INTERNATIONAL MULTIDISCIPLINARY BOOK SERIES
https://ibseries.com/
Bharat Brain Trust, Edited By: Dr. Joydeb Patra, Dr. Prodipta Barman, Dr. Tamal Gupta

IMBS, Vol. 04, No. 1, (2026)
Open Access. Online & Print
ISSN:

CHAPTER – 1

A STUDY ON BUILDING SUSTAINABILITY THROUGH E-WASTE RECOVERY AND GREEN JOB CREATION

Dr. GARGEE BASU
Assistant Professor,
School of Law, Brainware University, Barasat, India

1. Introduction

The rapid pace of technological development in recent decades has brought about significant transformations in how societies function, communicate, and consume. While these advancements have led to improved convenience, productivity, and connectivity, they have also resulted in an alarming rise in the generation of electronic waste (e-waste). As modern gadgets and digital devices become obsolete within increasingly shorter timeframes, their disposal has become a pressing concern. This surge in discarded electronic products poses serious threats to both the environment and public health due to the presence of hazardous materials such as lead, mercury, and cadmium. The improper handling and disposal of e-waste contaminate soil, air, and water, thereby endangering ecosystems and human well-being, especially in developing nations where regulatory mechanisms are often weak or poorly enforced.

In response to these challenges, the concept of a circular economy has gained prominence as an alternative to the traditional linear model of 'take, make, dispose.' The circular economy encourages a restorative and regenerative approach that prioritizes the extension of product life cycles through practices such as recycling, repairing, refurbishing, and reusing. This model aims to minimize waste, reduce dependency on virgin raw materials, and promote environmental resilience. Furthermore, the shift toward a circular economy is creating a new category of employment opportunities, commonly referred to as green jobs. These roles are rooted in sustainable practices and serve the dual purpose of protecting the environment while promoting inclusive growth. Green jobs contribute not only to economic development but also to social progress by addressing disparities in access to employment and resources. They play an important role in advancing social welfare goals, especially when integrated with community-driven initiatives and policies that prioritize environmental justice and sustainable livelihoods.

The continual surge in technological innovations has become a defining feature of the modern era. While these developments have enhanced various aspects of daily life, including communication, education, healthcare, and commerce, they have also contributed to a growing environmental burden. One of the most critical outcomes of this trend is the exponential increase in electronic waste. As consumer demand for the latest electronic products rises, older devices are frequently discarded, often without proper disposal or recycling methods in place. This uncontrolled accumulation of e-waste presents serious hazards, not only to natural ecosystems but also to human health, particularly due to the toxic substances contained in many electronic components. In countries like India, where waste management systems are still evolving, the impact is more severe, affecting informal workers and urban communities alike.

Bharat Brain Trust

DOI: https://doi.org/10.69889/IMBS.978-81-965700-1-9
ISBN: 978-81-965700-1-9

To counter these adverse effects, the adoption of the circular economy model is gaining momentum. This model focuses on extending the lifespan of products and materials through reuse, refurbishment, and recycling, reducing the need for continuous extraction of natural resources. Unlike the conventional approach that treats waste as the end of a product's life, the circular economy sees waste as a resource that can be reintegrated into the production cycle. As this model becomes more widespread, it is giving rise to employment sectors that are environmentally sustainable. These are known as green jobs—roles that support ecological preservation while also generating economic and social value. Green jobs contribute to reducing unemployment, especially among youth and marginalized groups, while also promoting practices that support long-term environmental health. Their emergence signals a shift towards a more balanced and equitable form of development where social welfare, environmental protection, and economic growth go hand in hand.

2. E-Waste and The Need for Sustainable Solutions

Important to mention about the electronic waste, or e-waste that refers to discarded electronic devices and components, including mobile phones, laptops, printers, televisions, refrigerators, and other household and industrial gadgets. As the rate of technological consumption accelerates, the life span of such products continues to shorten, leading to an unprecedented accumulation of obsolete electronics. When these discarded items are not handled properly, they release harmful chemicals such as lead, mercury, cadmium, and brominated flame retardants into the environment. These substances can leach into soil and groundwater or enter the air through burning, resulting in serious threats to public health and ecological systems.

Despite its dangers, e-waste is also a valuable secondary source of materials. Many discarded electronics contain precious and rare metals such as gold, silver, palladium, copper, and rare earth elements. These materials can be extracted through systematic recycling processes, thereby reducing the pressure on natural mining operations and conserving finite resources. Unfortunately, in countries like India, a large portion of e-waste is handled informally, often by untrained workers without protective equipment, posing severe risks to human health and limiting the economic potential of proper material recovery.

Integrating strategies like reuse, repair, refurbishment, and recycling into the management of e-waste not only limits environmental damage but also significantly reduces the need for new raw materials and energy consumption. These methods contribute directly to climate action, resource efficiency, and sustainable production—all of which are key components of global sustainability goals. More importantly, these practices open up new avenues for employment in the growing field of green jobs. Jobs in repair workshops, certified recycling units, materials recovery facilities, and e-waste auditing require skills that are increasingly in demand. This emerging sector supports inclusive economic growth by creating livelihoods, especially for urban youth and marginalized communities, while contributing positively to environmental protection.

The adoption of circular economy principles in the context of e-waste promotes systemic change. Instead of treating electronic products as disposable, the circular approach emphasizes designing products for longevity, ease of disassembly, and recyclability. It encourages a shift from consumerism to a more responsible use of technology. In doing so, it fosters industries based on sustainability, which in turn creates stable, dignified employment opportunities. Green employment in this context is not only about protecting the planet but also about building resilience in communities by providing meaningful work aligned with environmental values.

3. Green Jobs: Recycling, Repair, and Innovation.

The transition towards a circular economy is opening new frontiers in employment by fostering a wide range of environmentally sustainable occupations commonly referred to as green jobs. These jobs are not only rooted in ecological responsibility but also promote social equity by offering meaningful work to underrepresented and economically disadvantaged populations. Among the most prominent areas of green employment are recycling, repair, and innovation—three interconnected sectors that lie at the heart of resource efficiency and environmental stewardship.

Recycling plays a pivotal role in recovering valuable materials from discarded products, thereby reducing the need for extracting virgin resources. Workers engaged in recycling are involved in the collection, segregation, dismantling, and processing of waste materials, turning potential pollutants into usable raw materials. According to a report by the Central Pollution Control Board (CPCB, 2023), India generated around 1.6 million tonnes of e-waste in 2021-22, a figure that is steadily rising due to increased consumption of electronics. However, only approximately 25% of this

waste was processed through formal recycling channels. The formalization and expansion of this sector present significant employment potential. The International Labour Organization (ILO) estimates that globally, better waste management and recycling practices could create 6 to 20 million new jobs by 2030, with a major share in developing countries.

Repair services represent another vital component of green employment. By extending the life of electronic and electrical goods, the repair sector reduces the volume of discarded items and delays the need for new production, which often involves high energy and material inputs. Repair technicians, mobile service centers, and local workshops contribute not only to waste reduction but also to affordability, especially for lower-income communities. In India, the informal repair economy employs thousands, particularly in urban and peri-urban areas. For instance, mobile repair markets such as Delhi's Gaffar Market or Kolkata's Chandni Chowk support hundreds of skilled and semi-skilled workers, many of whom come from marginalized backgrounds. Encouraging certification and skill development in this sector through schemes like Skill India can further enhance the quality and reach of repair services, thus generating formal employment while strengthening the culture of maintenance.

Innovation, meanwhile, drives the evolution of green jobs by introducing sustainable technologies and business models. This includes the development of modular product designs, eco-friendly manufacturing processes, digital platforms for product lifecycle tracking, and startups working on upcycling and materials recovery. Globally, countries like Germany and the Netherlands have integrated innovation-led green jobs into their national employment strategies, especially within the context of the European Green Deal, which aims to make Europe climate-neutral by 2050. In India, emerging enterprises like Attero Recycling and Karo Sambhav are innovating in the field of e-waste management by using advanced recovery technologies and closed-loop systems. These firms not only contribute to environmental goals but also create high-skill jobs in engineering, data analytics, supply chain management, and environmental compliance.

The significance of these sectors goes beyond environmental protection. They address the broader goals of social welfare and economic inclusion by generating jobs that are accessible, skill-building, and sustainable in the long term. For communities that are often excluded from mainstream employment, such as women, youth, and workers in the informal sector, green jobs offer a pathway to economic stability and dignity. Moreover, these jobs resonate with the values of social work—community development, social justice, and ecological balance—by fostering work that improves both livelihoods and the environment. In conclusion, expanding green employment in recycling, repair, and innovation can help India and other nations meet their environmental targets while simultaneously advancing inclusive economic growth. Public policies that invest in training, technology, and infrastructure for these sectors are essential to fully realize their potential in creating a just and sustainable future.

4. Social Work and The Circular Economy.

Social work holds a central place in advancing the goals of the circular economy by bridging the gap between environmental sustainability and social equity. Traditionally focused on promoting social justice, community well-being, and inclusive development, the role of social workers has now expanded to include active participation in ecological initiatives. By facilitating community involvement, raising awareness about environmental issues, and promoting skill development in sustainable sectors, social work contributes to making the transition to a circular economy more inclusive and impactful.

One of the key ways in which social work intersects with the circular economy is through education, training, and capacity-building programs targeted at marginalized and vulnerable populations. In many parts of the world, social workers are involved in designing and delivering vocational training in areas such as e-waste management, electronics repair, upcycling, and sustainable material handling. These programs not only equip individuals with the technical skills needed for employment in green sectors but also enhance their sense of agency and participation in ecological restoration. In India, initiatives under the Deen Dayal Upadhyaya Grameen Kaushalya Yojana (DDU-GKY) and Skill India Mission have introduced green skill development modules, helping rural youth access jobs in sectors such as renewable energy installation, organic farming, and waste segregation.

Globally, several innovative models are integrating social work with circular economy principles to promote both environmental and social outcomes. For instance, the Restart Project in the United Kingdom organizes community repair events, where individuals can bring broken electronics and learn to fix them with the help of volunteers and technicians. This model not only extends product lifecycles but also creates spaces for community learning and collaboration, aligning with the values of empowerment and inclusion. Similarly, in the Netherlands, the Westerpark Circulair initiative combines social reintegration with circular design by employing people with limited job prospects

to work in reuse centers, repair shops, and sustainable construction projects. These programs reduce material waste while offering stable, meaningful employment.

In India, organizations such as **Chintan Environmental Research and Action Group** are working with informal waste pickers to formalize their work, provide health and safety training, and integrate them into structured recycling programs. This not only enhances the dignity and income of waste workers but also strengthens the efficiency of urban waste management systems. By collaborating with municipal authorities and corporate partners, such programs demonstrate how social work can act as a vital connector between policy, industry, and grassroots action.

In Latin America, the Reciclaje Inclusivo (Inclusive Recycling) program, active in countries like Brazil, Colombia, and Peru, integrates waste pickers into formal recycling chains through cooperatives and public-private partnerships. Social workers involved in these programs provide support in organizing, negotiating contracts, and advocating for policy changes that protect the rights and livelihoods of informal workers. This inclusive model ensures that the economic benefits of recycling are shared fairly while contributing to resource conservation and waste reduction.

By embedding social equity into environmental action, social workers help ensure that the circular economy is not just an economic or environmental shift, but a societal transformation. They play a critical role in addressing structural inequalities that may otherwise exclude marginalized communities from green employment opportunities. Furthermore, social work contributes to shaping sustainable consumption patterns by encouraging behavioural change at the household and community levels.

In conclusion, the integration of social work into circular economy frameworks enhances the effectiveness and fairness of environmental transitions. By creating pathways for disadvantaged populations to participate in green sectors—such as recycling, repair, sustainable manufacturing, and renewable energy—social work strengthens both the social and ecological fabric of communities. As the world moves towards more sustainable models of development, the contributions of social work will be essential in building systems that are not only environmentally sound but also socially just.

5. Impact and Long-Term Sustainability

The adoption of circular economy principles in the management of electronic waste has the potential to bring about profound and lasting transformations across environmental, economic, and social dimensions. By shifting from a linear 'produce-use-dispose' model to a system that values resource efficiency, repair, and recycling, societies can mitigate the harmful effects of unchecked consumption and waste generation. The benefits of this shift are not limited to ecological outcomes—they extend to human health, employment, urban planning, and inclusive growth.

Firstly, circular approaches reduce environmental degradation by minimizing the need for raw material extraction and lowering the volume of waste that ends up in landfills or informal dumping grounds. This is especially important in countries like India, where urban waste accumulation contributes significantly to soil and water pollution. For example, the e-waste management initiatives in Bengaluru have helped reduce the amount of hazardous waste entering the environment by promoting partnerships between local authorities, formal recyclers, and community workers. These efforts have led to cleaner surroundings and reduced toxic exposure for informal waste pickers.

Secondly, these practices promote the efficient use of resources, ensuring that valuable metals such as gold, copper, and lithium are recovered and reintroduced into production cycles. In Japan, the Tokyo 2020 Olympic medals were crafted entirely from recycled metals sourced from discarded electronic devices, collected nationwide. This project exemplified how resource circularity can be scaled up into national initiatives, simultaneously fostering awareness and reducing environmental impact.

Thirdly, improved e-waste handling significantly enhances public health, particularly for those working in waste collection, dismantling, and recycling. In places where e-waste is informally processed—often through open-air burning or acid baths—communities face severe health risks. Introducing protective technologies, formal processing units, and training for safe handling can reduce these risks. In Ghana's Agbogbloshie e-waste dump, one of the largest in the world, international partnerships have begun introducing safe recycling equipment and community health programs to counter decades of environmental neglect.

The circular economy also strengthens local economies by creating new streams of employment,

entrepreneurship, and innovation. Small and medium enterprises (SMEs) play a crucial role in this process by offering services in repair, resale, recycling, and upcycling. In India, start-ups like Karo Sambhav and Reco have developed models that support traceable, accountable e-waste collection and processing, providing jobs for both skilled and semi-skilled workers, and bringing visibility and dignity to the sector.

Moreover, circular practices contribute directly to the achievement of several **United Nations Sustainable Development Goals (SDGs)**:

- **Goal 8 (Decent Work and Economic Growth):** Green jobs in e-waste management offer dignified employment, skill development, and economic inclusion, especially for youth and informal workers.
- **Goal 11 (Sustainable Cities and Communities):** By reducing urban waste and promoting local recycling infrastructure, cities become cleaner, safer, and more resilient.
- **Goal 12 (Responsible Consumption and Production):** Encouraging product reuse and materials recovery directly addresses unsustainable consumption patterns.
- **Goal 13 (Climate Action):** Recycling and repair reduce greenhouse gas emissions associated with mining, manufacturing, and disposal, contributing to climate mitigation efforts.

By linking green employment with sustainability and the goals of social work, societies can build systems that are economically viable, socially inclusive, and environmentally sound. When governments, civil society, and industries collaborate to embed circular principles into policy and practice, they lay the foundation for a future where development does not come at the cost of ecological stability or social equity. The long-term sustainability of these efforts depends on continued investment in green skill development, public awareness, infrastructure, and strong regulatory frameworks that support the transition to a circular economy.

6. Conclusion: Towards A Sustainable and Equitable Future.

The circular economy offers a powerful and practical framework for addressing the escalating challenge of electronic waste while opening new avenues for employment through environmentally responsible activities. By promoting practices such as recycling, repair, and the development of sustainable technologies, it provides a pathway for minimizing environmental damage, conserving natural resources, and creating meaningful livelihoods. These green jobs not only reduce dependency on finite raw materials but also bring dignity and stability to workers, especially in underserved communities. They offer a model of growth that is regenerative rather than exploitative, one that values human potential and environmental stewardship in equal measure.

When these efforts are aligned with the values and practices of social work, their social impact is significantly enhanced. Social workers, by virtue of their close connection to communities, are well-positioned to facilitate awareness, skill-building, and participation in green sectors. Their involvement ensures that the benefits of the circular economy—economic opportunity, environmental protection, and community well-being—reach those who are most in need. Programs that train youth, women, and marginalized groups in repair and recycling not only equip them with practical skills but also foster a sense of inclusion and ownership in the broader movement toward sustainability.

Looking ahead, the realisation of a circular economy that is both just and effective depends on collaborative action across sectors. Governments must enact forward-looking policies that support sustainable business models, regulate waste responsibly, and incentivize innovation. Educational institutions must incorporate environmental literacy and green skills into mainstream curricula, ensuring that the next generation is prepared to contribute to sustainable industries. At the same time, investments in green infrastructure—such as certified recycling facilities, e-waste collection hubs, and repair centers—are critical for scaling up the impact of this transition.

There is a genuine reason for hope. Around the world, communities, entrepreneurs, and institutions are beginning to embrace circular principles and embed them into everyday practices. From mobile repair cooperatives in rural India to electronics recycling start-ups in Europe, these efforts demonstrate that change is not only possible but already underway. With continued commitment, shared responsibility, and a focus on equity, it is possible to build a future where economic development does not come at the cost of environmental degradation—and where every discarded product can become the starting point for something new, valuable, and sustainable.

References:

1. Central Pollution Control Board (CPCB). (2023). Annual Report on E-Waste Management 2021–22. Ministry of Environment, Forest and Climate Change, Government of India. Retrieved from https://cpcb.nic.in
2. International Labour Organization (ILO). (2019). Greening with jobs: World Employment Social Outlook 2018. Geneva: ILO. Retrieved from https://www.ilo.org/global/publications/WESO
3. Ellen macarthur Foundation. (2019). Completing the Picture: How the Circular Economy Tackles Climate Change. Retrieved from https://ellenmacarthurfoundation.org
4. Chintan Environmental Research and Action Group. (2020). Green Jobs and the Informal Sector: Linking Waste Management to Livelihoods in India. New Delhi: Chintan. Retrieved from https://www.chintan-india.org
5. Attero Recycling. (2023). Sustainable E-Waste Management and Material Recovery in India. Retrieved from https://www.attero.in
6. Karo Sambhav. (2023). Responsible E-Waste Recycling for a Circular Economy. Retrieved from https://www.karosambhav.com
7. Restart Project. (2022). Community Repair in Action: A Toolkit for Circular Engagement. London: The Restart Project. Retrieved from https://therestartproject.org
8. UN Environment Programme (UNEP). (2021). Global E-Waste Monitor 2020. Bonn/Geneva/Rotterdam: United Nations University, ITU, and ISWA. Retrieved from https://www.itu.int/en/ITU-D/Statistics/Pages/publications/wem.aspx
9. Ministry of Skill Development and Entrepreneurship (MSDE), Government of India. (2021). Green Skills Development Programme Overview. Retrieved from https://www.msde.gov.in
10. United Nations Development Programme (UNDP). (2022). Circular Economy in India: Opportunities for Transition to a Resource Efficient Future. New Delhi: UNDP India. Retrieved from https://www.in.undp.org
11. Tokyo Organising Committee of the Olympic and Paralympic Games. (2021). Tokyo 2020 Medal Project: Towards an Innovative Recycling Society. Retrieved from https://tokyo2020.org
12. Reciclaje Inclusivo. (2020). Inclusive Recycling in Latin America: Empowering Waste Pickers through the Circular Economy. Retrieved from https://reciclajeinclusivo.org
13. European Commission. (2020). The European Green Deal. Brussels: European Union. Retrieved from https://ec.europa.eu
14. Westerpark Circulair. (2021). Circular Economy and Social Inclusion: Case Study from the Netherlands. Retrieved from https://amsterdamcirculair.nl
15. Skill India Mission. (2023). Annual Report on Vocational Training and Green Job Readiness. Ministry of Skill Development and Entrepreneurship, Govt. Of India. Retrieved from https://skillindia.gov.in