



European Union Action to
Fight Environmental Crime

Illegal shipment of e-waste from the EU

A case study on illegal e-waste export from the EU to China

Work Package 4 “Case Studies”



This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no 320276.

ACKNOWLEDGEMENT

The research leading to these results has been carried out as part of the research project "European Union Action to Fight Environmental Crime" (www.efface.eu). EFFACE is a collaborative effort of 11 European universities and think tanks and is coordinated by the Ecologic Institute (www.ecologic.eu). The research leading to these results has received funding from the European Union FP7 under grant agreement No 320276.

AUTHOR(S)

Kristof Geeraerts, Institute for European Environmental Policy (IEEP)

Andrea Illes, IEEP

Jean-Pierre Schweizer, IEEP

With thanks to:

Paolo Razzini and Dr. Andrew Farmer

Manuscript completed in January 2015

This document is available online at: www.efface.eu

This document should be cited as: Geeraerts, K., Illes A. and J-P Schweizer (2015). Illegal shipment of e-waste from the EU: A case study on illegal e-waste export from the EU to China. A study compiled as part of the EFFACE project. London: IEEP.

DISCLAIMER

The text reflects only the authors' views and the EU or the Ecologic Institute are not liable for any use that may be made of the information contained therein. The views expressed in this publication are the sole responsibility of the author/s and do not necessarily reflect the views of the European Commission.

For permission to reproduce, please contact the Ecologic Institute at envcrime@ecologic.eu.

ABSTRACT

This report examines the case of illegal shipments of e-waste from the EU to China and the effectiveness of EU legislation to counter these shipments. Although the import of e-waste into China has been officially banned since 2000, it is estimated that around 8 million tonnes of e-waste are imported illegally into China every year. Despite empirical data suffering from high uncertainties, the scale of the e-waste trade, its environmental and health impacts, and its links to crime are difficult to contest. This case study reveals that many legal actors, such as companies, are involved in illegal e-waste shipments and that many actors involved walk on a thin line between legal and illegal. Profit plays a crucial role, but a series of push, pull and facilitating factors gives a more sophisticated picture of the drivers and motivations behind this environmental crime. Loosely structured organised crime groups are often behind illegal trafficking of e-waste to China. Traditional mafia-like organised crime groups seem to be rather marginally involved, mostly as facilitators of the e-waste crime. Enforcement in the EU suffers from differences in implementation of relevant legislation among Member States. The EU legislative framework, which has been significantly amended in recent years, however is sufficiently coherent and does not show major gaps. The recent legislative amendments have the potential to improve inspection and enforcement on the ground, but it remains to be seen whether this will effectively occur. Given the complexity of the e-waste problem approaches beyond enforcement and inspections are needed. As part of its conclusions this report also presents a series of policy recommendations.

Table of Contents

Executive summary	9
1 Introduction	12
1.1 Structure of the case study	14
2 Literature review	15
2.1 Main focus areas of the literature review	15
2.1.1 Regulatory framework behind the case study	15
2.1.2 General overview: the extent and the impact of the illegal activity	16
2.1.3 Links to organised crime with a view on key actors and the drivers behind illegal WEEE shipment	16
2.1.4 Problems with enforcement	17
2.1.5 Case study focus: main exporters in the EU and China	17
3 Description of the methodology	19
3.1 General research questions	19
3.2 Case specific research questions	19
3.3 Research methods applied: literature review and semi-structured interviews	20
4 Case presentation	21
4.1 Introduction: geographical scope and the extent of the illegal activity	21
4.2 Legal framework in the EU and China	22
4.3 The effectiveness of EU legislation and its enforcement	25
4.4 The effectiveness of Chinese e-waste legislation/policies and its enforcement	30
4.5 Main institutions involved at the different governance levels	31
4.6 Overview of key stakeholders	32
4.7 Links to organised crime	34
4.8 Motivations and drivers behind the illegal export of WEEE	36
4.9 Key environmental, social and economic impacts in China	38
4.10 Key groups of victims	40
5 Conclusions and policy implications	41

5.1	Nature of the environmental crime	41
5.2	Enforcement in the EU	42
5.3	Approaches beyond enforcement and inspections	43
References.....		45
Annex A: List of interview questions		51
Annex B: List of interviewees.....		53

List of Figures

Figure 1: The geographical scope of the case study: the European Union and China (with a focus on the main e-waste recycling and dismantling sites in China) 21

Figure 2: Actors involved in illegal e-waste shipments..... 32

List of Boxes

Box 1: Definition of WEEE and waste in EU legislation..... 12

Box 2: Examples of literature with similar case study focus..... 18

Box 3: Big e-waste smuggling case in China 35

Box 4: Transit through Vietnam 36

LIST OF ABBREVIATIONS

BAN	Basel Action Network
Bo2W	Best of two Worlds Model
CWIT	Countering WEEE Illegal Trade
EEA	European Environmental Agency
EEE	Electrical and Electronic Equipment
EFFACE	European Union Action to Fight Environmental Crime
EIA	Environment Investigation Agency
ELV	End-of-life Vehicle
ENPE	European Network of Prosecutors for the Environment
ESM	Environmentally Sound Management
EU	European Union
EUFJE	European Union Forum of Judges for the Environment
IEEP	Institute for European Environmental Policy
ILO	International Labour Office
ILT	Human Environment and Transport Inspectorate (the Netherlands)
IMPEL	European Union Network for the Implementation and Enforcement of Environmental Law
IMPEL TFS	IMPEL Transfrontier Shipment of Waste Cluster
ISWA	International Solid Waste Association
NGO	Non-governmental Organisation
OCGs	Organised Crime Groups
OECD	Organisation for Economic Co-operation and Development
PAHs	Polycyclic Aromatic Hydrocarbons
PBDEs	Polybrominated Diphenyl Ethers
PCBs	Polychlorinated Biphenyls
PCDD/Fs	Polychlorinated Dibenzo Dioxins/Furans
PIC	Prior Informed Consent
StEP	Solving the E-Waste Problem
SVTC	Silicon Valley Toxics Coalition
UNODC	United Nations Office on Drugs and Crime

WEEE	Waste Electrical and Electronic Equipment
WSCEP	Waste Shipments Compliance and Enforcement Platform
WSR	Waste Shipment Regulation

Executive summary

The case of illegal shipments of e-waste from the EU to China

The illegal shipment of e-waste from the European Union (EU) to third countries provides an example of a complex and serious environmental crime. Over the past decade or more, cross-border transport of e-waste to third countries has increased significantly. The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal has been translated into EU law via the EU's Waste Shipment Regulation (WSR) which forbids the export of Waste Electrical and Electronic Equipment (WEEE) to non-EU countries; nevertheless it is estimated that around 2 million tonnes of WEEE illegally leave Europe each year (Zoetman 2006).

China represents the largest downstream destination for e-waste exported from North America and Europe. According to the UNODC (2013) around 80 per cent of the total global amount of e-waste ends up in Asia – with around 90 per cent shipped to China. Despite the fact that the import of e-waste into China has been officially banned since 2000 the UNODC estimate implies that around 8 million tonnes of e-waste is imported illegally into China every year. Towns like Guiyu and Taizhou in China represent(ed) the most established and notorious locations for e-waste crimes, both in terms of the scale of the flows of WEEE and the impacts which they have had.

Despite empirical data suffering from high uncertainties, the scale of the e-waste trade, its impacts across spheres, and its links to crime are difficult to contest. Although the crime itself often involves less structured and centralised groups than other crimes, the severity of its impacts and its relation with other crimes suggest the seriousness of this issue. The impacts of e-waste trade are pervasive in the sites of e-waste management in China, where contamination of air, soil, water and biota are considerable. Environmental impacts have generated a considerable public health threat, with spill-over to surrounding areas through water and food systems. Employing large numbers of local and migrant workers, WEEE shipments have transformed social realities for people living in parts of China. For some this has become a lucrative industry, but for the majority involved it has worked to reinforce inequalities which intersect gender, race, class and age.

Alongside the availability of literature and empirical research, it is for these reasons that China has been chosen as destination country within this case study on illegal e-waste shipments from Europe.

Main findings

There is a **wide range of actors** who can be either directly or indirectly related to illegal e-waste shipment from the EU to China: producers, distributors, consumers, collectors, refurbishers, waste brokers, shipping companies, shipping agents, terminal operators, environmental inspectors, custom officials, police officers, organised crime groups, recyclers, downstream vendors, actors responsible for final disposal etc. More importantly the case study reveals that many legal actors such as legal companies are involved in illegal e-waste shipments, whether intentionally or not, and that many of the actors involved walk on a thin line between legal and illegal.

Although profit-making is a key explanatory factor, the main **motivations and drivers** for illegal e-waste shipments from Europe to China are the asymmetries in WEEE regulation and its enforcement, the asymmetries in development/unemployment and access to resources which exist between Europe and China, the massive production of e-waste in Europe, the reuse value of e-waste in China, the complexity of the e-waste flows and the competitiveness of the market and the ineffective or insufficient enforcement of

regulations in relation to the shipment of waste. In addition, factors such as ethnic networks, the cheapness of ship container transports and the nature of e-waste facilitate illegal transports.

Organised crime groups are often behind illegal trafficking of e-waste to China, although these groups are usually more loosely and informally structured than traditional mafia-like groups. Nevertheless, traditional organised crime groups might also be involved, but rather keep a low profile and act as facilitators of the e-waste crimes.

The current **EU legislative framework** to fight illegal e-waste shipments (mainly the Waste Shipment Regulation and the WEEE Directive), which has been significantly amended in recent years, is sufficiently coherent and does not show major gaps. However, there is still no level playing field within Europe as a result of differences in implementation and interpretation at Member State level. This holds in particular for prosecution: the number of infringements actually brought to the courts, the extent to which penalties are applied and the levels of the actual penalties greatly vary. There is furthermore a lack of exchange of information among public prosecutors. The EU therefore keeps on struggling to adequately enforce the rules to counter illegal shipments of e-waste to countries such as China.

The EU has introduced **extensive amendments** to both the **Waste Shipment Regulation** (in 2014) and the **WEEE Directive** (in 2012) concerning inspections and enforcement. These amendments have the potential to improve inspection and enforcement on the ground. Whether these will effectively occur will however depend on the willingness of the individual Member States to provide the necessary resources (such as budget and staff) to implement the new provisions in a meaningful way.

Furthermore, the **effectiveness** of the Waste Shipment Regulation and the WEEE Directive in halting illegal e-waste exports from the EU and halting the negative impacts on public health and the environment in China (and other developing countries) remains relatively limited given the complexity of the e-waste problem and its inter-linkage to broader waste management in the EU. The amendments to the EU legislation might yield improvements in enforcement but is unlikely to change the fact that **approaches beyond enforcement and inspections** are needed to deal adequately with the e-waste problem.

Main policy implications and recommendations

- Environmental harm rather than environmental crime should be taken as a frame of reference when trying to address the negative effects of e-waste shipments in developing countries.
- The focus of policy makers in Europe (and China) should not only be on strict crimes but also on activities that are on a thin line between legal and illegal activities.
- European policy makers should nevertheless make the fight against transnational e-waste crimes (and other transnational crimes related to the 'grey environment') a priority.
- European policy makers should provide for instance for substantial and permanent budgets for international police cooperation (at the level of Interpol or Europol) or for increased customs and other controls at the external borders of the EU.
- Member State authorities should introduce a more integrated approach towards enforcement whereby inspection activities downstream in the e-waste chain (e.g. at EEE outlets or at e-waste collection points) and inspection or other enforcement activities in more upstream segments of the chain (e.g. in ports) mutually support and inform each other.
- A list of contact points of prosecutors in the different Member States could be set up in order to enhance cooperation between prosecutors around Europe.
- Practitioners should also share their relevant case law best practices. The database of case law on environmental crime which is currently being developed by the IMPEL Transfrontier Waste Shipment Task Force and which has a special focus on illegal e-waste shipment could be helpful in this respect.
- Major enforcement stakeholders such as Europol, Interpol, IMPEL, the European Commission, ENPE, the Basel Secretariat and the UNODC could enhance cooperation further. The relevant competent authorities around Europe could establish joint investigation teams specifically focusing on the illegal shipment of e-waste.

- Confiscation measures could be implemented in order to create a less 'attractive' environment to commit the crime.
- Difficulties linked to investigating illegal shipments of e-waste from the EU to China and other countries could be surmounted by employing instruments on organised crime, such as the Palermo Convention. Therefore a broadening of this Convention's definition of 'organised crime' would have to be considered in order to incorporate environmental crime and illegal e-waste shipments in particular.
- The more frequent use of intelligence-led enforcement would provide a better insight on the illegal activities and would help to track down the worst offenders and organised crime groups. Furthermore, the more information key institutions have on illegal e-waste shipment the easier it would be to prevent these illegal activities.
- Approaches are needed that enhance regulation of the (informal) recycling industry in developing countries in order to avoid environmental harm from inadequate disposal of e-waste.
- The "Best of two worlds model" (Bo2W model) for instance suggests to integrate technically and logistically the manual dismantling of e-waste in developing countries and the 'best' end-processing practices in international state-of-the-art facilities (where hazardous and complex components are treated).
- However, for a country like China with a medium level of labour costs and a huge e-waste market it is recommended to practice full manual dismantling as a start and gradually mechanize pre-processing activities and to treat hazardous and complex e-waste fractions in international end-processing facilities. In the long run China could settle end-processing facilities locally.
- The EU could support establishing collection and recycling facilities in developing countries in accordance with the Bo2W philosophy. EU support measures might be partly or fully financed by electronic producers in the EU within the context of extended producer responsibility.
- Policies are needed that are even more than now directed towards the prevention or reduction of e-waste through reducing toxics or replacing them all together, making products environmentally friendly and easier to dismantle and recycle, thereby closing loops (extended producer responsibility) but also towards the reduction of consumption of electronic and electrical tools in Europe and the rest of the developed world.
- Consumers should be made fully aware of the possible links of illegal e-waste export in the EU, in particular of the vast amount of actors involved in the lengthy chain and their potential roles. More targeted awareness-raising campaigns could ensure the opportunity for citizens to put public pressure on national decision-makers to increase their efforts to tackle this environmental crime.

1 Introduction

The illegal shipment of e-waste from the EU to third countries provides an example of a complex and serious environmental crime. Over the past decade or more, cross-border transport of e-waste to third countries has increased significantly. The international Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal has been translated into European Union law via the EU's Waste Shipment Regulation (WSR) which forbids the export of WEEE to third countries; nevertheless it is estimated that around 2 million tonnes of Waste Electrical and Electronic Equipment (WEEE) illegally leave Europe each year (Zoetman 2006).

Box 1: Definition of WEEE and waste in EU legislation

According to the WEEE Directive e-waste “*means electrical or electronic equipment which is waste within the meaning of Article 3(1) of Directive 2008/91/EC, including all components, sub-assemblies and consumables which are part of the product at the time of discarding*”.

The Waste Framework Directive (2008/91/EC) defines waste as “*any substance or object which the holder discards or intends or is required to discard*”.

Source: Directive 2008/91/EC and Directive 2012/19/EU

Illegal shipments of e-waste represent an economic opportunity to those involved, but those receiving the waste, particularly localised informal recycling practices carry significant environmental, social and economic risks. The toxicity of this trade has become renowned and is best represented in images of endless piles of discarded computer monitors, televisions, copper wiring and polychlorinated biphenyls (PCBs) in Asia and Africa; and signifies the costs to be paid for a throw-away approach to Electrical and Electronic Equipment (EEE) which has been a luxury primarily enjoyed by those in Europe and North America. The adoption of the revised WSR in June 2014 aims to address many of the limitations of existing legislation and curb the scale of flows. Nevertheless it is expected that the export of WEEE will continue to be a significant concern.

China represents the largest downstream destination for e-waste exported from Europe. According to the UNODC (2013, p.105) around 80 per cent of the total global amount of e-waste ends up in Asia – with around 90 per cent shipped to China. Towns like Guiyu in China represent the most established and notorious locations for e-waste crimes, both in terms of the scale of the flows of WEEE and the impacts which they have had. Alongside the availability of literature and empirical research, it is for these reasons that China has been chosen as the most relevant case study for the European Union Action to Fight Environmental Crime (EFFACE) project, although it should be said that similar practices occur in other parts of Asia and Africa.

Based on existing literature and a number of semi-structured stakeholder interviews, this case study addresses five general research questions, as well as five additional case specific research questions (see Chapter 3) - firstly placing WEEE in the context of other environmental crimes in general, and secondly bringing out some of the nuances and peculiarities which this particular environmental crime can contribute to EFFACE respectively. A review of existing academic and grey literature on e-waste provides a basis for the study. This draws on both academic and grey literature, as well as the relevant regulatory framework, focusing on the Basel Convention and the WSR, but also considering additional legislation from Member States and China.

Whilst there is a growing body of literature on e-waste, empirical data suffers from high uncertainties. Nevertheless the scale of the e-waste trade, its impacts across spheres, and its links to crime, and organised crime in particular, are difficult to contest. Although the crime itself often involves less structured and centralised groups than other (environmental) crimes, the severity of its impacts and its relation with

other crimes suggest the seriousness of this issue. The impacts of e-waste trade are pervasive in the sites of e-waste management in China, where contamination of air, soil, water and biota are considerable. Environmental impacts have generated a considerable public health threat, with spill-over to surrounding areas through water and food systems. Employing large numbers of local and migrant workers, WEEE shipments have transformed social realities for people living in parts of China. For some this has become a lucrative industry, but for the majority involved it has worked to reinforce inequalities which intersect gender, race, class and age.

E-waste is also a matter for wider European and global concern. It highlights asymmetries in regulation, development and access to resources. Price differences in managing waste locally in Europe compared to exporting it to China motivate the crime. Existing legislation has largely failed to quell WEEE flows, and is undermined by a lack of a coherent and coordinated approach to managing e-waste and applying the WSR across Member States. Amendments to the WSR introduced in June 2014 will not fully come into force until 2017, but are hoped to address many weak points in enforcement chains.

1.1 Structure of the case study

The remainder of the case study is structured as follows:

- Chapter 2 provides an overview of the academic and grey literature that has been reviewed for this case study.
- Chapter 3 describes the methodological approach that has been applied and also lists the general and case specific research questions.
- Chapter 4 presents the core analysis of the case study examining a number of different aspects of the illegal shipments of e-waste from the EU to China.
- Chapter 5 outlines the main policy implications and conclusions linked to the case study.
- Annex 1 includes the list of questions that have been asked during the semi-structured interviews.
- Annex 2 provides the details of the interviewees.

2 Literature review

This chapter provides an overview of the academic and grey literature that has been reviewed for this case study on illegal WEEE shipment from the European Union to China, highlighting key conclusions and information gaps identified by the research community. This literature review involved the systematic research of both ‘grey literature’ produced by governmental, research and non-governmental organisations (e.g. European Commission, European Environment Agency, Secretariat of Basel Convention, United Nations Environmental Programme, Interpol, Greenpeace and Basel Action Network), as well as academic literature. In order to fully understand the context of the environmental crime assessed in this case study an extensive review of the legal background of transboundary shipment of waste was also undertaken. Finally, information published on the websites of relevant initiatives and platforms, such as the StEP¹ Initiative (StEP 2014), the WSCEP² Platform (WSCEP 2013) and ewasteguide.info information site (ewaste 2009), were also reviewed.

2.1 Main focus areas of the literature review

In order to effectively carry out a systematic research of relevant literature a staged approach was applied, i.e. in view of the objectives of this case study key focus areas of the literature review were established and relevant publications were reviewed under the different topics. These areas and the main literature found under them are further detailed below.

2.1.1 Regulatory framework behind the case study

As a starting point, key regulations and policies governing the transboundary shipment of waste were extensively reviewed in order to fully understand the regulatory framework against which the illegal activity is taking place.

The two key international treaties addressing waste shipment are the ‘Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal’ (Basel Convention 1989) and the ‘OECD Council Decision Concerning the Control of Transboundary Movements of Wastes Destined for Recovery Operations’ (OECD Decision 2001). The principles of these agreements are translated into European Union law via the EU Waste Shipment Regulation (WSR) (Regulation (EC) No 1013/2006) and subsequent Decisions. Given that the case study’s focus is on illegal e-waste export from the EU the main legal framework on which the case study builds on is the EU WSR; specifically its provision to ban the shipment of hazardous wastes from the EU to non-OECD countries.

In 2013, the European Commission proposed a revision to the WSR to provide for stronger national inspections of waste shipments, which was officially adopted in 2014. As a result, the EC proposal (EC 2013b) and the final amendment (Regulation (EU) No 660/2014) were also reviewed together with the Impact Assessment (IA) of the EC proposal (EC 2013a), which provides a useful background on the current enforcement problems behind illegal activities related to the WSR. Furthermore, a guideline on WEEE shipment developed by the EC (EC 2007) informed our understanding of the legal requirements of the WSR. Given its link to the EU WSR the WEEE Directive (Directive 2012/19/EU) was also reviewed by the study team.

In order to get a complete picture on the regulatory framework behind the case study the legislative developments on e-waste regulation in China were also reviewed by the study team. Various publications were found to provide a good overview of the current legal situation on e-waste import in China (e.g. Ni and Zeng 2009, Juan 2009, Wang et al. 2013).

¹ Solving the E-Waste Problem

² Waste Shipments Compliance and Enforcement Platform

2.1.2 General overview: the extent and the impact of the illegal activity

Cross-border transportation of waste, between both EU Member States and to and from third countries, has increased tremendously during recent years. Although such changes provide significant opportunities they also inherently carry substantial risks. Illegal waste shipment is one of the main problems in relation to transboundary waste shipment, which creates significant harm to the economic, social and environmental sectors; and according to the EEA (2012, p29-30) the number of illegal waste shipment instances in the EU is increasing. E-waste is one of the waste streams which have the most detrimental effects and therefore extensive literature can be found providing a good introduction to this type of environmental crime (see for instance EEA 2012, ILO 2012, Baird et al. 2014, Bisschop 2012, OECD 2012 and Salehabadi 2013). Some publications attempt to estimate the extent of the illegal activity, while others focus on the key impacts observed in developing countries.

Assessing the extent of the environmental crime

A number of publications were found to present estimates of the amount of WEEE generated and exported from the EU in total (e.g. Zoetman 2006 and Huisman et al. 2008) and from specific European countries to developing countries. Literature is available on major sourcing countries of WEEE, such as the Netherlands, Belgium (e.g. Seum and Hermann 2010), Germany (e.g. Sander and Schilling 2010) and the UK (e.g. Interpol 2009). Several publications were found to present estimates of the amount of WEEE imported illegally into China (e.g. UNODC 2014; Wang et al. 2013; Early 2013).

Data availability was considered to be good nevertheless one can question the quality of statistical data. An obvious reason for inaccuracy lies in the nature of any types of illegal activity but for instance the lack of differentiation between new and used EEE exported from the EU in statistical databases also makes data unreliable. As the WSR does not prohibit the export of used and second-hand EEE to non-OECD countries this loophole is frequently used by exporters and a significant amount of used EEE is shipped to developing countries which turns out to be non-functioning and thus considered as WEEE (EEA 2012, p26-28). Subsequently, the volume figures identified in relevant literature are seen as rough estimates which often use assumptions and extrapolations.

Environmental, social and economic impacts of e-waste

Even though some publications consider the overall impacts of WEEE streams on developing countries (e.g. ILO 2012) in most cases they look at specific geographical areas. Literature focusing on the impacts of WEEE in East Asia provides detailed information mainly on China (e.g. BAN and SVTC 2002 and Wang et al. 2013; Deng et al. 2007; Deng et al. 2006; Luo et al. 2007; Li et al. 2007; Leung et al. 2006; Wong et al. 2007). Human health and labour impacts of illegally imported e-waste are the best documented issues, while the impact of WEEE on economies is less studied. A great volume of academic literature examines the quantitative environmental and human health impacts of WEEE, including air and water pollution (for instance, Qingbin and Jinhui 2014 and Robinson 2009) and soil contamination levels (e.g. Zhang et al. 2014) and toxic material levels in blood samples (for instance KeQui et al. 2014). A number of publications, such as ILO (2012), also analyse the key groups of victims in the developing world who are suffering from the illegal import of e-waste.

2.1.3 Links to organised crime with a view on key actors and the drivers behind illegal WEEE shipment

Illegal activities often lead to structured and centralised actions and thus facilitate the development of organised crime. The literature review highlighted that this is also the case for illegal e-waste shipment and numerous publications address this issue (see for instance EC 2013a, Baird et al. 2014; Eurojust 2014; Fajardo 2014; Bland 2012; EIA 2011; UNODC 2009 and Interpol 2009). A link to other types of crimes, such

as forgery of customs and export documents, fraud and corruption was also identified (EIA 2011; Interpol 2011, p5). Some of the reports only provide a general view of the structure of the organised crime activities linked to e-waste shipment (e.g. Eurojust 2014) while others include specific case studies which present the results of on-site investigations (e.g. Bland 2012 and EIA 2011).

The literature review also highlighted that in the research community there is strong desire to identify the key drivers and motivations behind the illegal activity and organised crime (e.g. Eurojust 2014; Bisschop 2012; Hultman & Corvellec 2012; Liddick 2011; Fischer et al. 2008). According to a report by Interpol (2011, p4) the illegal export of e-waste is mainly driven by the economic benefits that can be gained. The current loopholes in enforcement and legislation also act as a motivation for the actors involved in the illegal activity (OECD, 2012; ILO, 2012). The European Commission also provides a detailed assessment of the underlying drivers of illegal waste shipment in the recently published Impact Assessment accompanying the proposal for a strengthened EU WSR (EC 2013a).

Case reports presenting specific on-site investigations also revealed the complex network of stakeholders related to illegal e-waste shipment from the EU to China. The 'export chain' is considered to be quite long; there is a large number of actors involved in getting the e-waste from the producer all the way to China's informal recycling sites. Key actors on the export side, who play an important role in the chain, include *inter alia* local authority disposals / civic amenities, waste brokers or agents and shipping companies (EIA 2011, p6-8, Sander and Schilling 2010, p61-65 and Bisschop 2012). The main stakeholders in China were also reviewed in order to provide a complete picture – see for instance Wang et al. 2013. A number of publications also analyse the main institutions which aim to control these illegal waste movements. According to Juan (2009, p65-92) the European Commission, national governmental bodies, such as Environmental Ministries, as well as local governments all play a key role in tackling the problem of e-waste shipment.

2.1.4 Problems with enforcement

Adequate enforcement of the EU WSR (and the WEEE Directive) should form the cornerstone of the fight against illegal (electronic) waste shipment in the EU and to answer the question whether current legislation is effective is one of the key objectives of this case study. The literature review revealed that there is room for improvement. For instance, not all Member States have the same level of enforcement/inspection and this leads to 'port-hopping', i.e. illegal waste exporters choose those ports where control is regarded to be the weakest (e.g. EC 2013a, p14-15; Bisschop 2012 & 2014). A joint report based on eight national audits revealed the current enforcement problems of the EU WSR (Algemene Rekenkamer 2013). As the Netherlands is one of the busiest e-waste export hubs in the EU and is considered a Member State with relatively good enforcement policies and practices the study team also reviewed the separate results of the Dutch audit (Algemene Rekenkamer 2012; VROM-Inspectie 2007 and 2011).

The outcomes of enforcement projects undertaken by the 'Transfrontier Shipment of Waste (TFS)' working group of IMPEL, the 'European Union Network for the Implementation and Enforcement of Environmental Law' also provided insights into the enforcement problems the EU currently faces. Key IMPEL projects include the Seaport Project I and II (IMPEL-TFS 2005), the Verification of Waste Project I and II (IMPEL 2004) and the Enforcement Actions Project I (IMPEL 2008), II (IMPEL 2011) and III (IMPEL-TFS 2014).

Lack of enforcement also plays a role in China and its neighbouring countries. This explains partially why e-waste imports continued to rise after China had introduced an import ban for all e-waste in 2000 (see for instance ILO 2012; Wang et al. 2013; Early 2013; BAN 2002).

2.1.5 Case study focus: main exporters in the EU and China

Throughout the systematic literature review numerous reports were found which focus on the different aspects of illegal e-waste shipment from the EU to China; nevertheless only a limited number of studies

addressed issues of a similar scope to this case study. A brief overview of the two main case studies, which were considered to address similar objectives, is provided in Box 2.

Box 2: Examples of literature with similar case study focus

There are two key reports which were considered similar to this case study. While Juan (2009) assesses the legal, systematic and practical aspects of transboundary e-waste shipment from the European Union (with a specific focus on the Netherlands) to China; Wang et al. (2013) provide a detailed overview of the e-waste problem in China.

Both give a brief summary of the legislative framework of transboundary shipment and a detailed stakeholder analysis, with the difference that Wang et al. (2013) solely focuses on the import side, i.e. on China. Juan (2009) also analyses the current systems in the Netherlands and China which are developed to track the illegal movements and Wang et al. (2013) gives a detailed assessment of the estimated volumes of e-waste in China and information on the informal and formal e-waste collection and recycling sectors.

Source: Juan (2009) and Wang et al. (2013)

Even though the focus and geographical coverage of a recently published UNODC³ report is broader (as it covers a number of different organised crime actions in East Asia and the Pacific) one of its chapters specifically analyses the illegal shipment of e-waste to Asia – primarily to China – from the developed world – mainly from the EU, the US and Japan – and therefore provides a detailed overview of the WEEE problem. The report provides estimates about the extent and nature of the illegal e-waste market and also tries to assess the potential annual value of the e-waste flow into East Asia. The report also discusses the main drivers behind the illegal activity, provides an overview of key stakeholders and specifically outlines the current situation in China's Guangdong province (UNODC 2013).

³ United Nations Office on Drugs and Crime

3 Description of the methodology

This case study is primarily based on qualitative empirical research, which builds on an extensive literature review and semi-structured stakeholder interviews.

In order to adequately develop the methodological approach for this case study the study team first identified how this specific case study addresses the general research questions of this work package of EFFACE. As a second step more specific research questions were proposed in order to clearly set out the main objectives of this case study. The final section of this chapter provides a short description of the applied research methodology.

3.1 General research questions

With regard to the general research questions of this work package of the EFFACE, this case study contributes to the following:

1. How does the case study contribute to understanding the concept of environmental crime?

This question is explored to a limited extent as the nature of the actors involved in illegal e-waste shipments and their networks are studied together with the link with organised crime.

2. How does the case study help to understand the main motivation to commit an environmental crime?

This question is extensively explored by focusing on *inter alia* the main motivations, the extent of the motivation, and the degree to which that can be changed.

3. To which extent are the enforcement procedures for discouraging environmental harmful conducts in your case study effective? If appropriate, please explain why different enforcement rules should be implemented.

This is core to this case study. In particular the case study explores the enforcement methods used in different Member States of the EU (and lessons on effectiveness).

4. To which extent are available data reliable to inform your case study? If appropriate, please explain why new data should be produced and how it can be done.

The degree to which reliable data are available to understand the extent of the criminal activity and enforcement response is addressed in the case study.

5. Why your case study is relevant to implement a coherent framework for an effective fighting of environmental crime at EU level?

The case study is important in examining the effectiveness of enforcement systems within Member States. This is a particular challenge for the EU and is different from many of the other types of environmental crime addressed within EFFACE.

3.2 Case specific research questions

In order to delineate the main objective of this case study a number of specific research questions were formulated and examined. These include the following:

1. What limits are there on determining the extent of illegal activity and how reliable is data especially on e-waste streams arising, shipments and loss in the process?
2. What are the main drivers to commit an environmental crime? What level of benefit is gained by those committing the crime (including organised crime) and, therefore, what effort is needed to overcome the motivation?
3. What are the weakest links in the relatively long enforcement chain? Why? What is needed to address the weaknesses?

4. Are proposed changes to the enforcement provisions of the EU WSR likely to improve enforcement?
5. Are there any approaches other than law on inspections and its enforcement to address the illegal shipment of WEEE from the EU?

3.3 Research methods applied: literature review and semi-structured interviews

The extensive literature review and research aimed to find sources of information which answer the questions above. This included the systematic searches of both 'grey literature' produced by governmental, research and non-governmental organisations (e.g. European Commission, European Environment Agency, Secretariat of Basel Convention, United Nations Environmental Programme, Interpol, Greenpeace and Basel Action Network) and academic literature. Statistical data, mainly official EU data, also provided an important source of information for Question 1, while information on current regulatory and enforcement regimes in the different Member States and China helped to answer Questions 3, 4 and 5. Thematic reports on illegal waste shipments and on the links between organised crime and environmental crime were the main sources to answer Question 2.

As a second step a limited number of semi-structured interviews were carried out with key stakeholders in order to fill in information gaps identified during the literature review. These included national governmental institutions (inspectors), dealing with e-waste streams in a number of selected EU Member States, international networks working on illegal waste shipment, academic experts and one civil society actor. The interviewees were carefully selected in order to maximize the utility of the interviews. The interviews were supported by a set of questions, which were tailored to each interviewee. This semi-structured approach enabled the study team to guide the interviews into areas where the stakeholders have the most expertise and interest. The interview questions are listed in Annex A, while the list of interviewees is indicated in Annex B. Given that information was to be collected from experts it is important that research ethics were adequately applied throughout the interview process. One of the key aspects of research ethics for this case study is privacy and confidentiality, given the highly sensitive nature of the case of illegal WEEE shipment. Therefore information extracted from the interviews is not directly attributed to individual interviewees, but only referred to in the text as follows: (Interview 2014). The names and positions of the interviewees are listed in Annex B. Confidential information will not be disclosed in any circumstances.

The literature review and the interviews triangulated government, corporate, civil society and academic perspectives. These findings were further triangulated with the data gathered from participation in an expert workshop on countering illegal e-waste trade at the premises of Interpol in Lyon (France) on 16-17 October 2014. At this workshop preliminary findings were presented from the Countering WEEE Illegal Trade (CWIT) Project. The CWIT project is a currently on-going EU FP7 project which focuses on the enforcement problems related to the illegal shipment of e-waste from the EU.

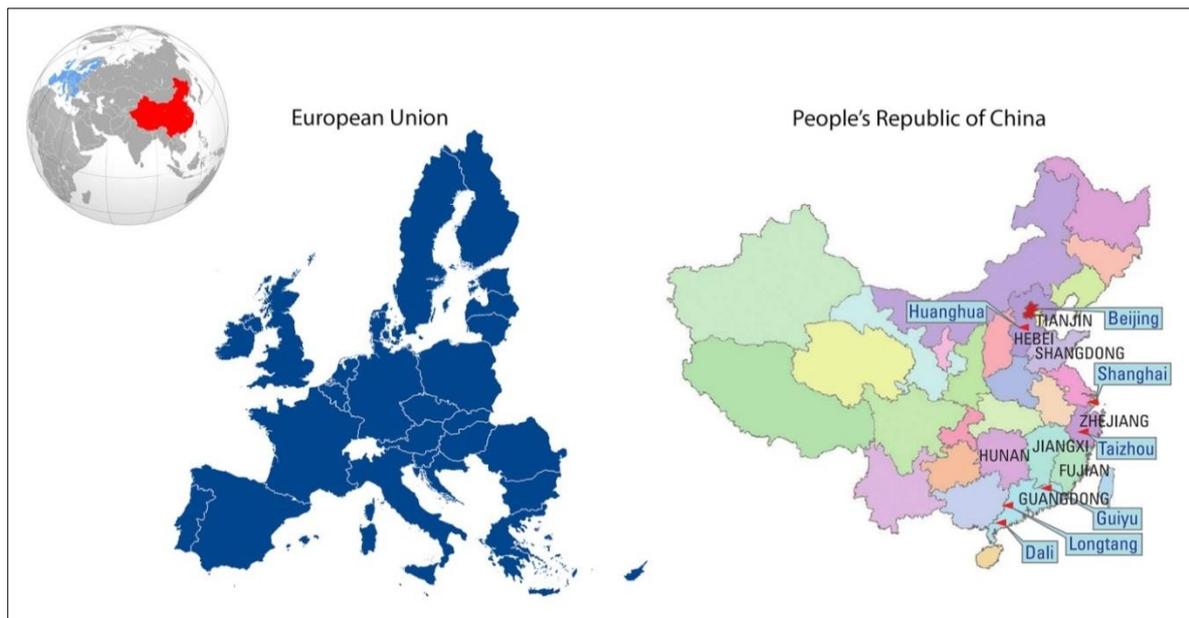
4 Case presentation

This chapter presents the core analysis of the case study. The illegal activity of e-waste export from the EU to China is analysed from a number of different aspects. The sections below assess the geographical scope and extent of illegal activity, the legal framework both in the EU and China of e-waste shipments, the effectiveness of these regulations and other policies, the main institutions involved at the different governance levels, the different stakeholders, the links to organised crime, the motivations and drivers behind the illegal activities, the key impacts of e-waste in China and the key groups of victims.

4.1 Introduction: geographical scope and the extent of the illegal activity

This case study focuses on the illegal shipment of e-waste from the European Union to China. The geographical scope of this case study – also highlighting the main e-waste recycling and dismantling sites in China – is shown in Figure 1.

Figure 1: The geographical scope of the case study: the European Union and China (with a focus on the main e-waste recycling and dismantling sites in China)⁴



Source: Adapted from Ni and Zeng, 2009

The first issue to consider is the extent of the illegal activity. This can be approached from different aspects, including the assessment of the e-waste domestically generated in the EU, the amount of e-waste exported from the EU, the illegal share of WEEE shipments from the EU and the amount of e-waste imported from the EU in China. Even though a limited amount of literature can be found on these points, as illegal e-waste shipment by definition is not tracked explicitly the quality of the overall statistical data can be questioned. An obvious reason for inaccuracy lies in the nature of illegal activity but also in particular the lack of differentiation between new and used EEE exported from the EU in statistical databases also makes data unreliable. As the EU WSR does not prohibit the export of used and second-hand EEE to non-OECD countries this loophole is frequently used by exporters and a significant amount of used EEE is shipped to

⁴ Beijing is only indicated for the readers' geographic reference.

developing countries which turns out to be non-functioning and thus considered as WEEE (EEA 2009, p.13-14). Subsequently, the volumes highlighted below are best considered to be very rough estimates which often are based on assumptions and extrapolations.

According to Huisman et al. (2008, p.39-91) in 2005 the amount of WEEE domestically generated in the EU was between 8.3 and 9.1 million tonnes. It was estimated that by 2020 this amount could reach 12.3 million tonnes. In line with Huisman et al. (2008) Zoetman (2006) estimated that in 2005 around 7 million tonnes of WEEE were generated in the European Union, while the UNODC (2013) estimated that since 2008 the EU has generated on average 6.5 million tonnes of e-waste annually which could increase to 12 million tonnes by 2015. This amount was calculated assuming that each EU citizen produced 15 kg WEEE and the population of the EU in 2005 was 475 million. Zoetman (2006) assumed that 10-20 per cent of the total amount of WEEE generated in the EU is illegally exported; furthermore 30 per cent of used computers, TVs and mobiles are legally exported to developing countries for reuse. By adding together these figures Zoetman concluded that 1.9 million tonnes of WEEE is leaving the EU annually, of which 50 per cent goes to Asia (0.95 million tonnes). 65 per cent of the amount of WEEE going to Asia ends up in China, which equates to 0.62 million tonnes of e-waste.

China controls a large portion of the recycling market, importing about 70 per cent of the world's 500 million tonnes of electronic waste (Earley 2013). The estimates of the amounts of illegally imported WEEE in China are also considered to be very rough, and do not reflect the true nature of the illegal activity. For instance, Wang et al. (2013, p.13-16) provides the following summary of estimates: in 2001 the Beijing Zhongse Institute of Secondary Metals assumed that more than 700,000 tonnes of e-waste were illegally imported via the Yangtze River Delta and using similar estimations it is assumed that another 700,000 tonnes of WEEE are imported via the Pearl River Delta. Another 150,000 tonnes of e-waste were imported via other harbour regions, which then adds up to a total figure of approximately 1.5 million tonnes of illegally imported e-waste. According to another estimate Guiyu, one of the largest informal e-waste recycling sites in China, alone processes over one million tonnes of WEEE annually (Ongondo et al. 2011). The UNODC (2013) estimated that in total around 8 million tonnes of e-waste are imported illegally into China every year. It is assumed that an extra 2 million tonnes are smuggled into the rest of East Asia, for instance to Vietnam. According to INTERPOL one tonne of e-waste is valued at US\$500 and if the differences in the numerous types of e-waste are taken into consideration an average figure of US\$375 per tonne can be estimated. Based on the annual volume of 10 million tonnes of e-waste in the East Asia region it can be concluded that the potential total annual value of WEEE would be around US\$3.75 billion (UNODC 2013, p.110).

4.2 Legal framework in the EU and China

The Basel Convention

The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal came into force in May 1992. At present the Convention has 181 Parties. The US is not a Party. The Convention seeks to provide enhanced control over the transboundary shipment of hazardous and other wastes with a view to act as an incentive for environmentally sound management (ESM) and reduce the frequency of such movements. The Convention promotes both non-trade based and trade based measures. As to the former, the Basel Convention urges to reduce the generation of hazardous and other wastes and the disposal of such wastes in the country of generation (Basel Convention 1989).

As to trade-based measures, the Convention gives each Party a right to forbid the import of any waste into its territory and imposes upon each Party a corresponding obligation to refuse to authorize the export of wastes to any state of import that has not specifically consented to the import concerned. The Convention puts forward a prior informed consent (PIC) mechanism. This requires each exporting Party to inform countries of import about intended shipments and to obtain written consent for each transfer from the country of import, with a view to keep transboundary shipments to a minimum (Basel Convention 1989).

A country of import has a “sovereign right” to decline the import of any hazardous or other waste for whatever reason. Each country of export has an obligation to forbid waste generators or exporters from initiating shipments of waste unless the country of export has obtained written consent and confirmation of a contract between the exporter and the disposer certifying environmentally sound management techniques from the country of import. In addition, each country of export has a duty to forbid the export, find an alternative facility, or re-import waste if there is reason to believe the waste will not be treated environmentally sound in the destination country (Basel Convention 1989).

The Convention requires Parties to consider as criminal illegal traffic that includes any transboundary movement of hazardous wastes or other wastes undertaken without complying with the Convention’s provisions (Basel Convention 1989). Article 4(3) does not impose a clear obligation on Parties to criminalise illegal traffic (X 2014). The text only requires Parties to “consider that illegal traffic in hazardous wastes or other wastes is criminal” (Basel Convention 1989). The transboundary movement of hazardous wastes is considered to be illegal if it takes place:

- without notification to all States concerned;
- without the consent of a State concerned;
- through consent obtained by falsification, misrepresentation or fraud;
- when the movement does not conform in a material way with the accompanying documents;
- or when the movement results in deliberate disposal of hazardous wastes breaching the Convention and general principles of international law (Basel Convention 1989).

The Basel Ban Amendment

Following criticisms by NGOs and some Nordic countries, an amendment to the Convention was adopted in 1995. This amendment, which is often called the “Ban Amendment” or “Basel Ban,” bans the export of hazardous wastes intended for final disposal and bans the export of hazardous wastes destined for recycling or recovery from OECD to non-OECD countries. As the Ban Amendment has not been ratified by three-fourths of the Parties who accepted it, it has not yet entered into force (Ban Amendment 1995; Secretariat of the Basel Convention 2014a).

There was however considerable opposition from several developed nations, in particular from the US. Surprisingly, several developing countries were of the opinion that the Basel Ban unfairly deprived their fragile economies of economic benefits arising from the recovery of materials from hazardous wastes (X 2014).

The EU Waste Shipment Regulation

The EU, together with its Member States, has been a Party to the Basel Convention since 1994 (Secretariat of the Basel Convention 2014b). The EU has implemented the Convention through *inter alia* Regulation (EC) No 1013/2006 on shipments of waste, the so-called Waste Shipment Regulation (WSR).

The EU WSR requires the Member States to control waste shipments. Member States must impose an appropriate penalty if businesses or institutions fail to comply with the WSR. The Member States themselves decide how they implement this requirement and how they cooperate with other countries.⁵

Whether a waste shipment is authorised under the WSR, and under what conditions, depends on the transboundary movement, the processing method, the type of waste and the country of destination. The WSR applies only to waste that crosses a national border. It imposes stricter requirements on shipments that are disposed (e.g. dumped) than on shipments that are recovered (e.g. recycled). If EEE waste is to be dumped after shipment, it is forbidden to be exported to non-EU countries. The WSR imposes stricter requirements on some waste types than on others depending on the environmental and health risk. The

⁵ Regulation (EC) No 1013/2006 of the European Parliament and of the Council of 14 June 2006 on shipments of waste. *OJ L 190, 12.7.2006*, p. 1–98.

WSR classifies waste as 'green' (less hazardous) or 'amber' (more hazardous). In relation to 'amber-listed waste', the notification procedure of the WSR applies. After the shipment of 'amber-listed waste' has taken place, the competent authorities in the country of origin must be sent two notifications from the country of destination: a notification of receipt (i.e. confirmation that the waste has arrived) and a notification of processing (i.e. confirmation that the waste has been treated). In relation to 'green-listed waste', a milder procedure applies (the so-called 'Annex VII procedure'): shipments subject to this procedure are not checked in advance and only required to fill in correctly the form in Annex VII of the WSR and ensure this form accompanies the shipment. The WSR distinguishes among two types of countries: countries subject to the OECD Decision and countries that are not subject to the OECD Decision. The WSR imposes stricter requirements on shipments to non-OECD countries. In addition, non-OECD countries may declare whether they are willing to accept green-listed waste for recovery and, if so, under what conditions.⁵

The EU WEEE Directive

In order to prevent and reduce the adverse impacts on the environment and human health of the generation and management of e-waste the EU has introduced the WEEE Directive, which came into force in 2003. The Directive covers a wide range of issues related to the management of WEEE, including the following (Directive 2002/96/EC):

- Product design: The dismantling and recovery, especially the recycling and reuse, of e-waste should be taken into consideration in the product design phase.
- Collection systems: Member States are required to set up separate e-waste collection systems in order to minimise the disposal of WEEE into municipal waste.
- Treatment: The producers of e-waste are required to apply the best available treatment, recovery and recycling techniques.
- Recovery: The producers must set up separate recovery systems in which the separately collected WEEE can be recovered. A recovery rate by an average weight per appliance is also established.
- Financing: Rules on financing in respect of e-waste from private households and other users are established.
- Information: It should be ensured that the users of the electrical and electronic equipment have the necessary information about amongst others the return and collection systems and the potential effects on the environment and human health.

In December 2008, the European Commission proposed to improve the WEEE Directive. This resulted in the adoption of a recast directive which came into force in August 2012 (Directive 2012/19/EU). One of the key changes was the introduction of mandatory collection targets; Member States are now required to collect 4 kg of e-waste per person per year. A separate article - Article 10 - was also introduced on the shipments of WEEE, which refers to the WSR. In relation to the shipments of e-waste another key improvement was the introduction of tighter requirements on providing documentary evidence of functionality of collected e-waste which is considered as reusable and therefore may be exported. Annex VI of the recast directive lists the documentary evidences that can be required to distinguish used EEE and WEEE and the steps for testing and record keeping to be carried out for used EEE.

E-waste related regulations in China

In 1996, partly based on the Basel Convention's agreement, the Chinese State Environmental Protection and Administration passed the 'Prevention and Mitigation of Environmental Pollution by Solid Wastes Act'. This act aimed to regulate the disposal of municipal and industrial solid waste by prohibiting the import of solid waste that is unusable as raw material and strictly regulating the import of those solid materials that can be reused (Ni and Zeng 2009, p.3992-3993). One of the key items of legislation on e-waste was introduced in China in 2000. This so-called 'Notification of the Import of the Seventh Category of Solid Waste (No.19/2000)' included a list of wastes which were prohibited to be imported into China. This list introduced an official ban on importing e-waste into China (Juan 2009).

In the years after the introduction of this official ban a number of other policies focusing on the management of e-waste were introduced (Wang et al. 2013, p.29-32). The 2006 'Technical Policy on Pollution and Prevention and Control of WEEE' aimed to reduce the overall volume of e-waste, as well as to establish the 'polluter pays principal' and the 'reduce, re-use and recycle' approaches to e-waste. An 'Ordinance on Management of Prevention and Control of Pollution from Electronic and Information Products' was implemented in 2007, which included a number of requirements for eco-design. The main aim of this ordinance is to reduce the use of hazardous and toxic substances in electronic equipment and to require producers to provide sufficient information to customers about their products. In this sense this ordinance has numerous similarities to the EU Restriction of Hazardous Substances Directive (Directive 2002/95/EC). In 2008, the 'Administrative Measures on Pollution Prevention of WEEE' was enacted in order to prevent the pollution caused by the storage, transport, disassembly, recycling and disposal of e-waste. This policy also established a licensing scheme for e-waste recycling companies. Finally, in January 2011 the 'Regulation on Management of Recycling and Disposal of Waste Electrical and Electronic Equipment' was adopted. This regulation is similar to the EU WEEE Directive (Directive 2012/19/EU) as it makes e-waste collection and recycling mandatory.

4.3 The effectiveness of EU legislation and its enforcement

This section addresses the effectiveness of the Waste Shipment Regulation (WSR) and the WEEE Directive in terms of countering illegal e-waste exports from the EU to developing countries. It does so by analysing the enforcement policies in the Netherlands first – as the Netherlands is one of those EU Member States with relatively advanced enforcement policies and practices – and subsequently analysing broadly the enforcement policies and its weaknesses in other EU Member States. Following that, the recent amendments to the WEEE Directive and the WSR are assessed in terms of their potential to address the weakest points in the enforcement chain in the EU as a whole and to improve enforcement in the EU.

The weakest points of the enforcement chain in the Netherlands

The Netherlands generally complies with the requirements arising from the WSR. It specifically complies with the requirement that Member States must control waste shipments and impose appropriate penalties in response to offences. It also complies with the requirement to cooperate internationally to prevent and detect illegal shipments (Algemene Rekenkamer 2012).

A coherent enforcement policy is in place and enforcers have an understanding of the waste market. The environmental inspectorate, customs and the police service inspect several thousand waste shipments every year to check compliance with the WSR. On-site inspections are also carried out at businesses, and the public prosecution service is responsible for the detection and prosecution of offences. The environmental inspectorate, customs and the police service also investigate specific waste flows such as e-waste so that they can intervene at an earlier stage. Many of the elements necessary for appropriate enforcement are therefore present (Algemene Rekenkamer 2012).

However, there are still aspects of enforcement that can be improved. Exchange of information within the enforcement network can be further improved. Only limited feedback is provided on the outcome of files that are transferred from one service to another. There is only limited insight into the impact of enforcement activities and the functioning of the WSR system as a whole. As a result the effectiveness of WSR enforcement in the Netherlands could not be assessed adequately. Firstly, this is because it is difficult to investigate illegal flows. Secondly, there are weaknesses in the registration systems of the environmental inspectorate and customs. Thirdly, police and customs do not report systematically figures on WSR infringements to the inspectorate's information centre (Algemene Rekenkamer 2012; VROM-inspectie 2007).

However, in the case of e-waste the environmental inspectorate has been able to make a rough estimate of the compliance rate and thus to say more about the impact of enforcement. Based *inter alia* on investigations of e-waste, the inspectorate's 2012 multi-annual plan puts the compliance rate at between

70 per cent and 80 per cent and concludes that compliance within the e-waste chain has improved as a result of enforcement activities. Earlier reports had come to the same conclusions (Algemene Rekenkamer 2012; VROM-inspectie 2007 and 2011). An evaluation of the various interventions in the e-waste chain found that there had been an improvement in the various actors' compliance. The EU collection target, for instance, had been easily exceeded and a large number of retailers had changed their return policies so that fewer return goods entered the illegal circuits (VROM-inspectie 2011).

Another issue of concern is that the Public Prosecution Service (*Openbaar Ministerie (OM)*) decides not to prosecute 30 per cent of WSR cases, which is a significantly higher rate than the OM's own target of 10 per cent. The Court of Audit did not find any explanation for this. This implies that either WSR offences go unpunished or that time is spent on preparing official reports for cases that do not have a chance of success (Algemene Rekenkamer 2012).

The weakest points of the enforcement chain in other EU Member States

A report by the Netherlands Court of Audit (*Algemene Rekenkamer*) compiling the findings of eight national audits identified many more and significant weaknesses in the implementation and enforcement of the WSR. The countries concerned are Bulgaria, Greece, Hungary, Ireland, Poland, Norway, the Netherlands and Slovenia. The study reveals huge differences as to the number and nature of inspections, the available resources, enforcement organisations involved and the existence of an enforcement strategy. The number of checks of (electronic) waste shipments varies from a dozen to several thousands per year (such as in the Netherlands). In six countries enforcement policy is insufficiently underpinned by an explicit risk assessment. In five countries enforcement is impeded by a lack of well-trained staff and technical equipment (reflecting differences in priorities among the countries' authorities) (Algemene Rekenkamer 2013). But even in Member States with more than average resources and staff available such as in the Netherlands and Belgium port authorities emphasize that personnel and financial limitations are severe obstacles to achieving better export control (ILO 2012).

In its impact assessment for the recent revision of the WSR, the European Commission also puts forward lack of inspection planning and risk assessments and lack of training for inspectors as major causes for enforcement problems in many Member States (EC 2013a).

The involvement of multiple organisations (customs, police services, environmental agencies, environmental inspectorates, etc.) creates challenges to coordination and cooperation between enforcement organisations. In three countries a lack of coordination impedes enforcement. Enforcement is complicated by the broad definition of waste used by the WSR and the resulting difficulties for enforcers and other stakeholders to interpret the definition and to work with it in practice. Another complication is the existence of two different code systems, the WSR/Basel codes and the international tariff codes used by customs authorities. Up until now only the Netherlands has developed a conversion table that allows customs to select high-risk (electronic) waste shipments for inspection (Algemene Rekenkamer 2013).

The information management in the countries audited is inadequate for the purpose of enforcing the WSR. *"There are weaknesses in the information systems used by the authorities, in the exchange of information within and between countries and in the registration and reporting of inspections, infringements and sanctions. There are no clear policies and guidelines for tackling problems with data collection and reporting"* (Algemene Rekenkamer 2013, p7).^{6 7}

⁶ Exchanging police and judicial information on criminal matters among enforcement authorities in Member States is not obvious as justice may not be impeded. The rights of the suspects for instance may not be harmed (Interview 2014).

⁷ Improving the exchange between countries of information on actors involved in illegal shipments is challenging as well, given that each country has its own privacy legislation. When exchanging information with third countries, existing international treaties need to be respected (Interview 2014).

All countries have little or no information on the impacts of their enforcement activities and have little or no insight into the functioning of the (electronic) waste system as a whole. The authorities particularly lack information on the final link in the enforcement chain, i.e. the processing of the (electronic) waste exported out of the EU. This results from a lack of attention for reviewing receipt and processing notifications (Algemene Rekenkamer 2012 & 2013).

As the system of receipt and processing notifications seems to be inadequate, enforcement authorities in the EU Member States might conduct *ex-post* inspections to verify that the waste has reached the destination cited in the notification and to verify the environmentally sound management at treatment and recycling plants in the destination country. Research however indicates that *ex-post* inspections are exceptional (Netherlands Court of Audit, 2014). It should be noted that stakeholders and national authorities have indicated a gap in the development of guidance in relation to the verification of environmentally sound management in third countries (EC 2013a).

The European Commission also identifies problems in earlier links of the enforcement chain as it points to the lack of up-stream inspections to detect illegal exports (EC 2013a).

Furthermore, huge differences among EU Member States have been revealed to what extent environmental crimes are prosecuted and in the way infringements are penalised. The same infringement may be subject to a very different penalty in one country than in another and differences may even exist between the regions of one Member State (Interview 2014). Even though the Environmental Crime Directive (Directive 2008/99/EC) requires Member States to ensure that environmental crimes are punished “*by effective, proportionate and dissuasive criminal penalties*” there are no uniform requirements and the definitions in the directive are vague. Another problem is linked to the liability of legal persons for the illegal environmental activity as the directive does not establish any requirements to impose criminal penalties on legal persons.

The findings also show that most European countries make only limited use of sanction instruments (Algemene Rekenkamer 2013). A particular challenge with regards to the illegal shipment of e-waste is to prove the actual intention of the perpetrators (Eurojust 2014). The courts in the UK for instance seem to give higher penalties for non-compliance and environmental crimes (Brosnan 2014). Despite huge profits from environmental crimes such as shipping e-waste illegally (estimated by the OECD at USD 30-70 billion per year), environmental crime is rarely prosecuted by national authorities. The UK, the Netherlands and Sweden are the only EU Member States which have dedicated public prosecutors for environmental crime (Eurojust 2014). Finally the European Commission concluded that insufficient provisions on the burden-of-proof in the WSR had created an uneven playing field across the EU and lead to port-hopping. Member States have indeed very different provisions as to the burden of proof they place on operators wishing to ship objects while declaring that these are not ‘waste’ but ‘products’ and therefore fall outside the scope of the WSR, or that the waste to be shipped will go to environmentally sound facilities in third countries (EC 2013a).

What amendments to the WSR have been adopted?

In June 2014 the EU adopted a revised waste shipment regulation (Regulation (EU) No 660/2014). Regulation (EC) No 1013/2006 was revised as a result of the problem of illegal waste shipments and the vagueness with which requirements on inspections and enforcement were formulated in the regulation. This vagueness has led to significant differences among Member States. As noted above some Member States have good inspection systems in place targeting both waste shipments in ports and at sites of waste producers and collectors (e.g. the Netherlands and the UK). Other Member States though have huge problems with enforcement and are short of appropriate structures and sufficient resources to control waste streams and carry out inspections. This situation leads to “port hopping”, i.e. illegal waste exporters choose those ports where control is regarded to be the weakest (EC 2013a).

The new regulation comprises reinforced measures to ensure more uniform implementation of the regulation throughout the EU. By 1 January 2017, Member States will have to establish inspection plans,

which must include the objectives and priorities of the inspections, the geographical area covered by the inspection plans and the tasks assigned to each authority involved. The inspection plans must be based on a risk assessment carried out for specific waste streams and sources of illegal shipments. They are to be regularly reviewed and updated at least every three years.

In addition, the amended regulation requires Member States in particular to clarify if waste has been correctly classified, to identify if waste is being shipped to 'environmentally-sound facilities', to give inspectors more power to demand documentary evidence from suspected illegal waste exporters (as to the origin and destination and that it is not waste) and to include a minimum number of physical checks in waste shipment inspections.

The regulation explicitly states that protection of the equipment against damage during transport, loading and unloading also needs to be investigated. This includes checking whether the equipment is packaged and stacked adequately. The inspection authorities may conclude that the objects or substances are waste if the required evidence has not been submitted within a specified period or if they consider the evidence made available to them inadequate to reach a conclusion or if they consider the protection against damage to be inadequate. The regulation now states that inspections may take place at the point of destination. However, from the wording it can be concluded that this is only a recommendation and not a requirement.

The regulation now specifically requires Member States to exchange information on waste shipments, waste flows, operators and facilities and enforcement measures (as part of the requirement to cooperate with each other). The regulation will apply from 1 January 2016.

It should be noted that the recast WEEE Directive adopted on 7 June 2012 already includes similar provisions reversing the "burden of proof" as mentioned above (EC 2013a).⁸

Do these amendments address the weakest points of the enforcement chain and thus will improve enforcement?

The amendments to the WSR do indeed address many weak points of the enforcement chain. The lack of inspection planning and risk assessment in EU Member States is being addressed by the requirement to establish inspection plans by 2017 and to have these plans based on risk assessments. This has the potential to improve the enforcement of WSR rules considerably as many Member States currently have an insufficient overview of waste streams and corresponding risks and do not (sufficiently) plan their inspection activities. Member States will have to prove through their plans they will meet the minimum requirements for inspections as stipulated in the amended WSR. Inspection planning based on risk assessment also helps to use limited resources efficiently (Interview 2014).

Another enforcement issue is being addressed by the new provision that gives inspectors more power to demand documentary evidence from suspected illegal waste exporters as to the origin and destination and that it is not waste including evidence of functionality. This provision shifts the "burden of proof" regarding the distinction between "waste" and "product" and the environmentally sound management in third countries on to suspected illegal exporters. The recast of the WEEE Directive (2012/19/EU) already

⁸ Annex VI of the recast WEEE directive (2012/19/EU) allows Member State authorities now to request the following evidence from the exporter: a copy of the invoice and contract regarding the sale and/or transfer of ownership of the product which explains that the electronic equipment is intended for direct re-use and fully functional; evidence of evaluation or testing in the form of a copy of a certificate of testing or proof of functionality on every item within the shipment and a protocol including all record information; a declaration made by the holder who arranges the transport of the items that none of them is waste; adequate protection against damage during transportation, loading and unloading in particular through sufficient packaging or adequate stacking of the shipment. Member State authorities could also require certain, prescribed steps for testing and record keeping for "products". In the absence of a proof that an object is a "product" and not "waste" and in the absence of adequate protection against damage during transportation, loading and unloading, Member State authorities are required to conclude that an item is "waste" and therefore presume that the load is an illegal shipment (EC 2013).

introduced in 2012 tighter requirements on providing documentary evidence of functionality of collected e-waste which is considered as reusable and therefore may be exported. (These tighter requirements are likely to make it more difficult for e-waste to be exported to non-OECD countries in Africa and Asia (e.g. China) as second-hand goods only to be treated and disposed under bad environmental conditions (Baird et al. 2014). However, these provisions had to be transposed into national law first before they could enter into force. Most Member States have only recently transposed these provisions, the official deadline being 14 February 2014. Therefore it is too early to draw conclusions on the effects of these new provisions on enforcement practices. As these requirements have now been incorporated into the WSR they are now directly applicable in the Member States.

The WSR now also requires that products are protected against damage during transportation, loading and unloading in particular through sufficient packaging or adequate stacking of the shipment. If enforcement authorities consider this protection insufficient, they may conclude that the products concerned are waste and therefore subject to export bans to non-OECD countries such as China. This would facilitate enforcement considerably: in many cases enforcement officials will be able to conclude more easily that shipments are illegal as they will not be required to empty full containers and test functionality of equipment on the spot (Interview 2014).

The lack of up-stream inspections to detect illegal exports has also been addressed. The old regulation already contained a provision that Member States shall provide for inspections of establishments and undertakings. The revised regulation now states that brokers and dealers should also be inspected. Furthermore, the new regulation stipulates that the risk assessment shall identify a minimum number of inspections required, including physical checks on establishments, undertakings, brokers and dealers – next to physical checks on waste shipments or on the related recovery or disposal.

The new regulation addresses the complication arising from the existence of two different code systems, the WSR codes and the customs tariff codes. A provision has been inserted into the WSR stipulating that the Commission shall adopt by July 2015 a preliminary correlation table between those codes. The Commission shall update this conversion table whenever changes are made to these code systems. This table will facilitate the control of (electronic) waste shipments by customs authorities.

In relation to the lack of well-trained staff, the regulation foresees now that the inspection plan – that Member States are required to establish by 2017 – needs to include information on the training of inspectors on matters relating to inspections. Whether this will lead to the adoption of proper training schemes remains to be seen.

The WSR now explicitly requires Member State authorities to investigate whether e-waste is being shipped to environmentally sound processing facilities, i.e. asking authorities in the destination country to demonstrate this. For some Member States enforcement practices will not change as they were already doing so, for other Member States which were until now hesitant about doing this this explicit requirement will help them to do so (Interview 2014). The new regulation however does not impose any minimum requirements concerning the implementation of *ex-post* inspections to verify that the waste has reached the destination cited in the receipt notification and to verify the environmentally sound management at treatment and recycling plants in third countries as referred to in processing notifications. It should be noted that almost no e-waste is shipped with notification from the EU to China and other non-OECD countries.

Based on this analysis we conclude that the amendments to the Waste Shipment Regulation generally have the potential to improve actions to counter illegal e-waste trade and therefore the effectiveness of the regulation. However, it will not necessarily guarantee a sufficient improvement in enforcement.

The WEEE Directive's recast

The recast has the potential to improve things as it aims to raise the e-waste collection rate of each Member State significantly. As a result the potential leakage of e-waste from the formal collection and treatment chain into illegal circuits will be reduced and therefore the opportunities for illegally exporting

e-waste from the EU. The better the WEEE Directive is implemented in the EU Member States, the easier the enforcement of the rules governing the transboundary shipments of e-waste (Interview 2014).

4.4 The effectiveness of Chinese e-waste legislation/policies and its enforcement

Countering informal e-waste recycling in China

The Chinese government has made great efforts in the last 10-12 years to introduce advanced e-waste recycling technologies and waste management principles from Western countries. However, attempts to formalize e-waste recycling have proven to be very difficult and challenging (ILO 2012 and Li 2012). Formal recycling companies or centres are mostly unable to compete with the informal sector, especially in collecting e-waste from consumers and covering the costs of processing (Interview 2014; Chi 2011 in: ILO 2012). As a result formal recycling and treatment facilities face difficulties in sustaining daily operation and capital flow (Hicks et al. 2005 in: ILO 2012). Therefore another approach was taken by Chinese central and local government, whereby incentives were introduced for informal recyclers to reduce improper recycling activities and diverting more e-waste flow into the formal recycling sector. The Chinese government has recently taken the approach of a policy of accommodation, often through setting up an industrial park where entrepreneurs can set up regulated WEEE enterprises (Interview 2014; ILO 2012).

Guiyu and Taizhou used to be the two biggest centres for informal e-waste recycling. However, in the last 5 to 10 years the authorities managed to phase out most of the informal recycling activities in Taizhou. As a result Guiyu (and its surroundings) is the only place in China left where informal recycling activities are concentrated on a large scale and where as a result the negative impacts on public health and the environment are the biggest (Interview 2014; Wang et al. 2013, p. 22).

Furthermore, new developments might further reduce the informal recycling activities in China in the future. Employment opportunities and salaries in the formal economy in China are rising very quickly, providing incentives for people not to engage anymore in informal recycling but instead to look for jobs in the formal sector. As China is getting rich quickly, Chinese consumers increasingly buy new electric and electronic products instead of second-hand products. As a result China is increasingly becoming an e-waste exporter itself. African brokers also come to China now to collect second hand goods like kettles, shavers, washing machines, etc. and to ship it to Africa (Interview 2014). These developments might also explain why China is putting in place efforts to counter illegal e-waste imports.

Countering illegal e-waste imports in China

Despite China's introduction in 2000 of a ban to import e-waste into the country, massive amounts of e-waste continued to be imported over the years to meet the demand for cheap second-hand goods and raw materials for the manufacturing industry. However, in recent years China has been stepping up its efforts to counter illegal e-waste imports. In February 2013, the Chinese government started a 10-month-long *Operation Green Fence* campaign, a multi-agency effort to more closely manage the activities of containerized waste imports, including e-waste imports. This initiative is in fact China's first major campaign to enforce its stringent waste quality legislation. As part of it customs officials were sent to the Chinese ports with a view to conduct rigorous inspections and physical checks on containers. Hundreds of thousands of tonnes of waste have been rejected. These shipments included waste that it is forbidden to import into China (including hazardous wastes, waste clothes, tyres, waste paints, etc.). Shipping companies were told to send these shipments back to the sender. The import licences of many companies were suspended (Earley 2013; Interview 2014). According to the International Solid Waste Association (ISWA), in the first three months of the campaign 55 shipments were stopped and 7,600 tonnes of recyclable materials rejected, resulting in containers being piled up in the ports (Earley 2013).

The recycling industry reacted in different ways to the *Operation Green Fence* campaign. Some recyclers were disappointed because of the increased bureaucracy and costs associated with the campaign.

However, other recyclers were pleased that quality expectations in China were being brought up to standards found in other parts of the world. It has been reported that the restricted flow of plastic scrap into Chinese ports caused both overseas exporters and Chinese manufacturers to look for alternatives, such as shipping plastic scrap to neighbouring countries such as Malaysia or Vietnam from where the scrap can be shipped into China with less scrutiny (Taylor 2014). The same is likely to be the case for e-waste (Interview 2014).

4.5 Main institutions involved at the different governance levels

The EC as the main executive body of the EU to propose new legislation has an essential role in establishing an effective enforcement framework of illegal waste shipment – see the recently adopted Amending Regulation of the WSR (EC 2013b). The Secretariat of the Basel Convention also plays an important role in governing the transboundary shipment of waste at the international level.

At EU level the role of the IMPEL Network, specifically the “Transfrontier Shipment of Waste” (IMPEL-TSF) Cluster, is important. IMPEL is an international non-profit association of the environmental authorities of EU Member States, as well as acceding and candidate countries of the EU and EEA countries (IMPEL-TFS 2012). The main objective of the TFS cluster is to support the practical implementation and enforcement of EU legislation on transfrontier waste shipment, which is primarily achieved via enforcement projects. These enforcement projects, such as the Seaport I and Seaport II project (see IMPEL-TFS 2005), aim to prevent and detect the illegal waste shipments through various forms of inspection activities. In 2012, a new network, the European Network of Prosecutors for the Environment (ENPE), was established in order to support practitioners to connect and share their knowledge and experience on environmental crime. The structure of the network is based on the model of the European Union Forum of Judges for the Environment (EUFJE).

The enforcement of the EU WSR is a competence of the individual Member States in the EU, which has important implications on the effectiveness of the regulation itself. Enforcement greatly varies between Member States. Evidence shows that export companies tend to use those ports where enforcement is the weakest and thus the least effective Member State can determine the whole success of the EU WSR (EC 2013a, p14-15). In most Member States the responsibility to control waste flows is divided between different competent authorities. For instance, in the Netherlands the following actors have a political responsibility for waste flows (Algemene Rekenkamer 2012, p6):

- The Minister of Infrastructure and Environment (I&E) – role in inspections;
- The State Secretary for Infrastructure and Environment (I&E) – role in environment protection;
- The State Secretary for Finance – role in tax and customs administration; and
- The Minister of Security and Justice (V&J) – role in public prosecution service and police.

The Ministry of I&E requested the ‘Human Environment and Transport Inspectorate’ (ILT), as part of the ministry, to carry out all enforcement tasks of the EU WSR. In practice, the ILT prepares the policy rules and sets the enforcement priorities (Algemene Rekenkamer 2012, p12-27).

In addition to the national ministries and other competent authorities, customs and police also play a key role in the enforcement of the EU WSR (Algemene Rekenkamer 2013, p27-29). In the Netherlands, the ILT works closely with the National Police Service Agency (KLPD), the regional police forces, the Public Prosecution Service (OM) and Customs (Algemene Rekenkamer 2012, p12-27).

With regard to the relevant institutions in China, Wang et al. (2013, p40-48) report that the following governmental agencies are involved in e-waste management in China:

- National Development and Reform Commission (NDRC);
- Ministry of Environmental Protection (MEP), Department of Pollution Control (DPC);
- Ministry of Industry and Information Technology (MIIT);
- Ministry of Commerce (MOC);

- Ministry of Finance (MOF); and
- General Administration of Customs (GAC).

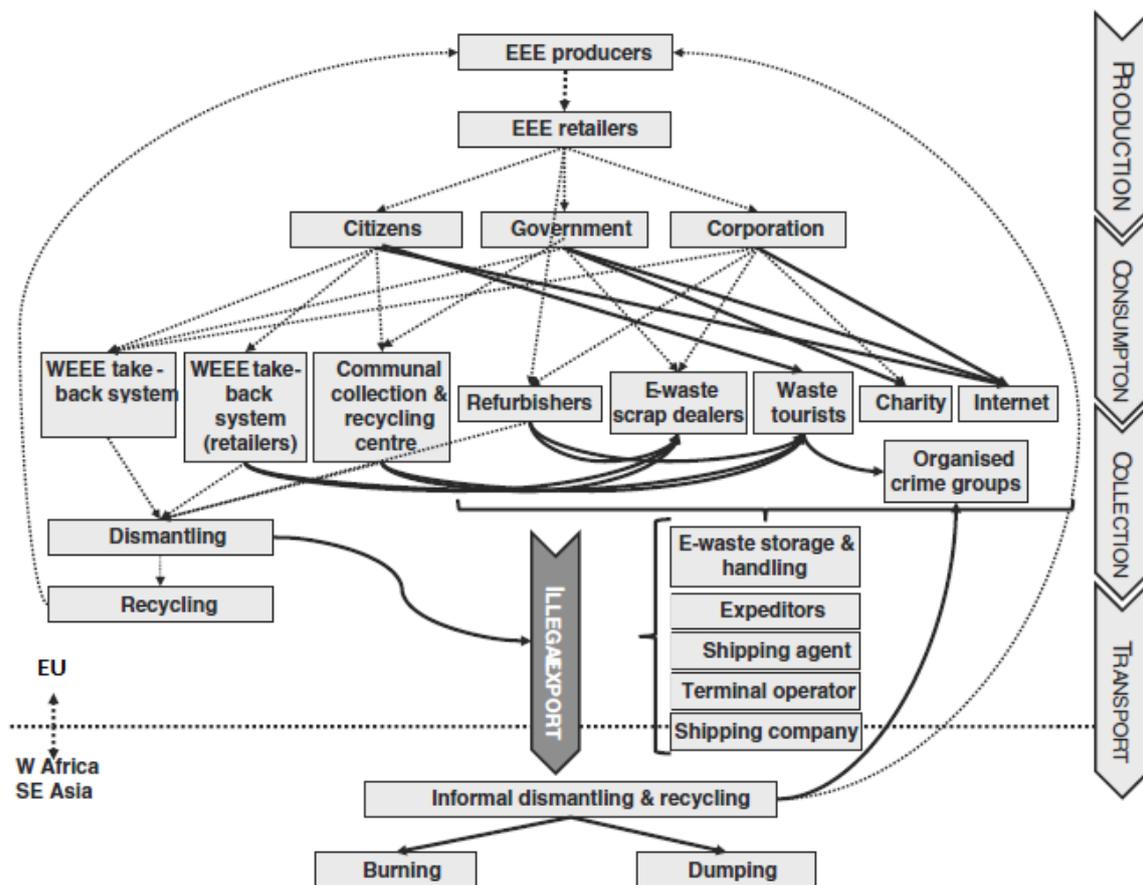
While the roles and responsibilities of the above agencies significantly vary, there are some overlaps too. The monitoring and prevention of illegal e-waste export is undertaken by customs, while it is the Environmental Protection Ministry's role to propose and implement legislation on e-waste (Wang et al. 2013, p40-48). As the Chinese governmental system is largely organised in a vertical way the Ministry of Environmental Protection is further replicated into Environmental Protection Bureaus (EPBs) at lower levels, such as at the provincial, city, district, county and township levels (Juan 2009, p65-92).

In addition to the above detailed institutions NGOs and research institutes also play an important role. Such organisations provide essential information background and/or advice for decision-makers and can therefore influence the governance of e-waste shipment.

4.6 Overview of key stakeholders

There is a wide range of stakeholders who can be either directly or indirectly related to illegal e-waste shipment from the European Union to China: producers, distributors, consumers, collectors, refurbishers, waste brokers, shipping companies, recyclers, downstream vendors and actors responsible for final disposal (see Figure 1). Given the geographical scope of this case study this section presents the key stakeholders in both sides and briefly describes their role. Please note that governmental actors are described in more detail in the previous section, whereas the role of organised crime groups is addressed in more detail in the section following this section.

Figure 2: Actors involved in illegal e-waste shipments



Source: Adapted from Bisschop 2012

Stakeholders in the European Union

Even though the producers of electronic appliances and the consumers who buy these appliances play an important role in terms of the amounts of generated e-waste, this stakeholder analysis starts from the point when the electric and electronic equipment is discarded and therefore these above mentioned actors are not detailed below.

Discarded EEE can end up in the retailer sector, in waste bins or can be brought to municipal waste collection points or recycling centres (Juan 2009). Numerous on-site investigations revealed that e-waste disposed by the public at waste collection points passes through a number of hands until it reaches its final destination in developing countries (EIA 2011). On-site investigations carried out in the UK by EIA (2011) showed that civic amenity sites routinely sell the disposed e-waste to outside companies which then illegally export the waste to developing countries, mainly to West Africa. Evidence in the UK showed that another crucial problem is that some of the municipal collecting sites do not record properly how much e-waste they receive and therefore it is harder to trace the illegal activities (Interview 2014). Other investigations revealed that collection points in Germany can be differentiated whether trading of the WEEE takes place or not. In those collection points where purchase and sale of e-waste is carried out in most cases a specialisation for different destination countries takes place. On the other hand, collection points which only store the e-waste can be also found. Here WEEE is consolidated for a long period and packed into large sea containers, which usually include a mixture of different quality products (Sander and Schilling 2010, p.61-65).

Another route is when businesses contract a specialised waste company to deal with the e-waste (UNODC 2013). In the UK the sub-contracting of a third party, often a small firm where the necessary recycling facilities are absent, takes place in many cases. There is a lack of due care and businesses do not feel responsible for the sub-contracted e-waste which is often diverted to the black market (Interview 2014).

As indicated above civic amenity sites can be in contact with unlicensed waste removal contractors but waste brokers or agents, as well as waste tourists, can also play an important role at this point of the export chain (Interpol 2009, p.20-23). Waste tourists are individuals or groups who originate from the destination countries, mainly from Asia or West Africa, and specifically travel to the EU to buy e-waste for export and/or sale and then are also involved in the illegal shipment. Waste agents usually provide the link between the exporters and the shipping lines and in many cases have a very close relationship with the exporters. Even though forwarding agents play an essential role in the illegal export of e-waste to West Africa illegal e-waste shipments to East Asia usually do not involve these agents, but shipping companies directly handle the export (Sander and Schilling 2010, p.61-65). According to Impel (2009) in many cases e-waste is shipped under false labelling or mixed with end-of-life vehicles (ELV).

Stakeholders in China

Even though the import of e-waste is officially banned in China (see section on legal framework above) it is still entering China via a number of different routes. As customs are becoming stricter scrap dealers and smugglers are now using less direct and less visible routes rather than bringing the e-waste directly to Chinese ports (Wang et al. 2013). Exporters often use Hong Kong, Taipei or the Philippines as the entering countries and then tranship the e-waste to smaller ports in China (ILO 2012, p.15). Even though Hong Kong is a Special Administrative Region (SAR) of China there is a legislative difference between the two countries and the legislation on e-waste adopted in China does not apply in Hong Kong. Subsequently, second-hand EEE and WEEE can be imported into Hong Kong and once it has been imported it can be then transported to other countries, including mainland China (Yoshida 2005 in Wang et al. 2013). Most of the e-waste that has been illegally imported into China then enters the informal refurbishment and recycling sectors, which compared to the formal sector have a lack of environmental, health and safety standards.

The informal recycling sector has been growing since the 1990s when imported waste began to enter China and individual recyclers started to use imported electric waste as sources for raw materials (Wang et al. 2013, p. 21-28). The main informal recycling sites are concentrated around key waterways and ports of

entry and include Guiyu, Longtang and Dali on the Pearl River Delta (Guandong Province), Taizhou on the Yangtze River Delta, Hebei Province, Hunan Province and Jiangxin Province (see Figure 1 on page 21). Guiyu and Taizhou used to be the two biggest centres for informal e-waste recycling. However, in the last 5 to 10 years local manufacturing in Taizhou has shifted away from the production of electronics and the local authorities in Taizhou have done major efforts to regulate the environmental impacts of e-waste recycling more strictly. As a result most informal recycling activities in Taizhou have been phased out (Interview 2014; Wang et al. 2013, p. 22). Most of the workers in the informal recycling sectors are rural migrants from agrarian regions in China who on average get USD 1.5 per day (Wang et al. 2013, p. 21-28). The products recovered in the informal recycling sector are then in most cases sold to the manufacturing sector, including both formal and informal sectors. The sells are often supported by the network of brokers (UNODC 2013).

On the other hand, the formal recycling sector is still at its early stages and mainly deals with the domestically generated e-waste in China. With regards to domestically generated WEEE in China the collector sector (which also has an informal and formal part) also plays an essential role. A crucial problem in the formal recycling sector is that the industry is not able to get sufficient volumes of e-waste, as most of WEEE ends up in the informal sectors, and this has negative implications on the investors' willingness to build new facilities (Interview 2014).

4.7 Links to organised crime

The link between illegal waste shipment and organised crime has been confirmed in recent years by many studies carried out by or on behalf of the United Nations, UNODC, Interpol, the EU and NGOs (Fajardo 2014). A recent report by Eurojust, the EU's judicial cooperation body, reveals that organised crime groups (OCGs) are behind cross-border environmental crime including illegal trafficking of e-waste (Eurojust 2014). Overall, the illegal export of e-waste is less structured and centralised than other organised pollution crimes. Rather than demonstrating the traditional hierarchical, centralised structure of organised crime, the involvement of organised criminality in illegal e-waste shipments is more loosely structured. Small groups organize for a short period of time to commit crime to obtain financial or other benefits, but dissolve more easily to form new groups (Fajardo 2014). According to the 2011 EU Organised Crime Threat Assessment (Europol 2011) these informal groups involved in illegal waste shipments usually consist of 5 to 10 people, with at least one member having ethnic links to the destination country. The degree of professionalism among these groups however varies. For instance groups involved in e-waste trafficking to West Africa seem to be less professional than groups involved in trafficking to China (Fajardo 2014; UNODC 2009).

Illicit e-waste shipments are often facilitated by cooperation with legitimate business, including those in the financial services sector, the import/export sector, and the metal recycling sector. Permits are often acquired through cooperation with specialists engaged in document forgery or by bribing permit issuing bodies (Europol 2011). Several European studies suggest that almost all legitimate companies are involved in illegal e-waste shipments either intentionally or unintentionally (Baird et al. 2014; Europol 2011). Investigation by the NGO Environmental Investigation Agency showed that local council recycling sites are also often involved. In 2010 the Plymouth City Council was fined almost £12,000 for selling TV monitors and other potentially harmful e-waste to unauthorised recyclers (EIA 2011; EA 2010). In that same year a company with headquarters in Merseyside was prosecuted for the illegal shipment to Hong Kong of e-waste originally collected from civic amenity sites in Cumbria (EIA 2011; Letsrecycle.com 2010).

Whether e-waste traffickers are best described as organised criminals has however raised some controversy. Some participants at a 2014 CWIT⁹ workshop on countering illegal e-waste trade confirmed that organised crime is involved in illegal waste shipments, however mostly in shipments of other types of

⁹ The Countering WEEE Illegal Trade (CWIT) Project is a currently on-going EU FP7 project which focuses on the enforcement problems related to the illegal shipment of e-waste from the EU.

waste than e-waste. In their view individuals or small, informal and loosely organised groups are mostly involved in illegal e-waste shipments rather than organised crime groups (CWIT 2014a). Other experts however are of the opinion that even those loosely structured groups might well fit the Palermo Convention definition of organised crime groups¹⁰, if the offence or crime is deemed “serious” in the countries concerned (Fajardo 2014).

Box 3: Big e-waste smuggling case in China

In January 2014, Chinese customs caught a smuggling company that engaged in large scale illegal e-waste trade. 54 people were arrested and 185 containers including 200 tonnes of e-waste were seized. The company smuggled e-waste from abroad to mainland China, using very complex and long shipment routes. It was reported that 2,800 containers of e-waste had been smuggled since 2013 by this company, totalling 72,000 tonnes of e-waste. The e-waste was imported from both western countries and Japan. The e-waste was first shipped to Hong Kong, then transhipped to a country in Northeast Asia and from there imported in China through smaller ports in Liaoning province where customs control is less strict or non-existent. From this province in the northeast of China the e-waste was shipped via inland roads to Guangdong province for resale or recycling. A huge indirect smuggling route of around 6,000 kilometres was set up to ship the e-waste from Hong Kong to Guangdong province (which is only 48 nautical miles away from Hong Kong) in order to circumvent the strict customs control in the ports in Guangdong (Interview 2014).

Preliminary findings of the research done within the CWIT project indicate that traditional mafia-like organised crime groups generally keep a low profile and might step in with a view to facilitate e-waste crime. This “facilitating crime” might include corruption or bribery, cybercrime, document forgery, identity theft and use of intimidation and violence (CWIT 2014). In its 2011 Organised Crime Threat Assessment Europol indicated there was evidence of corruption in the public and private sectors in Italy, especially in relation to the issuing of certificates by laboratory technicians. This, amongst others, has allowed Italy to become a transit country for e-waste shipments going to Africa and Asia (Europol 2011). Exporters of e-waste to China often avoid detection by going through Hong Kong, Taipei, Vietnam or the Philippines and then tranship the e-waste to smaller ports in China, where customs officers can be bribed (ILO 2012; Wang et al. 2013).

¹⁰ The 2000 UN Convention against Transnational Organized Crime (also known as the Palermo Convention) defines an organised crime group as “a structured group of three or more persons existing over a period of time and acting in concert with the aim of committing one or more serious crimes or offences [...] in order to obtain, directly or indirectly, a financial or other material benefit” (Palermo Convention, 2004: p.5).

Box 4: Transit through Vietnam

Another route through which e-waste and second-hand electronic goods enter China is via Vietnam. In particular Mong Cai is a major trade and smuggling hub through which e-waste is illegally shipped to China. In fact the city has become a major international smuggling hub for all kinds of goods such as cigarettes, drugs, firearms, ivory, tiger penises and even women. Organised criminals have been attracted to Mong Cai as the city is relatively close to the Vietnamese port of Haiphong (where controls on transits are rather nonexistent), as it is easy to transport goods across the river which separates the city from China and as the border controls are lax (Interview 2014; Bland 2012). It is clear that international smuggling syndicates are active in Mong Cai and surroundings. Whether these syndicates which engage in people, wildlife, drugs and firearms trafficking are also active in illegal e-waste trade is unclear (Interview 2014). As security and controls in China's main ports have been strengthened, smugglers have been prompted to use the port of Haiphong and the city of Mong Cai to ship illicit goods into China (Bland 2012). It is reported however that the Chinese government has taken some anti-corruption measures in previous years to counter illegal trade at this Vietnam-China border. Customs officials working in Dongxin, the Chinese city on the border with Mong Cai, are now subject to a rotation system. Officials are being sent from other regions within China to work and live in Dongxin during a limited period of three months and to be replaced afterwards by other colleagues (Interview 2014).

Participants at the CWIT workshop in October 2014 also confirmed that illegal e-waste shipments might go together with other 'parallel' crimes such as theft of goods and assets, other waste or pollution crime (such as illegal or legal shipments of end-of-life vehicles¹¹), drugs, firearms, human trafficking and money laundering. In a case of a waste storage facility in the Midlands (UK), for instance, the enforcement authorities discovered stolen vehicles, drugs and firearms together with the e-waste that was intended to be exported to West-Africa (EIA 2011).

4.8 Motivations and drivers behind the illegal export of WEEE

In order to understand how and why illegal shipments of e-waste from the EU to developing countries and China in particular take place, one should identify push factors, pull factors and facilitating factors. Push factors are those forces that drive illegal shipments of e-waste from their origin (supply-side factors). Pull factors are forces that draw illegal shipments of e-waste to their destination (demand-side factors). Facilitating factors are contextual elements that make illegal shipments of e-waste possible. Together these factors provide the motivations and drivers for actors involved in illegal shipments of e-waste to developing countries (Bisschop 2012).

Push factors

A major push factor is the historical development of the e-waste problem. The volume of e-waste has grown due to increased production and consumption of electric and electronic products. The digital revolution and technological developments resulting in regular replacements of e-products have led to a substantial increase in the quantity of e-waste. E-waste is currently one of the fastest growing waste markets and is likely to increase in the coming years given the exponential consumption of electric and

¹¹ Previous studies suggest that illegal shipments of e-waste often accompany end-of-life vehicles for export. Depolluted vehicles can be exported legally to many countries if adequately notified. However, vehicles are shipped for second-hand use to non-OECD countries and since shipping is based on volume, exporters will try to maximize the use of space by including other materials such as illegal shipments of e-waste (Bisschop 2012; Interpol 2009; Van Erp and Huisman 2010).

electronic products (Bisschop 2012). Furthermore, in Europe the perceived necessity of a market for cheap electrical and electronic products, a lack of producer responsibility and dissociation between consumption and waste production help to feed e-waste flows (Hultman & Corvellec, 2012).

Another push factor for illegal exports of e-waste is the EU waste legislation and WEEE legislation in particular. This legislation has led to higher environmental standards for treatment and therefore higher costs for treatment or disposal of WEEE (OECD 2012). Illegal activities can offer significant savings to WEEE management operators and are therefore financially attractive (Baird et al. 2014). In 2009, for instance, it was estimated that it is four times more expensive to incinerate waste in the Netherlands than to ship it to China. Others have estimated that it is 400 times cheaper to dump hazardous waste than to legally dispose it in the EU (OECD 2012). A study commissioned by the US Environmental Protection Agency (EPA) revealed that it was 10 times cheaper to export e-waste to Asia than it was to process it in the US (ILO 2012). Glass-to-glass recycling of computer monitors costs 50 cents per pound in the US, but only 5 cents in China (Liddick 2011). It is suggested that the economic and financial crisis also influenced the companies' willingness to avoid the costs of the legitimate e-waste recycling and dismantling processes (Eurojust 2014).

Several studies confirm that poor enforcement, including a low level of penalties, is a major push factor for illegal e-waste exports from the EU (OECD 2012; ILO 2012; BAN 2002). This impacts the risk of being caught which is considered to be generally low (Interpol 2010).

This low risk also relates to another push factor, i.e. the huge size and multi-actor character of the e-waste business, the complexity of the e-waste flows and the competitiveness of the market. Together with the nature of e-waste (e-waste can be disguised and mixed), this push factor explains why important opportunities exist for engaging in illegal activities (Baird et al. 2014; Bisschop 2012).

Other push factors have been identified. For instance high unemployment rates might encourage people to engage in illegal e-waste activities. High metal prices might drive informal door-to-door collection of e-waste by local collectors collecting metals and used equipment and therefore prevent e-waste to be handed over to formal compliance schemes (Huisman et al. 2012). According to Baird et al. (2014 p. 99) *"Consolidation and mergers within the waste sector have also put more pressure on smaller operators, who may be less able to compete in the market and may therefore be tempted to become involved in illegal activities"*.

Pull factors

The profit arises not only from differences in costs for treatment and disposal, but also from the reuse value of such equipment in the destination countries and from the extraction of valuable components and precious metals (Liddick 2011; Odeyingbo 2011).

Odeyingbo (2011) quantified the price of untested cell phones as €5 at the minimum in Nigeria, whereas a cell phone has a material value of around €1 in Germany. TV sets were estimated to generate €17 to €35 in Nigeria, whereas in Germany treatment costs are higher than any income from sales of the recycled materials (Deubzer 2011; Odeyingbo 2011).

In the destination countries, functional EEE and components are traded at higher prices than would be the case in the EU. The transport itself is relatively inexpensive. Often a mixed financing takes place via functional EEE, EEE which is used as a source of spare parts and via EEE which will no longer be used as such and either be used for production of raw materials or treated immediately (Sander and Schilling 2010).

It was calculated that importers of e-waste into Nigeria are able to make profits of several thousand euros per container. Importers into China and other developing countries make similar profits (Odeyingbo 2011; Deubzer 2011). Guiyu residents have made substantial profits from the industry, which is organised and controlled by local family groups. The extensive WEEE processing industry in Guiyu has been valued at about RMB 600 million per year, or approximately US\$72 million (Hicks et al. 2005). According to the UNODC (2013) environmental crimes, including illegal e-waste import, are among the most profitable

forms of organised crimes in the East Asia and Pacific region. In China high unemployment rates encourage people to engage in informal collection and recycling activities (ILO 2012). In fact the livelihoods of large population groups in China depend on the income from such activities (Wang et al. 2001 in Li 2012). It has for instance been claimed that many fishermen in China, unable to make a living from fishing, have reverted to ferrying illegal e-waste from Hong Kong to the Chinese mainland (Interpol, 2009). In Guiyu the actual recycling and processing of e-waste is done by poorly paid migrant workers from outside the area who are willing to endure the poor working conditions and the hazards of e-waste processing (Hicks et al. 2005).

Illegal recycling activities in China are particularly driven by China's growing appliance manufacturing sector which requires large amounts of raw materials and components. In this respect recycled materials are valued more than in the EU (Hicks et al. 2005). As a result the informal e-waste collectors and "recyclers" feed into the legal e-waste industry through the increased demand for secondary raw materials (Bisschop 2012).

Facilitating factors

According to Salehabadi (2013) transportation costs are low to Asian countries as many cargo ships from South-East Asia to Europe sail back to Asia with empty containers. This lowers the threshold for illegal transports. The anonymity of containers also facilitates illegal transports (Bisschop 2012). Illegal shipments of e-waste from Europe to China are facilitated by the presence of Chinese ethnic groups in Europe. The informal groups involved in illegal waste shipments to China usually have at least one member having ethnic links to the destination country (Europol 2011).

The nature of e-waste also facilitates illegal shipments: e-waste can be easily mixed up or sold as second hand goods (Baird et al. 2014; Bisschop 2012). Finally, WEEE collection points that are not adequately protected against theft make it easier for illegal operators to source WEEE (CWIT 2014).

4.9 Key environmental, social and economic impacts in China

In locations such as Guiyu, Qingyuan and Taizhou, China (see Figure 1 on page 21), the impacts of e-waste are pervasive across environmental, social and economic spheres. In not much more than a decade WEEE has become the central factor in determining everyday realities for those living and working in these sites of informal e-waste management (Hicks et al. 2005). It can be observed that imbalances in the global market economy, access to resources, and WEEE regulation are driving illegal waste flows and informal local management practices in China which exacerbate these inequities and, most critically, are degrading the natural environment and generating a number of acute human health risks (BAN and SVTC 2002; ILO 2012).

Environmental impacts

The environmental impacts of WEEE are substantial and highlight the toxic nature of its illegal trade. The scale of unregulated salvaging operations and the dumping of residual materials is driving complicated processes of environmental contamination (Frazzolia et al. 2010). There are three main sources of contaminants from WEEE: the original constituents of electrical equipment, such as lead and mercury; chemicals used in the recycling and separation processes, such as cyanide; and effluents formed during recovery processes, such as dioxins (ILO 2012). Field and laboratory research in China has shown that e-waste is significantly degrading air, soil, and water quality, as well as a range of biota (Walters & Santillo 2008). In Guiyu concentrations of multiple pollutants including heavy metals, polycyclic aromatic hydrocarbons (PAHs), polybrominated diphenyl ethers (PBDEs), polychlorinated dibenzo dioxins/furans (PCDD/Fs), and polychlorinated biphenyls (PCBs) have been found to exceed various international standards and local norms, in some cases by several scale factors (Deng et al. 2007; Deng et al. 2006; Luo et al. 2007; Li et al. 2007; Leung et al. 2006; Wong et al. 2007). There also exists a more nuanced

environmental impact from WEEE trade relating to global concerns about resource scarcity and sustainability. Whilst WEEE trade aims at recycling the valuable materials, it is an evidently wasteful and energy intensive industry and as such operates counter to global and EU ambitions for resource efficiency. There is also an indirect impact on climate change given the carbon insensitivity of the primary production of the substances of EEE. The adequate recovery and recycling of WEEE can therefore mitigate these impacts. Furthermore, if end-of life refrigerators and air conditioners are recovered in an environmentally-sound manner the impact of the ozone depleting substances contained in these devices on global climate change are mitigated (Secretariat of the Basel Convention 2011, p. 10-11).

Social and health impacts

Unsurprisingly the environmental impacts associated with WEEE have translated directly into a serious public health threat. Many of these threats are already apparent in medical diagnoses and statistical research. Some longer term risks may be yet to develop, and will still need to be understood (ILO 2012). Evidence suggests that WEEE is significantly increasing incidences of physical injuries and chronic disease, threatening not just workers but also current residents and future generations. High prevalence of skin, gastric, respiratory, hematic, neurological, prenatal, natal and infant diseases related to WEEE are becoming increasingly well documented (Grant et al. 2013). Health risks from WEEE can also be indirect, for instance if pollution enters the food and water systems. Contamination already outlined presents opportunities for harmful toxins to accumulate in agricultural crops, livestock and eventually humans (ILO 2012). In Guiyu, where rice is still cultivated, these risks are amplified and high concentrations of toxins found in agricultural soils and vegetation there suggest that this is already a reality (Sepúlveda et al. 2010; Song & Li 2014).

The e-waste recycling sector in China employs an estimated 250,000 people (Breivik et al. 2014). Although at a national scale this represents a relatively small number, at a local scale it has become the main source of employment for towns like Guiyu, where e-waste workers has in some estimates been shown to exceed the number of residents (Wu et al. 2012; Hicks et al. 2005). As a primary employer WEEE has become fundamental part of everyday life and transformed existing modes of social reproduction (Hicks et al. 2005). The informal, precarious, intensive and low paid nature of the work which informal e-waste processing provides reflect the limited social outcomes it can provide for the majority of those it employs (Pickren 2014). E-waste recyclers in Guiyu earn an average wage of US\$1.50 per day (ILO 2012).

Finally, security implications can be associated with the informal recycling of e-waste. In some cases end-of-life computers still contain personal data and information, which could be used for fraud (ILO 2012). When the UK based Environmental Investigation Agency carried out an e-waste related investigation they found that illegal traders were in contact with some governmental institutions, hospitals and fire services, and it was unlikely that the hard drivers were properly wiped before they were sold (EIA 2011).

Economic impacts

Although the environmental and health impacts relating to WEEE raise most concern, they cannot be fully understood without considering the economic motivations and impacts which underpin them (BAN and SVTC 2002; ILO 2012). The economics of e-waste can be understood in terms of upstream and downstream cost calculations, i.e. where it is sourced and where it is processed.

In China the value contained within the WEEE's components calculated by those engaged in its recycling is deemed to be, albeit unwittingly, commensurable with the environmental and social costs. The economic impact of this is the creation of an industry, made up mostly of informal enterprises in China which process e-waste, attempting to generate profit from the resale of copper, steel, aluminium, gold, and computer chips. There, potential in resource reutilisation and for income generation, allow WEEE to be perceived as an economic opportunity. Whilst environmental and health impacts are generated mostly by recycling practices, there exist complex value chains, at various stages of which the economic value of waste is extracted. This has seen Guiyu, for example, transform from a poor rice growing village into a highly dynamic and for some lucrative economic hub, processing up to 150 million tonnes of WEEE each year. The

emergence of this new industry has begun to impact upon other economic areas. In Guiyu, the presence of contaminants and heavy metals in surface and groundwaters has created a market for drinking water to be delivered from neighbouring towns (Hicks et al. 2005). On the other hand, WEEE is ultimately an externality of the mass consumption of electronic goods primarily in Europe and North America, from which most of the WEEE arriving in China is sourced (Breivik et al. 2014). The management of e-waste in China externalises the costs of a throw-away approach to electronic consumer goods elsewhere (Pickren 2014). For consumers the impact is that the costs of electronic goods and the management of the resultant waste are kept low, reducing incentives for changing practices, and providing a clear case in which the polluter does not pay.

Paradoxically the export of the value contained within WEEE also represents an economic loss to those nations which generate it. Having said this many European and American based “recyclers” of e-waste acting as middle brokers for Sino bound WEEE profit from this trade. In 2012 the e-waste recycling market earned revenues of \$1.3 billion (Frost & Sullivan 2013). The illegal export of e-waste has also led to a point where the legitimate modern recycling facilities in the EU cannot obtain the expected amount of WEEE. For instance, the UK recycling industry anticipated an annual volume of 1.5 million tonnes of WEEE to be processed. However, in reality the actual quantity was only the third of this amount (UNODC 2013).

4.10 Key groups of victims

The costs and impacts related to illegal shipment of WEEE are not evenly distributed. For the most part, the victims of e-waste are those directly involved in informal WEEE processing. The rudimentary methods used in e-waste processing puts those involved in these practices in direct contact with the aforementioned environmental and health risks. Spatially, due to the highly concentrated nature of WEEE practices, exposure is highest in those Chinese towns involved in the industry (Breivik et al. 2014) – see Figure 1 on page 21.

The risks associated with illegal shipment of WEEE are transboundary, consequently there are also passive victims to many of the environmental, social and economic impacts of WEEE in those localities where WEEE is being recycled and treated as well as further afield. Informal WEEE processing practices in many cases show disregard for surrounding communities, with waste and chemicals dumped in public spaces. In Beilin, China, it was shown that even the homes of WEEE workers had high levels of particulate matter putting others not engaged in the industry at risk (Brigden et al. 2005). Contamination of food and water sources already discussed further the potential for WEEE processing impacts to be felt regionally and even nationally (Sepúlveda et al. 2010).

Many of the impacts of WEEE processing in China are intensified when categories of age, race, gender and class intersect – highlighting the inherent social inequalities which e-waste reinforces. The industry mainly employs the poor and those who are already on the margins of Chinese society. Many of the workers come from ethnic and religious minorities, and whilst local family groups may organise the trade of waste, much of the recycling and treatment is carried out by rural migrants (Hicks et al. 2005). This indicates the existence of environmental discrimination in China. Likewise, the presence of children, pregnant women and young women with babies strapped to their backs in the WEEE processing sites demonstrates its potential to impact those parts of society which are most vulnerable and at risk (China Labour Bulletin, 2005; ILO, 2012). In Guiyu it is estimated that 80 per cent of children suffer from respiratory disease (Sepúlveda et al. 2010).

5 Conclusions and policy implications

Building on the academic and grey literature that has been reviewed and the stakeholder interviews that have been carried out this final chapter provides an overall conclusion highlighting the main challenges of encountering the illegal shipment of e-waste. It aims to outline the key lessons learnt during the research and also list a number of potential policy responses which could provide an effective solution to tackle the illegal activities.

5.1 Nature of the environmental crime

The case study reveals different legal-illegal interfaces throughout the e-waste chain. These interfaces can be broadly divided into two categories: antithetical interfaces where legal and illegal actors oppose each other and symbiotic interfaces where these actors cooperate with each other (see also Bisschop 2012).

Governments and companies as well as individual consumers can contribute to illegal shipments of e-waste. Actors in e-waste collection walk on a thin line between legal and illegal activities. E-waste brokers who play a role as legal intermediaries in transactions also act as intermediaries for illegal shipments through waste storage and handling. Other legal actors in Europe such as scrap metal dealers and refurbishers are also known to feed into illegal shipments.

Transport actors such as shipping companies, terminal operators, expeditors and shipping agents are also on a thin line between legal and illegal activities as they facilitate illegal shipments of e-waste: they all have e-waste smugglers as their clients.

It is even more difficult to draw the line between legal and illegal activities in China as a destination country of illegal e-waste transports. Informal collectors and dismantlers in China compete on the same market as formal actors and organised crime groups. They cooperate with legal actors from the manufacturing industry to sell to them the extracted raw materials. Although the imports of e-waste are illegal, they provide many Chinese inhabitants with a source of income. At the same time these imports entail harm to humans and the environment as the e-waste is not adequately 'recycled'. But even legal transports may cause harm.

The Chinese government which tolerated partially the import of e-waste in the past has been competing with European governments (in the search for secondary raw materials for their industries). However, in recent years the central government in China has significantly increased its efforts to control the import of waste (including e-waste), but might still be frustrated in its efforts as a result of lax control by local custom officials in remote parts of China or lax control by authorities in neighbouring countries.

The case study also reveals that the main motivations and drivers for illegal e-waste shipments from Europe to China are the asymmetries in WEEE regulation, the asymmetries in development/unemployment and access to resources which exist between Europe and China, the massive production of e-waste, the reuse value of e-waste in China, the complexity of the e-waste flows and the competitiveness of the market and the ineffective or insufficient enforcement of regulations. In addition, factors such as social/ethnic networks, the cheapness of container transports and the nature of e-waste facilitate illegal transports. Profit definitely plays a key role, but all these push, pull and facilitating factors together provide the motivations and drivers for illegal shipments of e-waste from the EU to China and other developing countries.

All this brings us to the conclusion that environmental harm rather than environmental crime should be taken as a frame of reference when trying to address the negative effects of e-waste shipments in developing countries. The focus of policy makers in Europe (and China) should not only be on strict crimes but also on activities that are on a thin line between legal and illegal. As the definition of what shapes illegality varies over time and place, policy makers might have difficulties in embodying this dynamism.

At the same time the case study reveals that organised crime groups are often behind illegal trafficking of e-waste to China, though mostly these groups are more loosely structured than traditional hierarchical mafia-like groups. Nevertheless, the case study indicates that traditional mafia-like organised crime groups might also be involved in illegal e-waste transports, but rather keep a low profile and act as facilitators of the e-waste crime. This should be recognised by European policy makers and should encourage them to make the fight against transnational e-waste crimes and other transnational crimes related to the 'grey environment' a priority and to provide for instance for substantial and permanent budgets for international police cooperation (at the level of Interpol or Europol) or for increased custom controls at the external borders of the EU.

5.2 Enforcement in the EU

It is clear that considerable amounts of e-waste continue to be shipped illegally from the EU to China (and other developing countries). The EU is struggling to adequately enforce the rules on shipments of e-waste from the EU to developing countries such as China. As significant differences between Member States continue to exist with respect to enforcement and inspections, illegal e-waste exporters and other key actors are able to exploit this lack of a level playing field by choosing those ports in Europe where control is regarded to be the weakest.

However, the EU has introduced extensive amendments to both the Waste Shipment Regulation (in 2014) and the WEEE Directive (in 2012) concerning inspections and enforcement. These amendments do indeed seek to address many of the weak points in the enforcement chain and therefore have the potential to improve inspection and enforcement on the ground. However most of these amendments are still to be implemented by the Member States. Therefore it remains to be seen whether the recent changes to the legislative framework will improve its effectiveness. Much will depend on the willingness of the individual Member States to provide the necessary resources (such as staff and budget) in order to enable the enforcement authorities to implement the new provisions in a meaningful way.

From the previous paragraphs – but also from the next ones – it can be concluded that the current EU legislative framework to fight illegal e-waste shipments (mainly the Waste Shipment Regulation and the WEEE Directive) is pretty coherent and does not show major gaps. However, there is still no level playing field within Europa as a result of differences in implementation and interpretation at Member State level. A major challenge at Member State level is to introduce a more integrated approach towards enforcement whereby inspection activities downstream in the e-waste chain (e.g. at EEE outlets or at e-waste collection points) and inspection or other enforcement activities in more upstream segments of the chain (e.g. in ports) mutually support and inform each other.

Prosecution

Even though the EU WSR in principal requires the Member States to penalise the infringements of the Waste Shipment Regulation the types of sanctions used around Europe and their effectiveness show a very mixed picture. The number of infringements actually brought to the courts, the extent to which penalties are applied and the levels of the actual penalties greatly vary (Algemene Rekenkamer 2013). For instance, in the Netherlands 30 per cent of EU WSR infringement cases are not prosecuted (see Section 4.3). Another problem is that public prosecutors around Europe are not sufficiently exchanging information neither on the prosecution guidelines of the EU WSR offences in their country nor on the penalties imposed on the offenders (Algemene Rekenkamer 2012).

A number of possible solutions to overcome the above issues have been drawn up by Eurojust (2014) and are presented here. One solution, which could enhance cooperation between prosecutors around Europe, would be the setting up of a list of contact points of practitioners in the different Member States. This would speed up the process of contacting prosecutors in other countries and would support the sharing of information even more, which could eventually lead to a more aligned prosecution system in the EU. Practitioners could also share their relevant case law best practices. The IMPEL Transfrontier Waste

Shipment Task Force is currently developing a database of case law on environmental crime, with a special focus on illegal e-waste shipment. This database when achieving its operational status would serve as a crucial source of information for the national practitioners who would be able to learn from these specific cases already judged in the different Member States.

Cooperation could be also enhanced between major stakeholders in the field of enforcement and prosecution actions related to environmental crimes, specifically to the illegal shipment of e-waste. This could involve for instance Europol, Interpol, IMPEL, the relevant DGs in the European Commission, ENPE, the Basel Secretariat and the UNODC. Furthermore, the relevant competent authorities around Europe could establish joint investigation teams specifically focusing on the illegal shipment of e-waste.

The penalties and the risk of detection of the illegal shipment of e-waste from Europe are still relatively low, while the actors involved in the illegal activities gain a substantial profit. In order to create a less 'attractive' environment to commit the crime one option could be to implement confiscation measures. This would create stricter conditions and could lead to the decrease of infringements. A greater attention on money laundering activities in relation to the illegal e-waste shipments could also increase the effectiveness of prosecution actions (Eurojust 2014).

Difficulties linked to investigating illegal shipments of e-waste from the EU to China and other developing countries could be surmounted by employing instruments on organised crime, such as the Palermo Convention. However, this Convention applies to 'serious crimes' which, for the purpose of the Convention is defined as a "*conduct constituting an offence punishable by a maximum deprivation of liberty of at least four years or a more serious penalty*". Nevertheless, the penalty threshold set by this international instrument is often not met for environmental crimes at national level (see also Eurojust 2014).

Many of those committing the crime are part of loosely structured networks or groups which definitely can be considered as organised crime groups, however without fitting the international legal definition of 'organised crime' of the Palermo Convention. As this might have major implications as to prosecution opportunities, a broadening of the definition should be considered in order to incorporate environmental crime and illegal e-waste shipments in particular.

Finally, in order to improve enforcement and prosecution the collection of intelligence linked to the illegal shipments of e-waste is essential. The more frequent use of intelligence-led enforcement would provide a better insight on the illegal activities and would help to track down the worst offenders and organised crime groups. Furthermore, the more information key institutions have on illegal e-waste shipment the easier it would be to prevent these illegal activities. More specific and better quality information is needed in particular on the motivations of the illegal shipments, the extent of the illegal activities, the main routes of the shipments and the key actors involved.

Between 2010 and 2011 Interpol's Environmental Crime Group has gathered information concerning the illegal shipment of e-waste. The information was provided by international law enforcement agencies. Even though preliminary conclusions were formed by Interpol the organisation highlighted that the information was very limited and therefore there is a need to substantially increase the information flow. Furthermore, the quality of information needs to be improved and better information sharing platforms need to be established (Interpol 2011).

5.3 Approaches beyond enforcement and inspections

Furthermore, it should be said that the effectiveness of the Waste Shipment Regulation and the WEEE Directive in halting illegal e-waste exports from the EU to developing countries remains relatively limited given the complexity of the e-waste problem. Recent challenges to these laws might at best yield limited improvements. It is part of an approach that aims to address problems related to the enforcement of rules regulating e-waste shipments and which involves among others developing a clear definition of and classification system for e-waste, creating clear guidelines or protocols for enforcement authorities and improving coordination and cooperation among authorities.

Efforts will only incrementally deliver improvements as long as these do not tackle the underlying problem, i.e. illegal e-waste shipments from the EU to China and other developing countries are mainly driven by profit maximization. The very low profit potential of discarded EEE in the EU compared to the profit potential in developing countries will need to be dealt with. Otherwise it will remain extremely difficult to halt illegal shipments of e-waste to developing countries.

Given the difficulty of banning trade of e-waste between the EU and non-OECD countries all together and given the fast domestic generation of e-waste in China and other developing countries, it is not entirely clear that trade bans and enforcing these will deal with the problems related to informal recycling in non-OECD countries such as China. Therefore approaches are needed that do not necessarily criminalise e-waste shipment but, instead, enhances regulation of the (informal) recycling industry in developing countries in order to avoid environmental harm from inadequate disposal of e-waste.

The “Best of two worlds model” (Bo2W) might give some insights into working with the informal sector in developing countries to improve practices therein. According to the Bo2W philosophy manual dismantling is preferred over mechanical separation. The former involves low technologies, low operational costs and higher yield of material liberation, whereas the latter involves high technology, high operational costs and a lower yield of material liberation. As pre-processing in developing countries often occurs in the informal sector providing a minimal income for the poor, high levels of mechanization and automation in pre-processing processes cannot be justified. At the same time the model states that technically advanced facilities are preferred over informal refining techniques, as the latter involves significantly higher environmental, health and safety risks. The Bo2W model therefore aims to integrate technically and logistically the ‘best’ pre-processing practices in developing countries (i.e. manual dismantling of e-waste) and the ‘best’ end-processing practices in international state-of-the-art end-processing facilities (where hazardous and complex components are treated). This should allow achieving the most sustainable and economic solution for the treatment of e-waste in developing countries. The Bo2W philosophy or model can be applied as a transition measure up until state-of-the-art end-processing facilities are settled in developing countries (Interview 2014; Wang et al. 2012).

Roadmaps for implementing the Bo2W model, however, might vary among developing countries depending on factors such as the level of labour costs and the size of the e-waste market. For a country like China with a medium level of labour costs and a huge e-waste market it is recommended to practice full manual dismantling as a start and gradually mechanize pre-processing activities and to treat critical e-waste fractions in international end-processing facilities. In the long run China could settle end-processing facilities locally (Wang et al. 2012).

The EU could support establishing collection and recycling facilities in developing countries in accordance with the Bo2W philosophy. EU support measures might be partly or fully financed by electronic producers in the EU within the context of extended producer responsibility.

In addition, policies are needed that are even more than now directed towards the prevention or reduction of e-waste through reducing toxics or replacing them all together, making products environmentally friendly and easier to dismantle and recycle, thereby closing loops (extended producer responsibility) but also towards the reduction of consumption of electronic and electrical tools in Europe and the rest of the developed world. Consumers should be made fully aware of the possible links of illegal e-waste export in the EU, in particular of the vast amount of actors involved in the lengthy chain and their potential roles. More targeted awareness raising campaigns could ensure the opportunity for citizens to put public pressure on national decision-makers to increase their efforts to tackle this environmental crime.

References

- Algemene Rekenkamer. 2013. *Coordinated audit on the enforcement of the European Waste Shipment Regulation - Joint report based on eight national audits*. Algemene Rekenkamer / Netherlands Court of Audit. Accessed 10 June 2014. http://www.eca.europa.eu/sites/cc/Lists/CCDocuments/other%20publications/Coordinated_audit_on_the_enforcement_of_the_European_Waste_Shipment_Regulation.pdf
- Algemene Rekenkamer. 2012. *Enforcement of the European Waste Shipment Regulation*. Rapport, Tweede Kamer, vergaderjaar 2012-2013, 33 418. Accessed 10 June 2014. http://www.courtsofaudit.nl/english/Publications/Audits/Introductions/2012/10/Enforcement_of_the_European_Waste_Shipment_Regulation
- Baird J., R. Curry and P. Cruz. 2014. "An overview of waste crime, its characteristics, and the vulnerability of the EU waste sector." *Waste Management & Research* 32: 97-105
- BAN and SVTC. 2002. *Exporting Harm – The High-Tech Trashing of Asia*. The Basel Action Network (BAN) and Silicon Valley Toxics Coalition (SVTC). Accessed 28 March 2014. <http://www.ban.org/E-waste/technotrashfinalcomp.pdf>
- Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (1989) <http://www.basel.int/Portals/4/Basel%20Convention/docs/text/BaselConventionText-e.pdf>
- Bisschop, L. 2014. "How e-waste challenges environmental governance". *International Journal for Crime, Justice and Social Democracy* 2 (2014): 82-96.
- Bisschop L. 2012. "Is it all going to waste? Illegal transports of e-waste in a European trade hub". *Crime, Law and Social Change* 58 (2012): 221-249.
- Bland, B. 2012. "Vietnam-China smuggling surges." *Financial Times*, 29 May 2012. Accessed December 12, 2014. <http://www.ft.com/intl/cms/s/0/e3bc38a8-9a8d-11e1-9c98-00144feabdc0.html#axzz3LgIe8BU>
- Breivik, K., Armitage, J. M., Wania, F., & Jones, K. C. 2014 "Tracking the Global Generation and Exports of e-Waste. Do Existing Estimates Add up?" *Environ. Sci. Technol.*, 48: 8735-8743.
- Brigden, K., Labunska, I., Santillo, D., & Allsopp, M. 2005. *Recycling of Electronic Wastes in China & India: Workplace & Environmental Contamination*. Amsterdam: Greenpeace International. Accessed 15 May 2014. <http://www.greenpeace.org/international/PageFiles/25134/recycling-of-electronic-waste.pdf>
- Brosnan, Anne. 2014. "Smarter Enforcement Strategies." Presentation made at the EFFACE conference 'Smart Enforcement: How to Target Environmental Law Enforcement Efforts in Times of Crisis?', Brussels, November 3, 2014.
- China Labour Bulletin. 2005. "The plight of China's e-waste workers". Accessed 20 October 2014, <http://www.clb.org.hk/en/node/16058/print>.
- CWIT. 2014a. Countering WEEE illegal trade project workshop, 16 & 17 October 2014, Lyon, France.
- CWIT. 2014b. "White paper for CWIT WP6 session in Lyon on Friday, Countering WEEE illegal trade project workshop", 16&17 October 2014, Lyon-France. Decision III/1 Amendment to the Basel Convention, <http://www.basel.int/Implementation/LegalMatters/BanAmendment/Overview/tabid/1484/Default.aspx>
- Deng, W., Louie, P., Liu, W., Bi, X., Fu, J., & Wong, M. 2007. "Distribution of PBDEs in air particles from an electronic waste recycling site compared with Guangzhou and Hong Kong, South China". *Environment International*, 33(8), 1063-1069.
- Deng, W., Louie, P., Liu, W., Bi, X., Fu, J., & Wong, M. 2006. "Atmospheric levels and cytotoxicity of PAHs and heavy metals in TSP and PM2.5 at an electronic waste recycling site in southeast China". *Atmospheric Environment*, 40(36), 6945-6955.

- Deubzer, O. 2011. *E-Waste management in Germany*. United Nations University Institute for Sustainability and Peace (UNU-ISP). Accessed 22 October 2014. <http://isp.unu.edu/publications/scycle/files/ewaste-management-in-germany.pdf>
- Directive 2012/19/EU of the European Parliament and of the Council of 4 July 2012 on waste electrical and electronic equipment (WEEE). OJ L 197. 24.7.2012. p.38-71
- Directive 2008/99/EC of the European Parliament and of the Council of 19 November 2008 on the protection of the environment through criminal law. OJ L 328. 6.12.2008. p.28-37
- Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives. OJ L 312. 22.11.2008. p.3-30
- Directive 2002/96/EC of the European Parliament and of the Council of 27 January 2003 on waste electrical and electronic equipment (WEEE). OJ L 37. 13.2.2003. p.24-38
- EA. 2010. Environment Agency press release: "Plymouth Council fined after waste electrical goods from the City ends up in the wrong hands", 11 June 2010.
- Earley, K. 2013. "Could China's 'green fence' prompt a global recycling innovation?" *The Guardian*, 27 August 2013. Accessed 11 December 2014. <http://www.theguardian.com/sustainable-business/china-green-fence-global-recycling-innovation>
- EC. 2013a. Commission Staff Working Paper – Impact Assessment Accompanying document to a legislative proposal and additional non-legislative measures strengthening the inspections and enforcement of Regulation (EC) No 1013/2006 of the European Parliament and of the Council of 14 June 2006 on shipments of waste. Brussels, 11.7.2013, SWD(2013) 268.
- EC. 2013b. Proposal for Regulation of the European Parliament and of the Council amending Regulation (EC) No 1013/2006 on shipments of waste. Brussels, 11.7.2013. COM(2013) 516.
- EC. 2007. "Revised Correspondents' Guidelines No1 – Subject: Shipment of Waste Electrical and Electronic Equipment (WEEE)."
- EEA. 2012. *Movements of waste across the EU's internal and external borders*. European Environment Agency. Accessed 25 March 2014. <http://www.eea.europa.eu/publications/movements-of-waste-EU-2012>
- EEA. 2009. *Waste without borders in the EU? Transboundary shipments of waste*. European Environment Agency. Accessed 25 March 2014. <http://www.eea.europa.eu/publications/waste-without-borders-in-the-eu-transboundary-shipments-of-waste>
- EIA. 2011. *System failure – The UK's harmful trade in electronic waste*. Environmental Investigation Agency. Accessed 14 May 2014. http://www.greencustoms.org/docs/EIA_E-waste_report_0511_WEB.pdf
- Eurojust. 2014. *Strategic Project on Environmental Crime*. Report. Accessed 25 November 2014. http://www.eurojust.europa.eu/doclibrary/Eurojust-framework/Casework/Strategic%20project%20on%20environmental%20crime%20%28October%202014%29/environmental-crime-report_2014-11-21-EN.pdf
- Europol. 2011. *OCTA 2011. EU Organised Crime Threat Assessment*, European Police Office. Accessed 12 May 2014. <https://www.europol.europa.eu/content/publication/octa-2011-eu-organised-crime-threat-assessment-1465>
- ewaste. 2009. "The ewasteguide.info." Accessed: 27 October 2014. <http://ewasteguide.info/>
- Fajardo, T. 2014 "Legal analysis of international instruments on organised crime in the perspective of fighting environmental crime". FP7 Research project "European Union Action to Fight Environmental Crime" (EFFACE). University of Granada.
- Fischer Christian, Nanja Hedal, Rikke Carlsen, Karin Doujak, David Legg, Judith Olivia, Sara Ludeking Sparvath, Matti Viisimaa, Thomas Weissenbach and Mads Werge. 2008. *Transboundary shipments of waste in the EU – Developments 1995-2005 and possible drivers*. European Topic Centre on Resource and Waste Management. Accessed 28 April 2014.

http://scp.eionet.europa.eu/publications/Transboundary%20shipments%20of%20waste%20in%20the%20EU/wp/tech_1_2008

Frazzolia, C., Orisakwe, O. E., Dragone, R., & Mantovani, A. 2010. "Diagnostic health risk assessment of electronic waste on the general population in developing countries' scenarios". *Environmental Impact Assessment Review*, 30(6), 388-399.

Frost & Sullivan. 2013. "European Waste Electrical and Electronics Equipment Recycling Market". Last accessed October 30, 2014, from Ends Europe: <http://www.endseurope.com/docs/131001c.pdf>.

Graham, J., Ini, G.Grewal and Lewis, J. 2007. *Ethics in Social Research: the views of research participants*. Government Social Research Unit. Accessed 4 November 2014. http://www.civilservice.gov.uk/wp-content/uploads/2011/09/ethics_participants_tcm6-5783.pdf

Grant, K., Goldizen, F. C., Sly, P. D., Brune, M.-N., Neira, M., van den Berg, M., et al. 2013. "Health consequences fo exposure to e-waste: a systematic review". *Lancet Glob. Health*, 1, 350-361.

Hicks, C., Dietmar, R., & Eugster, M. 2005. "*The recycling and diposal of electrical and electronic waste in China - legislative and market responses*". *Environmental Impact Assessment Review*, 25, 459-471.

Huisman J., Magalini, F. Kuehr, R., Maurer, C., Oglivie, S., Poll, J., Delgado, C., Artim, E., Szlezak, J., Stevels, A. 2008. *2008 review of Directive 2002/96 on Waste Electrical and Electronic Equipment (WEEE) – Final Report*. United Nations University, AEA Technology, Gaiker, Regional Environmental Centre for Central and Eastern Europe, Delft University of Technology, for the European Commission, Study No. 07010401/2006/442493/ETU/G4. Accessed 14 May 2014. http://ec.europa.eu/environment/waste/weee/pdf/final_rep_unu.pdf

Hultman J. & Corvellec H. 2012. "The European Waste Hierarchy: from the sociomateriality of waste to a politics of consumption" *Environment and Planning A* 44(10) 2413 – 2427.

ILO. 2012. *The global impact of e-waste: Addressing the challenge*. International Labour Office. Accessed 18 March 2014. http://www.ilo.org/wcmsp5/groups/public/---ed_dialogue/---sector/documents/publication/wcms_196105.pdf

IMPEL. 2014. *IMPEL TFS Enforcement Actions III. Final Report. Enforcement of the European. Waste Shipment Regulation*. European Union Network for the Implementation and Enforcement of Environmental Law. Accessed 17 July 2014, <http://impel.eu/wp-content/uploads/2014/08/FR-2013-22-Enforcement-Actions-III.pdf>

IMPEL. 2013. *IMPEL TFS Prosecutors Project 2013*. Accessed 16 December 2014. <http://impel.eu/wp-content/uploads/2014/05/FR-2013-24-Public-Prosecutors-phase-II.pdf>

IMPEL. 2012. *Transfrontier Shipment of Waste*. European Union Network for the Implementation and Enforcement of Environmental Law. Accessed 20 May 2014. <http://impel.eu/cluster-2/>; (IMPEL-TFS 2012)

IMPEL. 2011 *IMEPL-TFS Enforcement Actions II – Enforcement of EU Waste Shipment Regulation “Learning by doing”*. European Union Network for the Implementation and Enforcement of Environmental Law

IMPEL. 2008 *IMEPL-TFS Enforcement Actions I – Enforcement of EU Waste Shipment Regulation “Learning by doing”*. European Union Network for the Implementation and Enforcement of Environmental Law.. Accessed 17 July 2014. http://www.ies.be/files/repo/IMPEL-TFS_enforcement_project_I_final_report_June_2008.pdf

IMPEL. 2005. *IMPEL-TFS SEAPORT PROJECT II: International cooperation in enforcement hitting illegal waste shipments*. European Union Network for the Implementation and Enforcement of Environmental Law. Accessed 23 July 2014. <http://impel.eu/wp-content/uploads/2010/02/2005-8-Seaport-II-Final-Report.pdf>

- IMPEL. 2004. *IMPEL-TFS Verification 2 Project: Is what you see, what you get?* European Union Network for the Implementation and Enforcement of Environmental Law. 2004. Accessed 28 July 2014. <http://impel.eu/wp-content/uploads/2010/02/2004-16-Verifications-II-Final-Report.pdf>
- Interpol. 2011. *Information management – Strategic Analysis Report on Illegal Export of Electronic Waste to Non-OECD countries*. Interpol Environmental Crime Programme. Accessed 18 July 2014. <http://www.interpol.int/Crime-areas/Environmental-crime/Resources>
- Interpol. 2009. *Electronic waste and organised crime: Assessing the link (Phase II Report for the Interpol Pollution Crime Working Group)*. Interpol. Accessed 19 May 2014. <http://www.interpol.int/Crime-areas/Environmental-crime/Resources>
- Juan Wang. 2009. “Transboundary shipment of E-Waste – Regulations, systems, stakeholders and solutions” Master Thesis, Delft University of Technology.
- KeQiu Li, ShaSha Liu, QiaoYun Yang, YuXia Zhao, JunFang Zuo, Ran Li, YaQing Jing, XiaoBo He, XingHua Qiu, Guang Li and Tong Zhu. 2014. “Genotoxic effects and serum abnormalities in residents of regions proximal to e-waste disposal facilities in Jinghai, China.” *Ecotoxicology and Environmental Safety*. 105: 51-58
- Letsrecycle.com. 2010. “EA secures prosecution over hazardous WEEE exports”, 20 July 2010.
- Leung, A., Cas, Z., & Wong, M. 2006. “Environmental contamination from electronic waste recycling at Guiyu, southeast China”. *Journal of Material Cycles and Waste Management*, 8(1), 21-33.
- Liddick, D. R. 2011. *Crimes against Nature: Illegal Industries and the Global Environment*. Santa Barbara, CA: Praeger.
- Li, H., Yu, L., Sheng, G., Fu, J., & Peng, P. 2007. “Severe PCDD/F and PBDD/F Pollution in Air around an Electronic Waste Dismantling Area in China”. *Environmental Science and Technology*, 41(16), 5641-5646.
- Luo, Q., Cai, Z., & Wong, M. 2007. “Polybrominated diphenyl ethers in fish and sediment from river polluted by electronic waste”. *Science of the Total Environment*, 383, 115-117.
- Pickren, G. 2014. “Geographies of E-waste: Towards a Political Ecology Approach to E-waste and Digital Technologies”. *Geography Compass*, 8(2), 111-124.
- Ni, Hong-Gang and Zeng Eddy Y. 2009. “Law Enforcement and Global Collaboration are the Keys to Containing E-waste Tsunami in China” *Environmental Science & Technology* 43 (2009): 3991-3994.
- Odeyingbo, O. A. 2011. *Assessment of the Flow and Driving Forces of Used Electrical and Electronic Equipment into Nigeria and within Nigeria*. Master thesis at BTU Cottbus. Cottbus.
- OECD. 2012. *Illegal Trade in Environmentally Sensitive Goods. OECD Trade Policy Studies*. Accessed 13 May 2014. http://www.oecd-ilibrary.org/trade/illegal-trade-in-environmentally-sensitive-goods_9789264174238-en
- OECD Council Decision Concerning the Control of Transboundary Movements of Wastes Destined for Recovery Operations (2001) <http://www.oecd.org/env/waste/30654501.pdf>
- Ongondo F. O., I. D. Williams and T. J. Cherret. 2011. “How are WEEE doing? A global review of the management of electrical and electronic wastes”. *Waste Management* 31:714-730
- Pickren, G. 2014. “Geographies of E-waste: Towards a Political Ecology Approach to E-waste and Digital Technologies”. *Geography Compass* 8/2: 111-124.
- Qingbin Song and Li Jinhui. 2014. “Environmental effects of heavy metals derived from the e-waste recycling activities in China: A systematic review” *Waste Management*
- Regulation (EU) No 660/2014 of the European Parliament and of the Council of 15 May 2014 amending Regulation (EC) No 1013/2006 on shipments of waste. OJ L 189, 27.6.2014, p.135-142
- Regulation (EC) No 1013/2006 of the European Parliament and of the Council of 14 June 2006 on shipments of waste. OJ L 190, 12.7.2006, p.1

Robinson B. H. 2009. "E-waste: An assessment of global production and environmental impacts." *Science of the Total Environment*. 408: 183-191

Salehabadi Djahane. 2013. *Solving the E-waste Problem (StEP) Green Paper: Transboundary Movements of Discarded Electrical and Electronic Equipment*. Cornell University. Accessed 13 July 2014. http://www.step-initiative.org/tl_files/step/files/5.%20StEP%20Task%20Forces/5.1%20TF%201%20Policy/5.1.4%20Projects/Transboundary%20Movement%20of%20WEEE/StEP_GP_TBM_20130325.pdf

Sander, K., and Schilling, S. 2010. *Transboundary shipment of waste electrical and electronic equipment / electronic scrap – Optimization of material flows and control* (Project No. (FKZ) 3708 93 300. Umwelt Bundesamt. 2010. Accessed 1 September 2014. <http://www.umweltbundesamt.de/sites/default/files/medien/461/publikationen/k3933.pdf>

Secretariat of the Basel Convention. 2014a. "Basel Convention Ban Amendment." Accessed 25 November 2014. <http://www.basel.int/Implementation/LegalMatters/BanAmendment/Overview/tabid/1484/Default.aspx>

Secretariat of the Basel Convention. 2014b. "Status of ratifications". Accessed 25 November 2014. <http://www.basel.int/Countries/StatusofRatifications/tabid/1341/Default.aspx>

Secretariat of the Basel Convention. 2011. *Where are WEEE in Africa? Findings from the Basel Convention E-waste Africa Programme*. Accessed 12 June 2014. <http://www.basel.int/Implementation/Ewaste/EwasteinAfrica/Overview/PublicationsReports/tabid/2553/Default.aspx>

Sepúlveda, A., Schluep, M., Renaud, F. G., Streicher, M., Kuehr, R., Hagelüken, C., et al. 2010. "A review of the environmental fate and effects of hazardous substances released from electrical and electronic equipments during recycling: Examples from China and India". *Environmental Impact Assessment Review*, 30, 28-41.

Seum Stefan and Andreas Hermann. 2010. *Building local capacity to address the flow of e-wastes and electrical and electronic products destined for reuse in selected African countries and augment the sustainable management of resources through the recovery of materials in e-wastes - Component 1: Flows of used and end-of-life e-products from Germany, The Netherlands and Belgium*. Oko Institute e.v. Accessed 19 May 2014. <http://www.oeko.de/oekodoc/1370/2010-451-en.pdf>

Song, Q., & Li, J. 2014. "Environmental effects of heavy metals derived from the e-waste recycling activities in China: A systematic review". *Waste Management*.

SteP. 2014. "Solving the E-waste Problem." Accessed 27 October 2014. <http://www.step-initiative.org/index.php/Home.html>

Taylor, Brian. 2014. "Clearing the fence." *Recycling today*, 13 January 2014. Accessed December 11, 2014. <http://www.recyclingtoday.com/rtge0114-operation-green-fence.aspx>

United Nations Convention against Transnational Organized Crime, 2004

UNODC. 2013. *Transnational Organized Crime in East Asia and the Pacific – A Threat Assessment*. Accessed 26 November 2014. http://www.unodc.org/documents/data-and-analysis/Studies/TOCTA_EAP_web.pdf

UNODC. 2009. "Transnational trafficking and the rule of law in West Africa: a threat assessment", United Nations Office on Drugs and Crime, Last modified July 2009: www.unodc.org/documents/data...analysis/.../West_Africa_Report_2009

Van Erp, J. and Huisman W. 2010. "Smart regulation and enforcement of illegal disposal of electronic waste". *Criminology and Public Policy* 9: 579–590.

VROM-inspectie. 2011. Evaluatie en vooruitblik ketenproject elektrische en elektronische apparaten 2010, Ministerie van Infrastructuur en Milieu, Den Haag, 20 april 2011.

VROM-inspectie. 2007. Het beeld verhelderd. Handhavingsactie 2006 op de export van afgedankte elektrische en elektronische apparaten, Eindhoven, 8 maart 2007.

- Walters, A., & Santillo, D. 2008. "Evidence of environmental and health impacts of electronics recycling in China: an update". Amsterdam: Greenpeace International. Accessed 15 May 2014. <http://www.greenpeace.to/publications/impacts-of-e-recycling-china-update.pdf>.
- Wang, F., Kuehr, R., Ahlquist, D. and Li, 2013. J. *E-waste in China: A country Report*. United Nations University and Tsinghua University. 5 April 2013. Accessed 20 May 2014. <http://isp.unu.edu/publications/scycle/files/ewaste-in-china.pdf>
- Wang, F., Huisman, J., Meskers, C. E. M., Schluep, M., Stevels, A., & Hagelüken, C. 2012. "The Best-of-2-Worlds philosophy: Developing local dismantling and global infrastructure network for sustainable e-waste treatment in emerging economies". *Waste Management* 32: 2134–2146.
- Wong, C., Duzgoren-Aydin, N., Aydin, A., & Wong, M. 2007. "Evidence of excessive releases of metals from primitive e-waste processing in Guiyu". *Environment Pollution*, 148, 62-72.
- WSCEP. 2013. "A Platform for International Collaboration Promoting Compliance with Environmental Law." Accessed 27 October 2014. <http://www.wscep.org/>
- Wu, K., Xu, X., Peng, L., Liu, J., Guo, Y., & Huo, X. 2012. "Association between maternal exposure to perfluorooctanoic acid (PFOA) from electronic waste recycling and neonatal health outcomes". *Environ. Intl.*, 28, 1-8.
- X. 2014. *Analysis of International Legal Instruments relevant in the fight against Environmental Crime*. FP7 Research project "European Union Action to Fight Environmental Crime" (EFFACE). Queen Mary University of London & University of Granada.
- Zhang Quang, Jingjia Ye, Jinyuan Chen, Hangjie Xu, Cui Wang and Meirong Zhao. 2014. "Risk assessment of polychlorinated biphenyls and heavy metals in soils of an abandoned e-waste site in China." *Environmental Pollution*. 185: 258-265
- Zoetman B. C. J. 2006. *Global Waste Electrical and Electronic Equipment (WEEE) streams estimates*. Tias Business School and Telos, Brabant Centre for Sustainable development, Tilburg University Accessed 15 May 2014. <http://library.certh.gr/libfiles/PDF/GEN-PAPYR-3211-GLOBAL-WASTE-ELECTRICAL-by-ZOETEMAN-in-WEEE-Paper-maart-PP-13-Y-2007.pdf>

Annex A: List of interview questions

Questions for interviews on illegal e-waste activities and enforcement in the EU

This list of questions is meant to guide the interviewer when conducting the semi-structured interview. These questions were adjusted and selected according to the contacted expert's background and the circumstances under which the interview was conducted (e.g. time available, type of semi-structured interview, level of detail of answers). This implies that not all questions were asked per se. The interviewee was presented a list of potential weak points in the enforcement chain within a Member State or the EU as a whole (see Q7), and was asked to identify/select the most relevant ones and to provide more detail on those. Depending on the expert interviewed questions were rather focused either on 1 or a few Member States or on the EU as a whole.

1. What data is available on illegal WEEE shipments from the EU to developing countries and to China in particular?
 - How reliable is this data?
 - How accurate is this data?
2. In what way is information of illegal WEEE shipment gathered and managed in your country/in the EU?
 - Do you think it is an effective approach?
 - If not, how this could be changed?
3. What are the main drivers of illegal e-waste shipments to developing countries and China in particular?
4. Who are the main stakeholders involved in illegal shipment of WEEE from your country/the EU to China?
5. Are you aware of the links between illegal WEEE shipment and organised crime and/or corruption in your country?
 - If yes, what are these?
6. How effective is current national and EU level legislation on countering illegal WEEE shipments?
 - Do enforcement activities have any impact on reducing illegal e-waste shipments?
 - Which enforcement actions towards illegal WEEE shipment are considered to be the most efficient in your country?
7. What are the main reasons behind ineffective enforcement in your country?
 - What are the weakest points in the enforcement chain?
 - Lack of inspection planning
 - Lack of risk assessment underpinning inspections
 - Lack of training for inspectors
 - Lack of technical equipment
 - Lack of coordination among enforcement authorities
 - Lack of ex-post or downstream inspections
 - Lack of upstream inspections
 - Limited use of criminal penalties
 - Lack of prosecution
 - Insufficient penalties (e.g. too low fines)
 - Lack of power for inspections
 - As to burden of proof regarding distinction between waste and products and regarding environmentally sound management of waste
 - Lack of guidance for customs (given co-existence of 2 code systems)
 - Inadequate information management
 - Inadequate information systems
 - Inadequate exchange of information within countries
 - Inadequate exchange of information between countries
 - Inadequate registration and reporting of inspections, infringements and sanctions
 - Lack of insight into functioning of e-waste system as a whole
 - Any other weak points?
8. What is needed to address the weaknesses?
9. Are recent changes to the enforcement provisions of the EU WSR likely to improve enforcement? Why (not)?
 - Inspection plans

- Risk assessment for specific waste streams and sources of illegal shipments
 - Requirement to include minimum number of physical checks in waste-shipment inspections
 - Requirement to investigate protection of equipment against damage during transport, loading and unloading
 - Requirement to investigate whether waste is being shipped to 'environmentally-sound facilities'
 - Inspectors having more power to demand documentary evidence from suspected illegal exporters as to the origin and destination and that it is not waste
 - ...
10. Are changes to the WEEE Directive (2012) likely to improve enforcement?
- Inspectors having more power to demand documentary evidence from suspected illegal exporters
11. Which weaknesses have not been addressed by the new legislation so far?
12. What other changes to legislation (such as the WSR) are required?
13. What other policies are required? / Are there any approaches other than law on inspections and its enforcement to address the illegal shipment of WEEE from the EU?
- Enhancing regulation of informal e-waste recycling industry in developing countries (informal sector development schemes)
 - Policies to prevent or reduce e-waste
 - Policies to reduce consumption and production of EEE
 - Certification "best practices" in e-waste recycling
 - ...
14. What about prosecution in your Member States/the EU? Is there any room for improvement?
- Many of those involved in illegal e-waste trade are part of loosely structured networks or groups which can be considered as organised crime groups, however without fitting the international legal definition of 'organised crime' of the Palermo Convention. *Does this in your view have implications for prosecution of these crimes?*

Questions for interviews on illegal e-waste activities and e-waste policies in China

Other interviews will be more focused on developments in China. Some of the questions from the above list might be adapted for the purpose of these interviews.

1. What data is available on illegal WEEE shipments from the EU to China?
 - a. How reliable is this data?
 - b. How accurate is this data?
2. In what way is information of illegal WEEE shipment and informal WEEE recycling gathered and managed in China?
 - a. Do you think it is an effective approach?
 - b. If not, how this could be changed?
3. What are the main drivers of illegal e-waste shipments to China?
4. Who are the main stakeholders involved in illegal shipment of WEEE from the EU to China / in illegal WEEE imports into China?
5. Are you aware of the links between illegal WEEE shipment and organised crime and/or corruption in China?
 - a. If yes, what are these?
6. What action has been taken by the Chinese government in recent years with view to:
 - a. counter illegal e-waste imports in China?
 - b. address the negative impacts of informal e-waste recycling in China?
7. To what extent have legal and illegal e-waste shipments from the EU to China been subject to change in recent years?
8. How do these developments in China influence enforcement policies in EU?
9. What kind of cooperation exists between China and the EU on the issue of illegal e-waste?
10. Have the EU and China been exchanging views on this issue?
11. What kind of policy tools could be introduced in both the EU and China to address the problems of illegal e-waste shipments and informal e-waste recycling in China?

Annex B: List of interviewees

Julian Newman, Environment Investigation Agency (EIA), UK, 25 November 2014

Feng Wang, Research Associate, United Nations University, Institute for the Advanced Study of Sustainability (UNU-IAS), Operating Unit SCYCLE, Germany, 26 November 2014

Huib Van Westen, Dutch Environment Inspectorate (ILT, Inspectie voor Leefmilieu en Transport) + IMPEL, the Netherlands, 28 November 2014

Bart Palmans, Flemish Environment Inspectorate, Belgium, 4 December 2014

Lieselot Bisschop, Post-doctoral researcher – Research Foundation Flanders & Ghent University
Assistant Professor - John Jay College of Criminal Justice, 18 December 2014

