# Sustainability Innovation

# Report Of Recycling And Reusing Of Electronic Waste In Shenzhen

Wanwan She, The Affiliated International School of Shenzhen University

CHUQING XIE, The Affiliated International School of Shenzhen University

RUIQI LIU, The Affiliated International School of Shenzhen University

ZETONG LIN, The Affiliated International School of Shenzhen University

Yue Wu, The Affiliated International School of Shenzhen University

# Summary

Electronic waste as an intractable problem has bothered people’ s life for a long time. Nowadays in Shenzhen, we can still see a large amount of end-of-life products being thrown at the corners of streets casually without anyone to deal with. Thus, we start to think of the appropriate solutions to tackle this problem.
On online surveys and offline field investigations, we notice that a large majority of nearby residents has little information and knowledge about the correct disposal of e-waste and how detrimental it can be if it is not disposed in the right way. Data also shows that residents who live near the waste treatment plant suffer from different types of chronic diseases such as lung cancer and thyroid dysfunction. Problems like economic repercussion and predicted rise in the use of electronic devices also occur.
Examining these challenges, we see two root causes: the prosperous development of Huaqiang North Electronic Markets in the past which lead to a large waste generation and the lack of attention from people and relevant regulations and laws. After knowing the root causes, we know our aim is.
The solutions generated were trying to deal with the root causes we summarized above. We decided to educate the public in order to raise their awareness of the seriousness and the eco-friendly disposal method of e-waste. Besides, we hope to strengthen the supervision of responsible units to prevent further pollution of waste. Besides, it is also essential for us to improve the technical level of recycling and reusing this waste and hence a professional waste disposal enterprise should be established to solve this problem specifically.
In order to find the optimum method that suits our community best, we figure out different criteria to evaluate these solutions: Is the dissemination of relevant knowledge of electronic waste publicly acceptable? Is the establishment of electronic waste disposal enterprises being supported by government policies? Could manufactures obey the rules of government to design more environmentally friendly products etc.
Therefore, our action plan is generated mainly based on them. We implement two solutions: holding information sessions among communities which help residents understand more about this problem and send a persuasive letter to Shenzhen government, trying to remind them the seriousness of e-waste and introduce some accessible solutions they can carry out.
In conclusion, our solutions and action plan is under deliberate measures and full efforts of our teammates. Information sessions and persuasive letters and other methods directly deal with the root causes and challenges we mentioned above.

From our perspective, they would be effective in solving this problem especially in the long run.

# Choose the Topic

# Identify the Challenges

1. The predicted rise of the use of electronic devices, thus the rise in electronic waste
Relevant inputed data suggests a positive relationship between the boom in population (household size) in this case, and the use of all appliances. In 2019, the world generated a striking 53.6 Mt of e-waste, an average of 7.3 kg per capita. The global generation of e-waste grew by 9.2 Mt since 2014 and is projected to grow to 74.7 Mt by 2030 – almost doubling in only 16 years. Most of the e-waste was generated in Asia (24.9 Mt), while the continent that generates the most in kg per capita is Europe (16.2 kg per capita). Europe is also the continent with the highest documented formal e-waste collection and recycling rate (42.5%). In all other continents, the e-waste documented as formally collected and recycled is substantially lower than the estimated e-waste generated.
The correlation of the population growth and the volume of electronic waste should be a striking alarm. To alleviate this, the task of downsizing should be distributed on a global scale. Continents such as Europe and Asia should probably implement stricter relevant environment decrees and legislations as they are the major contributors.

2. Many people are oblivious that the electronic waste needs to be thrown into some special bins.
The education system in our city did not cover the basic knowledge of electronic-waste classification and the corresponding harm of not collecting them.
Government, as well, does not take the leading role in electronic waste cycling, thus citizens may not regard it as urgent for them to do so. That is why the government should start off by devising laws about correct way of classifying electronic waste and set penalties if citizens do not obey the rules.

3. Pernicious impact of electronic waste on the environment and human bodies
E-waste contains a string of detrimental chemicals: mercury, lead, brominated flame retardants, and cadmium. When these electronics are mishandled during disposal, these chemicals find their way into the water cycle and the penetration of soil. For example, when e-waste is buried or incinerated, heavy metals in it will seep into the soil and enter rivers and groundwater, which will cause pollution of local soil and groundwater, directly or indirectly causing damage to local residents and other living things.

In the process of dealing with e-waste，a large number of harmful gases are released, such as highly toxic dioxins, furans, polychlorinated biphenyls and other carcinogens, causing harm to the natural environment and human body

The residual Freon emissions from the abandoned air conditioning and refrigeration equipment will destroy the ozone layer in the atmosphere, causing the greenhouse effect and increasing the incidence rate of human skin cancer.

Many informal sectors stoke the health risks. For example, primary and secondary exposure to toxic metals, such as lead, results mainly from open-air burning used to retrieve valuable components such as gold. Combustion from burning e-waste creates fine particulate matter, which is linked to pulmonary and cardiovascular disease. The relevant results proved that the heavy metals have been accumulated in the 5 human tissues (5 tissue: placenta, umbilical cord blood, blood and serum, hair, and urine). Finally, the human body burden of heavy metals would appear on the human health, and cause all kinds of diseases e.g. cancers, mental health and neurodevelopment disorders, thyroid dysfunction, and general physical health deterioration (DNA damage and effects on gene expression

4. Economic repercussions
The high rate of obsolescence and depreciation of mechanical appliances have led to the generation of large amounts of electronic waste.
The recycling industry faces many challenges as e-waste contains many different materials assembled by various technologies (Sonnenfeld, 2006). Toxic materials cling to non-toxic materials, making it more difficult and a safety risk to separate and recycle, requiring a large investment of labor, highly sophisticated technology and money to ensure safety. (Basel Action Network, 2011)
The value generated from the safe and correct recycling of e-waste exceeds the cost of recycling, making it not cost-effective to invest in new technologies.

data table of household size and use of appliances

# Identify a Root Cause

1 Huaqiang North as an important electronic parts production and trading place brings economic benefits but also generates a lot of electronic waste.

Shenzhen is a large modern city with a large population and a high proportion of young people, who are generally well educated and have a high demand for electronic products. Huaqiang North is an important electronic products business zone located in Shenzhen, Guangdong Province, China, known as "China's first electronic street", it is the largest commercial street in mainland China, is one of the most influential computer hardware, electronic components market.

The origin of Huaqiang North Electronics Market is related to the global industrial development trend when China's doors were first opened after the reform and opening up. As early as the preparatory period of the Shenzhen Special Economic Zone, the electronics industry was used as the leading industry for processing incoming materials. Between 1979 and 1980, before the construction of Shenzhen's first high-rise building, the Electronics Building, began, resources from the electronics industry in the Mainland and Hong Kong were already gathering at the intersection of Shennan Avenue and Huaqiang North.

Construction of the Electronics Building began in January 1981 and was completed in August 1982, with the Sage Building later built adjacent to it. The Electronics Building was Shenzhen's first landmark and its completion subsequently made electronics manufacturing the largest industry in Shenzhen at the time.
In 1988, Shenzhen Electronics Group changed its name to Saige Electronics Group and set up the country's first electronic products market dedicated to the sale of domestic and foreign electronic components on the ground floor of the Saige Industrial Building - the Saige Electronics Ancillary Market (the predecessor of the Saige Electronics Market). It was operated by more than 160 local and mainland manufacturers from Shenzhen and 10 Hong Kong companies in the form of self-operated self-sales and joint-sales. At this time, the prototype of Huaqiang North was formed, and the Shangbu Industrial Zone was transformed from a factory area into a pivotal market for electronic components in China.

At the beginning of the Sage Electronic Market, the area was only 900 square meters with 43 merchants. Although the area was small and the conditions were very simple, it was a market that met the needs of the market development at the beginning of the reform and opening up, and the positioning of such a distribution

market for production materials filled a gap in the market. After the establishment of the SEG Group, its member companies once numbered more than 100, including well-known electronic enterprises in Shenzhen such as Sanda, Huaqiang, Konka and Aihua.

Due to the geographical advantage of Shenzhen's proximity to Hong Kong and the special history of the special economic zone established by the reform and opening up, Shenzhen Huaqiang North came into being, but over time it has brought economic benefits at the same time, a large amount of electronic waste generation is inevitable, and this is one of the fundamental reasons for the proliferation of electronic waste

2 The lack of awareness of the hazards of e-waste in the early years has made the public less aware of the correct treatment of e-waste and the lack of investment in technological research and development has made safe recycling inefficient.

Due to insufficient attention and lack of relevant laws and policies, the e-waste recycling industry has not formed a complete industrial chain, which hinders the entry of capital and reduces the efficiency of research and development for treatment technology. High costs and taxes make the recycling price offered by formal processing enterprises lower, and most recyclers prefer to sell their used appliances to small workshops that offer higher prices. Coupled with low public awareness of recycling, many people are not familiar with e-waste recycling and dismantling enterprises and think it is easier to sell to small traders, which makes centralised recycling of e-waste even more difficult.

There is a lack of awareness of the need to dispose of obsolete electronics and e-waste separately, and informal e-waste recyclers often lack knowledge of the associated behavioural hazards: if users have to pay for recycling e-waste, they generally choose to ignore the collection and recycling system because of the lack of effective incentives. And the inconvenience of the existing system, which requires time and effort to dispose of e-waste, creates a lack of incentive to dispose of it properly. In addition, the lack of suitable sites to dispose of hazardous waste and e-waste residues, as well as poorly regulated or enforced e-waste legislation and inadequacies in existing technology may also contribute to the proliferation of e-waste.

Huaqiang Bei map

# Generate Solutions

We should vigorously develop green economy, circular economy, adhere to the three principles of "reduction", "innocuousness" and "recycling", transform "resource-product-waste" into a "resource-product-recycled resources" development model, strengthen the recycling and reuse of e-waste, reduce the loss of domestic resources, and improve the utilization rate of resources. In the design and production of electronic products, we should vigorously develop new recyclable green materials, in the process of electronic products research and development design, production, etc., the implementation of "green engineering", and strive to eliminate or control e-waste from the source, so that the source of pollution on human health and the environment to minimize the harm, thereby reducing the harm of e-waste.

1.Reduce the generation of e-waste
1.1 Restrict the import of e-waste from abroad
High processing costs are driving developed countries to export e-waste. China, in the developing world, has become a place for e-waste produced in developed countries. Shenzhen, one of China's major port cities, also receives an enormous amount of e-waste from abroad each year. In response, the Chinese government's preferred solution is to legislate and enforce it: to resist and restrict such practices. According to the information released by the Chinese Customs, on July 8, 2020, Wenjindu Customs, a member of the Shenzhen Customs Department, returned a batch of electronic "foreign garbage" with a total of 17,000 used electronic LCD screens weighing 231.15 kg. This is the effect of the solution. The Chinese government should improve the law in this area and give an absolutely adequate police force to monitor and enforce the law.

1.2 Educate the public on how to handle end-of-life products and encourage them to extend their life through repair and reuse
This approach is currently being adopted in Singapore and can be done in China. According to statistics, Singapore produces more than 60,000 tons of e-waste each year, but the rate of e-waste collection has been low, in 2020 the amount of e-waste collection is only 1400 tons. This year, the Singapore Science and Technology Industry Association and the Institute of Sustainable Life of Social Enterprises launched the "Old Electronics Regeneration Program" online. The six-month event, held online and offline, aims to raise public awareness of environmental awareness and tackle the growing problem of e-waste.
During the event, organizers launched a live event to demonstrate how to repair

different categories of electronic products, and posted a series of popular videos on social media about electronic parts, materials, and more. Organizers have also designed interactive sessions that invite people to upgrade or repair used electronics, and the winners will receive cash incentives. Physical electronics repair stations will also be built in a few months. In general, extending the life of electronic products can directly reduce the generation of electronic waste.

2. Strengthen the supervision of relevant responsible units to prevent e-waste pollution of the environment.
2.1 The factory is required to be responsible for the discharge of pollution
At present, China's waste household appliances dismantling the market management of the chaotic state, not only caused serious environmental pollution, but also to the safety of a great hidden danger, should cause local governments at all levels to attach great importance to. The solution to this is to follow the "polluter pays" principle. The Chinese government should require electronic and electrical manufacturers to be responsible for their products and the waste they may generate during production, and pay a certain amount of tax for subsequent clean-up. At the same time, waste disposal plants should also be fined for the toxic gas emissions they emit when disposing of e-waste. Only those who make pollution can be punished, so that manufacturers can be warned to reduce pollution emissions. In fact, in China, there are already enterprises engaged in green production. For example, Haier company, the damage and harmfulness of products to the environment are determined in the product R & D stage. Haier computer strictly controls the environmental protection requirements of products in the new product development stage. Those that do not meet the environmental protection requirements will not be adopted and imported. Pollution will be eliminated from the beginning of design.

2.2 Guide the public to green consumption
Not only should businesses be responsible for pollution, but consumers who contribute to it should also pay for it. The government should encourage fewer producers who use toxic raw materials by promoting and guiding consumers to consume environmentally friendly electronic products. Consumers need to raise awareness of the dangers of e-waste, while the government raises the environmental awareness of the whole society, encourages public participation, creates a good atmosphere and forms a virtuous circle.

3. Recycling of e-waste
3.1 Manufacturers are advised to take into account the environmental impact of products from design, manufacture, sale, consumption to recycling and disposal of waste products.
The final waste disposal and recycling process is taken into account in the production process to recycle e-waste more efficiently.

### 3.2 Improve the technical level of e-waste recycling

Despite the efforts of countries and industries, it now appears that technological breakthroughs are particularly needed to isolate rare metals with very low components from well-structured electronic devices, such as the separation of radon from mobile phone vibrators. The low-cost recycling of e-waste is also a problem that has not yet been solved. Only by upgrading the technology and making recycling a simple and inexpensive thing can we really promote the recycling of e-waste. E-waste contains a variety of heavy metals, which also bring wealth when they cause harm, and can be used as valuable raw materials if extracted from them. At present, the treatment methods of e-waste include melting, refining and electrolysis. If advanced technology can be used to deal with, these used appliances will not only not harm the environment, but also will produce good economic and social benefits.

### 3.3 Establish professional electronic waste disposal enterprises

In the United States, the recycling industry of electronic waste has been formed, with more than 400 companies, mainly including specialized companies, non-ferrous metal smelters, municipal solid waste treatment enterprises, electronic product manufacturers (OEMs) and dealers. The United States owns California electronics Recyclers International company. ERI is one of the largest e-waste recyclers in the United States, with operations in seven places in the United States. Since entering the industry more than ten years ago, its profit margin has increased explosively. In April 2005, only about 4.5 tons of e-waste were recovered, and by April this year, it had reached about 10000 tons. Most residents of New York City recycle their e-waste by ERI. In 2015, these e-waste exceeded 900 tons. Besides being good for the environment, e-waste recycling can also bring profits. In fact, there is a lack of such large professional enterprises to carry out e-waste recycling in China.

# Identify the Criteria

Criteria 1:
Is the dissemination of relevant knowledge of electronic waste publicly acceptable?
When combating such environmental problems, the first consideration lies in whether we could conquer it in the long run, rendering education ever more significant. It follows that the cooperation with relevant educational institutions need to be cohesive and should be taught by pundits in the environmental sector.

Criteria 2:
Is the halt of imported electronic waste financially viable?
When considering the cancellation of imported practices, we have to judge whether the regional economy does rely on such transactions. Fortunately, Shenzhen has already transformed itself into a domestic economic hub, supporting itself mainly through advanced financial services without having to bear the repercussions of electronic waste. And thus these restrictions of imports could be sustainable in financial terms.
The cost of collecting e-waste is mainly about the advanced technology required-as these waste cannot be arbitrarily burned or dumped- but current technology has allowed the cost of this method to be largely spread out. Scientists have already put forward the possibility of recycling the e-waste as raw materials or intermediate goods across various industries. This could mean that the cost of collecting and recycling e-waste would be spread out to more sectors, and thus incentivize the companies to follow this practice.

Criteria 3:
Can the design of new model of recycling electronic waste be massively produced in the coming decade?
The feasibility of the machines should also be taken into account. Given the coronavirus context nowadays, many programs could be conducted online and could be filed as one of the many parts of school credits, which would incentivize students to be imparted. The follow-up tests on these relevant issues should also be carried out to test whether students could comprehend the knowledge.

Criteria 4:
Is the establishment of electronic waste disposal enterprises being supported by government policies?
Electronic waste disposal has not yet become one of the mainstream firms in our cities. It is therefore pivotal for the government to serve as a conduit to implement

specific tax incentives, subsidies, or low-interest loans to these corresponding entrepreneurs, so that they would gain a sense of financial security and could concentrate more on the devise of new technologies on disposal.

Criteria 5:
Could manufactures obey the rules of government to design more environmentally friendly products?
Not necessarily. That is why some foreign countries have developed tradeable permits to regulate firms' behaviours by setting the environmental protection as a free market, where firms could transact permits and be rewarded or penalized according to their industrial practices. Our city may also take initiative to devise such a technique.

# Evaluate the Solutions

1.Reduce the generation of e-waste
1.1 Restrict the import of e-waste from abroad
GOOD: The most efficient way to dissolve the electronic garbage enter to our county.
BAD: The tariff of restrict the electronic waste flow into China could not be a useful way to manage. Because if we make the tariff to foreign country to restrict waste input, the foreign would also increase the tax for the goods which we usually input a lot to earn money to balance account.
1.2 Educate the public on how to handle end-of-life products and encourage them to extend their life through repair and reuse
GOOD： The education from the school can make the students know how to recycle the electronic waste and the teach them how to fix to maintain their life. The children behaviors can lead their parents think about themselves, with more and more adult know about how to manage the scrap and fix the thing they buy.

2. Strengthen the supervision of relevant responsible units to prevent e-waste pollution of the environment.
2.1 The factory is required to be responsible for the discharge of pollution
GOOD: Manufacturers pay high bill in the debris of their product, so the manufactures could mention that the bill for them to pay in environmental management is too heavy for them to make them have less profit, they would be concern with their debris and make their product to make less waste.
BAD: Many of the manufacturers pay very high bill in their debris of the product, so most of them will not consider about the debris' future. They only want to get the highest profit and the lowest cost.
2.2 Guide the public to green consumption
GOOD: People behaviors usually can influence the environment, if people choose the environmental protection product as precedence, these would inspire the enterprise force in environmental protection goods because they will think the "environmental protection" could be a stunt to attract people buy more goods from their enterprise, so the enterprise will have a finger in the pie.

3. Recycling of e-waste
3.1 Manufacturers are advised to take into account the environmental impact of products from design, manufacture, sale, consumption to recycling and disposal of waste products.
BAD: Most of the manufacturers only consider about the profit that they can get

from the purchaser and the manufacturers usually don’ t consider about the fee that the consumers need to pay for the government to dispose the waste and the result for the environment.

3.2 Improve the technical level of e-waste recycling

GOOD: The company can avoid mining or exploiting the metal or crude oil to erode the landform or leak oil in to the sea hurt the animal and the atmosphere.

BAD: The purity of the cyclic mixture usually blends with different kinds of other materials like the heavy metal, plastic scrap, they could not eliminate completely. And the rest of the residue may difficult to manage because they are not useful.

3.3 Establish professional electronic waste disposal enterprises

GOOD: The enterprise which can dispose the electronic waste can make them have profit in the special department. As we know there are only few of company do the waste dispose. If we can make professional electronic waste management, that department could be a leader enterprise will get high profit and the government will support them heavily. The government would give some policy to maintain this company to survive.

BAD: These company may usually in heavy stress because they need to solve nearly all of the electronic waste in their city or even

Chemical treatment

The chemical treatment of e-waste, also known as wet treatment, puts the crushed e-waste particles into an acidic or alkaline liquid, and the leachate then goes through a series of processes such as extraction, precipitation, replacement, ion exchange, filtration and distillation to finally obtain high-grade metals.

BAD: The chemical treatment process uses strong acids and highly toxic fluorides, which generate large amounts of waste liquid and emit toxic gases that are harmful to the environment.

Pyrogenetic attatck

Pyrogenetic attatck is a method of incineration, smelting, sintering and melting of e-waste to remove plastic and other organic components enriched with metals.

BAD: In Guangdong Guiyu town and others have adopted these two environmentally harmful treatment methods, which have brought serious impact on the local environment as well as sustainable development.

Mechanical treatment

Mechanical treatment of e-waste is a method of sorting using the differences in physical properties between the components, including disassembly, crushing, sorting and other steps, and the sorted material can then be subsequently processed to obtain recycled materials such as metal, plastic, glass, etc.

GOOD: This treatment method has low cost, simple operation, not easy to cause secondary pollution, easy to achieve the advantages of scale

Microbial treatment

The use of microorganisms to leach gold and other precious metals is a new technology that began to be studied in the 1980s to extract precious metals from low content materials. The activity of microorganisms makes other non-precious metals in gold and other precious metal alloys oxidize and become soluble into the solution, so that the precious metals are exposed for recovery.

GOOD: Biotechnology extraction of gold and other precious metals has the advantages of simple process, low cost and easy operation, but the leaching time is longer.

# Make an Action Plan

Action plan

1. Introduction

1.1 The superiority of this plan

Recycling e-waste as a long-lasting problem which has not yet been perfectly solved by any country is a quite difficult task to do. But from the solutions and evaluations above, we can see that although we cannot think of any superior techniques to reuse electronic waste, there are still methods we can do currently are to disseminate relevant knowledge and information about the seriousness of e-waste in order to raise residents and corporations' awareness of this problem and to persuade government to set regulations to supervise consumers and invest sufficient funds on encouraging elite scientists to develop new techniques to recycle this waste in a more eco-friendly way.

1.2 Survey result& action plan aim

Based on our previous survey, people's wish for reducing electronic waste is high: approximately 75% of survey takers say they will be happy to see the e-waste can be reused and recycled in an appropriate way. Also, we can see that about 20% of these interviewees have little knowledge about the exact drawbacks and problems of e-waste. Thus, our aims are to raise people's awareness of the seriousness of electronic waste and to encourage innovation among scientific researchers.

2. Solution design

2.1. Information Session

2.1.1 Lecture

Finding professional lecturers to impart knowledge about the adverse impact brought by electronic waste and about how to correctly deal with end-of-life products as most residents have not yet formed a correct notion of tackling this waste. Also, we hope residents can be more interactive with lecturers during these sessions as they can ask questions to the lecturers to get a deeper understanding. We will also design different type of lectures based on participants' cognitive level, for adults and students, the content will be more comprehensive and detailed since we believe they are able to memorize more than the senior and children. Besides, detailed booklets can be given in case they forgot what they learnt. As for children and the elderly, our lectures will mainly included the most important and basic information and our informing style will be more vivid, using videos, photos and games to make the whole lecture more understandable. Lectures can be held more frequently for kids and senior citizens since they have more spare time and lecturers can use this extra time to go over information they learnt before as revision.

2.1.2 Theme activities
We will hold theme activities in each community to encourage more people to have a better understanding on e-waste. Games and seminars are given in order to attract more people to get involved especially children and the elderly.
2.1.3 Volunteers
We can find people such as undergraduate students or environmentalists who have the willingness to participate in the information session as volunteers. Using volunteers can effectively reduce the budget and financial burden for the government as they can employ less.
2.14 Animation
Compared with words, using vivid sound effects and diagrams to explain and impart information about the process of recycling end-of-life products and the drawbacks of e-waste to both the environment and people themselves is more attractive and easy for people to understand and remember especially for children and elder residents.

3. Implementation Plan
3.1 How to attract people’ s attention
The main purpose of information session is to disseminate relevant knowledge about electronic waste to residents and raise their attention towards this problem, so what we want is to attract as much people as possible. In order to attract residents’ attention, we can play music or display animation video on a big screen. Also, chairs and canopy tents can be arranged in time so that there are sufficient seats for lectures and seminars. A comfortable place will be more attractive for people to seat down and listen to a lecture. Besides, for the theme activities, we can give out some prizes such as toys, books about electronic waste or some daily necessities for people who actively participate in these activities. Residents especially children or housewives will then be easily attracted by these gifts. For workers, gifts and animation might not be effective, so the best way is to make this information session compulsory for them to participate, or the government can fund firms to give workers who attend these activities bonus or extra holiday. In this way, more people will be willing to join in our information session and hence greatly raise people’ s attention to e-waste.
3.2 Government
3.2.1 Ways of contact
Email of Shenzhen government: webmaster@sz.gov.cn. Website of Shenzhen Human settlements committee: www.szhec.gov.cn. Email of Shenzhen Environmental Sanitation Management Office: szhw@cgj.sz.gov.cn. Email of Shenzhen Science and Technology Innovation Committee: zgczjk@sticmail.sz.gov.cn.
3.2.2 Content of persuasive letters
-the importance of regulations and laws
The government should implement certain regulations to supervise both consumers

and manufacturers who dispose end-of-life products in a wrong way. Giving punishments like fines or compulsory community service can be an effective way to let them think carefully before do so.

-the importance of innovation and improved techniques

The government should invest funds in encouraging more scientific researchers to invent or develop new techniques to solve the way of recycling e-waste. At present, there is not a specific way to extract the useful component from the e-waste, and most of the e-waste is simply buried under the ground or be incinerated which are disastrous way to both the environment and residents nearby. So if scientists can invent an efficient method to deal with this waste, it would be a great progress in both environmental and economic development.

-promotion of willingness of citizens

As the leader in the city, the government should positively participate in our plan, shown as role model for residents. When the government implements certain measures or regulations to deal with electronic waste, residents will take the responsibility to protect the urban environment together. Besides, the government should also disseminate relevant information to citizens frequently and show their enthusiasm on solving this problem. In this way, citizens will consider the government as a responsible and competent agency and will be more cooperative with the government.

# Prototype and Test

## Prototype Design

Due to our limited knowledge in Chemistry and other subjects, and lack of ability to deepen in to the e-waste recycling industry, the only thing we can do is to advocate and inform consumers with the importance of recycling electronic products. At the same time, we can encourage producers to produce and treat these end-of-life products in an eco-friendly way. This logo is regarded as a symbol of our notion and action towards e-waste and hence we want to use this logo to represent our attitude and idea to people.

logo

## Feedbacks learnt from users

*This part is absent or not available temporarily.*

## Improvement for next iteration

*This part is absent or not available temporarily.*

# Team Credits

Summary: Lin Zetong
Identify the Challenges: She Wanwan
Identify a Root Cause: Lin Zetong, She Wanwan, Liu Ruiqi, Xie Chuqing, Wu Yue
Generate the solutions: Liu Ruiqi
Identify the Criteria: Lin Zetong
Evaluate the solutions: Wu Yue
Make an Action Plan: Xie Chuqing

# Onsite Conference File

# Judge Comments

" I applaud the team for picking up e-waste recycling as a topic to explore. It is often shocking to see the quantum of the amount of electronics that we waste. The team has identified and explored the background of the issue in good detail. However, as with any scientific work, I encourage them to properly cite their sources. This helps someone else who wants to build on or even challenge your work to be able to do so in a more effective manner.
It is good to also see that the team has briefly touched on planned obsolescence. I encourage them to explore the topic further as they develop this work, especially the link to demand. It also encourages the team to reflect on how overall global demand and growth in complexity of technology has affected e-waste as well. A more advanced policy approach to e-waste issue to explore further is EPR (extended producer responsibility).
I would suggest to the team that no problem is too big to tackle! I really appreciate the intent to write a letter to your local representative highlighting the harm caused by e-waste as well as enlightening the community about these issues. These steps, while small, could easily become the first steps in a successful journey! Good luck and I hope the team continue this (and similar) work to improve the environment and society we live in.
"