The Dynamics of E-waste

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Background

E-waste[1], or electronic waste, is one of the fastest growing waste streams, due to the rapid obsolescence of electronic goods and contemporary consumption patterns.

A portion of E-waste can be sold and reused as second-hand products, effectively expanding the lifespan of electronic products and bridging the digital gap between countries (Ejiogu, 2012). Moreover, E-waste contains valuable metals, such as copper, silver and gold, that can be extracted (Herat & Agamuthu, 2012; see also Schluep et al., 2009). On the downside, E-waste also contains numerous toxic substances (Robinson, 2009).

Facts & Figures

- E-waste is one of the fastest growing types of waste (Widmer *et al*., 2005);
- 20-50 million tonnes of E-waste is generated globally per year (UNEP, 2006);
- E-waste is mostly produced by Europe, the United States and Australasia (Robinson, 2009);
- E-waste comprises 8% of municipal waste in rich countries (Robinson, 2009);
- Two-thirds of E-waste from the EU and US ends up in landfills and is not recycled properly (European Commission, 2011);
- 51% of E-waste shipments to non-OECD countries is illegal (Kraan *et al*., 2006);
- An estimated 75% of computers shipped to developing countries is irreparable waste (Benebo, 2009; Schmidt, 2006).

Each year, large quantities are transferred between countries. Exporting countries often violate international treaties on the transfer of hazardous waste (Robinson, 2009). Receiving countries often lack legislation or an overview of what is coming into the country and the know-how to safely process E-waste (Herat & Agamuthu, 2012). When handled improperly, E-waste pollutes the water, soil and air, and affects human health (for an overview, see Herat & Agamuthu, 2012; Ejiogu, 2012; Robinson, 2009). There is evidence that some (agricultural) export products are contaminated as well (Robinson, 2009).

For all these reasons, E-waste has received lots of attention in the receiving countries and in the scientific community. This peer-reviewed Science Digest provides a brief overview of E-waste research, and recent findings.

Scientific Debate

In the past five years alone, there were more than 1,500 scientific articles dealing with E-waste. Research on this topic is mostly done in the areas of environmental sciences and engineering. Corsini et al. (2013, forthcoming) reviewed E-waste research from 2001 to 2011. Management and policy issues were predominant areas of research in Europe, during the period going from 2001 to 2006. Chemical pollution of the environment and related health issues in developing countries gained a predominant role from 2006 to 2011. Recycling activities are present in the different areas of studies mentioned above. In comparison to other research areas, E-waste logistics have been a small area (Corsini et al., 2013, forthcoming).

Two of the few scientists who did conduct research on the logistics of E-waste, are Lepawsky & McNabb (2010). They mapped international flows of E-waste (see Figure 1). Contrary to what is commonly thought, Lepawsky & McNabb found that: 1) the international trade in E-waste is a more complex story than being one about

Impacts of E-waste (Robinson, 2009)

- E-waste pollutes the soil, the air, and the water;
- People are exposed to the contaminants through smoke, dust, drinking water and food;
- Fish, prawns, carp and other marine life near E-waste spots are contaminated with toxic substances;
- Some agricultural or manufactured products for export are contaminated.

[1] E-waste and WEEE (Waste Electrical and Electronic Equipment) describe discarded appliances that use Electricity. E-waste describes discarded electronic goods, such as computers, televisions and cell phones, while WEEE also includes traditionally non-electronic goods such as refrigerators and ovens (Robinson, 2009).

'rich' countries dumping waste in 'poor' countries, 2) the trade in E-waste occurs mainly within regions, instead of between regions, 3) the *Pollution Haven Hypothesis*[2] is an important, but partial, explanation of observed trade patterns and, 4) there is a need to conceptualize the trade and traffic of E-waste as dynamic processes.

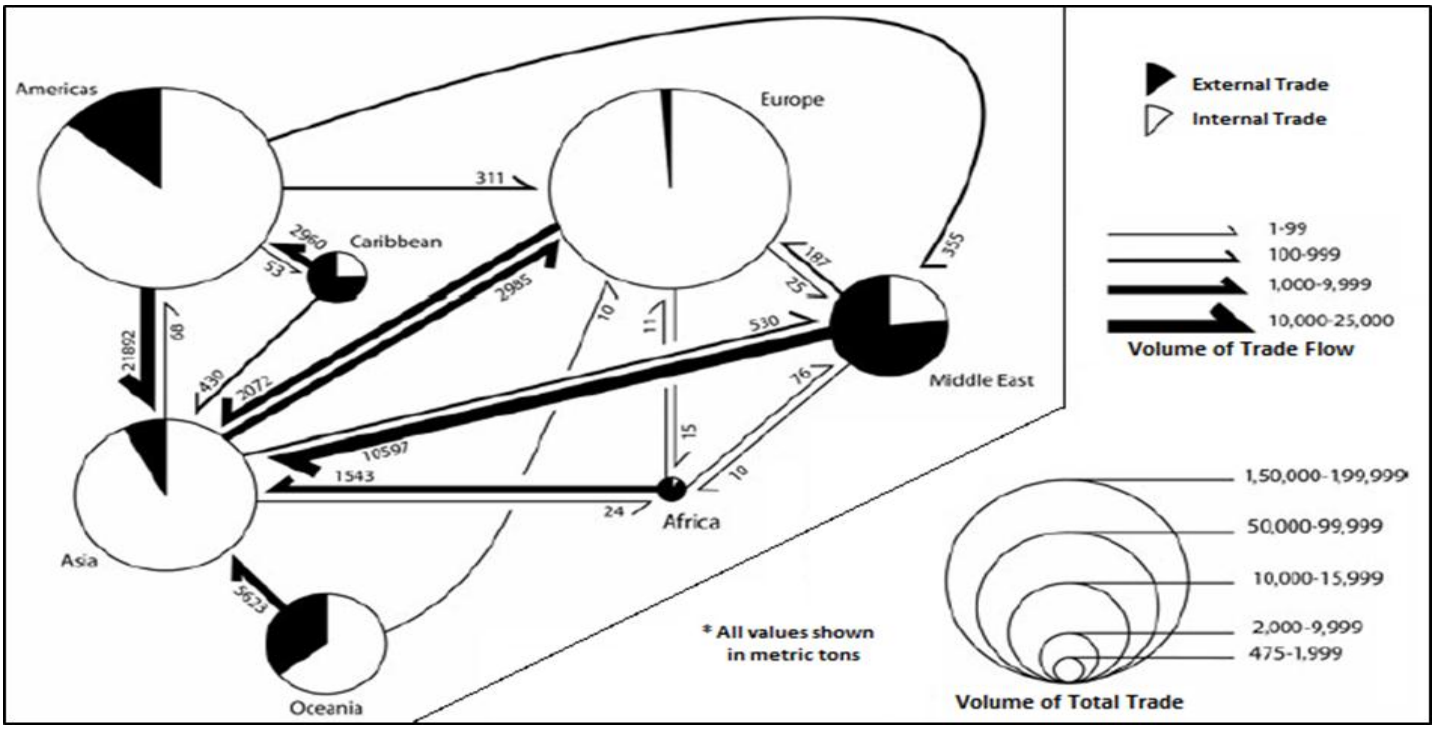

Figure 1. Global trade in E-waste, 2006
Source: UN COMTRADE, calculations and Figure by Lepawsky and McNabb (2010); Layout partially adapted by author.

The emergence of transnational crime around E-waste is another neglected topic. A frontier scientist in this area is Bisschop (2012). She analysed the case of illegal transports of E-waste in a European trade hub, by conducting field research and interviews with key informants. She found that many different actors, both legally and illegally, knowingly or unknowingly, facilitate or are involved in the illegal transports of E-waste. Some of her informants disclosed the involvement of organised crime groups. She concluded that economic, cultural, political and social motives and opportunities together determine the illegal flows of E-waste.

Environmental, economic and social issues associated with E-waste are changing. For example, China is becoming a major E-waste producer (Robinson, 2009). The chemical composition of E-waste changes with the development of new technologies and pressure from environmental organizations on electronics companies to find alternatives to environmentally damaging materials (Robinson, 2009). The routes of E-waste change (Lepawsky & McNabb, 2010; Bisschop, 2012), as well as the final destinations (see also Bernhardt & Gysi, 2013).

Further issues for consideration

The following issues are suggested for consideration by policy makers:

- More responsibility for producers of electronic goods;
- Efficient use of metals by reusing and recycling a larger proportion of E-waste.

[2] The *Pollution Haven Hypothesis* is the proposition that pollution-intensive economic activity will tend to migrate to those jurisdictions where costs related to environmental regulation are lowest (Lepawsky & McNabb, 2010).

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