**China's** toxic informal **e**-**waste** recycling: local approaches to a global environmental problem.

1. China’s inexpensive labour and manufacturing abililties have already made it the world’s factory and for e-waste recycling it is no exception. Informal workers do majority of e-waste collection and recycling in cities throughout China.
2. The illegal global trade of e-waste makes it a transboundary environmental governance problem of local and global scales.
3. Weak e-waste legislation and social marginalization are also major barriers to protecting e-waste recyclers and the environment.
4. E-waste can be defined as , “end-of-life electronic products including computers, printers, photocopy machines, television sets, mobile phones and toys, which are made of sophisticated blends of plastics, metals, among other materials.
5. The U.S., U.K, and the EU are the major exporters of e-waste to China benefiting from low-cost labour and disposal. Only 25% of all e-waste is accounted for and recycled safely by official mean , the remaining 75% is lost in the illegal e-waste stream.
6. China is the largest producer, consumer and exporter of e-waste in the world. The global estimate of e-waste generation is 20-50 million tons annually, the UN predicts that by 2017, e-waste generation will increase to 65.4 million tons per year. Moreover, 70%-80% of all e-waste is exported to Asian countries and 90% of that is received by China.
7. Mordern electronic appliances have a complex mix of materials and can contain up to 60 different elements, ,some reusable, some hazardous and some both. This complex mix is especially found within PCBs (Printed Circuit Boards), which are burned in the open air and mined for chips and precious metals.
8. Informal workers do not utilize personal protective equipment due to either lack of education about the dangers of unsafe recycling practices or lack of access to equipment.
9. Informal workers handle, disassemble, shred, burn, and smelter e-waste products to recover reusable materials within. The burning of e-waste is used to retrieve precious metals and raw material. Copper is stripped from wires in open-air acid baths, rotors are melted to extract aluminium and silver, and the majority of dismantling is done by hand. During dismantling, recyclers are exposed to dioxins, POPS (PERSISTENT ORGANIC POLLUTANT), brominated flame retardants and heavy metals, which persist in the environment for long periods of time.
10. The China WEEE directive, or the regulations for the administration of the recovery and disposal of waste electrical and electronic products, went into effect on January 1, 2011, introduces the principle of extended producer responsibility and covers the duties of manufacturers, importers, repairers, and enterprises dealing with the disposal of e-waste.
11. Article 22 states that enterprises not qualified for disposal of WEE shall be prohibited fro disposing WEEE products. Qualification requrements include having proper facilities and professional technical personnel along with appropriate equipment for safety and environmental protection. Article 34 also call for the use of centralized disposal areas, as to comply with the pollutant discharge standards and the environmental standard for pollution prevention and treatment caused by solid wastes. The directive does not consider the existing dispersed small shops that collect e-waste for disposal , many of which are not qualified.
12. Article 7 is one of the most important facets to the directive, announcing a fund for the disposal of WEEE products to tbe established, thereby providing a funding mechanism for WEE treatment. It states that enterprises producting EE products have an obligation to t pay into the fund and it also provides subsidies to qualified disposal and recycling operations. However, “Several critical matters concerning the fund also remain open for the Mnisitry of Finance to determine including what entities are required to contribute to the fund, and how contriuction amounts will be determined” (Ji, 2011:368). This lac of detail on provisioning of the fund leaves many questions about how licensed plants will be able to afford the treatment and processing costs, especially if they are faced with inadequate amounts of e-wastes. This also reflects the Directive’s vagueness of producer responsibilities despite its focus on EPR.
13. Article 5 recognizes that the system should include the current multi-channel network of collector, buyers and sellers of e-waste products but lacks coordination with these social realities. Informal collectors are hard to trace since they work on their own time and it is hard to determine the working relationships they have with which small enterprises or recycling plants. There is thus no way to monitor whether informal collectors deliver to certified enterprises are not vigorously enforced (Chung and Zhang, 2011). Legislation does not recognize the formal is still inseparable from the informal system. Furthermore, refurbished and resold second hand products are not guaranteed to have met mandatory health and safety requrements as Article 12 requires , seeing as there is no authorized certification organization for second hand products.
14. The China RoHS or the Administrative Measure of the Control of Pollution Caused by Electronic Information Products was enforced in 2007 and aims to reduce or eliminate the pollution of toxins and harmful substances contained in EE products.
15. The RoHs limits six toxic substances, including lead, mercury, cadimium, hexavalent chromium, PBBs (polybrominated biphenyls), and PBDEs (polybrominateddiphenyls ethers).
16. Chinese consumers have little knowledge of RoHS compliant products, there is a lack of suppliers who screen for RoHS compliance, and there is a shortange of industry from adopting China RoHS practices. There is also a lack of finances for RoHS training and problems with innovative technology. The major stakeholders in electronic manufacturing, industry , and corporate sector believed that the lack of government supportive economic policies was the strongest barrier to China RoHS implementation and that all three ranked lack of RoHS practices to be shared and studied was a significant barrier.
17. Zhongguancun, Houbajia, and Dongxiaokou in China was examined and found that E-waste collectors have freedom to collect what they want at locations they choose. They build business relationships with a large network of collectors, vendors and small enterprises.
18. Informal e-waste is difficult to regulate because of socio-economic reasons.
    1. Large disparity of income and livelihoods between rural and urban areas in china. This creates a flow of second-hand electronic and electrical products from urban to rural areas.
    2. There is a general unwillingnenss of consumers to return their WEEE to companies or licensed plants as the price consumers receive form formal or government facilities is significantly lower due to collection and treatement costs. A pilot project in Suzhou could only offer 50 Yuan for an old computer, while informal collectors offered 150-200 Yuan, plus the convenience of door-to-door collection.
19. Only socially marginalized people are engaged in informal recycling so it creates a barrier to government recognizing that workers are vital members of society whose work provides livelihoods and a valuable community service.
20. **The informal sector’s unwillingness to be regulated is perhaps the largest barrier to ensuring safe practices in e-waste recycling work. Collectors and dealers are free to buy and sell whatever they want. They are independent and they donot want to lose money with mandated pricing or lose their jobs to mechanical processing.**
21. The government’s lack of direct recognition and reluctance to address poor working conditions, health and environmental risks in the informal sector is the biggest hurdle
22. Legislation has mostly focused on producers in the upstream and official recycling processes in the downstream. Regulations drafted specifically for informal e-waste recycling is needed.
23. Regional goernance required by WEEE directive and RoHS should no tonly regulate transboundaye-waste movements but cacn improve sustainable development of EE by fostering innovation in technologies as well as knowledge exchange and education. Regulation should include creating partnerships with southeast Asian countries to increase monitoring at ports of entry and customs where the illegal e-waste trade is active.
24. NGOs like Greenpeace and the Basel Action Network and many others have illuminated the enormous health risks faced by informal plastics and e-waste recyclers, but few have yet to take action on the ground to address the problems. In China, NGOs have now become important non-state actors in the political arena. NGOs need to conduct more local research, including interviews and surveys that take a social perspective to understand the complexities of the e-waste sector, and understand how e-waste dealers work every day, what challenges they face, and what methods would be most beneficial in enabling their safe work.
25. Both NGOs and GONGOs can also help build monitoring capacity of small enterprises so that practices meet occupational health and safety standards, even if they are not licensed. They can develop safer manual dismantling practices with workers so that they reduce dangers of contamination. Education should include how to properly handle certain EE items such as batteries , rotors, and PCBs along with proper dismantling of appliances such as refrigerators and air conditioners.
26. **Legislation needs to recognize the efficiency of the informal recycling market to strengthen safer modes of recycling.This means realizing the potential of the informal work force and legitimizing their work and place in society by creating legislation that integrates the existing system by improving existing methods and not necessarily replacing them.**