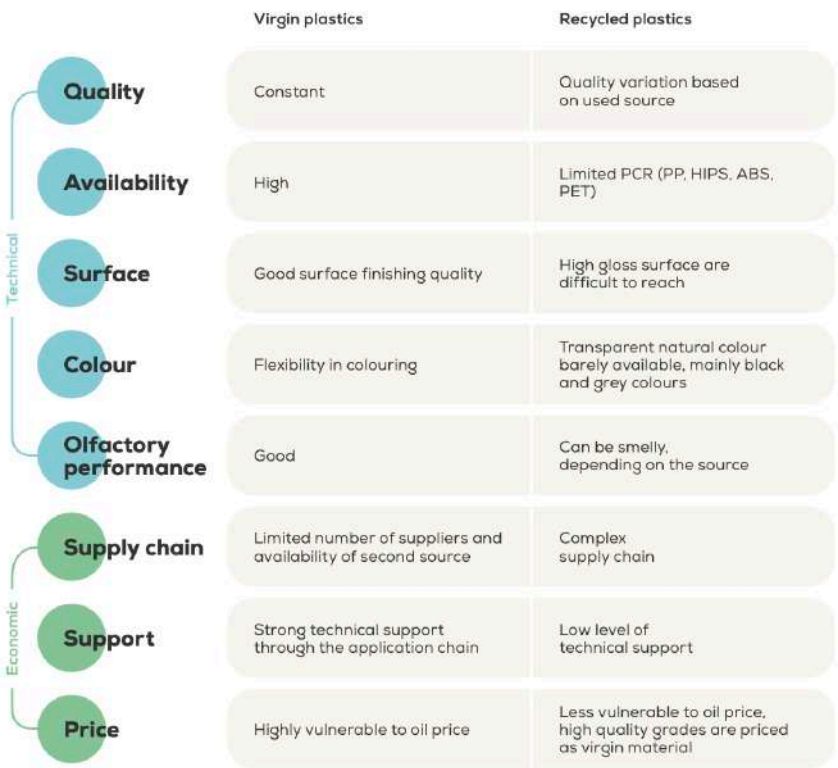
According to the Tokyo Organising Committee (TOCOG), a total of 78,985 tons of discarded devices were collected, which included approximately 6.21 million used mobile phones, along with digital cameras, handheld games and laptops. These were then classified, dismantled and melted down by highly trained contractors. This meant that the goal of collecting 30.3 kilograms of gold, 4,100 kilograms of silver and 2,700 kilograms of bronze was reached by the time the collection cycle closed on March 31, 2019.

TOCOG also revealed that the uniforms for the Olympic Torch Relay are made (partially) from recycled plastic bottles, the victory ceremony podiums made from recycled household and marine plastic waste, with the committee again leaning on the Japanese public that contributed around 45 tons of household plastic in order to create the 100 podiums for the Games.

Case Study 6: Design for Recycling, PolyCE

PolyCE showcase the differences between virgin plastic and recycled plastic, for businesses/ users to identify both kinds of plastic. It provides easy identification, ease of use and ready references for decision making.

Figure 4: Virgin versus recycled plastics



INTEGRATING RECYCLED MATERIALS COMES WITH BALANCING DESIRABILITY, FEASIBILITY AND VIABILITY

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Dr Shalini Sharma is the Founder of Global Institute for Circular Economy and Sustainable Development Goals, the first of its kind of organisation in India, dedicated to march for meeting global goals UN SDG 2030. She also founded unique 'International Alliance on Circular Economy and SDGs' (IAoCE&SDGs), currently having more than 100 experts, organisations, industry and academia from India , Europe and Asia, as its members.

She is also the Co-Founder & CEO of Sanshodhan: An E-Waste Exchange Pvt Ltd. (the company mentored by NASDAQ Entrepreneurial Center, Silicon Valley, USA) and Founder Director of Global Institute for Circular Economy and Sustainable Development Goals (ICE&SDGs).

She innovated world's first tech-based circular economy platform for e-waste sector and continues to work on development of digital standards and circular economy model for various sectors.

Her innovation is recognised as Highly Commended The Circulars 2019, World Economic Forum, Davos at The Circulars 2019. Her circular economy innovations are also awarded by Responsible Finance and Investment, United Kingdom & DDCAP Abu Dhabi; DIPP, Government of India; and various other organizations.

Global Institute for Circular Economy and Sustainable Development Goals (ICE&SDGs)

The Global Institute for Circular Economy and Sustainable Development Goals (ICE&SDGs) is an international think tank that works towards the advancement of science and technology through cutting-edge R&D and innovation and foster to the principles of good governance, supporting the business for social good through its service offering.

ICE & SDGs is unique organisation (NGO), dedicated to work on resource efficiency, circular economy and sustainable development goals (SDGs). ICE&SDGs works on circular economy, circular cities, SDG mapping, advisory services for corporates and industry, sustainability reporting, government for policy making, R&D projects, capacity building, CIRCULAR ECONOMY CERTIFICATION for Products, Offices & Manufacturing units, ZERO-WASTE Certification for businesses and offices, GHG accounting and management plan for industry and states, and creating enabling ecosystem to meet the global goals, UNSDGs 2030.

Also, ICE&SDGs has launched 'International Alliance on Circular Economy and SDGs', where we have founder members and mentors (senior officials) from Niti Aayog, Government of India; Tata Chemicals, Government of Telangana, Government of UP; Minion, WeGot, Vascobel Brussels; EEB Europe, Hindalco, Marks & Spencer, Sopra Steria and more.

ICE&SDGs lead the YouTube channel **SUSTAIN, A Leadership Talk Series** **(channel link:** https://bit.ly/3AFXIfs**).**

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