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# **E-Waste Management in India: Key Issues and Recommendations**

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# 1 Introduction

Electrical and electronic products have become mainstays of a modern life and are a sign of rising prosperity. While they provide services that enhance the quality of life, at the end of their useful life, they contribute to one of the fastest growing waste streams globally. The increased use of Electrical and Electronic Equipment (EEE) and their high rate of obsolescence is leading to around 41.8 million tons of e-waste generation globally that is growing at an annual growth rate of 4 to 5 per cent per year (Baldé, (2015):24-25). While e-waste has been recognised as a global challenge, in developed countries it creates a significant burden on the formal waste management system. As a result, there are significant leakages to the developing countries. For instance around 75% to 80% of e-waste is shipped to countries in Asia and Africa for “recycling” and disposal while majority of imported e-waste in developing countries is managed through informal unsafe recycling channels (Perkins et al., (2014): 287).

In India, as in several other developing countries, most of the e-waste is managed by the informal sector. With an estimated generation of around 1.7 million tonnes of e-waste and 7% growth rate, it presents a significant challenge (Baldé, (2015):42)), (ILO, 2014), Dwivedy and Mittal (2010a,b). The private sector, both informal and formal, is at the forefront in managing this challenge globally. However, due to trans-boundary movements of e-waste (originating from developed countries) as well as the presence of the informal sector (in developing countries), the role of policy in managing this challenge becomes crucial. In India, policy response to this challenge was relatively prompt for a developing country. As early as 2008, the Government of India announced the Guidelines for Environmentally Sound Management of E-waste and in 2011 formulated the E-waste Management and Handling Rules (2011). The Rules announced in 2011 have been recently revised.

With the recent announcement of the amended Rules, there is renewed interest amongst the relevant stakeholders in responding to the challenge of e-waste management in India. This amendment also provides an opportunity to revisit some of the challenges and opportunities of e-waste management in India. In this paper we present an overview of e-waste management in India and highlight some of the critical issues. In what follows, we outline the key challenges and opportunities of e-waste management in the Indian context in the next section. Section 3 presents a brief excursus into the Indian policy response while section 4 presents the building blocks of a sustainable e-waste management system. We conclude with the way forward and a set of recommendations.

## 2 Challenges and Opportunities in E-Waste Management

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### 2.1 Challenges

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#### Environmental Challenges

E-waste contains many toxic substances that are released into the environment, if not handled in a controlled environment. For instance, along with valuable materials, like Gold, Silver, Platinum, Palladium, Copper, plastics and glass, e-waste contains over 50 toxic elements like Mercury, Arsenic, Lead, Chromium, PCBs etc. These toxic elements can cause long-term health problems like neurological and endocrinal disorders and in some cases even cancer (Agarwal, (2012): 14). During unsafe recycling of e-waste by the informal sector toxic substances are likely to contaminate the environment and harm the health of the workers involved.

The informal sector workers are largely unaware about the health impacts and the use of protective gears is rare. Metal recovery, through the open burning of PVC wires releasing brominated and chlorinated dioxins as well as carcinogenic Polycyclic Aromatic Hydrocarbons (PAHs) into the soil, water and air, is rampant in the informal sector. One of the most valuable fractions of e-waste are Printed Circuit Boards (PCBs). In the informal sector, PCBs are de-soldered and chips are burned and/or put into acid baths to extract gold or other precious metals. Such extractions processes have the potential for tin and lead inhalation as well as inhalation of brominated dioxin, beryllium, cadmium and mercury by workers and residents. Further, fumes of acids, chlorine and sulphur dioxin gases can lead to respiratory problems such as pulmonary diseases, respiratory failure, and death (Nischalke, (2008)). The environmental challenges are further exacerbated because of the limited capacities of the State Pollution Control Boards (SPCBs) to monitor the diffused sources of environmental pollution.

#### Social Challenges

Despite widespread and extensive use of electrical and electronic equipment in India across income groups the awareness regarding e-waste is very limited. Advertising by electrical and electronic sector companies have negligible mention of how the equipment should be handled after end of life. At the same time, government or NGOs concerned about the issue of e-waste have also had limited success in creating awareness regarding e-waste. Arguably the limited awareness amongst consumers regarding e-waste indirectly promotes unsafe recycling as consumers are less likely to pay for recycling related services or deposit e-waste for safe recycling at prices lower than those offered by the informal sector.

Another key social challenge is the integration of the widespread informal sector. Medina (2007) estimates that around 2% of the population in developing countries depends on waste picking or informal waste management sector for livelihood. For India, this number would be around 24 million people. Even if we assume 10% of these people are involved in e-waste management, this would imply that nearly 2.4 million people are involved in informal sector e-waste management either directly or indirectly. These estimates might not be completely inaccurate. For instance, according to estimates of the district administration, around 1 to 1.5 lakh people are involved in informal e-waste recycling in Moradabad (Uttar Pradesh) alone. Workers are paid around INR 200 per day for working in the e-waste recycling sector with women and children earning far less (CSE, 2015). However, the challenge is that there are few alternate livelihood opportunities for the people involved in informal e-waste recycling and they are likely to be

harassed by police and environment department staff. The situation is likely to worsen if there is an exclusive environmental focus while implementing the e-waste rules with scant attention paid to livelihoods of the informal sector.

### **Economic Challenges**

Developing countries have thriving informal e-waste markets that seem to have advantages when compared to their formal counterparts. The advantages stem from the historical building up of networks and market intelligence. Also, as the informal sector lies outside the ambit of regulatory oversight, it has cost advantages as compared to the formal sector by not being subject to the taxation and environmental laws. Most of these cost advantages occur particularly in the early stages of the value chain such as collecting, dismantling and refurbishing.

However, there are significant economic disadvantages to the informal sector as well. In spite of being extremely well networked and with significant business intelligence, informality does not allow these actors to access formal sources of finance limiting their ability to expand beyond a certain size. Also, the informal nature of operations makes them susceptible to the demands of the legal authorities.

In the case of e-waste management, the simultaneous presence of the informal and formal markets has the potential economic challenge of creating competition between the two. Such competition for e-waste has the potential to undermine the financial feasibility of the formal sector and can lead to environmentally inferior outcomes.

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## **2.2 Opportunities**

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### **Social Opportunity**

The social opportunity in e-waste management emanates from the possibility of raising awareness of communities, engagement of citizens and the mainstreaming of the informal sector. Public education and awareness can play a crucial role in conveying the benefits of clean and safe disposal of e-waste. Such awareness has the potential to create consumer pressure on electrical and electronic goods producers to develop approaches for environmentally sound disposal of e-waste.

While there is significant uncertainty regarding the role of the informal sector in waste management in the future, presently it plays a significant role (Schindler, Demaria and Pandit (2012):18-19). Further, it is argued that the impact of the informal sector in terms of economic, social and environmental aspects is mostly positive achieving a net benefit while formal waste management operations have a net cost (Ezeah, Fazakerley and Roberts (2013):2514). In spite of the synergies between the social and economic aspects of e-waste management in the informal sector, there are concerns regarding unsafe recycling practices emitting hazardous substances affecting health of informal sector workers as well as others (Wath et al., (2010):25). With the introduction of formal and safe recycling systems it is possible to create jobs in the recycling units as well as creation of livelihood opportunities for the informal sector workers in the formal ecosystem. However, the creation of such opportunities would require significant investment and support by the state.

### **Economic Opportunity**

With 1.7 million tonnes of e-waste being generated annually, and assuming a conservative value of INR 1000 per ton, the sector could have a turnover of INR 1.7 billion. A network of collectors, traders and recyclers can create jobs and generate tax revenues for the government. In addition,

due to the recovery of useful materials and the resulting reduction in mining of virgin raw material, e-waste management is expected to result in cost saving as well as reduced environmental cost of production.

In a recent paper, Gupta and Ganesan (2014) suggest that the raw materials required for manufacturing electrical and electronic equipment is in short supply in India. For instance, there are no known reserves of cobalt, poor reserves of boron, copper, lead, titanium; not well explored reserves of molybdenum, chromium, graphite, boron, rare earths, platinum Group, materials, gypsum, tungsten, gold, perlite, antimony etc. (Gupta and Ganesan, (2014)). By managing e-waste well, valuable secondary raw materials can be recovered that can reduce India's dependence on import of expensive minerals and metals for manufacturing IT and electronic equipment.

Also, there are significant greenhouse gas emission reductions possible from the associated reduction in mining activities. Further, refurbishing reusable parts makes it possible for households to access appliances and communications technology relatively cheaply, a particularly important consideration for low-income rural consumers in developing countries (Lines et al., 2016).

### **Environmental Opportunity**

The environmental damage caused due to harmful air, water and land emissions from unsafe recycling practices create irreversible environmental damage. Introducing safe recycling practices reduce harmful emissions and helps maintain safe environmental conditions. India, a growing economy, needs significant amount of metals and minerals that are not available presently or would require large investment in mining, processing etc. Effective e-waste management can provide secondary resources that reduce the requirement for virgin raw materials.

### 3 Indian Experience of Implementing Policies Related to E-waste Management

Following advocacy efforts of several NGOs and international organizations, the government of India announced the e-waste (Management and Handling) Rules in 2011. These Rules came into effect from 1st May, 2012. The rules were applicable to every producer, consumer, and bulk consumer involved in the manufacture, sale, purchase and processing of electrical and electronic equipment (EEE). The Rules also fixed responsibilities for collection centres, recyclers, and dismantlers of e-waste. Further, the rules mandate registration of collectors, dismantlers and recycler from both the informal or formal sector. These rules also impose the Extended Producer Responsibility (EPR) and Reduction of Hazardous Substances (RoHS) provisions.

Despite the implementation of the E-waste (Management and Handling) Rules, 2011 for five years, not much has changed on ground. The informal sector still recycles most of the e-waste. A study by Toxics Link ((2014):12) puts the onus on both the producers as well as the SPCBs. The study finds that of the 50 major electronic and electrical equipment brands, 34% have taken no action in response to the E-waste Rules of 2011. Another 30% had taken few steps only to comply with the e-waste rules while most have not set up any physical take-back system. Further, State Pollution Control Boards and Committees, responsible for inventorisation of e-waste, grant and renewal of authorisation, recycler registration, monitoring compliance and action against violations of these rules, were also found inadequately equipped. For instance only seven states had carried out a thorough analysis of e-waste generated and most had limited information on their web platforms. Most importantly, the report highlighted that Indian consumers, paid by the informal sector, have no financial incentive to return their products to formal channels in the absence of a financial incentive. As a result, very limited amount of e-waste is returned for recycling through the formal channels (Toxic Links, (2014): 30-47).

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#### 3.1 E-waste Management Rules (2016)

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With the experience of implementing the E-waste Rules for 5 years and the renewed interest in waste management due to the Swacch Bharat Missions, the government has introduced the E-Waste (Management) Rules, 2016 that shall come into force from October 1, 2016. These rules *apply to every manufacturer, producer, consumer, bulk consumer, collection centres, dealers, e-retailer, refurbisher, dismantler and recycler involved in manufacture, sale, transfer, purchase, collection, storage and processing of e-waste or electrical and electronic equipment.* In this section, we highlight some of the key recommendations of the new rules that could have a significant bearing on enhancing environmentally sound management of e-waste in India.

**Collection Centres** The new rules define that only the producer, individually or as an association jointly, can establish a 'collection centre' to collect the e-waste. Such collections centres would channelise the e-waste to the dismantler/recycler. The collection centres would act in accordance with the authorisation granted for Extended Producer Responsibility to the producer. The collection centres would follow the norms set as per the guidelines of the Central Pollution Control Board. The same norms would also apply to the collection centres established by the dismantler/ refurbisher/ recycler. These collections centres would be approved as a part of the authorisation issued by the State Pollution Control Board where the facility exists. A key



challenge of this amendment is that it excludes collection centres run by NGOs, informal sector organization or citizens unless they become partners of one or the other producers. Establishing such partnerships may not be feasible for decentralized collection centres and as a result the collection network would not be as extensive as it could have been in the absence of this amendment.

**Deposit Refund System** A significant change in the new rules is the introduction of an economic instrument in the forms of a Deposit Refund System (DRS). The implementation of a DRS would involve collecting a deposit from consumer that is refundable when consumer deposits the e-waste for safe recycling. However, DRS schemes are unlikely to work for products that have relatively long lives. For instance, a television has a life of around 15-20 years in India. It is difficult to envisage a situation where the original owner of the product would safely keep the claim slip for DRS for this duration. The situation would be further complicated by extending the life of the product through reselling or just passing on the product to another entity. The implementation of DRS needs to be closely monitored and debated as it has the potential for significant impact. However, to create such an impact, DRS needs to be implemented under the close watch of the regulatory authorities and must be withdrawn if it does not yield the desired results within a short period of time. This is crucial because the consumers would bear the financial burden of implementing this scheme and unscrupulous actors have the potential to gain significantly from subverting such a system.

**E-waste Exchange** An innovative instrument, introduced as part of the new rules, is the 'e-waste exchange'. The exchange is an independent market instrument offering services for sale and purchase of e-waste generated from end-of-life electrical and electronic equipment between agencies or organisations authorised under these rules. However, it is only available for large players. The scope of the e-waste exchange could be enhanced to include individual consumers as well as micro and small-scale enterprises (including those in the informal sector) that handle significant amount of e-waste. This is especially crucial because these actors might be most reluctant to deal with extensive paperwork required for compliance with the Rules. The e-waste exchange has the potential to use IT enabled services for effective implementation of the rules.

**Extended Producer Responsibility** The new rules present a more stringent version of Extended Producer Responsibility as compared to the Rules of 2011. The clearest manifestation is the announcement of targets. The authorized EPR entities now have obligation to declare targets of how much e-waste they will recycle which should be 30% of the e-waste they are likely to generate based on past sales. As it is challenging to trace products and link them to individual EPR entities they are free to ensure processing of a certain quality of e-waste irrespective of the brand.

While targets have the potential to channelize investments by the producer for setting up of infrastructure for e-waste management, it is unclear whether such investments would lead to enhanced environmentally sound recycling. This aspect is critical in the Indian context due to the presence of the informal sector. Most large brands have limited experiences of dealing with informality. By not making the informal sector as critical actor for the implementation of EPR, these Rules have missed a crucial opportunity. In the absence of clarifying the role of the informal sector, EPR might just be another step in privatising waste management without adequate social safeguards.

Further, given that most of the e-waste handling is managed by the informal sector, a low cost option for producers might be to source the material from the informal sector. While this may

seem attractive in the short run, by not addressing the underlying problem of environmental violations in the informal sector, this option may lead to the continuation of environmentally damaging recycling. This risk becomes even more severe in the face of constrained capacities of the regulatory authorities, especially the State Pollution Control Boards.

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### 3.2 Revisiting the Policymaking Process for E-waste in India

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Recent research shows that policy making in waste management is not a linear process as envisaged in the literature on policy cycles but is a complex process involving multiple actors with diverse objectives (Chaturvedi, Vijayalakshmi, and Nijhawan (2015) p.7). The e-waste stakeholder landscape is a prime example of such complexity. With actors in the formal and informal value chain and widely divergent objectives, policy making on e-waste has to be situated in the broader political economy of waste management. However, the e-waste regulations in India take a largely linear world-view and do not adequately take into account the complexity of the diverse actor-objective matrix. As a result, the focus is on certain aspects of e-waste management, of which the environmental aspect takes precedence. Such focus on environmental aspects leads to a further marginalization of the interest and objectives of major stakeholders whose interests might not primarily be driven by a concern for the environment. This is especially true for the informal sector whose primary interest in e-waste management is as a livelihood generating activity.

The attempts at regulating e-waste thus far have been as an environmental policy issue. A recent CSE report (2014:p.6-10) highlights that the approach is geared towards giving multiple clearances, consents and authorizations with poor monitoring and enforcement. The CSE report has highlighted that most State Pollution Control Boards (SPCBs) suffer from severe deficit of man-power, infrastructure, and competence in addition to the challenge of transparency and accountability. For example a technical officer in the Maharashtra PCB is responsible for monitoring more than 250 factories while only 30% of the sanctioned posts have been filled in PCBs of Haryana, Andhra Pradesh and Odisha. In present situation increasing the burden of monitoring on SPCBs by including enforcement of e-waste rules 2016 may not lead to effective compliance. It is argued that in place of command and control regulation that has had limited success so far it would be prudent to create incentive for a self-sustaining and safe business ecosystem for e-waste management.

While treating e-waste management as an environmental policy may yield desired results in the developed countries, in countries like India such attempts are unlikely to yield the socially and economically desirable outcomes. It is therefore crucial to announce accompanying measures that target the social and economic aspects of e-waste management along with the environmentally focused Rules. This insight to policy making is not recent. It was first suggested by the first Nobel Laureate in Economics, Jan Tinbergen in 1952 (see Tinbergen (1952)).

## 4 Building Blocks for Sustainable E-waste Management

The complexity of the e-waste landscape in India also presents significant opportunities. We now outline how the presence of different actors and ongoing initiatives provide the strengths for developing an effective and sustainable e-waste management system in India.

### **Informal Sector and its potential:**

A key resource in India is the presence of the widely networked and experienced informal sector. There is widespread literature that establishes the strengths of the informal sector. However, there are limited experiences globally of working with the informal sector at scale. As a result, there are few role models to emulate (with possibly notable exceptions in Latin America). India can show the way in mainstreaming informality in waste management. However, this would require significant engagement of state agencies. It would be akin to reinventing the wheel if the formal sector establishes its own collection system while informal sector collection is considered illegal. We believe that the e-waste management challenge in India cannot be solved without involving the informal sector. Therefore, experiences from projects by NGOs and through bilateral cooperation in several large cities should be utilized to devise ways for engaging the informal sector in e-waste management.

### **Availability of skilled workforce and limited job opportunities:**

India has a high share of working age population and there is a need to create employment opportunities. E-waste management can create new job opportunities and appropriately designed educational or skill enhancement programs can ensure that skilled workforce is available at reasonable costs to successfully implement safe e-waste management programs.

### **Developed culture of repair and reuse:**

Traditional practices in India support the idea of reuse, repair and refurbishment and discourages wasteful consumption. This culture needs to be sustained especially given the experiences of Europe and United States. The renewed interest in Collaborative Consumption and Circular Economy shows that the traditional Indian practices need to be given active policy support so that we do not go through the same development process as in the US and Europe and build on the existing strengths of the Indian Economy.

### **Rapidly Rising Awareness:**

Although countrywide levels of awareness regarding e-waste in India are low, due to the efforts of government and NGOs, there exist pockets of excellence especially in large cities. These pockets of excellence are concentrated in educational institutions in a few cities. Any future initiative should build upon these pockets of excellence and continue to concentrate on children and youth as agents of change. Also, significant experiences exist regarding awareness creation efforts for regulators as well as producers that can be utilized to design national level capacity development programmes. A notable addition to such initiatives is the intervention designed by the Department of Electronics and Information Technology (DeitY) to raise awareness amongst all the relevant stakeholders in India. The nationwide programme is likely to provide significant fillip to the capacity building of relevant actors for effective implementation of the Rules in India.

### **Relatively low levels of per capita waste generation – advantages of starting early:**

India has a relatively low per capita e-waste generation at 1.3 kg per capita as compared to China's 4.4. The US, UK and Germany currently generate more than 20kgs on a per capita basis. This early start has the potential to develop effective systems that not only tackle the challenge when e-waste generation expands but also leapfrog the experience of the more developed economies. Further, starting early also provides a window of opportunity to scale-up recycling capacities while implementing measures to limit waste generation.

## 5 Strategic Approach

Having outlined the challenges and opportunities as well as the strengths of the e-waste management landscape, we now outline the key elements of a strategic approach to e-waste management in India.

### **State-civic-business alliances:**

As mentioned above, there are multiple actors with diverse objectives involved in e-waste management in India. To devise and implement a sustainable working model, there is a need for across the board collaboration involving government, NGOs, informal sector and formal recycling businesses. There is significant evidence to suggest that large scale transformation in existing consumption and production patterns would require collaborative efforts of actors with diverse objectives. In e-waste management, models have been suggested that show that there are possibilities for cooperation between the informal and the formal sector in the e-waste management value chain. These opportunities need the enabling support of the producers as well as the regulators. As a result, state-civic-business alliances need to be developed. A key actor for developing such alliances would be local government officials (from ULBs) involved in waste management as well as in implementing environmental regulations (for instance, from SPCBs).

### **Deepening Engagement of SPCBs with OEMs and Formal Recyclers:**

With numerous industries to regulate and limited number of staff, it is often argued that command and control measures are not the most effective means to achieve environmental objectives as envisaged in policy documents. Therefore, innovation in the form of next generation “policy” processes where the environmental regulator is seen as the facilitator for compliance to environmental regulations needs to be tested in India. Initiatives have already been launched in a few states and need to be further expanded and strengthened across the country.

### **Strengthening links between SPCBs and ULBs:**

While cities, the biggest generators of e-waste, are managed by ULBs, the environmental monitoring of compliance to the e-waste rules falls under ambit of the SPCBs. This division of responsibilities has the potential for enhanced compliance, but experience of implementing other waste management regulations suggests that it is often difficult for the SPCBs to effectively monitor ULBs. By creating platforms for engagement between SPCBs and ULBs and developing model cooperation projects, effective implementation of the E-waste Rules can be strengthened. Expecting already burdened SPCBs to monitor all the relevant stakeholders involved in e-waste management is unlikely to yield desired results.

### **Debate and engage with informality:**

Our discussion thus far has emphasised the key role of the informal sector in e-waste management in India. The government should collaborate with civil society organization as well as directly with actors in the informal sector to identify potential entry points for mainstreaming the informal sector. On the basis of such interactions, model projects should be developed that are based on the collaboration between the informal and formal actors in the private sector. Several examples of such collaborative projects exist in India as well as in other developing countries. However, the success of such models over time depend crucially on the convening role of the

state. India's leadership in debating and engaging with the informal sector has the potential to provide game changing results and create an example for other developing countries to follow.

#### **Hub and Spoke Model for Infrastructure:**

A high-tech refinery that can extract precious metals from sorted e-waste components needs billions of dollars in investment. Therefore, it is only possible to install such plants to cater to an entire region, while state-wide material recovery facilities and city-wide collection infrastructure is required to provide adequate amount of material for the regional refinery. This strategy for developing hub and spoke model for infrastructure can play a crucial role in maintaining viable recycling businesses. However, developing such models would require across-state discussions and overall leadership of the Central Pollution Control Board that provides the strategic orientation for development of adequate and appropriate infrastructure.

#### **Capacity Building of Regulators:**

With the introduction of new e-waste rules it is crucial to devote significant investments for capacity building of regulators. While training modules are available or are being prepared there is a need for handholding and mentoring of officers at the local level to ensure enforcement. The Department of Electronics and Information Technology (DeitY) has also launched a nation-wide initiative for such capacity building. This initiative needs to be sustained and up-scaled for effective implementation of the e-waste rules in the long run.

## 6 Key Recommendations

Based on our analysis of the challenges and opportunities, the current policy response as well as the strengths of the Indian e-waste landscape, the following key recommendations emerge in line with the strategic orientation:

### **Develop a Raw Material and Secondary Resource Strategy for India:**

E-waste management is directly linked to the need for developing a raw material and secondary resource strategy not only for electrical and electronic sector manufacturing but also broadly for the entire economy. With increasing production there is likely to be an increased demand for raw material that can be fulfilled by the secondary resources from the recycling sector. A technical advisory group that informs policy processes cutting across different secondary resources must be established. The recently established India Resource Panel by the MoEFCC could play such a role.

### **Creation of a Knowledge-base:**

Most policy discussions in India on e-waste are based on anecdotal evidence or small sample studies. Evidence based policy advocacy and research needs significant investments by domestic and international sources that fund the creation of relevant knowledge products. For instance, there is a need to prepare inventories of e-waste generation at national and state level to enable better planning of recycling requirements. Similarly, database of appropriate technologies with suggested business models should be developed for entrepreneurs (including those from the small scale informal sector) interested in setting up their own e-waste recycling businesses.

### **Development of Appropriate Infrastructure:**

While the experience of developed countries can provide suggestions for the development of state of the art technologies, the development of appropriate infrastructure would require adaptation of these technologies to the Indian context. Collaboration with bilateral and multilateral agencies could facilitate such transfer of technology and development of appropriate infrastructure. However, the development of such infrastructure could also be a result of domestic R&D. The DeitY has already developed some indigenous technologies but these require significant up-scaling and increased funding for further R&D.

### **National Programme on Awareness and Capacity Building:**

Although the new e-waste management rules are in place, most stakeholders lack the awareness and capacities for effective implementation of the Rules. Therefore, there is a need to develop targeted capacity building programmes for SPCBs, schools and other key stakeholders. The DeitY has launched a programme in 10 states, however this programme needs to be expanded to the entire country. Also, such programmes need to be developed to leverage private sector finance to enhance the effectiveness and outreach.

### **Cross Ministry Collaboration for Developing Effective Policies and Programmes on E-waste:**

The management of e-waste has implications for several stages of the life cycle of electronic and electrical products – from mining, design, manufacturing, consumption to the end of life stage. At the same time, different actors with diverse objectives in the private and public sector are

involved in the management of e-waste. Therefore, it is crucial to develop cross ministerial collaboration to address the challenge at a systemic level rather than at a particular life cycle stage level. Such thinking could have significant implications for the implementation of flagship schemes of the government of India. For instance, our discussion thus far would suggest that the Digital India, Make in India and Skill India initiative can all include measures that help achieve the objective of the initiative while also contributing to sustainable e-waste management in India.



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