Need for the Legal Regime in Electronic Waste Management in Dehradun, Uttarakhand India

[1]Ms. Shuchita Agarwal , [2]Dr. Susanta Kumar Shadangi

Research Scholar,

[1]ICFAI Law School, ICFAI University, Dehradun

[2]Associate Professor,

ICFAI University, Dehradun

ABSTRACT

Environmental concerns and health hazards are closely linked. Pollution of air, water and land can lead to adverse health effects in humans and animals. Pollutants can include hazardous chemicals, heavy metals, radiation, and other toxic substances. Exposure to these pollutants can cause a variety of health issues ranging from respiratory problems, skin irritation, and neurological impairments to cancer and even death. In addition to the direct health risks posed by these pollutants, they can also have an indirect impact by affecting food, water, and soil quality. Poor quality food and water can lead to food-borne illnesses and water-borne diseases, while contaminated soil can cause long-term health effects. The most effective way to address environmental concerns and health hazards is to reduce or eliminate the sources of the pollutants.

This study appraises the facts, administration, dumping practices of waste and harmful materials produced by the people of Dehradun, India in end of the year 2022. An online questionnaire of approx. 200 respondents as according to the sample size condition was done in the end of year 2022. The deduction of the study shows the amount of effected Electronic-waste engendered by diverse income categories assemblages from the products used by inhabitants in one year.

Keywords: Environment, E-Waste, Electronics, Environmental law

1. BACKGROUND

Electronic waste, or Electronic-waste, contains a variety of hazardous materials that can pose significant environmental concerns and health hazards during the management process. Here are some of the main environmental and health hazards associated with Electronic-waste management across the globe:

I.   **Toxic Materials:** Electronic-waste often contains toxic materials such as lead, mercury, cadmium, and brominated flame retardants, which can contaminate soil, water, and air if not managed properly. Exposure to these toxic materials can cause various health problems, including damage to the nervous and reproductive systems, kidney damage, and cancer.

II. **Air Pollution:** The improper management of Electronic-waste can lead to the release of harmful chemicals and gases into the air. For example, the burning of Electronic-waste can release toxic chemicals into the atmosphere, contributing to air pollution.

III. **Water Pollution:** Electronic-waste can also contaminate water sources if not managed properly. Water can be contaminated by the release of hazardous chemicals and metals from Electronic-waste that is not disposed of properly.

IV. **Soil Contamination:** The soil can also be contaminated by Electronic-waste, especially if it is not disposed of properly. Toxic materials in Electronic-waste can leach into the soil, leading to contaminated crops and health hazards for people and animals.

V.   **Occupational Hazards:** Electronic-waste management can also pose significant occupational hazards for workers involved in the process. Workers involved in the handling and recycling of Electronic-waste are exposed to various hazardous materials that can cause respiratory problems, skin irritation, and other health issues.

The environmental and health hazards associated with Electronic-waste management highlight the importance of proper management and recycling of electronic waste. It is crucial to develop comprehensive Electronic-waste management systems that prioritize the health and safety of workers and the environment to prevent these hazards.

The overall consequence exhibited up the necessity of responsiveness on the major issues of Electronic-waste. The government must include without coming up for the approaching contrary effects on atmosphere and well-beings to humanoid lives.

This can involve reducing the amount of pollution generated by factories, cars, and other sources, as well as changing agricultural practices to reduce the use of fertilizers and pesticides. In addition, governments can implement regulations and laws to limit the release of pollutants into the environment. Finally, environmental education and awareness campaigns can help to raise public awareness and encourage people to take action to protect the environment and their own health.

1. 1 Composition of Electronic-waste

Electronic-waste is composed of a variety of materials, including plastics, glass, metals, and circuit boards. Typically, circuit boards contain a variety of metals, including lead, tin, nickel, copper, aluminium, and gold. Plastics may include polyvinyl chloride (PVC) and polyethylene terephthalate (PET). Glass may contain lead, arsenic, and other toxic materials, while metals may include mercury, cadmium, and chromium.

The conformation can vary depending on various aspects such as the sort of electronics being discarded, consumer behavior, and the recycling infrastructure available in different countries. However, some common components found in Electronic-waste include:

i.   Printed Circuit Boards (PCBs) - contain metals like gold, copper and silver, and hazardous materials like mercury, lead and cadmium.

ii.   Batteries - typically contain lead, cadmium, and lithium, which can be harmful to the health of humans and also the environment if not taken proper care off.

iii. Plastics - used in the casings and other components of electronics, these can be difficult to recycle and can release harmful chemicals if burned.

iv.   Metals - in addition to those found in PCBs, Electronic-waste can contain other metals like aluminium, steel, brass.

The composition of electronic-waste can vary by country, depending on factors such as the types of electronics that are commonly used and discarded, and the level of recycling infrastructure in place. For example, a study of Electronic-waste in India found that PCBs accounted for the highest proportion of hazardous materials, followed by batteries and plastics. In the United States, CRTs have historically been a major component of Electronic-waste, but as these devices are phased out, newer electronics like smartphones and tablets are becoming a larger proportion of the waste stream.

Overall, Electronic-waste is a rising worry around the whole world, because the amount of electronic devices being produced and discarded continues to increase. Proper management and reprocessing of electronic-waste is important to minimize the impact of electronic waste on the human health and environment.

2. IMPACT OF ELECTRONIC-WASTE

Electronic-waste has become a major environmental issue due to its potential to harm the environment. The discarding of electronic-waste if done in an improper way can lead to the release of hazardous materials such as mercury, lead, and cadmium in the atmosphere. These materials can cause serious health problems if they are not handled properly. In addition, electronic-waste also contain some valuable constituents such as gold, copper, and aluminium, which we can recover if the Electronic-waste is recycled properly. Electronic-waste can also contribute to climate change. When Electronic-waste is burned, it releases harmful gases like methane and CO_2 which also leads to global warming. Also, the production of electronics often involves the use of toxic chemicals, which can pollute air and water sources. Finally, electronic-waste can also contribute to the depletion of natural resources. As more and more electronics are produced, more resources are consumed, leading to a strain on the environment. This can lead to the destruction of habitats and ecosystems, as well as the loss of biodiversity.

Electronic-waste, or electronic waste, can have a range of impacts across different countries and regions, including economic, environmental, and social impacts. Some of the impacts of Electronic-waste across various countries globally are:

2.1 Environmental Impact

Electronic-waste contains harmful metals like cadmium, mercury, and lead, which can pollute the atmosphere and harm human health if not managed properly. These metals can enter in the water and soil, contaminating the food chain and

affecting local ecosystems. Inappropriate throwing away of electronic-waste also contributes to pollution like air, water and change in the climate, as these automated devices are often burned or dumped in landfills, releasing greenhouse gases and other harmful pollutants.

2.2 Social Impact

The informal recycling of electronic-waste in some states can lead to wellbeing hazards for workforces who are often subjected to unsafe working conditions and exposure to toxic substances. This informal sector of electronic-waste recycling is often unregulated and underpaid, and workers are often unaware of the potential health hazards they face. Economic Impact: Electronic-waste management can be costly, and many countries dearth the necessary substructure to appropriately accomplish and dispose of electronic waste. The cost of managing electronic-waste can lead to a burden on local governments, and in some cases, the cost is passed on to consumers.

2.3 Impact on Health

Revelation to hazardous substances in electronic-waste can contribute to grave health glitches, which includes respiratory and cardiovascular diseases, progressive disorders, and cancer. This is a significant concern for workforces involved in informal electronic-waste reutilizing, who are often not provided with appropriate personal protective equipment.

Overall, electronic-waste is a worldwide issue that necessitates international cooperation and coordination to address. Proper organization of electronic-waste through appropriate collection, recovering, and discarding practices can minimize the economic, environmental and social impacts of electronic waste.

3. ELECTRONIC-WASTE GENERATION IN INDIA AND IN GLOBAL CONTEXT

Electronic-waste is a rising environmental and health concern in both India and the global context. In India alone, it is projected that 2 million tons of electronic waste is produced annually and is anticipated to reach 5.2 million tons by 2020. This accounts for 3-5% of the world's total electronic-waste. India is the fifth major manufacturer of electronic-waste in the world. The majority of electronic-waste in India is generated by urban areas, with the top five cities contributing more than half of the total Electronic-waste generated in the country. Electronics and electric tackle such as computers, mobile phones, televisions, and refrigerators are the chief sources of electronic-waste in India. In the global context, the amount of Electronic-waste is growing exponentially. It is projected that over 50 million tons of Electronic-waste is engendered yearly, a number that is expected to double by 2050. The top five countries that generate the most Electronic-waste are the China, United States, Japan, Germany, and India. The main reason behind the rising quantity of electronic-waste is the rapid advancement of technology and the increase in the production and consumption of electronic products. As these products become obsolete, they are quickly replaced by newer models, resulting in a large amount of Electronic-waste. A significant amount of electronic-waste is not properly disposed of, and often ends up in landfills, where it can leach toxic chemicals into the environment. This can lead to health problems for those living in the vicinity of the landfill, as well as to environmental damage. In addition, improper recycling of electronic-waste can contribute to the release of hazardous materials, such as lead and mercury, into the environment. To reduce the quantity of Electronic-waste produced, it is significant to guarantee that electronic products are correctly castoff and disposed of. This can be done through the implementation of government regulations that require manufacturers to safeguard the appropriate discarding of their products. It is also important to raise awareness of the potential dangers of Electronic-waste and the importance of its proper discarding.

Electronic-waste, or electronic waste, is a mounting problem in the global context, as the world becomes increasingly dependent on electronic devices. Electronic-waste states to castoff electronic devices such as smartphones, processors, televisions, and other electronics.

According to the United Nations, the world engendered approximately 53.6 million metric tons of Electronic-waste in 2019, with an estimated value of $57 billion USD. This is a significant increase from the estimated 44.4 million metric tons generated in 2014.

The states with the uppermost electronic-waste peer group per capita are the United States, Norway, and Switzerland. However, it is important to note that a significant amount of Electronic-waste is also generated in emerging countries, particularly in Africa and Asia.

A major concern with Electronic-waste is the environmental impact it can have. Electronic-waste can comprehend dangerous substances such as cadmium, lead and mercury, which can leach into the environment and cause harm to human health and ecosystems.

Energies are being utilized to address the electronic-waste problem, including through initiatives such as the Basel Convention, whose objective is to reduce the transboundary program of hazardous wastes, including Electronic-waste. Additionally, many countries and organizations have implemented Electronic-waste recycling programs, which aim to recover valuable materials from discarded electronics while dropping the ecological impression of electronic-waste.

3.1 Volume of Electronic-waste generated

The amount of Electronic-waste generated globally each year is estimated to be between 20 and 50 million metric tons. This is equivalent to around 4-7 kg of Electronic-waste per person. According to the UN, the amount of Electronic-waste generated globally is expected to increase by 21% to 52.2 million metric tons by 2021.

The volume of Electronic-waste generated across the globe varies significantly by country, and it is challenging to provide an exact figure due to the lack of accurate data from some nations. However, based on available data, here are some estimates of the volume of Electronic-waste generated in various countries:

3.1.1 China: According to a report by the United Nations University, China generated the largest volume of Electronic-waste in the world in 2019, estimated at 10.1 million metric tonnes.

3.1.2 United States: The United States generated an estimated 6.9 million metric tonnes of Electronic-waste in 2019, according to the same report by the United Nations University.

Japan: Japan generated an estimated 2.2 million metric tonnes of Electronic-waste in 2019, according to the same report.

3.1.3 India: India generated an estimated 3.2 million metric tonnes of Electronic-waste in 2019, according to the same report.

3.1.4 European Union: The European Union generated an estimated 12 million metric tonnes of Electronic-waste in 2019, according to a report by the European Environment Agency.

It is noteworthy that these statistics are just estimations and may not reproduce the exact capacity of Electronic-waste produced in each republic. Additionally, the definition of Electronic-waste can vary between countries, which can make it challenging to compare data from different nations.

3.2 Electronic-waste problems in India

India is one of the world's largest consumers of electronic products, which has resulted in the country facing significant Electronic-waste problems. Here are some of the main Electronic-waste problems in India:

3.2.1 Illicit Trade: India has become a major destination for illegally imported electronic waste, as the country lacks proper laws and regulations on the import of Electronic-waste.

3.2.2 Health Hazards in Informal Sector: A significant portion of Electronic-waste in India is managed by the informal sector, which is made up of scrap dealers and unregistered recyclers. The informal sector often uses primitive and hazardous methods of recycling, which can lead to the release of toxic substances into the environment and cause harm to the health of workers. Inadequate waste discarding and recycling practices in India can lead to serious health hazards. Poor management of Electronic-waste can result in exposure to hazardous chemicals and heavy metals, causing severe health problems to people living near Electronic-waste centers.

3.2.3 Environmental Damage: Improper discarding of Electronic-waste can also cause environmental damage, as the toxic components of Electronic-waste can contaminate soil, air, and water.

3.2.4 Lack of Awareness: There is often a lack of awareness among the general public about the hazardous effects of Electronic-waste and the importance of proper discarding. This results in a large amount of Electronic-waste being disposed of in an improper manner

3.2.5 Lack of Legislation: India does not have specific laws and regulations for the proper management of Electronic-waste. This has made it difficult for companies to follow proper recycling and discarding practices. There are some laws in India related to Electronic-waste management, such as the Electronic-waste (Management) Rules, 2016, which provide guidelines for the collection, transportation, and discarding of Electronic-waste. However, enforcement of these laws can be weak, and the penalties for non-compliance are often low.

3.2.6 Lack of Proper Management: The management of Electronic-waste in India is often inadequate, with only a small portion of electronic waste being collected, recycled or disposed of properly. This has led to significant amounts of Electronic-waste being dumped in landfills, which can be hazardous to human health and the environment.

3.2.7 Limited Infrastructure: There is limited infrastructure and resources for proper management of Electronic-waste in India. While some Electronic-waste recycling plants exist, they are not sufficient to meet the needs of the country.

The Electronic-waste problem in India poses significant environmental and health risks, and it is important for the country to develop a comprehensive Electronic-waste management system to address these issues.

4. ELECTRONIC-WASTE GENERATION IN DEHRADUN, UTTARAKHAND

The emerging countries operators depends on industrialized countries for electric apparatus's, In India a considerable portion of workers chiefly depends on Europe and North America for electric devices. According to the report by the International Data Corporation India's marketplace of mended and second-hand headsets grew by 14% from 2018. India's most important phone market of the repaired and used handsets increased up to approx. 35 million units. The term "digital gap" in emerging countries upsurges the trans-boundary passageway of second-hand products. India attracts both second-hand market as well as phone markets of features in which millions of people buy smartphones, tablets every year. The speedy surge in the edification sector and Information Technology (IT) productions in mega-cities of India. Dehradun is recognized as the education hub of Northern India. Dehradun is the capital of Uttarakhand, near the Himalayan slopes the 28th state of India. The city has an area of 3,088 sq.km, with population of 16, 96, 694 (Census of India, 2011). Dehradun is surrounded by the IT industries and various educational establishments. Uttarakhand has 13 districts but has only Eight registered Electronic-waste dismantlers and recyclers as according to CPCB data as on 31st January, 2023. As per the official website of the state's pollution control board, there is no devoted database obtainable after 2017.

The agenda of the study was to ruck statistics around:

i. EEE consumption by income groups and generated Electronic-waste

ii. Electronic-waste receptiveness and education practices instigated by around 200 respondents of Dehradun

iii. Socio-economic status of the respondents and households

iv. Electronic-waste generated by Dehradun

v. Hazardous substances generated by Electronic-waste.

5. ANALYSIS OF SOCIO-ECONOMIC PROFILE

Variable	Occurrence	Percentage
Gender		
Male	85	42.5%
Female	115	57.5%
Age Groups (y)		
18-25	45	22.5%
26-60	105	52.5%
>60	50	25%
Income Groups		
LIG	34	17%
MIG	109	54.5%
HIG	57	23.5%
Occupation/ Job nature		
Student	67	33.5%
Academician	88	44%
Self employee	23	11.5%
Corporate	22	11%

6. AWARENESS OF E WASTE

	0%-20%	21% -40%	41%-60%	61%-80%	81%-100%
Knowledge of the word E waste				Yes	
Knowledge of e			Yes		

waste					
E waste is harmful for us?			Yes		
Have you come across with the benefits of Electronics and electrical (E) waste		Yes			
EPR is responsible for collecting e waste			Yes		
Knowledge of E waste collecting centres near to you	Yes				
Knowledge of dumping process	Yes				
How much it is harmful for environment		Yes			
Knowledge of harmful contents present in E waste	Yes				
E waste is harmful for us				Yes	

7. ELECTRONIC-WASTE MANAGEMENT IN INDIA

7.1 Awareness

Raising awareness among citizens, businesses, industries, and government officials around the position of proper supervision of electronic-waste is the first step to handling electronic-waste in India. This can be done through campaigns, seminars, and other public engagement activities.

7.2 Collection

Collection of electronic-waste should be done in an organized method. Special collection centres should be set up to confirm that the waste is collected efficiently and safely.

7.3 Handling and Clearance

The electronic-waste must be treated and dumped of in an ecologically safe method. This can be done by recycling, reusing or disposing of the waste in a way that does not harm the environment.

7.4 Legal Framework

A legal framework should be established to ensure that the organization of electronic-waste is done in compliance with the law. This includes setting up of laws, regulations, and guidelines to safeguard that electronic-waste is accomplished in a accountable method.

7.5 Monitoring and Reporting

Regular monitoring and reporting of the electronic-waste supervision process must be done to ensure that it is carried out in an effective and sustainable manner.

Electronic waste, is an increasing concern in India as the country continues to experience rapid technological development and increasing consumption of electronic devices. The supervision of electronic-waste in India varies across diverse states, with some states implementing effective strategies and others facing challenges.

8. MANAGEMENT OF ELECTRONIC-WASTE IN MAJOR STATES IN INDIA

8.1 Maharashtra

Maharashtra is one of the foremost states in electronic-waste management in India. The state has established a robust outline for electronic-waste management and has set up several electronic-waste reprocessing facilities. It has also implemented strict regulations for the dumping of electronic-waste and has established an arrangement for the assortment and transportation of electronic-waste.

8.2 Karnataka

Karnataka has also taken significant steps on the way to electronic-waste administration, with the state administration setting up Electronic-waste recycling units in several cities. However, the state faces some challenges, such as the lack of adequate infrastructure and awareness among the general public.

8.3 Tamil Nadu

Tamil Nadu has made progress in Electronic-waste management, with the state government implementing a program to collect Electronic-waste from households and setting up several Electronic-waste recycling units. However, the state still looks for encounters such as inadequate infrastructure and a absence of consciousness among the general public.

8.4 Delhi

Delhi is one of the major manufacturers of Electronic-waste in India, but the city faces several challenges in electronic-waste management. The city lacks adequate infrastructure for Electronic-waste recycling and discarding, and the informal sector is responsible for a significant portion of Electronic-waste handling, leading to ecological and health hazards.

Gujarat: Gujarat has made some progress in Electronic-waste management, with the state government setting up Electronic-waste recycling units in several cities. However, the state still has to face challenge like lack of alertness among the general public and inadequate organization for electronic-waste administration.

8.5 Uttarakhand

Uttrakhand is a state in northern India that has made some progress in the supervision of electronic-waste, but there are still significant challenges to be addressed.

9. CHALLENGES IN ELECTRONIC-WASTE MANAGEMENT OF UTTARAKHAND

9.1 Regulatory Framework

Uttarakhand has implemented the Electronic-waste (Management) Rules, 2016, which provide guidelines for the collection, transportation, and discarding of Electronic-waste in the state.

9.2 Electronic-waste Collection

The state government has set up several collection centers for electronic-waste in major cities such as Dehradun and Haldwani. These centers are responsible for collecting Electronic-waste from households, schools, and other institutions.

9.3 Electronic-waste Recycling

Uttarakhand has several authorized Electronic-waste recycling units in the state, which are responsible for the safe and responsible discarding of Electronic-waste. However, these facilities are not enough to handle the volume of Electronic-waste generated in the state.

Challenges: Uttarakhand faces several challenges in electronic-waste management, such as a lack of awareness among the general public about the proper discarding of Electronic-waste. The informal sector is also responsible for a significant portion of Electronic-waste handling, leading to environmental and health hazards. In addition, there is a absence of satisfactory structure for Electronic-waste management in the state.

9.4 Initiatives

To address these challenges, the Uttarakhand government has launched several initiatives, such as awareness campaigns and training programs for stakeholders involved in Electronic-waste management. The government is also working to

establish more Electronic-waste recycling units in the state and is encouraging public-private partnerships to address the issue.

Overall, while Uttarakhand has made some progress in Electronic-waste management, there is still a long way to go to address the issue effectively. It is essential for the government and other stakeholders to work together to raise awareness about the proper discarding of Electronic-waste, establish the necessary infrastructure for Electronic-waste management, and encourage the adoption of sustainable practices to reduce the generation of Electronic-waste in the state.

While some states in India have made significant progress in Electronic-waste management, there is still a long way to go to address this growing problem effectively. It is essential for the government and other stakeholders to work together to implement effective Electronic-waste management strategies, raise awareness among the general public, and establish the necessary infrastructure to handle Electronic-waste safely and responsibly.

10. ROADMAP FOR DEVELOPMENT OF ELECTRONIC-WASTE MANAGEMENT IN INDIA

10.1 Create Awareness

The first step for the successful implementation of Electronic-waste management in India is to create awareness among the general public about the importance of Electronic-waste management. This can be done through various media such as television, radio, newspapers, magazines, and the internet.

10.2 Establish Proper Collection System

The second step for the successful implementation of Electronic-waste management in India is to establish proper collection systems. This can be done by setting up collection centers where people can deposit their old electronic items.

10.3 Develop Recycling Infrastructure

The third step for the successful implementation of Electronic-waste management in India is to develop recycling infrastructure. This can be done by setting up recycling centers and facilities where Electronic-waste can be recycled and reused.

10.4 Set up Regulatory Framework

The fourth step for the successful implementation of Electronic-waste management in India is to set up a regulatory framework. This can be done by implementing policies and regulations that will ensure proper collection and discarding of Electronic-waste.

10.5 Promote Reuse and Reselling

The fifth step for the successful implementation of Electronic-waste management in India is to promote reuse and reselling of electronic items. This can be done through campaigns and initiatives that will encourage people to donate their electronic items to reuse and resell.

10.6 Encourage Recycling

The sixth step for the successful implementation of Electronic-waste management in India is to encourage recycling of electronic items. This can be done through campaigns and initiatives that will encourage people to recycle their old electronic items.

10.7 Establish Waste Treatment Facilities

The seventh step for the successful implementation of Electronic-waste management in India is to establish waste treatment facilities. This can be done by setting up facilities that will process and treat Electronic-waste in an environmentally friendly manner.

11. ROADMAP FOR UTTARAKHAND

Dehradun is concentrating on Electronic-waste administration and strategies to open 51 specialised Electronic-waste centres. Its purpose is to make city and state free from Electronic-wastes. Mayor of the Dehradun Municipal

Corporation (DMC), inducted an Electronic-waste supervision system and minimisation movement, sideways with a joint exertion by the Society of Pollution and the Environmental Conservation Scientists (SPECS), Uttarakhand State Council of Science and Technology and National Missions on Himalayan Studies.

Currently, the city produces less than two tonnes of Electronic-waste annually but intends to upsurge the number in the approaching years. Dehradun Municipal Corporation, quantified that the city has 24 Electronic-waste bins and two NGO automobiles focused on Electronic-waste assembly from the city. The new centres will gather and overhaul Electronic-waste. Also, Dehradun has 42 precise Electronic-waste containers in the city which will also upsurge employment openings in the State. The staff will accept specialised training and procedural support as well.

According to the Secretary of SPECS, 7 centres would begin processes soon. Other sites will be recognized and soon commence the work. Administrators hope for more engagement opportunities with the new centres. The workers will also obtain special physical activity and technical backing. In addition to the door-to-door assemblage of Electronic-wastes, it will have drop off centres in Jakhan and Harrawala. Since 2018, Waste Warriors, an ecological NGO, has been occupied with DMC for an efficient Electronic-waste collection movement.

Currently, Electronic-wastes from Dehradun go to Haridwar for dispensation. The cast-off wastes can be mended and reprocessed sometimes. They are also demanding the citizens to abandon Electronic-wastes appropriately.

12. CONCLUSION

The study assessed the Electronic-waste generation and absence of information among the citizens of Dehradun. The muddled sector and inappropriate discarding of more than 4000 MT of Electronic-waste in year 2022. As per the pollution control board of Uttarakhand database of 2022, around 10100 MT of amount send to recyclers which comprises dangerous substances in 2022. If we linked these two data standards than it is determined that values have augmented. A need mindfulness among the peoples of Dehradun is must, which comprises of knowledge of Electronic-waste, contrary effects on atmosphere as well as on human health due to risky substances present in EEE. This can be attained all through meetings with locals, announcements through pictures and banners and movements on available guidelines on Electronic waste. The state government must establish the plants on recycle and reuse.

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