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Sustainability may broadly be seen from the three dominant frameworks, such as Circular Economy, Social and Solidarity Economy, and Ecological Economics. Circular Economy Framework: While there has been discussion of the circular economy for over two decades, there has been a growing interest in applying the concepts and principles of circular economy (CE) in industrial clusters. Interestingly some of the factors such as support systems, systems enablers, and decentralization of technologies for regenerative economies have also been reflected in the recent literature. Mass and energy transfer balances in secondary and tertiary activities have been at the heart of studies in a circular economy. Sustainable Development Goal (SDG) compass also largely adopts mass and energy balance techniques to help corporations transition to sustainability. SDG Compass is one of the least challenging tasks for large linear specialized value chain production-based corporations to align its value chain to meet a few of the indicators of the SDGs. The United National Statistical Commission provides a workable list of SDG indicators that corporations can use to benchmark their achievements on SDGs. There is a growing understanding and experience of the limitations of these approaches toward achieving sustainability. Social & Solidarity Economy Framework: The Social and Solidarity Economy (SSE) evolved as a counter to the capital and technology-intensive features of the mainstream economy and focused on community participation and ownership in enterprises/cooperatives. Social entrepreneurship as part of this field of study focuses on the purpose of the enterprise being the people and not the external financial investors. Ecological Economics Framework: Ecological economics is built on the increasing understanding that economics is embedded in the broader ecosystem that supports all human activity and hence economic analysis needs to be renewed to this new holistic understanding of the need for balance between artificiality in humans and nature. First, CE focuses largely on the circularity of material movements through reuse, recycling, and reduction techniques. Second, the Solidarity Economy focuses on building trust, fraternity, and sharing among the members of a community to build solidarity. Third, Ecological Economics attempts to revamp the current economic logic from an ecological period and seek a balance between humans and nature. While the first is focused on Economics, the second is focused on Social, and the third is focused on Ecology.

Keywords: Circular economy, Sustainability, Economics, Social, and Ecology.

Overview

This paper highlights the existing sustainability frameworks from design factors of interconnected sub-systems and overall systems science perspective in the context of specific ecosystems, these are (a) Natural Ecosystem, (b) Indigenous Ecosystem, (c) Rural Ecosystem, (d) Urban Ecosystem, and (e) Industrial Ecosystem.

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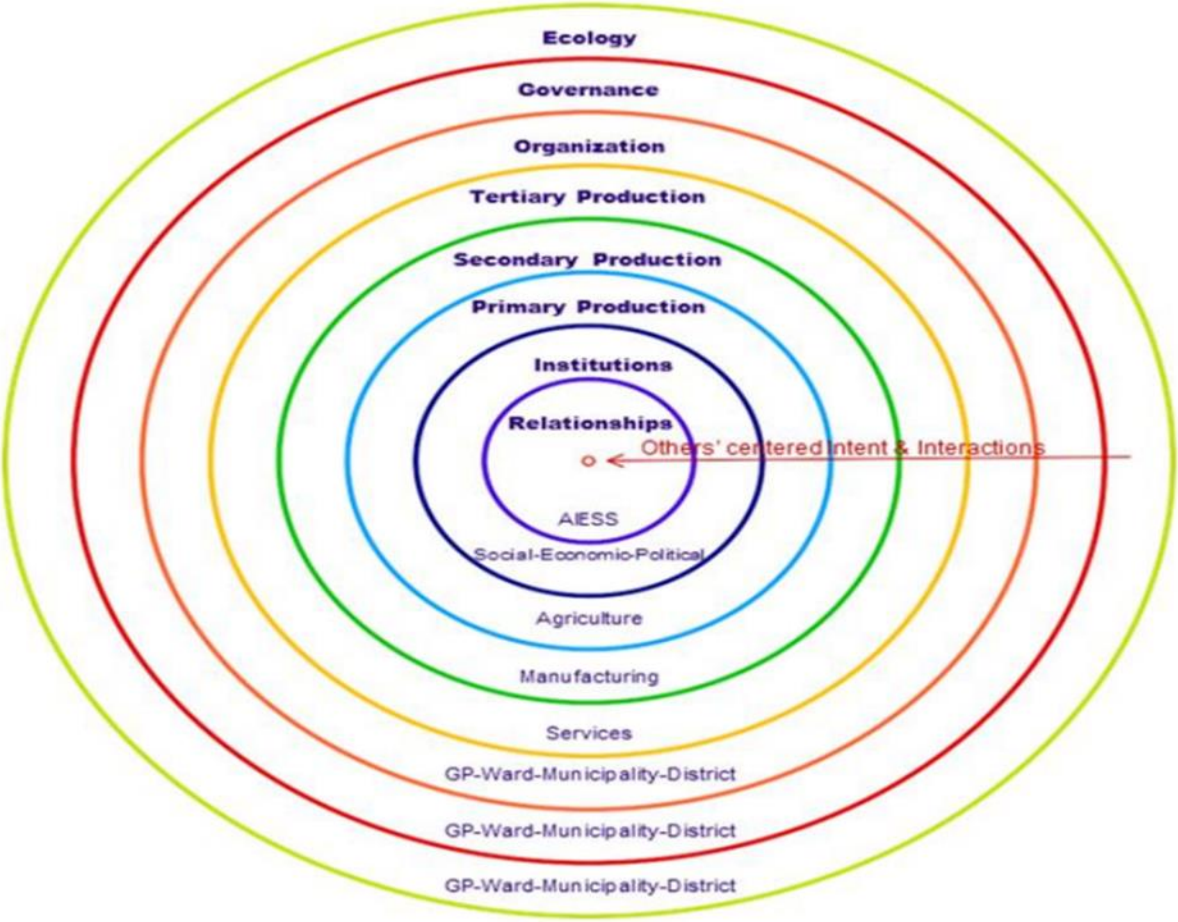
The following multi-disciplinary interconnected themes are Relationships, Institutions, Primary Production, Secondary Production, Tertiary Production, Organization, Governance, and Ecology in the context of specific ecosystems, and their regenerative capacities are demonstrated below. The interconnections and interdependence of the above eight themes in the context of an Ecosystem may be visualized below.

Interlocked Dimensions in an Ecosystem



All Interacting Evolving Systems Science (AIESS) Perspective
Source: Amar KJR Nayak, October,2016

While the above dimensions are generally perceived as linear to each other, these dimensions and most importantly, the factors relating to each of these dimensions (at the micro-level) seem to be interconnected and interdependent. The eight dimensions are accordingly shown in concentric circles as interlocked dimensions in an ecosystem.

Relationships: The key factors in relationships can include a sense of interdependence, the notion of well-being, a mental construct, morals and values, and faith and belief. The five factors of the relationship dimension address relationships at different levels. Faith and belief are at the core of an individual. Morals and values are an outcome of relationships at a family level, mental construct is an outcome of our education, training, and experience. A sense of interdependence is an outcome of the relationship with neighbors and in one's small community. The notion of well-being is the overall societal orientation towards what is perceived as capital and wealth. The nature and state of relationships often shape the sustainability of our endeavor in building institutions, production systems, organizational designs, community governance, and ecology where we live. The nature and depth of relationships seem to have been at the core of human engagements and our endeavor toward sustainability. These relationships are aligned with the ecological principles for inter-generational sustainability.

Institutions: This includes both formal institutions and informal institutions. Accordingly, institutions are the norms, rules, and conventions that regulate the functioning of an ecosystem. Deciphering the issues and factors of an institution has been one of the most challenging tasks. Increasingly there has been the realization that without appropriate institutions, sustainability can only be a distant dream. The key factors of this dimension can include norms and conventions, rules and regulations, principles of justice, interaction intensity, and institutional loading.
Primary Production: Agriculture, the primary production activity is greatly being impacted by climate change and has been increasingly becoming unsustainable across the world. The key factors of production are water, soil, seed-plant-animal genes, farm diversity, and farm ecology.

Secondary Production: The Manufacturing and Processing Industry is the most path-dependent and has been the challenging area for transition. The dynamic interactive process analyses of the key factors of this sector can include raw materials, coordination systems, product technology, diversity of human actors, and physical infrastructure. SDG Compass of the UNO is one of the relevant frameworks for analysis of this sector.

Tertiary Production: The service sector, the dominant sector of the global economy. The dynamic interactive process analyses can include the following key factors in value creation, such as machinery and raw material, coordination system, process technology, diversity of cultures, and local networks. Transitions in this sector, especially in banking and financial services, the hospitality industry, and local transport have been most prominently observed.

Organization: Organizations have been the key engines of economic growth in human enterprise systems. However, today's organizational designs, especially in the secondary and tertiary sectors seem to greatly facilitate private financial capital creation as compared to social wealth creation in a society. Organizations both Producer Organizations (POs) and Industrial Organizations (IOs) need to be designed such that they can evolve to be community enterprise systems and not private enterprises.

The key design factors of organizations in general can include size, scope, technology, ownership, and management. Size refers to the number of members and geographical extent. Scope refers to the number and type of activities that an organization can engage in. Technology refers to the process and product technology suitable for an organization. Ownership refers to the shareholding structure in the organization and management refers to the management structure, and type of managerial skills appropriate for an organization.

Governance: Governance has been an encompassing dimension in subsystems and systems of our society. It has therefore been an important component of the sustainability of our community systems. To identify factors and principles of governance that can facilitate sustainable community systems at the lowest level of governance that is at the Ward or Gram Panchayat level as well as are technically consistent for sustainability at higher levels of governance, such as district, state, national, and global level. The key factors under governance can include frequency of interactions, decision-making method, problem-solving approach, resource dependency, and governance architecture and responsibilities.

Ecology: Ecology represents a basic comprehensive unit (habitat-ecosystem) of our planet that is driven by the fundamental principles of nature. Ecology includes all living (biotic) and non-living (abiotic) objects in each habitat. The natural principles of interconnection, interdependence, and caring for the weakest are the principal axioms of a thriving ecosystem. For sustainability, the design and systems analysis of the other concentric and embedded layers of any ecosystem is determined by the above natural principles. The key factors of this dimension can include Changes (atmospheric), Renewability (of resources), Balance (of species), Compatibility (of human and natural systems), and Openness (in ecosystems).

Challenges for the Circular Economy

Environmental Policies and Standards

Environmental degradation has been recognized as a major concern by world-level organizations such as the United Nations, the International Finance Corporation, and the governments of several countries. Various environmental policies have been described to combat air pollution, water pollution, waste management, soil pollution, and climate change, which must also be considered by manufacturing companies. To support this policy, the International Organization for Standardization (ISO) has set some international standards for the manufacturing sector, such as the ISO 14000 series. In India, the authorities have introduced the Environmental Protection Act of 1986, the Water (Prevention & Control of Pollution Act, 1974), the Air (Prevention & Control of Pollution Act, 1981), and the Environmental Impact Assessment Notification 2006 to protect the environment.

Economic Policies

Manufacturing is the backbone of any economy as it contributes to GDP and job creation. The Government of India has pursued many ambitious goals under the Make in India plan, such as Foreign Direct Investment (FDI), Goods and Services Tax (GST 2017), and Foreign Trade Policy (2016-2020) to reach the level of a developed economy. MSMEs will contribute significantly to a fully developed advanced production system through efficient and systematic management of taxes and transactions.

Societal Laws and Policies

Since the first industrial revolution, social problems have been observed, such as overtime, inadequate distribution of labor, wage differentials, protection claims, health care, and essential facilities. The Indian government has enacted several laws to protect workers' rights and improve living standards, such as the Trade Union Act and the Industrial Employment Act. Labor laws and policies should be binding guidelines for MSME registration.

Quality Standards

The quality of a product plays a crucial role in attracting the customer's attention. Due to inferior quality and lack of standardization, many Indian products are rejected several times in the international market, resulting in huge costs, which are called quality costs. The reason for this inadequate quality is inadequate monitoring of quality standards by the manufacturer. For quality control, the International Organization for Standards (ISO 9000 series), American Society for Quality (ASQ), and Bureau of Indian Standards (BIS) are considered the most important institutions in the world, USA, and India respectively, which must be followed by Indian manufacturers to expand cross border trade. Low quality also invites cheaper imports from competing countries.

Proposed Model Inclusive Manufacturing System (IMS) for the Circular Economy

MSMEs are the backbone of populous countries like

China and India, but most of these MSMEs are not well-equipped with new technologies. They are also not fully aware of regulatory compliance, legal requirements, policies, and innovations. Considering the current situation in populous developing countries, especially in India, a new manufacturing paradigm has been introduced, the Inclusive Manufacturing System (IMS), as shown in Figure 4. Inclusive manufacturing can be defined as: "incorporating innovations and advances in manufacturing to address societal (employment, education, health care, and labor), economic (cross-border business, trade policy, cost of products and services, and contribution of manufacturing to GDP), and environmental (natural resources, energy, air quality, clean water availability, recyclable and sustainable products) solutions by bringing together resources in a geographically distributed environment with the support of advanced manufacturing technologies (IT systems, Artificial Intelligence, High-Performance computation, and CPSs) through the integration of the semantic web and the Internet of Things to achieve the goal of minimal market time, better quality, lower cost, faster services, and greener manufacturing."

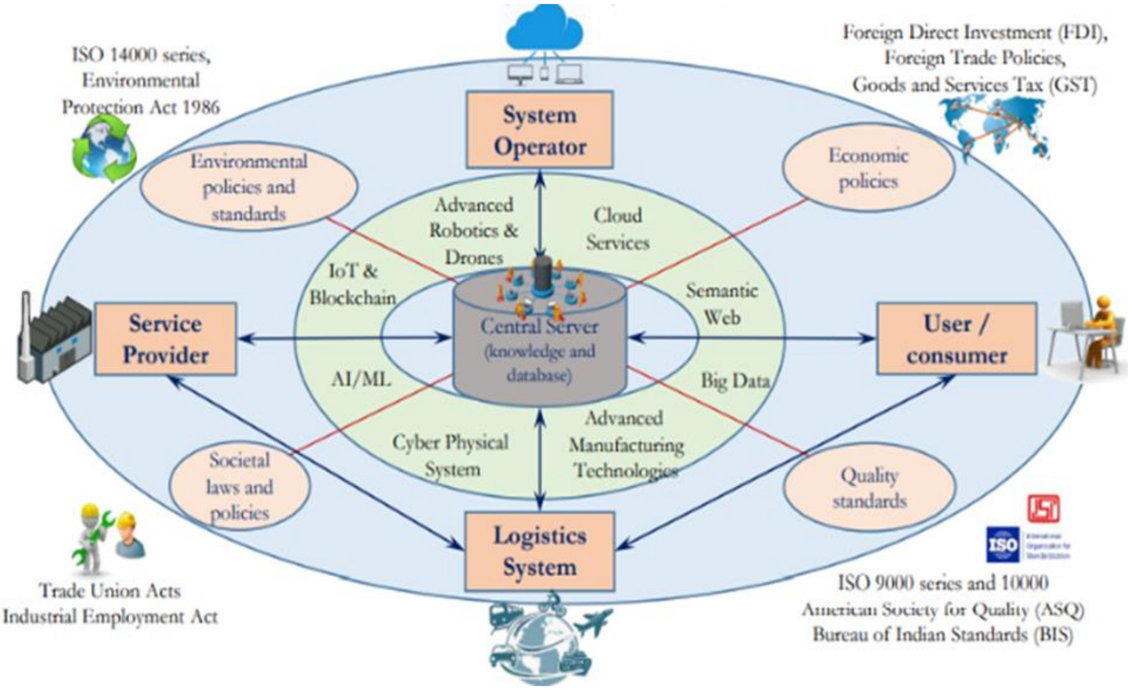


Figure 2. Inclusive Manufacturing System
Source: Singh et al. (2019).

System Operator: A leading IMS member operates and manages the entire system with support from platform providers. Essential assistance is provided to service providers and customers by making the latest technologies available. System operators and platform providers work as brokers because they are the third parties connecting consumers and service providers.

Service Provider: Production resources and capabilities are provided by this participant in the form of services. Service providers fulfill the technical requirements of a physical item or design activity requested by customers.

Logistics System: The logistics system is the fourth partner in the proposed integrative production system.

It is used to provide transportation and physical movement of goods from one place to another, storage, and warehousing activities by using real-time data monitoring and tracking technologies.

User or Organization: Consumers are crucial players in a business that purchases and consumes manufactured goods and related services.

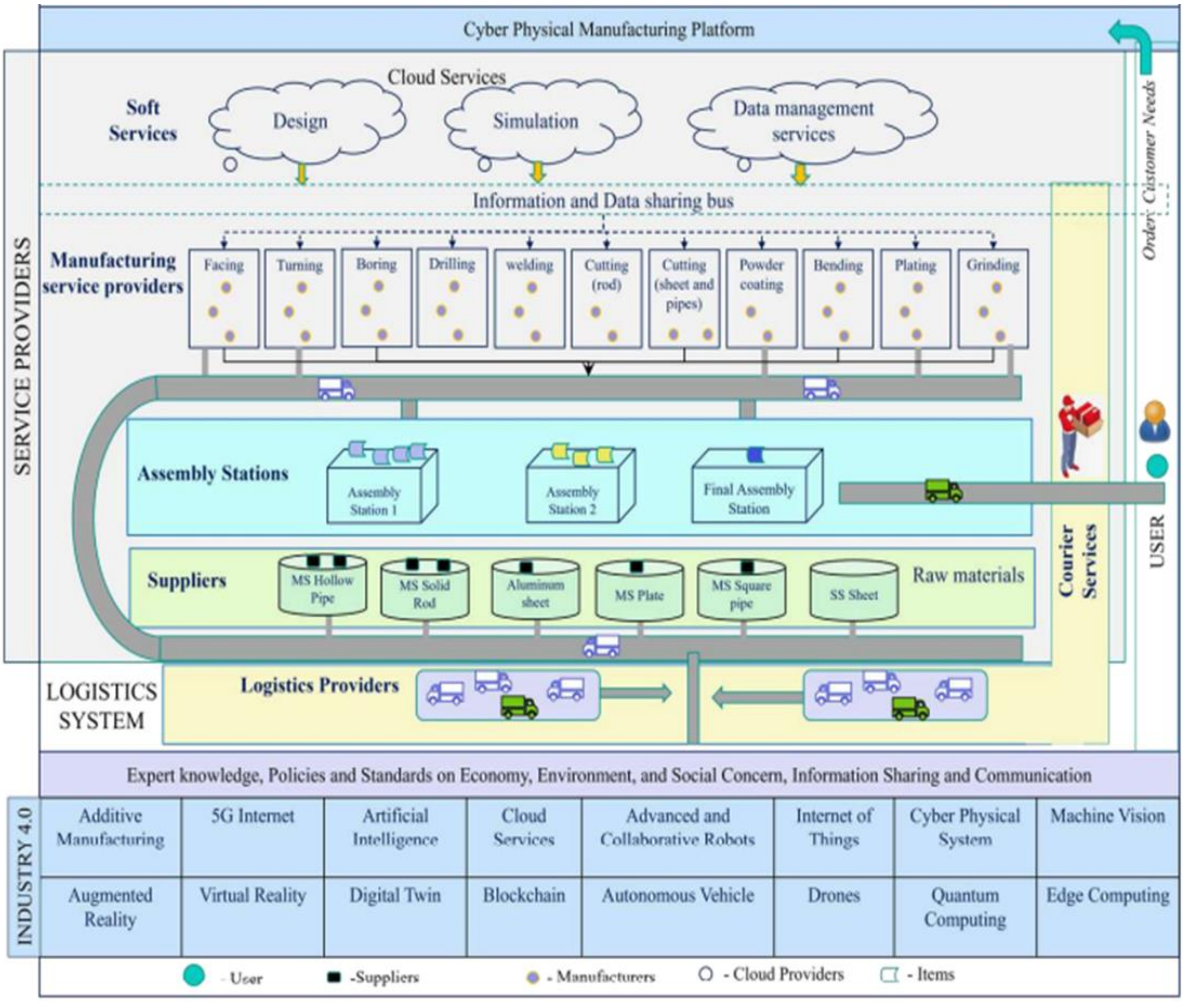


Figure 3: Cyber-Physical Manufacturing Platform
Source: Singh et al. (2019).

The figure shows the framework of the IMS considering four participants that perform different activities from order initialization to final delivery. These include the user or customer (end user and organization), the system operator, the service providers (software services, suppliers, manufacturing services, and assembly stations), and the logistics system (transportation and courier services). The suppliers provide raw materials and semi-finished products (e.g., only raw materials in this study). Logistics service providers help connect suppliers with manufacturers, manufacturers with other production units and assembly stations, and assembly stations with customers through courier services.

Various manufacturers perform numerous operations (e.g., facing, drilling, boring) to process the original raw material through subsequent production steps (e.g., operations) into a final product. Depending on the available resources, i.e., machines, several manufacturing steps can be carried out in a company. Assembly stations put the product into its final form by picking up parts and assemblies from manufacturers. Finally, courier service providers take care of the delivery of the products to the customers by using logistics service providers.

Resource Recovery

Resource recovery is the systematic detour of waste that was destined for disposal for a specific reuse. It is the processing of recyclables to recover or reclaim materials and resources or convert them to energy. These activities are carried out in a recovery facility. Resource recovery is not only environmentally important but also cost-effective. It reduces the amount of waste requiring disposal, saves landfill space, and conserves natural resources.

Resource recovery (as opposed to waste management) uses LCA (life cycle analysis) and attempts to provide alternatives to waste management. For mixed MSW, several broad studies have found that management, source separation, and collection, followed by reuse and recycling of the non-organic portion and energy and compost/fertilizer production from the organic material through anaerobic digestion is the preferred path.

An example of the benefits of resource recycling is that many discarded items contain metals that can be profitably recycled, such as the components of circuit boards. Wood French fries in pallets and other packaging materials can be recycled into useful products for horticulture. Recycled wood French fries can be used as surfacing for paths, walkways, or play areas.

Application of rational and consistent waste management practices can yield a range of benefits including:

Economic: Improving economic efficiency through the means of resource use, treatment, and disposal and creating markets for recyclables can lead to efficient practices in the production and consumption of products and materials, resulting in the recovery of valuable materials for reuse and the potential for new jobs and new business opportunities.

Social: By reducing negative health impacts through proper waste management, the resulting impacts are more attractive to civic communities. Better social benefits can lead to new employment opportunities and potentially lift communities out of poverty, especially in some of the poorer developing countries and cities.

Environmental: Reducing or eliminating negative impacts on the environment by reducing, reusing, recycling, and minimizing resource extraction can lead to improved air and water quality and help reduce greenhouse gas emissions.

Waste reducing, reusing, and recycling (3R)
Waste Hierarchy

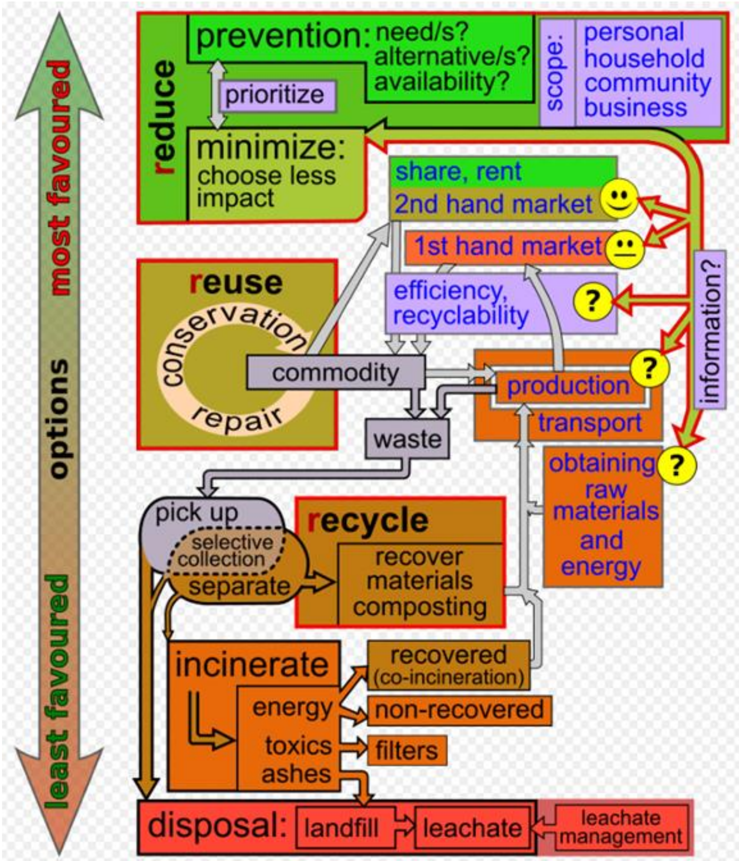


Figure 4: waste hierarchy of the 3 Rs (reduce, reuse, recycle)
Source: https://en.wikipedia.org/wiki/Waste_management#/media/File:Waste_hierarchy_rect-en.svg

The philosophy of today's society is "take-make-use-dispose", i.e., we use resources, process them into products, and throw them away as waste after use. This leads to two problems: one is the scarcity of resources on the earth, and the other is the increase of waste on the earth, because the earth has limited resources and a finite capacity to absorb waste, and with the increase of population and luxurious lifestyle, this problem is getting bigger. Manufacturers are making efforts to use resources efficiently. They are continuously working to minimize costs and waste. However, this is limited only to production and not to the whole system. There are some research practices toward end-of-use/end-of-life (EOU/EOL) that are not currently accepted by manufacturers. Our interest must be to close the loop of manufacturing by recycling and reusing the materials. So, we can say that remanufacturing is not accepted by companies, although its benefits are highlighted by researchers. The United Nations Development Program (UNDP) - Responsible Consumption and Production (RCP-12) focuses on the efficient management of our common natural resources and the disposal of toxic waste and pollutants. The goal is to encourage industry, businesses, and consumers to recycle or reduce waste, and to help developing countries shift to more sustainable consumption patterns by 2030. To reduce the burden of waste and pollution, both industrial and municipal waste should be recycled and reused. Therefore, a circular economy or circulation system should be implemented in the production process to minimize the use of raw materials and waste generation (Hysa et al., 2020).

In addition, hazardous and infectious medical waste should be properly disposed of according to guidelines (WHO, 2020c). It is now clear that the majority of people (especially in developing countries) are not adequately informed about waste segregation and disposal (Rahman et al., 2020). Therefore, the government should conduct comprehensive awareness campaigns on proper waste separation, treatment, and disposal through various mass media.

For example, India is the country with the fifth largest e-waste generation (Bandela, 2018) and generated 3230 kilotons of e-waste in 2019, which is equivalent to 2.4 kg per capita (Forti et al., 2020). Figure 6 shows the growth of e-waste in India.

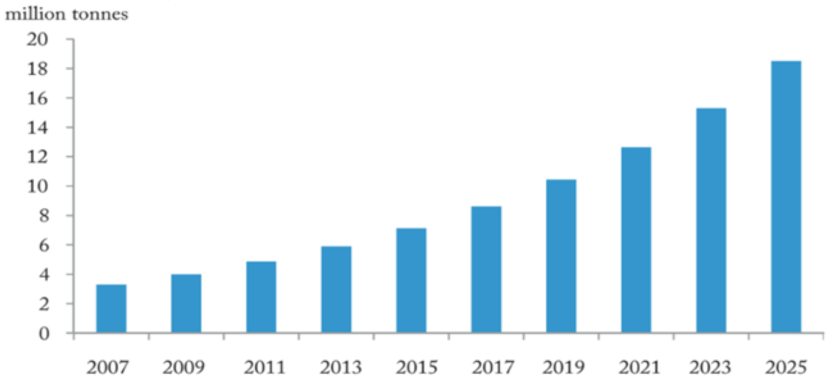


Figure 5: E-waste in India {Source: Annamalai (2015)}

Although laws requiring manufacturers to collect and properly recycle e-waste have been in place in India since 2011 (Kaur, 2019), only 1.5 percent of India's total e-waste is recycled by certified recyclers (Pandit, 2016). Pandit (2016) notes that improper dismantling by the unorganized sector and scrap dealers has resulted in e-waste concentrations in Indian soil that are twice the global average.

For example, the Advert Foundation launched an e-waste management campaign in Delhi (TNN, 2014). Nokia, in turn, launched its e-waste "take back" campaign through its Priority Dealers and Nokia Care Centers in New Delhi (Sadia, 2013). However, in the absence of formal collection mechanisms, "unused" products are stored in homes in both cities. These "unused" products stored in houses could eventually end up in the unorganized sector (Gautam, 2016) if the public is not educated to dispose of e-waste properly. Kwatra et al. (2014) found that 74 percent of households sold e-waste to scrap dealers. Therefore, there is a need to raise awareness and establish proper collection points to reduce the problem of e-waste.

There is an increasing need for end-of-life management of products by manufacturers. ninety-five percent of e-waste is collected and recycled by the informal sector (Agarwal et al., 2021). Manufacturers should establish a take-back mechanism for e-waste collection.

From the end-user perspective, the following is needed: education on the 3Rs (reduce, reuse, recycle) and awareness of collection points.

In this context, there is a need to improve skills and provide certification for repair work (Gautam, 2016). There is an urgent need to improve the infrastructure of recycling facilities to reduce the amount of e-waste that ends up in landfills and to raise awareness in the informal sector to reduce processes such as open burning and acid bleeding (Manish and Chakraborty, 2019).

Finally, there is a need to involve local nongovernmental organizations in e-waste collection (Central Pollution Control Board, 2011) and to integrate informal e-waste collectors into formal e-waste processing facilities (Turraga and Bhaskar, 2017).

Challenges in developing countries like India related to waste

In areas with developing economies, waste collection services are often depleted, and landfills are inadequately managed and uncontrolled. The problems are exacerbated. Problems with management complicate the situation. Waste management in these countries and cities is an ongoing challenge due to weak institutions, chronically inadequate resources, and rapid urbanization. All these challenges, along with a lack of understanding of the various factors that contribute to the waste management hierarchy, impact waste treatment.

In developing countries, waste management is usually done by the poor to ensure their survival. It is estimated that 2% of the population in Asia, Latin America, and Africa rely on waste for their livelihoods. Family-based or individual manual waste pickers are often engaged in waste management practices for which there are few support networks and facilities, putting them at increased risk for health consequences. In addition, this practice prevents their children from further education. Participation of most citizens in waste management is low, and residents of urban areas are not actively involved in the waste management process.

Wastewater treatment and reuse

The world is facing increased water stress, driven by population and economic growth, land use changes, increased climate variability, and change, growing industries declining groundwater supplies, and water quality. Water pollution due to toxic metals and organic compounds remains a serious environmental and public problem. Moreover, faced more and more stringent regulations. Water pollution has also become a major source of concern and a priority for most industrial sectors. It is important to know the potential threats to source water and human beings from wastewater discharged by industrial or commercial activities before its release into the environment. Wastewater treatment is closely related to the standards and/or expectations set for effluent quality.

Industrial wastewater treatment describes the processes used for treating wastewater that is produced by industries as an undesirable by-product. After treatment, the treated industrial wastewater (or effluent) may be reused or released to a sanitary sewer or to surface water in the environment. Some industrial facilities generate wastewater that can be treated in sewage treatment plants. Most industrial processes, such as petroleum refineries, and chemical and petrochemical plants have their specialized facilities to treat their wastewater so that the pollutant concentrations in the treated wastewater comply with the regulations regarding disposal of wastewater into sewers or rivers, lakes, or oceans. This applies to industries that generate wastewater with high concentrations of organic matter (e.g., oil and grease), toxic pollutants (e.g., heavy metals, volatile organic compounds), or nutrients such as ammonia. Some industries install a pre-treatment system to remove some pollutants (e.g., toxic compounds), and then discharge the partially treated wastewater to the municipal sewer system.

Most industries produce some wastewater. Recent trends have been to minimize such production or to recycle treated wastewater within the production process. Some industries have been successful at redesigning their manufacturing processes to reduce or eliminate pollutants. Sources of industrial wastewater include battery manufacturing, chemical manufacturing, electric power plants, the food industry, the iron and steel industry, metal working, mines and quarries, the nuclear industry, oil, and gas extraction, petroleum refining and petrochemicals, pharmaceutical manufacturing, pulp, and paper industry, smelters, textile mills, industrial oil contamination, water treatment, and wood preserving. Treatment processes include brine treatment, solids removal (e.g., chemical precipitation, filtration), oils and grease removal, removal of biodegradable organics, removal of other organics, removal of acids and alkalis, and removal of toxic materials.

To control the challenges of water pollution, both industrial and municipal wastewater should be properly treated before discharge. Besides, the reuse of treated wastewater in non-production processes like toilet flushing and road cleaning can reduce the burden of excess water withdrawal.

Case Study: Water harvesting and conservation by reuse of runoff water. Hindalco has always focused on aspects of resource criticalities. Water, being a scarce resource, Hindalco takes various initiatives to reduce its freshwater consumption. This is evident through the initiatives taken at our plant, which are described below:

Our plant location is a low-lying area compared to our locality. The wastewater of the community is being entered into our premises through seepage into the stormwater drain. We have taken the initiative towards water reuse by collecting that stormwater in our stormwater collection pit as runoff water. We took this runoff water as an opportunity for us. We have laid down a pipeline from the stormwater pit to our effluent treatment plant (ETP). At ETP, we have a clarifier and reverse osmosis (RO) system to treat this runoff water. To monitor this runoff water, we have installed one level sensor at the stormwater pit and one flow meter at ETP for monitoring the quantity of utilized runoff water.

Benefits and impact on business

- A step ahead to sustainable development through natural resource conservation.
- There is a possibility to multiply water conservation practices in other areas.
- Reduction in freshwater consumption.

Solutions for waste reducing, reusing, and recycling (3R)

4a Behavioral change in daily life

To reduce the carbon footmark and global carbon emigration, it's necessary to change the mindset in our diurnal life and optimum consumption or coffers like; avoiding reused and locally grown food, making compost from food waste, switching off or freeing electronic bias when not used, and use a bike rather of an auto for shorter distances.

4b International Cooperation

To meet the sustainable environmental pretensions and protection of global environmental coffers, like the global climate and natural diversity, combined transnational trouble is essential (ICIMOD, 2020). Hence, a responsible transnational authority like the United Nations Terrain Program (UNEP) should take an effective part in preparing time-acquainted programs, arranging transnational conventions, and coordinating global leaders for proper perpetration. Science and Technology play a vital part in the socio-profitable development of a nation. Rapid advances in technology have led to significant enhancement in all sectors of frugality. With the emergence of the rearmost technologies, there has been a drastic shift in the way we suppose, work, and unite with others. Also, access to new technologies has fully converted the nature/ operation of work. The entire world has become a global village. On the one hand, it has increased the effectiveness and effectiveness of associations, on the other hand, it has rebounded in increased complexity, query, and competition in the internal and external terrain of the associations. To manage this turbulence in the terrain, enterprises have to make judicious relinquishment and prolixity of technologies, which may lead to improvement of productivity, enhancement in living conditions, and profitable growth of the country. More specifically, enterprises need to map their technological capability and capability so that innovative products and services may be produced, thereby leading to the inclusive and sustainable development of the nation.

Inter-generational Equity: Following effective waste management practices can provide subsequent generations with a more robust economy, a fairer and more inclusive society, and a cleaner environment.

4 Prospects and Scope of IMS

To achieve the sustainable pretensions of UNDP, the target of' Make in India', Inclusive growth of the frugality, rising trends of the current marketing strategy, and changing client actions and conditions, tremendous openings are envisaged for the Inclusive Manufacturing System. Many of the reasons are mentioned herewith IMS perpetration provides a centralized platform to Micro, Small, and Medium Enterprises (MSMEs) for their collaboration with resource composition. Grounded on literal data and client demand, substantiated and customized orders can be fulfilled. colorful environmental, profitable, and societal issues can be resolved with the perpetration of associated programs and norms, and it helps in maintaining the sustainability aspects. Continued monitoring and selection of the stylish players from the request through the system, perfecting product quality and effective services that lead to significant growth in cross-border business and donation of the manufacturing sector. New inventions, implicit openings, job creation, perfecting life, and inclusive growth can be witnessed with the expansion of the manufacturing sector. Eventually, similar generalities can play a big part and become the backbone of Atmanirbhar Bharat (Self-reliant India), giving the ideas of oral for original for global,' make for the world', and' brain drain to brain gain'.

Conclusion

To meet the sustainable environmental pretensions and protection of global environmental coffers, like the global climate and natural diversity, combined transnational trouble is essential (ICIMOD, 2020). Hence, a responsible transnational authority like the United Nations Terrain Programme (UN Environment) should take an effective part in preparing time-acquainted programs, and arranging transnational conventions, to achieve profitable, social, and ecological impacts, a paradigm shift is needed. This necessitates companies redefining resource use, product processes, and their relationship with business mates along the entire value chain. In 1784, the first artificial revolution began with water-powered machines. Electricity (2.0) made mass production possible. With the help of IT and electronics (3.0), robotization has advanced up to the moment's digitalization (4.0). With indirect frugality, we want to drive the urgently necessary Revolution 5.0, creating a positive influence on people and our terrain. The idea of the indirect frugality powered by Cradle to Cradle is to ensure that the coffers used can serve as starting accouterments for new, pollutant-free products after they've been used. This allows them to circulate continuously in product cycles rather than" downcycling", the end is to enable the" upcycling" of products. Current results like participating in generalities or play are formerly away in the right direction on the road to indirect frugality. Still, the thing is to produce a positive footmark with optimized nutrient cycles through results that are suitable for the biosphere and the technosphere. It isn't enough if only many deals with these motifs and only individual product groups are optimized. However, there's no way around the indirect frugality, If companies want to make a conspicuous donation to climate protection and resource conservation. Everyone can donate and be part of the result. Together, we're driving a 5th artificial revolution, with Cradle to Cradle as a new approach for products, processes, structures, and metropolises.

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