Chapter 9

Creating Integrated Business, Economic, and Environmental Value within a Circular Economy in India

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1. Introduction

Increasing competitiveness in a circular economy should be driven by public and private investments that enhance resource efficiency and reduce pollution and emissions. A circular economy is not a luxury for developing countries like India. This transformation is akin to a revamped industrial revolution, one that seeks better use of resources. Economically this means changing the composition of the economy towards an increasing range of resource-efficient sectors. This chapter investigates the challenges and opportunities of how firms, sectors, and community organisations can and will be able to strike a better balance between economic growth and resource efficiency in the context of India's emerging circular economy paradigm. Based on meta policy analysis and case studies on resource recycling, we identify and demonstrate that blended business and economic value can be created by adopting a circular economy approach in an integrated way.

2. Targets, Monitoring, and Benchmarking for a Circular Economy in the Indian Context

In developing circular economy policies that are based on resource efficiency principles, governments should include provisions for measuring baselines, quantifying problems, setting targets, and monitoring progress towards achieving them through benchmarking (Park, Sarkis,

and Wu, 2010). Quantitative targets and indicators are useful in determining the level of change required, while also allowing for comparisons between companies or different government initiatives. At the same time, targets are useful at the national level to orient action by governments. Furthermore, indicators can help in measuring the progress of specific actions to improve resource efficiency against the predefined targets.

Recent reviews of resource efficiency in fast-growing economies of Asia have shown that the definition of national quantitative targets is important to show ambition, create commitment, and send clear policy signals for a circular economy. For example, the World Energy Council (2008) found that quantitative targets for improving energy efficiency could avoid disjointed actions and provided a long-lasting context for energy efficiency policies. Setting energy efficiency targets can form the basis for monitoring the national policy outcomes and tracking the progress.

Resource efficiency targets must be sufficiently clear for key actors such as specific government agencies, industry, and consumers to understand and act on. The targets should integrate different policy fields and provide verifiable interim results for material flow indicators and targets (Li et al., 2010). A recent evaluation showed that India along with several countries in the region have now adopted national energy efficiency programmes with quantitative targets. Yearly monitoring is usually a requirement of such programs.

India has initiatives to measure resource efficiency across its national economy. Table 9.1 presents the national targets for achieving material, energy, and water efficiency of selected countries. India has set ambitious resource productivity, recycling, and waste reduction targets in the water and energy sectors. The targets undergo yearly performance measurement and are supervised. Japan, China, and Singapore are the other countries that have set targets in all three key areas of resource efficiency that includes material efficiency. Overall, targets for achieving resource efficiency are more commonly used than material or water efficiency targets.

2.1. Policy Instruments

Comprehensive policies comprising both regulatory and market-based tools are needed to achieve greater resource productivity and thus a circular economy. Once goals and targets for resource efficiency have been set, governments need to assess what policy tools and instruments are available to achieve them and how these can be effectively implemented. Several recent reports discuss policy instruments that may be used to promote resource efficiency. Currently, governments have a wide choice of different instruments to formulate a sound policy framework for resource efficiency. In India, over the past 2 decades, policy instruments have gradually evolved from traditional command-and-control regulations to economic instruments, information-based measures, and voluntary initiatives. An optimal mix of policy instruments will frequently include all four of these approaches. It is unusual for a single policy instrument to operate in isolation in India. In most situations, a mix of

instruments is used to tackle a specific circular economy problem. There are many advantages to using a mix of policy instruments, including: (i) accounting for the multi-aspect nature of circular economy challenges, (ii) enhancing the effectiveness of one instrument with the help of another and vice versa, and (iii) reducing administrative costs and improving enforcement possibilities.

The challenge for policymakers in India is to select an appropriate combination of policy instruments to meet specific objectives while also having a positive economic and social impact. Policy instruments should be combined in a way that provides a balanced and sound approach to promote resource efficiency while being tailored to the unique context of local or national conditions. They must also be mutually reinforcing and without perverse incentives.

To achieve greater resource efficiency, policymakers in India try to shift companies' or householders' actions from a current wasteful practice to one that conserves resources. This attempt usually calls for a twofold policy approach, which includes both measures aiming to phase out the undesirable product and behaviour as well as measures to increase the market for more sustainable products. In addition, shifting from less desirable products and behaviours (laggards) to better ones (front runners) requires policies that stimulate innovation, both for individual products and at the system level. For example, in addition to improving the fuel efficiency of automobiles, there is also a need to support the development of new energy sources for vehicles to facilitate the dissemination of social innovations such as car sharing, to improve public transportation systems as viable alternatives to cars, and to reduce mobility needs through better city planning.

Four generic groups of policy instruments being adopted in India can be used to promote resource efficiency. It is important to note that it is usually difficult to categorise policy measures as being purely 'regulatory', 'economic', 'information-based', or 'voluntary' since they overlap.

2.1.1. Regulatory instruments

Traditional regulatory instruments set legal standards in relation to resource efficiency and performance, pressures, or outcomes. They are often referred to as command-and-control instruments in the economic literature and have traditionally been favoured by governments to carry out environmental policy. Regulatory instruments are policy mechanisms that are non-voluntary in nature and they compel resource use change by the threat of penalties for non-compliance. Penalties are set by legislation and are used to influence the behaviour of users by encouraging them to avoid punishment for non-compliance. Traditional regulatory instruments have several benefits, which explain their widespread use in circular economy policymaking. For governments, the setting of standards is inexpensive and the goals for policy achievement are clear. They also impose minimum performance requirements and mandate compliance.

Table 9.1. Resource Efficiency Targets of India Compared with Those of Other East Asia Summit Countries

Country	Material Efficiency	Energy Efficiency	Water Efficiency
Australia		Generate 20% of energy from renewable sources by 2020.	
China	▪ Increase GDP generated per tonne of 15 main resources consumed including energy, iron ore, non-ferrous metals, and non-metals by about 25% over 2003 in 2020. ▪ Increase the comprehensive use rate of solid industrial wastes from 55.8% in 2015 to 60% in 2025. ▪ Target the proportion of reused copper, aluminium, and lead in production output to reach 35%, 25%, and 30%, respectively, by 2020. ▪ Increase the amount recycled of major renewable resources by more than 65% by 2030 compared with the 2003 level. ▪ Limit the storage and treatment of industrial solid wastes to approximately 4,500 million tonnes. ▪ Constrain the growth rate of garbage to approximately 5% by 2010.	Reduce energy consumption per unit of GDP by 20% in 2010 compared with the 2005 level.	▪ Reduce water consumption per unit of industrial value added by 30% in 2015 compared with the 2005 level. ▪ Improve the effective utilisation coefficient of agricultural irrigation water from 0.45 in 2005 to 0.50 in 2010.
India	Realise waste conversion rate of at least 25% by 2025.	Achieve energy savings of 10,000 MW in 2020.	Increase water use efficiency by 20%.
Japan	▪ Improve resource productivity by 60% by 2020. ▪ Improve cyclical use rate by 40–50%. ▪ Reduce final waste disposal amount by 60%.	Improve energy efficiency by at least 30% in 2030.	
Republic of Korea	Increase recycling by 53% by 2015.	▪ Reduce energy intensity by 46% by 2030. ▪ Reduce energy consumption by 42	

Country	Material Efficiency	Energy Efficiency	Water Efficiency
		million tonnes of oil equivalent by 2030.	
New Zealand		▪ Generate 90% of electricity from renewable sources by 2025. ▪ Non-transport energy savings of 30 petajoules (PJ) by 2025.	
Philippines	Achieve waste conversion rate of at least 25% by 2016.	Reach average annual energy savings of 23 million barrels of fuel oil equivalent.	
Singapore	▪ Reach 60% of household waste recycling by 2012. ▪ Achieve recycling rate of 70% by 2030.	Improve energy efficiency by 35% from 2005 levels by 2030.	Reduce domestic water consumption to 140 litres per person per day by 2030.
Thailand		Reduce energy consumption by 13% in 2010 and 20% in 2020.	Reduce water use by 10% between 2012 and 2020.
Viet Nam		Reduce total energy consumption by 3–5% (2010–2015) and then by 5–8% (2015–2020).	

Source: Compiled by authors from various documents.

On the other hand, traditional regulatory instruments are often seen as inflexible and costly to enforce, and they provide incentives only to avoid penalties rather than to improve outcomes. Also, industries are reluctant to follow the regulations, arguing that uniform regulation ignores the unique situation of each company and imposes excessive costs due to ineffective allocation of the compliance burden. This resistance can even make some regulations impossible to implement. The shortcomings of traditional regulatory instruments and the difficulties of implementing them effectively do not imply that they should be avoided or replaced. Rather, it is important to develop more dynamic and flexible policy approaches to a circular economy. This can be achieved by combining regulatory instruments with other types of policy tools and by introducing regulatory instruments sequentially.

In recent years, we have seen a trend in the development and implementation of more innovative and flexible regulatory instruments to promote resource efficiency in other parts of the world which India can look into. They typically not only included standards on emissions or technologies and environmental liability, but also extended producers' responsibility via product take-back, environmental controls, enforcement through permits and inspection by authorities, and other measures to mobilise public action to change the patterns of production and consumption in order to improve resource efficiency.

Many countries in the East Asia Summit region have introduced regulatory instruments to promote resource efficiency. These include (i) laws and regulations to promote energy efficiency and renewable energy (for example, New Zealand's Energy Efficiency and Conservation Act 2000, Japan's Energy Conservation Law 1997 and 2008 and its Top Runner standard programme [Box 1], China's Energy Conservation Law 1998 and 2008, India's Energy Conservation Act 2001); (ii) laws and regulations to promote resource efficiency and sustainable production and consumption (for example, Japan's 3R (reduce–reuse–recycle) laws and China's Circular Economy Law 2008 and Cleaner Production Law 2002); and (iii) laws to promote low-carbon and green growth (such as the Republic of Korea's Framework Act on Low Carbon and Green Growth 2009).

These new regulatory instruments typically define various stakeholders' responsibilities (including those of governments at all levels, businesses, and consumers) and combine the traditional command-and-control and legal liability approach with economic instruments, information disclosure, and governmental procurement measures.

Box 1. Japan's Top Runner Standard Programme

Japan's Top Runner Programme was introduced in 1998 as part of the country's Energy Conservation Law to improve energy efficiency in energy-using products. The programme is a regulatory approach administrated by the Japanese Ministry of Economy, Trade and industry and does not provide any kind of government incentives. One of the most important characteristics of the Top Runner Programme lies in its focus on the supply side of important markets. Stringent energy efficiency standards have been established for 21 product categories, including passenger vehicles, air conditioners, refrigerators, and television sets. Instead of setting a minimum energy performance standard, the current highest energy efficiency rate of a product in each category is taken as the standard (the 'Top Runner'). This standard represents the target value of energy efficiency that has to be reached by all products belonging to the category within a certain period. Since the introduction of the programme, each product category has achieved significant energy efficiency improvements. For example, the energy efficiency of air conditioners improved by 67.8 percent between 1997 and 2004. Energy efficiency improvements for other product categories include electric refrigerators, 55.2 percent (1998–2004); gasoline passenger vehicles, 22.8 percent (1995–2005); vending machines, 37.3 percent (2000–2005); and computers, 99.1 percent (1997–2005). Overall, the Top Runner Programme is expected to achieve 0.35 exajoules (EJ) of energy savings between 1998 and 2010.

Source: Authors.

2.1.2. Economic and market-based instruments

More recently, greater emphasis has been placed on the use of economic instruments to help correct the market failures in India. Perform, Achieve and Trade (PAT) is a programme introduced among the industrial units and works by encouraging certain behaviours through

the use of market-based instruments that bring economic incentives. All identified industrial units are mandated to reduce their specific resource consumption. The reduction targets are based on their current efficiency (average plant reduction target is about 4.8 percent). Industrial units that are able to achieve their targets receive energy savings certificates, which can be traded on the power exchanges and bought by non-compliant units to meet their compliance requirements. Industrial units that are unable to meet the targets (through their own actions or the purchase of certificates) are liable to a financial penalty. In contrast to regulatory instruments, which force all regulated entities to comply with the same standards, the incentives and disincentives provided through economic instruments such as PAT can generate different behaviours depending on each actor's specific circumstances. This flexibility can often reduce the overall compliance costs quite significantly compared with uniform regulations.

The two most notable advantages of economic instruments over traditional regulation are their cost effectiveness and their ability to provide incentives for innovation and improvement beyond a certain level of performance. However, in order to obtain the desired effects, economic instruments usually require sophisticated institutions for implementing and enforcing the instruments, particularly in the case of charges and tradable permits.

Charges and taxes need to be collected and monitoring is required to avoid 'free-riding' practices. Tradable permits are particularly challenging in the implementation; creating a well-functioning market may require a fairly large administration, and the regulated entities usually need training on how to use the permit market effectively. Another drawback of economic instruments is that their effects on resource consumption are not as predictable as under a traditional regulatory approach.

Examples of the many different types of economic instruments are subsidies (including the removal of environmentally harmful subsidies); taxes (on emissions or products); rebates (on tax, purchase of resource-efficient products); tradable permits; and deposit refund schemes.

2.1.3. Information-based measures

Information-based measures have become more popular in India recently. This is partly because of the lower costs of dissemination brought by information technology. These policy instruments provide information on the resource efficiency of certain products, services, or systems in a standardised manner so that consumers and investors can make more informed decisions. Approaches such as public information campaigns, eco-labelling schemes, research and development, and public disclosure of a company's environmental performance are used to generate knowledge about the adoption of resource-conserving practices. Information-based measures may be mandatory or voluntary.

One advantage of information-based measures is their low implementation costs compared with the complex administration need for regulatory instruments. In addition, they can raise public awareness about more sustainable consumption patterns and provide incentives to

companies for reducing their environmental burden in order to avoid competitive disadvantage. Information-based measures can also enhance the effectiveness of economic instruments, such as environmental taxes, especially if they convey information on private benefits. Conversely, the effectiveness of information-based measures largely depends upon the reactions of the information recipients (Karl and Orwat, 1999). Approaches such as eco-labelling can be ineffective in markets where consumers have low awareness levels of environmental issues or where the amount of discretionary spending is low.

One of the most common types of information-based measures in India is the use of eco-labelling schemes. These schemes display information about the environmental performance of a product or service so that consumers can make informed choices when purchasing. Several states have introduced programmes to help create market preference for resource-efficient products and equipment. For example, the Green Leaf Scheme has been developed to conserve resources, reduce pollution, and improve waste management. Environmental certification is awarded to products – such as refrigerators, computers, air conditioners, and building materials – which are shown to have the least detrimental impact on the environment. Participation in the scheme is voluntary. Another regional example is Singapore's Energy Smart Building Labelling Programme, which seeks to promote energy-efficient buildings. This eco-label awards office buildings, hotels, and retail malls that perform in the top 25 percent in terms of energy efficiency within their cohort.

Education of firms and consumers is another important information-based measure and is critical to the decision-making process. India has introduced educational programmes to enhance knowledge of the population on resource-efficient behaviour. For example, the state government of Tamil Nadu introduced the 'Re-thinking Waste-in-Schools Education Programme' to promote awareness of resource efficiency issues within school communities. The Bureau of Energy Efficiency has proposed an environmental tax reform that entails a reconsideration of the present tax system. It seeks to use the revenues from environmental taxes to reduce the tax burden on beneficial economic activities, such as investment or employment. It thereby shifts the tax burden towards the 'bads' such as pollution, waste, and resource depletion and away from the 'goods' such as employment, income, and investment.

Opinions differ concerning the effectiveness of voluntary initiatives to achieve circular economy outcomes. On the one hand, voluntary initiatives are more flexible than traditional regulatory instruments. Geller et al. (2006) found that voluntary agreements between governments and the private sector can be effective, especially in situations where regulatory instruments are difficult to enact or enforce. In Europe and Japan, for example, voluntary agreements have led to significant reductions in industrial waste use in a number of sectors.

In contrast, voluntary initiatives usually work well when people also have another incentive to change their behaviour. It is believed that voluntary initiatives are likely to be more effective if there is a threat of command-and-control regulation being put into use (Bengtsson et al., 2010). For instance, Price (2005) found that initiatives that combine voluntary efforts

with a mix of incentives and penalties have higher participation rates and are generally more successful at meeting their predetermined targets.

Box 2. Firm-Based Circular Economy Standards in India's Cement Industry

The cement industry is a very material-intensive (energy and water) industry and is responsible for large amounts of resource consumption, greenhouse gas (GHG) emissions and air pollution. Some of the larger multinational cement companies have moved to establish a set of firm-based global efficiency standards, which include uniform approaches to managing and reporting energy, water use, and pollution emissions.

The case study cement firm in India operates six cement plants with a total production capacity of about 12 million tonnes of cement per year. In 1999, a building conglomerate acquired the largest ownership stake in the firm. This conglomerate operates 129 cement plants in more than 30 countries around the globe and maintains various forms of firm-based global efficiency standards. These standards range from standardised management and reporting practices to performance standards for energy use and emissions.

The conglomerate uses a standardised set of economic and resource efficiency performance metrics that all plants must report on. Other standards relate to GHG emissions and the use of waste. The conglomerate as a whole has a stated target of reducing carbon dioxide (CO_2) emissions by 20 percent from the firm's baseline emissions in 1990 by the year 2010. All plants are required to follow a prescribed methodology to calculate and report CO_2 emissions, to develop a plan for reducing emissions, and to increase the use of waste materials as a source of fuel.

The introduction of firm-based global standards had significant impact on India's cement plants. For instance, the standards led to the introduction of computer-based, real-time monitoring of resource use and emissions, along with specific protocols for calculating and reporting air emissions, water use, and GHG emissions. The conglomerate helped these plants prepare a plan to reduce CO_2 emissions, which resulted in a 12 percent reduction in carbon emissions intensity by 2005. Furthermore, the Indian firms were able to benchmark their own resource efficiency targets because they had access to standardised performance information for other plants operated by the conglomerate. In addition, the firm introduced a standardised alternative fuels and raw materials programme, which resulted in a dramatic increase in the use of alternative fuels and raw materials. Finally, the plants have been able to bid on intra-firm contracts to provide technical assistance for other plants within the firm network. In 2002, the Indian plants earned over US$10 million by providing technical assistance to other plants operated by the conglomerate.

Overall, the implementation of firm-based global resource efficiency standards has proven to be a successful approach to performance-based continuous improvement towards a circular economy. Intra-firm benchmarking served as a platform for firm-wide learning and for creating an intra-firm marketplace for technical assistance.

Source: Jose (2015).

Management standards, such as the ISO 14000 series, can also be understood as a voluntary initiative. Although such standards are not policy tools in a strict sense, they can be used by policymakers for circular economy goals, for example, by requiring all major suppliers and governmental agencies to be certified. In addition, ISO 14000 management systems require the certificate holder to identify key indicators of environmental impacts, set targets, and follow up achievements.

Firm-based resource efficiency standards are also emerging as an important influence on the circular economy in India. These standards are uniformly applied to all plants worldwide and are not tied to the local regulatory requirements of the place where they are located. This typically means that a plant is required to go beyond compliance with local and national standards in order to meet firm-based global environmental standards. Economic globalisation is the underlying key driver for firm-based resource efficiency standards. There is also growing external pressure on firms and industries around resource efficiency and pollution issues which makes firms face the risk of damage to brand reputation (Angel and Rock, 2005). Nowadays, firms are challenged with managing complex global production networks at multiple sites of production with different regulatory expectations and with a need to respond to various end-market regulations. As a consequence, firms are adopting their own global standards as a necessary way to operate their global production networks (Box 2).

3. Current National Policies That Promote Resources Efficiency and Support Circular Economy in India

3.1. Resource Efficiency

Resource efficiency can be defined as the amount of materials needed to produce a particular product. Material efficiency can be improved in two ways: (i) by reducing the amount of materials contained in the final product, and (ii) by reducing the amount of materials that enter the production process but end up in the waste stream. Numerous countries in the East Asia Summit region have implemented national policies to promote material efficiency (Table 9.2). Japan, China, and the Republic of Korea (henceforth Korea), in particular, have introduced comprehensive policies and legislation to reduce waste and resource consumption and to increase recycling.

India introduced rules on municipal solid waste in the 2000s which obligate municipalities to segregate organic from household waste to be treated through composting. The National Environmental Policy (2006) looked at the efficient use of resources by reducing use per unit of economic output and proposed actions for recycling and reuse of waste. The Plastics Manufacture and Usage Rules of 2003 set objective targets for the development of plastics recycling with the target of 1.7 million tonnes annually. Since the introduction of this legislative framework, India has made substantial progress in achieving greater recycling rates, while reducing final disposal amounts and dioxin emissions. For instance, after the

introduction of these product-oriented recycling acts, the amount of waste for final disposal in 2012 was 44 percent lower than in 2000 (Zhou et al., 2013).

Resource efficiency has also developed into an important issue for the local governments, which introduced the smart city and eco-town concepts to support a circular economy and resource scarcity associated with rapid economic development. The smart city operation plan requires low resource consumption, low emissions of pollutants, and minimal waste discharge using the 3R principles. Smart city plans also recognises that the development of a circular economy is an important strategy for the economic and social development of India. Industrial enterprises are required to reduce resource consumption and recycle waste materials. The Government of India also allocates funds for businesses to encourage innovation in recycling technologies. Furthermore, it provides tax breaks to enterprises using resource-efficient technologies and equipment. Enforcement of smart cities requires the enactment of supporting regulations; some of these have been enacted whereas others are still being drafted. Another important future step outlined in the law is the development of a Smart City Development Plan, which will outline the major tasks and measures necessary to achieving a circular economy. In addition, it will define indicators for rates of waste reuse and recycling.

Box 3. Volume-Based Waste Fee System in the Republic of Korea

The Government of the Republic of Korea introduced a volume-based waste fee system in 1995 in order to reduce waste generation at the source and maximise waste recycling. Households and small commercial operators are required to purchase designated bags to throw away their garbage and a waste collection fee is charged in proportion to the amount of waste thrown away. This way, the public has an incentive to generate less waste to minimise the costs. The cost for waste treatment is recovered from the sale of the designated bags. The average price for a 20-litre garbage bag was US$0.38 in 2004.

To avoid illegal dumping or waste burning, a fine of up to US$1,000 is imposed on violators. The government has also introduced a reward system for reporting illegal dumping activities. Anyone who reports such an activity is paid as much as 80 percent of the fine charged to the violator. These measures have successfully reduced illegal dumping in urban areas. However, waste burning by rural residents and dumping in public gardens and rivers are still problematic, and the government is devising new strategies to monitor and prevent these activities.

After 10 years of implementation, the system has proven to be very successful in reducing the generation of municipal solid waste and increasing the recycling rate. Between 1994 and 2004, municipal solid waste generation decreased by nearly 14 percent. In the same period, the national recycling rate increased from 15.4 percent to 49.2 percent.

Source: KLRI (1997).

Korea is another country in Asia that has implemented a number of national policies to increase material efficiency. India can look to Korea for lessons to be learnt for making the 'Made in India' policy more sustainable. The Act on the Promotion of Saving and Recycling of Resources of Korea (1992) seeks to contribute to sound development of the national economy by facilitating the use of recycled resources and by reducing the generation of wastes and facilitating recycling. It also includes product design provisions for vehicles and electrical goods. Producers of these goods are required to consider ways to use less material, adopt recyclable materials, curb the use of hazardous substances, reduce product weight, and make products easier to dismantle (KLRI, 1997).

The Government of the Republic of Korea also introduced a mandatory extended producer responsibility (EPR) system through amendments of the Act on the Promotion of Saving and Recycling of Resources in 2003. The EPR system applies to a specified list of products and packaging materials and imposes continuing accountability on producers over the entire life cycle of their products. Under the EPR system, the government sets mandatory take-back and recycling requirements for each product, and producers have to pay fees to join organisations that handle the collection and recycling obliged. Producers that do not meet their obligations are penalised (Walls, 2006). Other policy initiatives by the government to promote material efficiency include volume-based waste collection (Box 3), regulations for promoting recycling of construction waste, and a non-governmental organisation campaign to reduce food waste (Yoshida, Shimamura, and Aizawa, 2007).

Table 9.2. Examples of National Policies, Laws, and Regulations to Promote Material Efficiency in India Compared with Those of Selected East Asia Summit Countries

Country	Policy Details
Australia	National Waste Policy (2010): Aims to avoid waste generation, to reduce the waste amount, to reduce the waste for disposal amount, and to manage waste as a resource
China	▪ Circular Economy Law (2008): Promotes the development of a circular economy, improves resource utilisation efficiency, and protects and improves the environment, also realising sustainable development; refers to the reduction, reuse, and recycling of resources during production, circulation, and consumption ▪ Environmental industrial park policy: Established around 30 pilots of eco-industrial parks ▪ Solid Waste Act (1995, amended in 2004): Establishes a legal framework for product take-back and recycling ▪ Regulation on the Management of Electronic Waste: Regulates the mandatory recycling and treatment of waste electrical and electronic appliances (televisions, refrigerators, washing machines, air conditioners, and computers); intends to promote the circular use of resources
India	▪ National Environmental Policy (2006): One key objective is the efficient use of environmental resources by reducing use per unit of economic output, and proposes actions for recycling and reuse of waste ▪ Plastics Manufacture and Usage Rules (2003): Development of plastic recycling targets – amount recycled: 1.7 million tonnes in 2010
Japan	▪ Fundamental Law and Plan for Establishing a Sound Material-Cycle Society (2000 and 2003, amended in 2008): Framework law and implementation

Country	Policy Details
	programme to move the country towards a recycling-based approach in product design, manufacture, use, and disposal. Established targets to be achieved by 2015 in resource productivity, cyclical use rate, and the amount of final disposal. ▪ Individual product laws have set up targeted recycling regimes for containers and packaging, home appliances, food waste, construction materials, and end-of-life vehicles ▪ Law on Promoting Green Purchasing (2002) : Eco-labelling programs for appliances ▪ Law for Promotion of Effective Utilisation of Resources (2006): Deals with battery take-back, labelling, and reuse ▪ Waste Management and Public Cleansing Law (2003): Ban on waste incineration
Republic of Korea	▪ Waste Management Act (1995): Volume-based waste collection; extended the producers' responsibility for electronic appliances and vehicles with mandatory targets for product recovery and recycling ▪ Act on the Promotion of Construction Waste Recycling (2003): Construction work contracted by a public agency must use more than a certain level of recycled aggregate. ▪ Act on the Promotion of Saving and Recycling of Resources (1992, amended in 2003): Promotes the efficient use of resources, waste prevention, and resource reutilisation towards improving the environment. Amendments to the act introduced a mandatory extended producer responsibility (EPR) scheme. ▪ Second Comprehensive National Waste Management Plan (2002–2011): National framework for the promotion of waste reduction policies; includes waste reduction and recycling targets (e.g. increase recycling by 53% in 2011).
Malaysia	▪ Solid Waste and Public Cleansing Management Act (2007): Aims to improve the collection, recycling, and disposal of solid waste; prescribes recycling and separation of recyclables ▪ National Strategic Plan for Solid Waste Management (2005): Comprehensive efforts to promote the reduction, reuse, and collection of solid waste
New Zealand	▪ Waste Minimisation Act (2008): Encourages waste minimisation and a decrease in waste disposal; requires product stewardship schemes for priority products; puts a levy on all waste disposed to landfills, introduces a waste minimisation fund to provide financial assistance for projects that increase resource efficiency ▪ New Zealand Waste Strategy (2002): Zero waste concept is the long-term goal. One major goal is to increase the economic benefit by using material resources efficiently. Contains 30 aspirational targets for improved waste management, minimisation, and resource efficiency
Philippines	▪ National 3R policies: Set the goal of achieving waste conversion rate of at least 25% by 2006. ▪ Ecological Solid Waste Management Act (2000): Mandates management for 'zero waste' as a national policy; requires local governments to recycle 25% of waste collected
Singapore	▪ Green Plan 2012: Has a 'zero landfill' objective. Includes a national recycling programme for households launched in 2001 with target 60% recycling by 2012. The recycling rate in 2009 was 57%, up 16% by 2030.
Viet Nam	▪ National 3R Strategy: Sets 3R targets for 2020 ▪ Environmental Protection Law (2005): Includes 14 provisions to promote 3R and related activities

Source: Compiled by the authors.

3.2. Energy Efficiency

Energy efficiency is associated with economic efficiency and includes technological, organisational, and behavioural changes towards a circular economy. The introduction of energy efficiency policies brings multiple benefits to national economies. The industry sector in India accounts for about 45 percent of total commercial energy consumption in the country (96.21 million tonnes of oil equivalent [Mtoe]). It is one of the largest contributors to CO_2 emissions after the power sector. A broad analysis of industrial energy-use patterns shows

Table 9.3. Examples of National Policies, Laws, and Regulations to Promote Energy Efficiency in India Compared with Those of Other East Asia Summit Countries

Country	Policy Details
Australia	▪ National Framework for Energy Efficiency (Stage 1 in 2004, Stage 2 in 2008): Stage 1: Addressing the barriers to the energy efficiency uptake; Stage 2: Implementing energy efficiency measures ▪ National Strategy on Energy Efficiency (2009): Provides a nationally consistent and coordinated approach to energy efficiency by transitioning Australia into a low-carbon economy and by reducing barriers for energy efficiency uptake ▪ Energy Efficiency Opportunities Act (2006): Encourages large energy-using businesses (those using more than 0.5 petajoules [PJ] of energy per year) to improve their energy efficiency by identifying, evaluating, and publicly reporting on cost-effective energy-saving opportunities
China	▪ 12th Five-Year Plan (2011–2016): Targets to reduce energy consumption per unit of gross domestic product (GDP) by 50–60% from 2000 levels by the year 2020 ▪ Energy Conservation Law (1998, amended in 2008): Seeks to encourage the rational use of energy and promote improvements in energy conservation technologies ▪ Energy conservation technologies: Includes an energy efficiency labelling scheme and establishment of energy conservation audit facilities in local governments ▪ National Climate Change Programme (2007): Proposes a range of measures to improve energy efficiency and energy conservation; includes an energy efficiency objective of reducing energy consumption per unit of GDP by 20% in 2010 ▪ Procurement Policy for Energy Efficient Products (2004): Requires government agencies to prioritise products that are certified as energy-efficient in the procurement process
India	▪ Energy Conservation Act (2001): Legal mandate for the implementation of energy efficiency measures ▪ National Mission for Enhanced Energy Efficiency (2008): Programmes are anticipated to result in savings of 10,000 megawatts (MW) by the end of 2012. As part of the National Action Plan on Climate Change, this national mission proposes four new initiatives: (i) market-based mechanism for trading in certified energy savings, (ii) accelerating the shift to energy-efficient appliances in designated sectors, (iii) demand

Country	Policy Details
	side management programmes, and (iv) developing fiscal instruments to promote energy efficiency. ▪ National Energy Efficiency Plan (approved August 2009): Sets up energy efficiency targets for industry by December 2010 ▪ Other initiatives for improved energy efficiency: Energy Conservation Building Code (2007); mandatory energy audits of large industrial consumers (2007), enhancing efficiency of power plants; and introduction of mandatory energy labelling programme for appliances (2006) ▪ National Hydro Energy Policy (2001): Electricity from renewable sources such as mini hydros and hydropower ▪ Clean Air Initiative (2008): 'Bachat Lamp Yojana' programme to promote energy-saving devices
Indonesia	National Energy Policy (2006): Framework policy that seeks to increase energy efficiency and promote renewable sources of energy
Japan	▪ Energy Conservation Law (1979, last amended in 2008): Provides the legal framework for improvements in energy efficiency and conservation. Regulatory measures include (i) Businesses need to report their energy use, employ an energy manager, and prepare the energy conservation targets; (ii) Transport service providers need to prepare energy conservation plans; (iii) Manufacturers need to enhance energy consumption efficiency of products; (iv) Building sector needs to implement energy conservation measures; and (v) Energy conservation labelling programme for air conditioners, televisions, and refrigerators ▪ Energy and Environment Policy (Progressive over the years): Includes measures for improved energy resource use efficiency and diversification of energy resources ▪ National Plan for Promoting Energy Efficiency and Conservation (Progressive over the years, last amended 2011): Aims to improve energy efficiency by at least 30% from 2003 levels in 2030
Republic of Korea	National Basic Energy Plan (2008–2030): Calls for increased energy efficiency – energy intensity target: 46% reduction by 2030 from the current levels and energy consumption target: reduction of 42 million tonnes of oil equivalent (MToe) by 2030 from the current levels
Malaysia	10th Malaysia Plan (2011–2015): Includes energy efficiency objectives such as intensifying energy efficiency initiatives in industry, transport, and commercial sector; also promotes greater use of renewable energy for power generation and by industry.
New Zealand	▪ Energy Efficiency and Conservation Strategy (2007): Detailed action plan for increasing the uptake of energy efficiency, conservation, and renewable energy programmes across the economy, and to make doing so part of the normal behaviour of the country's programmes; seeks to achieve a number of targets (e.g. 90% of electricity generated from renewable sources by 2025). Programmes are expected to achieve 20 petajoules (PJ) of energy savings in the transport sector by 2015 and 30 PJ of savings in non-transport energy per year by 2025.
Philippines	▪ National Energy Efficiency and Conservation Program (2004): Seeks to achieve the efficient use of energy to minimise environmental impacts; targets to achieve an average annual savings of 23 million barrels of fuel oil equivalent and 5,086 gigatonnes (Gt) of CO_2 emissions avoidance

Country	Policy Details
Singapore	Energy Efficient Singapore Strategy (2009): Promotes the adoption of energy-efficient technologies and measures by addressing market barriers to energy efficiency; builds capacity to drive and sustain energy efficiency efforts and to develop the local knowledge base and expertise in energy management; raises awareness among the public and businesses to stimulate energy behaviour and practices; promotes research and development to enhance Singapore's capability in energy-efficient technologies.
Thailand	▪ National Energy Strategy (2005): Key component was the efficient use of energy to reduce energy consumption by 13% in 2008 and by 20% in 2009. ▪ Energy Conservation Promotion Act (1992, revised in 2007): Promotes the use of energy-efficient materials and equipment by setting energy-efficient standards ▪ National Energy Policy and Development Plan (2006): Seeks to promote energy efficiency by setting standards for energy-intensive appliances and labelling of products
Viet Nam	▪ National Energy Efficiency Program (2006–2015): Seeks to coordinate efforts for improving energy efficiency, reducing energy losses, and implementing extensive measures for conservation of energy. ▪ Law of Energy Conservation and Efficiency Use (2011–2015): Target to reduce total energy consumption by 3–5% (2006–2010) and then by 5–8%.

Sources: Compiled by the authors.

that seven sectors account for about 60 percent of industrial energy consumption: (i) cement, (ii) pulp and paper, (iii) fertilizer, (iv) iron and steel, (v) textiles, (vi) aluminium, and (vii) chlor-alkali. Most of the plants in these sectors are large units, few of them are operating under the public sector. These sectors have been included as 'designated consumers' by the Bureau of Energy Efficiency under the Energy Conservation Act 2001 (nearly 750 such consumers have been identified by the bureau). Although no detailed baseline of energy consumption data for industrial consumers is available from a single source, several individual studies reveal that significant potential exists for energy efficiency improvements in industry. Various energy sector studies also show that there are wide variations in specific energy consumption (energy required to produce one unit of the product) within the same industrial subsector using comparable technology. Though some units exhibit energy efficiency levels that are at the global frontier, a large number of units operate at much lower energy efficiencies. This indicates that there is substantial scope for energy efficiency improvements within an industrial sector.

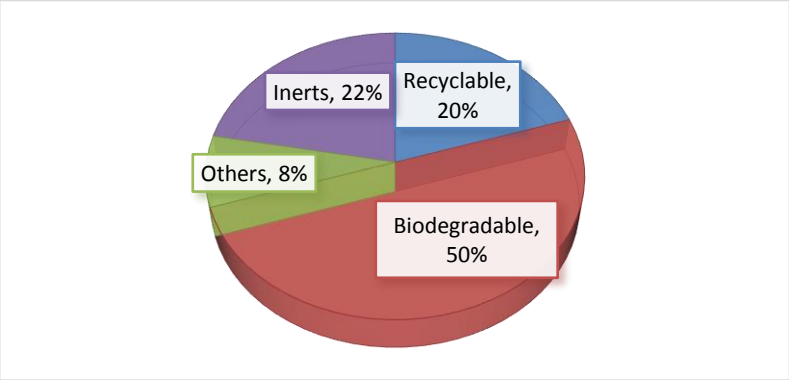
For example, the specific thermal energy consumption for modern cement plants is as low as 663 kcal/kg (2,775 kJ/kg) of clinker, and for old plants, as high as 900 kcal/kg (3,768 kJ/kg) of clinker. Similarly, the specific power consumption of some modern cement plants is about 65 kilowatt-hour (kWh) per tonne of cement, whereas this figure is close to 90 kWh/tonne of cement for old plants. India's National Action Plan on Climate Change estimates that various schemes and programmes initiated by its government would result in energy savings of 10,000

megawatts in various sectors of India's economy. Table 9.3 provides an overview of the national policies to promote energy efficiency that have been implemented in India compared with other East Asian Summit countries.

4. Current Patterns of Resource Use and Waste Generation in India

The rate of waste generation in India is growing very quickly owing to industrial development and urbanisation. The current composition of waste carries a high potential for recycling that is barely exploited. Generally, about 15 percent of waste material, which consists mainly of paper, plastic, metal, and glass, can be retrieved from the waste stream for further recycling. Another 35–55 percent of waste material is organic waste, which can be converted into useful compost, leaving only 30–50 percent that needs to go to landfills (Asanani, 2006). Figure 9.1 shows the composition of municipal solid wastes in India. More than 50 percent are biodegradable and 20 percent are recyclable.

Figure 9.1. Composition of Municipal Solid Wastes in India



Source: Authors' compilation based on Central Pollution Control Board (CPCB) 2013 data

Table 9.4 highlights the amounts of waste generated in India's cities and states over a period.

Waste materials such as paper, plastic, metal, glass, rubber, leather, and rags are recycled mainly through private initiatives and the informal sector. In spite of different laws and targets, waste recycling is still neglected by industrial units because of its low value and the lack of a market. Composting is underdeveloped and remains the domain of the hundreds of small-scale schemes run by private initiatives. There exist several case studies, however, in which raw materials that formed part of the value chain are recycled and reused to improve the resource efficiency at different levels.

Table 9.4. Waste Generated in India's States in 2004 and 2014

State	Solid Waste Generated MT/day (1999–2000)			Solid Waste Generated MT/day (2009–2014)
	Class I cities	Class II towns	Total	
Andaman & Nicobar	–	–	–	50
Andhra Pradesh	3,943	433	4,376	11,500
Arunachal Pradesh				93,802
Assam	196	89	285	1,146.28
Bihar	1,479	340	1,819	1,670
Chandigarh	200		200	380
Chhattisgarh	–	–	–	1,167
Daman, Diu & Dadra	–	–	–	41
Delhi	4,000		4,000	7,384
Goa	-			193
Gujarat				7,378.775
Haryana	3,805	427	4,232	536.85
Himachal Pradesh	623	102	725	304.3
Jammu & Kashmir	35		35	1,792
Jharkhand	–	–	–	1710
Karnataka	3,118	160	3278	6,500
Kerala	1,220	78	–	5,200
Lakshadweep	–	–	–	21
Maharashtra	8,589	510	9,099	19,204
Manipur	40	–	40	112.9
Meghalaya	35	–	35	284.6
Mizoram	46	–	46	4,742
Madhya Pradesh	2,286	398	2,684	4,500
Nagaland	–	–	–	187.6
Orissa	646	9	655	2,239.2
Pondicherry	60	9	69	380
Punjab	1,001	265	1,266	2,793.5
Rajasthan	1,768	198	1,966	5,037.3
Sikkim	–	–	–	40
Tamil Nadu	5,021	382	5,403	1,2504
Tripura	33		33	360
Uttar Pradesh	5,515	445	5,560	11,585
Uttaranchal	–	–	–	752
West Bengal	4,475	146	4,621	12,557
Total	**48,134**	**3,991**	**52,125**	**127,485.107**

MT = megatonne.
Source: Central Pollution Control Board (2015).

4.1. Bangalore: Social Enterprise Initiatives on the Circular Economy

Bangalore has been the testing ground for various local level circular economy initiatives in the past 15 years. A number of organisations and firms have conceptualised the popularly termed decentralised resource and waste management system by involving the community residents. Essentially, these systems arose out of the need to compensate for inadequacies in the existing services. The initiatives included setting up systems for doorstep collection and localised composting. The system involved rag pickers and other employable men and women from the lower economic strata to find resaleable and recyclable items in discarded material. Education and awareness of neighbourhood cleanliness and experiments with the various composting methodologies were also carried out. Some activities are small scale, involving a number of blocks within a ward, whereas other activities cover various wards or are citywide initiatives. It is important to recognise that these local initiatives are responsible for bringing about the changes and improvements in the waste management system now enjoyed under Swachha, a solid waste management programme of clean Bangalore.

Through the Swabhimana, a solid waste management programme specialised in composting in Bangalore, a platform of stakeholders (different groups of companies in the electronic industry and governmental agencies) and waste retrievers were made aware of the circular economy problem. Residents and companies were motivated and formed into committees. Meetings and competitions were organised, as were camps and treks. Programmes in schools showed films and distributed posters, pamphlets, handbills, and songs. Through such programmes, many other methods of communicating the message relating to resource use were shared. Training programmes were also held for all levels of government officials working in the area. Meetings were also held with contractors who were in charge of clearing the garbage.

Priorities were set based on achieving maximum participation from citizens by involving them in the planning, in motivating their neighbouring firms, and in executing the project through committees. Both the Bangalore Development Authority and the Bangalore Industrial Development Corporation are fully involved as implementing agencies along with Swabhimana.

4.2. Citizens Charter in Namakkal: A 10-Point Charter to Achieve Circular Economy Status

By implementing the tasks on its 10-point charter, Namakkal became free of garbage. It announced its zero-garbage status in 2013. The charter has the following features:

- Extend the scheme of door-to-door collection with segregation to the entire town and make streets and industries free of garbage and waste.
- Remove encroachments from road and streets and prevent re-encroachments.
- Levy waste management service charges on industrial units, commercial complexes, and garbage-generating industries.

- Generate vermicompost from organic waste through eco-friendly techniques by involving voluntary organisations and private bodies on a build–operate–transfer basis, sell the inorganic recyclable recyclable garbage, and convert the compost yard into gardens.
- Engage two mop-up teams with two auto model carriers to remove waste around the clock and keep the town free of garbage all the time.

4.3. Mumbai: Construction Waste and Debris Recycling

Mumbai as the largest industrial city in India generates about 2,300 metric tonnes of construction waste every day (CPCB, 2015). In September 2012, the Municipal Corporation of Greater Mumbai issued the Demolition and De-silting Waste (Management and Disposal) Guidelines. However, the debris still ended up in dumping grounds, where it was mixed with other waste, thereby rendering it unfit for treatment. Youth for Unity and Voluntary Action (YUVA) came up with a decentralised solution for the problem of debris management. The initiative received support from the City and Industrial Development Corporation (CIDCO), the landowning and planning authority of Navi Mumbai municipality. The collaboration resulted in the formation of the CIDCO–YUVA Building Centre, which has recycled debris into construction material such as bricks and interlocking pavers.

However, the initiative has several setbacks:

- Most builders are not aware of the initiative. Those who are aware of it argue that they cannot use the recycled debris until an authorised government agency such as the Central Building Research Institute certifies it.
- Getting funds to set up debris-recycling plants has been a problem, and the unit should be supported by the municipal infrastructure.
- The delivery of debris by the local authority is inefficient.
- Escalating cement prices increase the cost substantially.

5. Financing Schemes to Support Circular Economy

5.1. The Role of Public Financing and Budget Outlays

The role of the private sector in financing resource recovery (e.g. waste-to-energy) facilities is growing in India. The Government of India has already earmarked more than US$650 million exclusively for waste management. The government has also earmarked approximately US$20 billion over a period of 7 years for the development of infrastructure in 63 cities under smart city development. The 12th Finance Commission has allotted approximately US$1 billion for supplementing the resources. The funds allocated under the 12th Finance Commission Scheme are 100 percent grants. Those under industrial waste reuse have a grant component of 37–80 percent, the grant component under small and medium-sized enterprises is 70 percent or more (GOI, 2013).

The central and state governments share the funding, with each contributing 25 percent. The other 50 percent is to be met by institutional financing and market funds. Funds flow from the central and state governments to the nodal agency as a grant. However, the amounts flowing from the nodal agency to the implementing agencies for projects are a mix of loans and grants such that 75 percent of the central and state shares are recovered into a revolving fund at the level of the megacity (AIILSG, 2012). The objective is to create and maintain a special fund for the development of resource recycling infrastructure assets on a sustained basis.

5.2. Public Subsidy for Waste-to-Energy Projects

The Ministry of Agriculture and the Ministry of Environment, Forests and Climate Change have been actively promoting waste composting, while the Ministry of New and Renewable Energy has designed schemes to promote waste-to-energy projects. The Ministry of Agriculture introduced a centrally sponsored plan for a balanced and integrated use of fertilisers, under which support is given to local bodies and the private sector for setting up composting plants to convert municipal solid waste into compost. This grant is available for up to a third of the project's cost, subject to a maximum of Rs5 million per project. The grant is provided for buildings, plants, and machinery only. The allowable treatment capacity of the plant ranges from 50 to 100 tonnes per day. The Ministry of Environment, Forests and Climate Change provides financial subsidies of up to 50 percent of the capital costs to set up pilot demonstration plants on municipal solid waste composting. The ministry also extends limited financial assistance for waste characterisation and feasibility studies. The scheme was first introduced in 1992. Subsequently, three pilot projects were sanctioned for qualitative and quantitative assessment of solid waste in the cities of Hyderabad, Shimla, and Ghaziabad.

5.3. Tax Holiday for Circular Economy Project Entities

As announced in the Union Budget 2014/15, an undertaking or enterprise that is engaged in resource recycling projects is allowed a deduction under section 801A of the act of profits and gains related to such projects (AIILSG, 2012). The deduction equals 100 percent of such profits for 10 consecutive assessment years in the years of the project. To qualify for a tax holiday under this provision, the enterprise must satisfy the following conditions:

- A company or a consortium of companies registered in India owns the enterprise carrying on the infrastructure business, including industrial waste management.
- The enterprise has entered into an agreement for developing, maintaining, and operating an infrastructure facility.
- The agreement is with one of the following: the central government, the state government, the local authority, and other statutory body, or such other entity or body as may be notified to the central government.
- The infrastructure facility shall be transferred to the government or local authority within a period stipulated in the agreement.

5.4. Sectoral Lending by Financial Institutions

Authorities and the private sector also take advantage of funding from financial institutions, which include the following at the national level:

- Housing and Urban Development Corporation
- Industrial Credit and Investment Corporation of India
- Infrastructure Development Finance Company
- Infrastructure Leasing and Financial Services
- National Bank for Agriculture and Rural Development
- India Renewable Energy Development Agency
- Industrial Development Bank of India
- Commercial banks, suppliers, creditors, and private venture capital funds

5.5. Carbon Finance

Carbon finance provides an opportunity for an extra source of revenue for waste resource recycling projects in developing countries. The main idea behind carbon finance is that industrial countries will pay for projects in developing countries that contribute to the improved resource efficiency and the reduction of GHG emissions. Carbon reduction credits at the prevailing market price to the industrial countries through the CDM allow the waste-to-energy projects to qualify for financing. The Ministry of Environment, Forest and Climate Change of India has a nodal officer to handle these issues. Anaerobic degradation in landfills generates biogas that contains nearly 50 percent methane is equivalent to 21 tonnes of CO_2. Hence, capturing landfill gas can produce quite a good amount of certified emissions reduction credits for which municipal authorities can receive money. These funds can pay for the system's installation and the operations carried out. The prevailing rate per tonne of carbon equivalent ranges from US$6 to U$9. The project authorities only have to specify that they have reduced emission levels by appropriately managing the landfill, compost plant, or waste-to-energy plant.

Waste-to-energy projects initiated in Chennai, Delhi, and Hyderabad exemplified the opportunities for CDM financing. Two waste-to-energy plants based on refuse-derived fuel were set up in the state of Andhra Pradesh in 2008. Each of the plants produces 6.5 MW of power, likely using predominately agricultural and municipal solid waste and not industrial waste. Finally, some small biomethanation (anaerobic digestion) plants are working successfully in the states of Andhra Pradesh and Maharashtra where methane energy is produced from waste.

6. Challenges to an Integrated Business, Economy, and Environment Model for a Circular Economy in India: An Assessment

Resource efficiency schemes at the city and sectoral levels in India generally serve only a limited part of the economy. Lack of financial resources and planning capacity to cope with the economy's increasing growth affects the availability or sustainability of material collection and reuse. Operational inefficiencies, inappropriate technologies, or deficient management capacity of the institutions involved also gives rise to inadequate uptake. More involvement of private companies is seen as an easy way out. However, an important factor in the success of private sector participation is the ability of the client to write and enforce an effective public–private partnership. Three key components of successful arrangements are competition, transparency, and accountability.

Nevertheless, in India, resource efficiency is the primary responsibility and duty of the authorities and environmental agencies. State legislation and the local acts that govern municipal authorities include special provisions for collection, transport, and disposal of waste. Most state legislation does not cover the necessary technical or organisational details of a circular economy. The acts do not specify in clear terms which responsibilities belong to whom. Moreover, they do not mention specific raw material use and waste collection systems, do not mandate appropriate types of waste storage depots, do not require covered waste transport issues, and do not mention aspects of waste treatment or sanitary landfills.

Given the absence of appropriate legislation and targets, or of any monitoring mechanism on the performance of authorities, the system towards a circular economy at local and sectoral levels has remained severely deficient and outdated, when compared to other East Asia Summit countries.

On the other hand, a significant number of states are in the process of establishing resource efficiency standards towards a circular economy. They need to have good indicator frameworks, technical expertise, and financing. This requires a whole-of-government approach, fostering inter-ministerial and inter-firm cooperation. Such an approach would lead into integration of circular economy considerations at all levels of decision-making. Coordinating bodies and institutions should also monitor the progress towards fixed targets through appropriate macro and micro indicators, identify win–win solutions for scaling up circular economy activities, and define the relevant trade-offs for decision makers.

7. Conclusion

With rapid economic growth, the resource consumption rate has increased greatly in India. In the near future, India will be facing formidable challenges in resource shortages. Therefore, implementing circular economy principles is crucial for India's process industries and municipal governments. Based on the meta-analysis in China, it is understood that the government has instituted the basic policies for developing a circular economy, aimed at

improving efficiency of resources and energy and thereby achieving sustainable development. However, more attention is needed for setting the targets, identification process, and institutional integration towards a circular economy. Traditionally, creating economic value and promoting environmental stewardship have been regarded as a zero-sum game. An industry leader or administrator that has to choose to focus on environmental issue such as resource efficiency would naturally assume a sum loss of economic value. One important way of escaping this zero-sum game is to use innovative financing and an integrated policy approach involving the application of regulatory, economic, and voluntary policy instruments, as demonstrated by India's progress in implementing circular economy concepts.

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