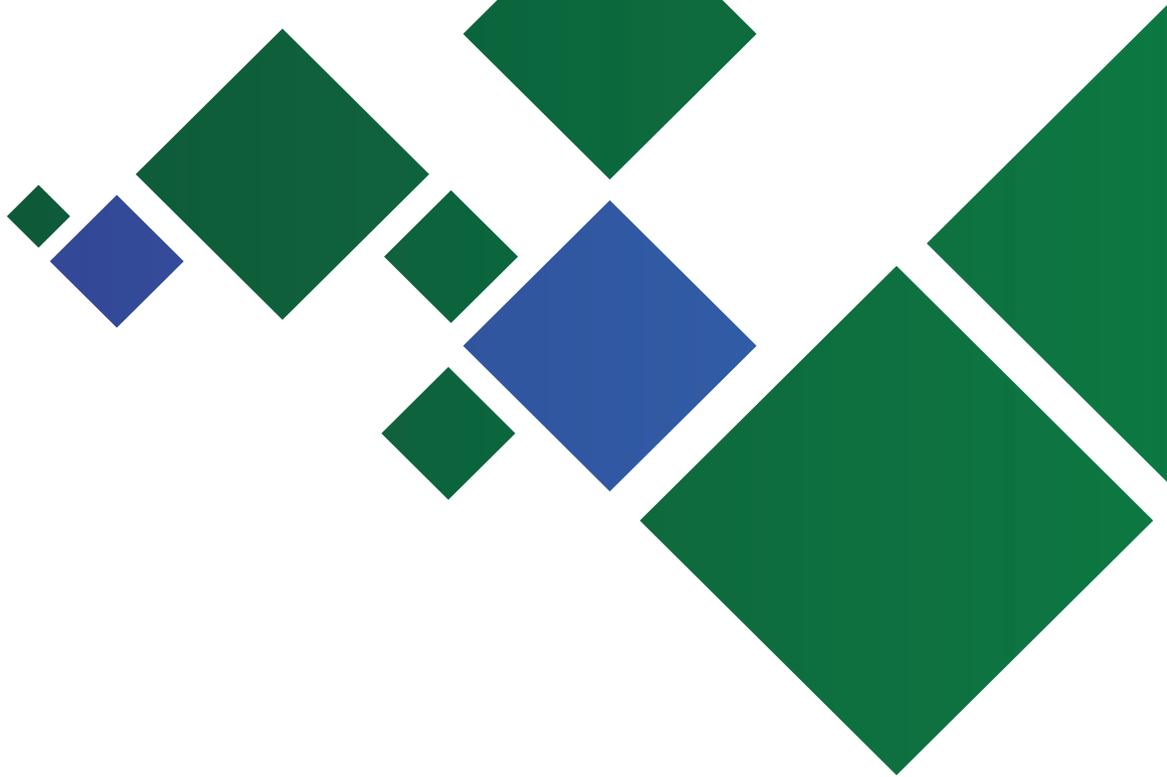




AUDITING WASTE MANAGEMENT



INTOSAI
Working Group
on Environmental
Auditing



This publication was prepared by the INTOSAI Working Group on Environmental Auditing (WGEA). The WGEA aims to improve the use of audit mandate and audit instruments in the field of environmental protection policies, by both members of the Working Group and non-member Supreme Audit Institutions (SAIs). The WGEA has the mandate to

- Assists supreme audit institutions (SAIs) in acquiring a better understanding of the specific issues involved in environmental auditing;
- Facilitates exchange of information and experience among SAIs; and
- Publishes guidelines and other informative material for their use.

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Foreword

Waste is a continually growing problem, globally, regionally and locally. If not properly handled, waste can cause global, regional and local pollution. Unsound management of waste may lead to the contamination of soil, freshwater, air emissions and marine pollution. This may in turn entail serious risks for the environment and for human health.

The international movement of waste is increasing. This means that waste issues are exported from countries with advanced waste technologies, and imported into countries lacking basic waste infrastructure. Problems faced by waste-importing countries are amplified by an extensive illegal waste market. According to United Nations Environment Programme (UNEP), “[t]here is likely no other area of organized crime that provides such a significant opportunity for money laundering and tax fraud as waste disposal, with its near complete lack of monitoring, statistics or reporting”.

In the 7th Survey on Environmental Auditing (2012), municipal, solid and non-hazardous waste was identified by SAIs as the second most important environmental issue in their country. The scope of waste-related issues is reflected in the activities of SAIs worldwide. Municipal, solid and non-hazardous waste was the most audited environmental topic (53 per cent), followed by audits on hazardous waste (32 per cent).¹

This paper is an updated version of the INTOSAI guidance paper *Towards Auditing Waste Management* (2004).
Towards Auditing Waste



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¹ INTOSAI Working Group on Environmental Auditing (2013). Seventh Survey on Environmental Auditing. [Online] Available at: <http://www.environmental-auditing.org/Home/WGEAPublications/Surveys/tabid/129/Default.aspx> [Accessed on 15 December 2015]



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Abbreviations & Acronyms

BAT	Best Available Technology
BATNEEC	Best Available Technology Not Entailing Excessive Costs
CRT	Cathode-rays tubes
EPA	European Protection Agency
EU	European Union
GHS	Globally Harmonized System of Classification and Labelling of Chemicals
GIS	Geographical Information System
GRID-Arendal	Global Resource Information Database, A center collaborating with the UNEP, located in Arendal, Norway
IMO	International Maritime Organization
LCA	Life Cycle Assessment
NAO	The National Audit Office

OAG	Office of the Audit General
OECD	Organization for Economic and Co-operation Development
PCB	Polychlorinated Bephenyls - industrialchemicals
POP	Persistent Organic Pollutant
SAI	Supreme Audit Institution
SARS	Severe Acute Respiratory Syndrome
UNEP	United Nations Environmental Programme

Executive Summary

Background Orientation on Waste

Although the definition of waste varies across countries, it is generally based on the term 'discard' and is something the holder intends to get rid of. Waste may be classified according to its origins, composition or management. This guidance paper is based on the distinction between hazardous and non-hazardous waste. Radioactive waste is not covered in this paper. As waste may entail serious hazards for the environment and for human health, the sound management of different waste streams is of great importance. This chapter provides an overview of the 'waste management hierarchy': a prioritised list of the most efficient waste policies. The overall prevention of waste is placed at the top of the hierarchy, followed by reduction, recycling, recovery and disposal. The economy of waste, and policy tools for correcting failures in the waste market, are also presented in this chapter.

Step 1 Identifying Environmental and Health Risk Scenarios for Waste Management

Step 1 involves assessing the materiality and probability of risks related to waste. Materiality may be based on the number of people affected, the dispersal, reversibility and acuteness of the dangers. Habitat of species must also be considered when assessing the materiality of risks. The probability of waste risks increases when the handling of waste is not carried out according to strict quality requirements. The risk of damage is higher in countries with inadequate systems for collection and management of waste, creating possibilities for informal waste activities. In this step, it is also important to consider the international dimension of waste, as waste is transported across the globe. The transboundary movement of waste creates opportunities for illegal waste activities, which are described in this step.

Step 2 Mapping Out the Actors and Their Responsibilities

Step 2 involves getting an overview of the organizational structure of waste management. An overview should include the most important actors: legislative bodies, relevant ministries, control authorities and waste handlers. Furthermore, it is important to map out the systems for handling different waste streams. This step also gives an overview of international legislation with which the relevant actors are obliged to comply. These also constitute possible audit criteria.

Step 3 Identifying Possible Governance Problems Related to Waste Management

Step 3 gives an overview of common national and international governance problems that occur in waste management. Weak implementation of international agreements, weak coordination between relevant authorities, inadequate policy impact assessments, weak systems for monitoring, control and enforcement, and the lack of technical and organizational capacities are some of the problems raised in this step.

Step 4 Selecting an Audit Topic

Step 4 is based on relevant risks identified in the previous step, and involves picking an appropriate audit topic. This part links possible audits to the three E's in performance auditing: Economy, efficiency and effectiveness. It also provides a list of possible questions and approaches when conducting a waste audit.

Methodology for Waste Audits

The final chapter on methodology provides an overview over possible methods for carrying out a waste audit. Common and more innovative methods are outlined in this chapter, illustrated by audit cases from different parts of the world. This chapter also presents some of the possibilities when conducting cooperative audits in the waste field.

Introduction

Waste is a continually growing problem, globally, regionally and locally. The handling of waste, which commonly involves landfills, the operation of unsound incinerators, or dumping, usually leads to discharges into the soil, air and water, and is a source of global, regional and local pollution. The problem is amplified by trends in consumption and production patterns and by the continuing global urbanisation.

Due to the increased transboundary movement of waste, waste has become a highly international issue. Waste-related issues are exported from developed countries, and subsequently imported into developing countries. The costs associated with the proper handling of waste makes it profitable to ignore waste treatment and to dispose of waste in a way that is dangerous to human health and the environment. Illegal dumping and unauthorised export are examples of criminal activities associated with the handling of waste.

Waste-related challenges vary widely across countries. While many developing countries lack basic infrastructure and services for waste collection and disposal, other countries turn waste into a resource by using advanced waste management systems.

Despite these differences, all countries benefit from reducing the total amount of waste.¹ Supreme Audit Institutions (SAIs) are therefore urged to take account of all the levels of the waste management hierarchy when conducting a waste audit. This involves considering the prevention, reduction, recycling and recovery, as well as the disposal of waste.²

1 United Nations Economic and Social Council (2011). Report of the Secretary-General: Policy Options and Actions for Expediting Progress in Implementation: Waste Management. Commission on Sustainable Development 19th Session, 2–13 May. Doc. E/CN.17/2011/6. [Online] Available at: http://www.un.org/ga/search/view_doc.asp?symbol=E/CN.17/2011/6&Lang=E [Accessed on 15 December 2015]

2 Waste management hierarchy on page 17

THE INTOSAI WGEA RECOMMENDS AUDITING WASTE

Deficiencies in a country's waste management systems are a matter of national importance and therefore of interest to the SAI. Audits help raise awareness of the problems addressed. Auditing waste management is a way to help reduce the problems caused by waste in a country by revealing shortcomings of the waste management system and identifying areas of improvement. By exposing insufficiencies related to waste management, the SAIs may help improve the quality of waste management, and thereby also the national and international environment.

Waste-related issues are not only a national concern. The illegal export of waste constitutes a large part of organised waste crime, posing major risks to human health and the environment. Varying definitions and classifications of waste, as well as insufficient international monitoring, control and enforcement create loopholes for criminal actors. Cooperation between SAIs is therefore important in order to capture risks generated at the international level.

The INTOSAI WGEA recommends conducting cooperative audits and exchanging of information and expertise when auditing waste. As transboundary movement of waste continuously adapts to new regulatory environments, SAIs are encouraged to be equally inventive in finding new ways of cooperating. In addition, the auditor may also apply innovative methods from other fields when conducting waste audits.

Background Orientation on Waste

WHAT IS WASTE?

Most countries have adopted some form of definition of waste. Although these definitions vary across countries, they are generally based on the term 'dispose'. In other words, waste is something that the holder intends to get rid of or has gotten rid of. The value of the object plays no role in defining whether an object is waste or not.

Article 2.1 of the Basel Convention defines wastes as “substances or objects which are disposed of or are intended to be disposed of or are required to be disposed of by the provisions of national law”.

The United Nations Statistics Division applies a more detailed definition of waste: “Wastes are materials that are not prime products (that is products produced for the market) for which the generator has no further use in terms of his/her own purpose of production, transformation or consumption, and of which he/she wants to dispose. Wastes may be generated during the extraction of raw materials, the processing of raw materials into intermediate and final products, the consumption of final products, and other human activities. Residuals recycled or reused at the place of generation are excluded.”

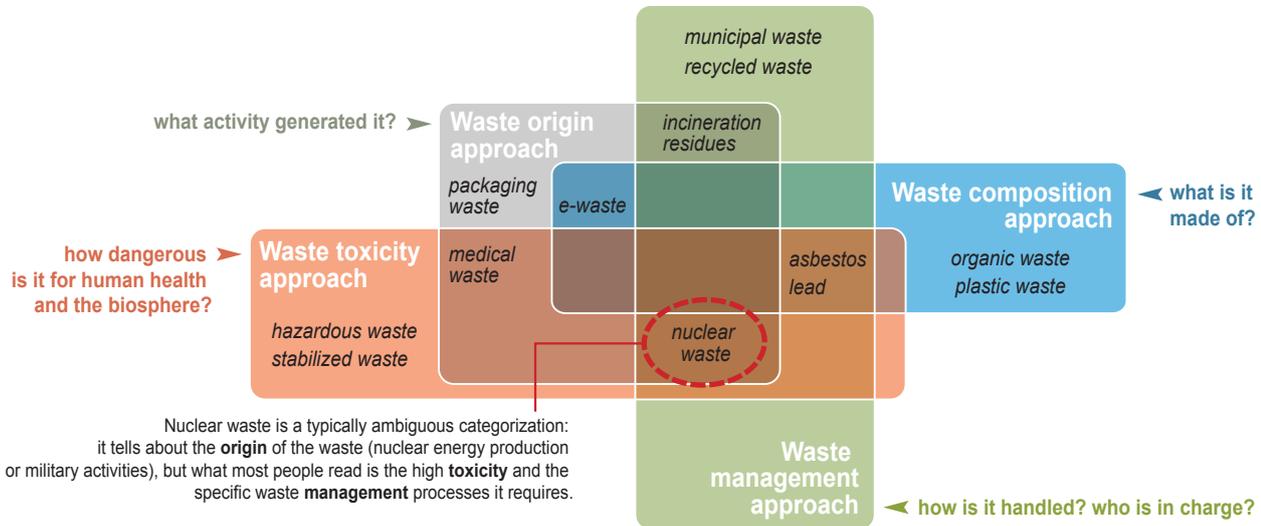
CLASSIFYING WASTE

There are many ways of classifying waste. Waste may be categorised according to its origins (which activities generate the waste?); composition (what is the waste made of?); toxicity (how dangerous is the waste?); or management (how is the waste handled?). The figure below illustrates how the different classifications of waste overlap.

About the difficulties of classifying waste (and counting it)

Different approaches and overlapping definitions

Statistical institutes of the world use various waste classifications, based on different approaches. This diversity is the major obstacle to data globalization and comparison.



Cartography by GRID-Arendal and Zoi Environment Network, www.grida.no

For a legislator, the distinction between hazardous and non-hazardous waste is often the most important parameter, since legislation is usually stricter for hazardous waste than non-hazardous waste. This distinction is also useful for auditors, as the different pieces of legislation applying to hazardous and non-hazardous waste are usually accompanied by different organizational structures and different policy instruments.

The presentation in this guidance paper is based on the two main categories: non-hazardous and hazardous waste. Although radioactive waste is hazardous, it is normally covered by separate legislation, and therefore not treated in this paper.

Non-Hazardous/ Solid Waste

All waste not classified as hazardous may be labelled as solid. Non-hazardous is often used as a synonym for 'solid waste'. Even though they are not always chemically hazardous, wastes consisting of powders, fluids and gasses are classified as hazardous as they need special handling in order to prevent unwanted dispersal. Common non-hazardous components are papers, plastics, glass, metals and beverage cans.

Although not considered hazardous, solid waste can cause considerable harm and damage. The dumping of non-hazardous waste may contaminate drinking water through leachate or flooding, and subsequently poison the water sources for people and animals. Landfilling and burning of non-hazardous waste creates air emissions, and may affect local air quality.

Hazardous Waste

Put simply, hazardous waste is any waste that poses a threat to human health and the environment. For this reason, many countries have strict regulations on the storage, collection and treatment of hazardous waste. The Basel Convention and the OECD Decision include lists of waste streams, characteristics and components that fall within the definition of hazardous waste (see text box).³ Most hazardous waste originates from industrial production.

The Basel Convention includes a list of 45 waste streams ('Y-numbers') and hazardous constituents that should be controlled. The Convention also covers waste with hazardous properties, such as toxic, poisonous, explosive, corrosive, flammable, ecotoxic and infectious.

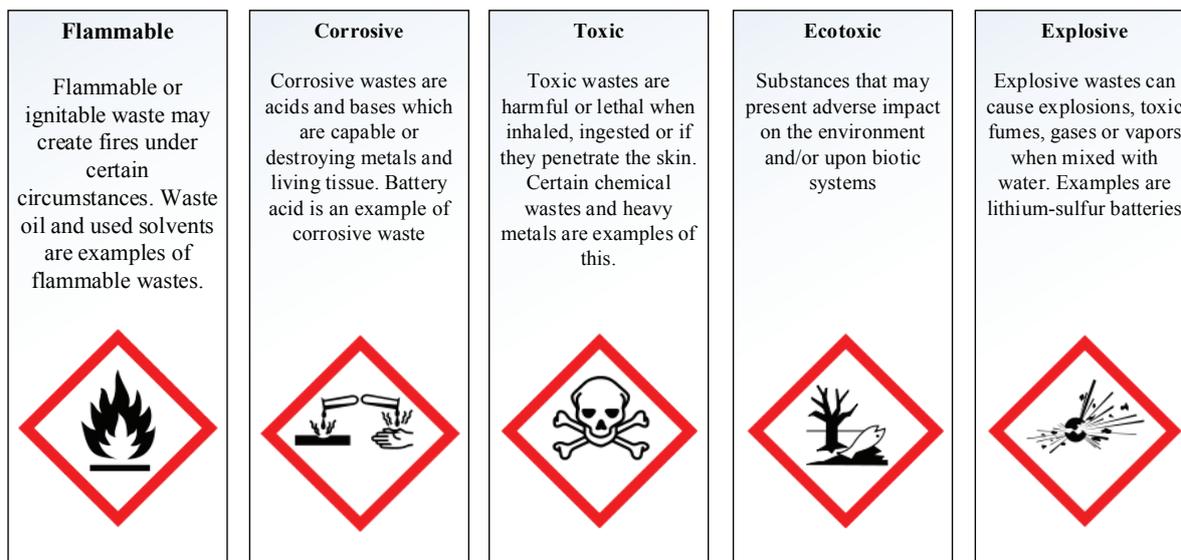
The OECD Decision on Control of Wastes Destined for Recovery Operations C (2001)/107/FINAL (OECD 2015) has adopted the lists of hazardous waste streams and hazardous characteristics from the Basel Convention. In addition to this, it introduces the Amber Control Procedure over hazardous wastes requiring approval from the destination country.



Photo: Hazardous waste (iStock/hh5800)

3 Basel Convention (1989). The Basel Convention on the Control of Transboundary Movement of Hazardous Wastes and their Disposal. Available at: <http://www.basel.int> [Accessed on 15 December 2015]; OECD. The OECD Control System for waste recovery. [Online] Available at: <http://www.oecd.org/env/waste/theoecdcontrolsystemforwasterecovery.htm> [Accessed on 15 December 2015]. Note that these agreements do not include radioactive waste.

Different hazardous wastes require different treatment and final handling, due to both the physical and chemical characteristics of the waste and the level of dangerousness. The chemical composition of waste will have an impact on the collection and recycling processes. Some wastes may need special treatment due to their physical properties, even though they do not have chemical hazardous properties. Three such properties are liquid, gaseous or powder. Such waste needs special handling to avoid unwanted dispersal of the waste. Five defining characteristics of hazardous waste are illustrated in the figure below.



Common hazardous characteristics. Hazard pictograms developed by Globally Harmonized System of Classification and Labelling of Chemicals.

Source: Basel Convention, Annex I *Categories of wastes to be controlled*.

Hazardous waste must be controlled from the generation of the waste to its final disposal. While hazardous wastes can often be recycled in a sound manner, wastes that cannot be recycled must be treated to reduce its toxicity, and stored safely in order to avoid leakages. The creation of hazardous waste may be reduced by not co-mingling hazardous and non-hazardous waste, or by using different materials in production processes.⁴ Special kinds of hazardous waste include medical waste, electronic and electrical equipment, and are presented in the following sections.

Electronic and electrical equipment (E-waste) is a generic term for waste originating from out of life electric and electronic equipment, such as computers, televisions and home appliances. E-waste is generally categorised as hazardous waste due to its toxic components, such as PCB, lead, quicksilver, cadmium, mercury and brominated flame-retardants. These materials can cause damage if not treated properly. Insufficient treatment of this waste will cause contamination of the soil, water and air and may pose a great risk to human health. E-waste may also contain precious metals such as gold, copper and nickel, as well as rare materials such as indium and palladium. These metals may be recovered, recycled, and used as a source of raw materials.⁵

4 UNEP and GRID-Arendal (2004). Vital Waste Graphics 1. [Online] Available at: <http://www.grida.no/publications/vg/waste/> [Accessed on 15 December 2015], p. 33-34.

5 UNEP and GRID-Arendal (2015). Waste Crime - Waste Risks: Gaps in meeting the global waste challenge. [Online] Available at: <http://www.grida.no/publications/rr/waste-crime/> [Accessed on 15 December 2015]



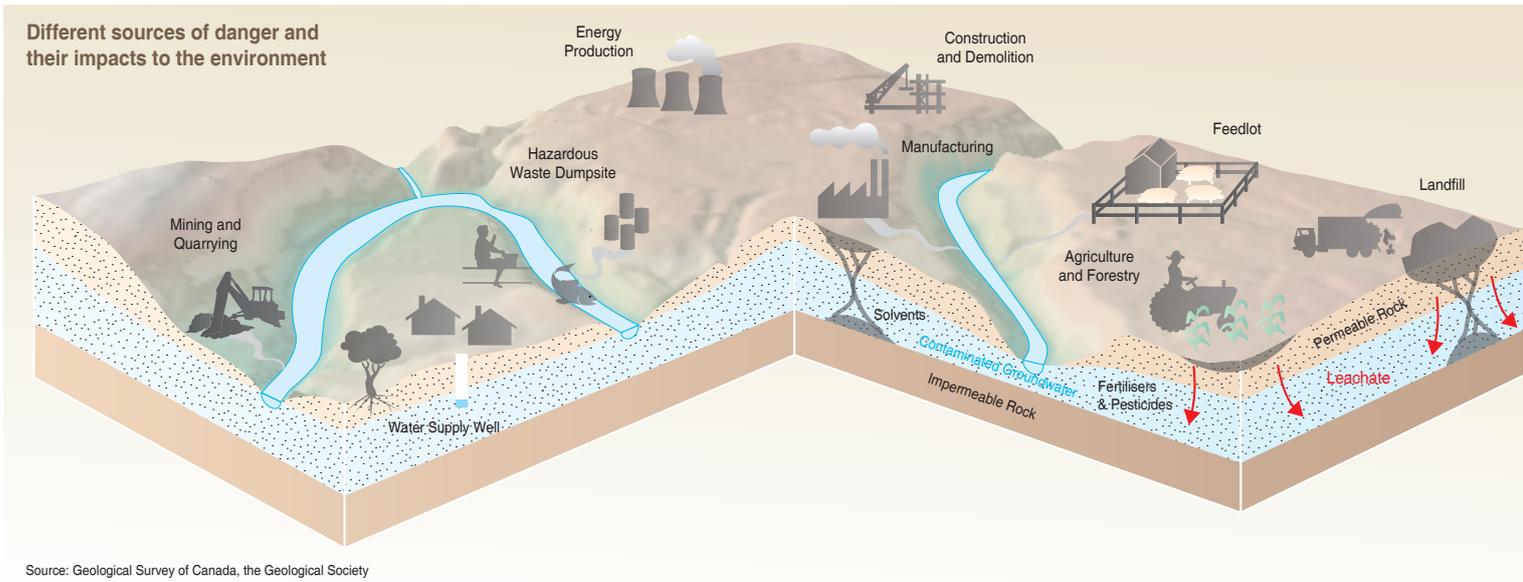
Photo: E-waste dumpsite (iStock/Lya_Cattel)

Healthcare waste is a form of hazardous waste and involves waste from the treatment of diseases in humans and animals. This type of waste usually consists of medicines, sharp objects, bandages, chemicals, pharmaceuticals, body fluids and body parts (from amputations and surgery). While about 85 per cent healthcare waste is non-hazardous, the remaining 15 per cent is considered as hazardous.⁶ Healthcare waste may be infectious, toxic or radioactive. Healthcare waste may also contain bacteria and potentially harmful microorganisms that can spread harmful diseases if not taken care of properly. Healthcare waste may also lead to the spread of drug-resistant microorganisms into the environment. Inadequate incineration may lead to ash residues and the release of pollutants, such as toxic metals, into the air. Healthcare waste therefore needs special treatment such as incineration or high-temperature treatment to kill or disable the bacteria. Chemical treatment is one of several alternatives to incineration.

⁶ World Health Organization (2015). Health-care waste. Fact sheet N°253. [Online] Available at: <http://www.who.int/mediacentre/factsheets/fs253/en/> [Accessed on 15 December 2015]

ENVIRONMENTAL AND HEALTH PROBLEMS RELATED TO WASTE

Hazardous waste may cause long-term contamination of soil and water and severely affect people's health and living conditions. The figure below illustrates some of the sources of these dangers, and the impacts these activities have on the environment. It is worth noting that while these problems occur in both high- and low-income countries, the consequences are often more severe in low-income countries as these lack the resources to reduce the adverse effects from waste.



Source: Geological Survey of Canada, the Geological Society

Cartography by GRID-Arendal: www.grida.no

Soil Contamination

Hazardous substances may enter into soil as water trickles through contaminated sites leaching out chemicals, fertilisers or pesticides. Contaminated soil can damage flora and fauna directly and indirectly release toxic components into the food chain. Ingesting, inhaling or touching contaminated soil may have serious adverse impacts on humans and animals. Toxic components such as Persistent Organic Pollutants (POPs)⁷ pose particularly great risks to human health and the environment as they bioaccumulate through the food chain. Animals eating contaminated plants have higher doses of contaminants than if they were directly exposed. For humans, contaminants may have effects on the nervous system, injure the kidneys and cause mental disorders and cancers.⁸

7 See text box on Obsolete Pesticides and Persistent Organic Pollutants (POPs), p. 14.

8 UNEP and GRID-Arendal (2004). Vital Waste Graphics 1. [Online] Available at: <http://www.grida.no/publications/vg/waste/> [Accessed on 15 December 2015].



Photo: Animals eating waste (iStock/Claudiad)

Surface and Groundwater

Precipitation or surface water seeping through waste will absorb hazardous components from landfills, agricultural areas, feedlots etc., and carry them into surface and groundwater. This may lead to changes in the chemistry of water, with major effects on the ecosystem and the food chain. Contamination of surface and groundwater may cause damage to wetlands, and their ability to support healthy ecosystems and control flooding. Contaminants may also enter into the food chain through fish and shellfish, and accumulate when eaten by other animals. Contaminated groundwater also poses a great health risk, as it is often used for drinking, bathing and recreation, as well as in agricultural and industrial activities.¹⁰

OBSELETE PESTICIDES AND PERSISTENT ORGANIC POLLUTANTS (POPs)

The spread of obsolete pesticides is a growing global concern, as a large part of the stock is classified as extremely hazardous. Obsolete pesticides are pesticides that have deteriorated, or that have been banned due to their adverse environmental and health effects. The chemical by-products that are produced as the pesticides deteriorate may become even more toxic than the original product. Due to the immense chemical complexity of pesticides, there is no single solution for handling obsolete pesticides.

Around 30 per cent of the world's obsolete pesticides are classified as Persistent Organic Pollutants (POPs). POPs pesticides (organochlorins) are organic chemical substances that are highly toxic to humans and wildlife and remain intact for a long time. POPs are easily spread throughout the environment may travel thousands of kilometres from their source. Obsolete pesticides are regulated by the Stockholm, Rotterdam and Basel Conventions.

Reference: Food and Agriculture Organization of the United Nations (FAO). Obsolete Pesticides. [Online] Available at: <http://www.fao.org/agriculture/crops/obsolete-pesticides/what-dealing/obs-pes/en/> [Accessed on 15 December 2015]

9 Zoë Environment Network and GRID-Arendal (2012). Vital Waste Graphics 3. [Online] Available at: <http://www.grida.no/publications/vg/waste3/> [Accessed on 15 December 2015]

10 UNEP and GRID-Arendal (2004). Vital Waste Graphics 1. [Online] Available at: <http://www.grida.no/publications/vg/waste/> [Accessed on 15 December 2015].



Photo: Water pollution (iStock/luoman)

Marine Pollution

Marine pollution constitutes a large threat to marine life, fisheries, mangroves, coral reefs and coastal zones. Approximately 80 per cent of the pollution comes from land-based sources, such as pesticides, POPs, heavy metals from mine tailings and electronic waste, radioactive substances, wastewater and marine litter. As for marine litter, plastic waste is a growing concern as it spreads across the world's oceans. As plastic material degrades slowly, it may remain drifting in oceans from years to decades and form entire islands of debris. Plastic may also transport other hazardous waste, such as POPs, with long-term effects on the environment. Marine pollution also includes oil spills, discharges of oily waste from ships, and untreated sewage.¹¹

Air Emissions

Air emissions are mainly produced by fumes from incineration and landfill gases. Fumes from open waste burning practices release hazardous components into air. Old or badly operated incineration plants may also be a source of hazardous emissions such as heavy metals and dioxins. An important share of greenhouse gas emissions related to waste is released into air during the degradation of organic

¹¹ UNEP (2012). Global Environmental Outlook 5. Chapter 6 Chemicals and Waste. [Online] Available at: <http://www.unep.org/geo/geo5.asp> [Accessed on 15 December 2015]; Nellemann, C. and Corcoran, E (Eds) (2006). Our precious coasts - Marine pollution, climate change and the resilience of coastal ecosystems. United Nations Environment Programme, GRID-Arendal, Norway, www.grida.no

matter in landfills. While methane typically constitutes 55 per cent of the emissions from landfills, carbon dioxide represents around 35 per cent. A number of other gases are released in smaller amounts.¹² Air pollution may also cause health effects such as respiratory problems, as contaminants are absorbed into lungs and human tissue. Some air contaminants may also harm animals and humans when in contact with skin.

Odour and Littering

Waste left in streets or at landfill sites, can also be a source of odour and littering problems. A landfill can cause loss of amenity and nuisance several kilometres away from where it is located. While littering is often an aesthetic problem, it may also constitute an environmental risk. Marine plastic litter may carry POPs, and littering on land may lead to the blocking of drainage pipes and cause secondary environmental problems such as flooding.

WASTE MANAGEMENT HIERARCHY

For many years, waste policies in most countries have mainly consisted of incineration or disposal in landfills. In recent years, however, the concept of ‘integrated waste management’ is gaining currency in developed countries. This approach is based on a set of priorities known as the waste management hierarchy, shown in the figure below.



Cartography by UNEP/GRID-Arendal, www.grida.no

12 UNEP and GRID-Arendal (2006). Vital Waste Graphics 2. [Online] Available at: <http://www.grida.no/publications/vg/waste2/> [Accessed on 15 December 2015]

While the waste management hierarchy has been adopted in most countries, the economic feasibility will often decide what actually happens to the waste. In general, OECD countries have sound waste management systems, while non-OECD countries struggle with landfills, and lack systems for separating waste. Many countries still lack technology and funding in order to raise awareness, improve waste collection and treatment methods. Thus, even if open dumps are the least desirable solution, this is actually the most commonly used method of waste disposal in many countries. However, the prevention and reduction of waste is considered to be the most efficient solution in both high-income and low-income countries.¹³

At each of the levels in the waste management hierarchy, the government may intervene to ensure sound management. A good waste policy should include all of the levels. The waste hierarchy determines the premises for an audit of waste management, as we will return to when selecting an audit topic in step 4.

Prevention and Reduction

The first stage in the waste stream is prevention. Preventing waste is deemed the most efficient solution to the problems caused by waste, and is thereby placed at the top of the waste hierarchy. Prevention may involve reducing the quantity of waste, limiting the adverse impacts generated by waste, and reducing the content of harmful substances in materials.¹⁴ Policies aimed at reducing the amount of waste may involve changing consumer patterns or strategies in the manufacturing industry. Reducing the packaging in a few companies may, for example, be much more efficient than recycling measures in thousands of households.¹⁵ As the waste management generates revenue for businesses, changes in the waste market itself may also reduce the amount of waste.

Recycling

There are several reasons for recycling as much of the waste as possible: it reduces the amount of waste sent for final disposal; it reduces the need for transport; and it makes use of valuable resources in the waste and reduces the use of virgin raw materials.

However, recycling will always generate 'waste of the waste' which needs to be disposed of in a sound manner. Recycling also requires transport of waste to the recycling plant, and the recycling process itself may require energy. Informal and unsound recycling is also a widespread problem in many waste-importing countries, and may also involve criminal activities.

13 UNEP and GRID-Arendal (2004). Vital Waste Graphics 1. [Online] Available at: <http://www.grida.no/publications/vg/waste/> [Accessed on 15 December 2015]; UNEP (2012). Global Environmental Outlook 5. Chapter 6 Chemicals and Waste. [Online] Available at: <http://www.unep.org/geo/geo5.asp> [Accessed on 15 December 2015]

14 This definition is applied in the EU Directive 2008/98/EC. Available at: <http://ec.europa.eu/environment/waste/framework/>

15 Zoi Environment Network and GRID-Arendal (2012). Vital Waste Graphics 3. [Online] Available at: <http://www.grida.no/publications/vg/waste3/> [Accessed on 15 December 2015]



Photo: Recycling (iStock/Brasil2)

Recovery

Energy produced by incineration and gasification may be used to produce hot water, steam or electricity. Some processes, such as composting and bio-methanisation, involve the recovery of energy and raw materials, for example fertilising products. Recovery of waste may be carried out by the generator of the waste, or organised externally after the collection and transport stages. As energy recovery produces air emissions, it is often less preferred than re-use and material recycling.¹⁶

Disposal

Disposal is the end station for the waste, and secure handling here is of paramount importance. Disposal in landfills is the most common solution for handling waste that cannot be treated by recycling, composting or incineration. Landfills vary from open, uncontrolled dumps to sanitary landfills that are a fully acceptable environmental solution. The main differences are in the way they are operated and the level of adverse environmental effects they produce. To reduce or eliminate the hazardous properties of waste, treatment is required at the disposal site. The two main approaches are thermal destruction and chemical treatment.

¹⁶ EU Directive 2008/98/EC. [Online] Available at: <http://ec.europa.eu/environment/waste/framework> [Accessed on 15 December 2015]; UNEP and GRID-Arendal (2006). Vital Waste Graphics 2. [Online] Available at: <http://www.grida.no/publications/vg/waste2/> [Accessed on 15 December 2015], p. 24-25.

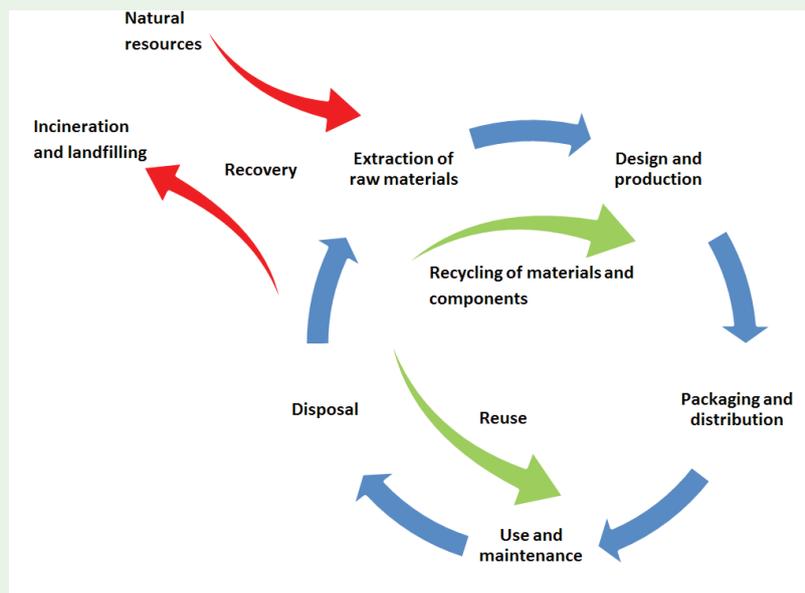


Photo: Waste disposal site in Greenland (iStock/Andreas Altenburger)

THE LIFE CYCLE OF A PRODUCT

Many of us associate waste with the final disposal of a product. However, waste occurs at every stage of the production process. The figure below depicts the phases in the life cycle of a product, in which raw materials are turned into products, consumed and eventually discarded. Thereafter, the waste can be reused, recycled or disposed of.

Figure: Product life cycle. Based on cartography by UNEP/SETAC



The extraction of raw materials, which is the first step in manufacturing any product, generates waste. Only a small share of the material contains the elements that are used in the product. The extraction of the mineral from the raw materials also requires physical or chemical processes that generate residues. As an example, a wedding ring containing five grams of gold may leave 3 tonnes of waste.

It is estimated that the **design** of a product determines 70 - 90 per cent of the environmental impact of a product. The **production phase** of a product generates excess materials, ending up as waste.

Packaging represents an increasing share of household waste. The production of common packaging materials, such as plastic, also requires large amounts of chemicals.

The **distribution** of a product generates air emissions.

Use and maintenance of a product, for example a car, generates large amounts of hazardous waste, such as fuel, oils, wax, paint, rubber, washing powder and batteries.

Life cycle assessment (LCA) is increasingly widespread amongst local and national authorities. The approach involves taking account of a product's environmental impact throughout its entire life span. An important objective of the life cycle approach is to help policy makers avoid shifting the environmental impact from one phase to another in a product's life cycle. Life cycle information also allows consumers to make informed decisions when purchasing a product.

References: Zoë Environment Network and GRID-Arendal (2012). Vital Waste Graphics 3. [Online] Available at: <http://www.grida.no/publications/vg/waste3/> [Accessed on 15 December 2015]; UNEP and GRID-Arendal (2006). Vital Waste Graphics 2. [Online] Available at: <http://www.grida.no/publications/vg/waste2/> [Accessed on 15 December 2015], p. 24-25.

THE ECONOMY OF WASTE

The global waste market sector is estimated to be USD 410 billion annually, excluding a large informal sector not accounted for.¹⁷ From an economic point of view, the generation of waste creates both revenues and costs. While the generators of waste often pay for the disposal and treatment of waste, these costs constitute revenues for actors operating within the waste sector. Government regulations and financial incentives determine to a significant extent these revenues and costs. The figure below provides an overview of the central costs and revenues related to waste.

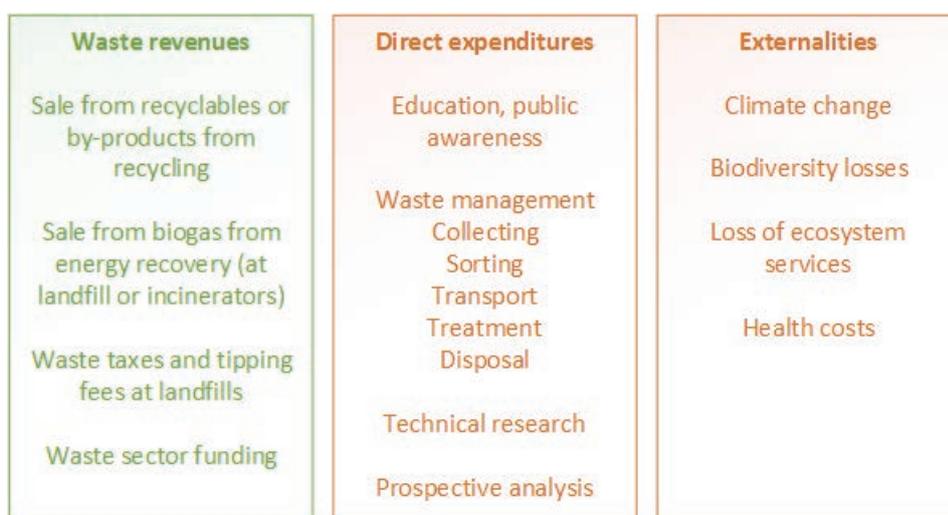


Figure: Waste revenues and costs. Based on figure from Zoë Environment Network and GRID-Arendal (2012).

¹⁷ UNEP and GRID-Arendal (2015). Waste Crime - Waste Risks: Gaps in meeting the global waste challenge. [Online] Available at: <http://www.grida.no/publications/rr/waste-crime/> [Accessed on 15 December 2015]

Waste Revenues

Waste is a by-product of economic activity, by businesses, government and households. However, waste is also an input to economic activity –either through recovery of material or energy.¹⁸ Private actors operating in the waste sector may generate revenues from the sale of recyclables, the by-products of recyclables, sale of biogas from energy recovery or waste sector funding. High energy and raw material prices increase the demand for these activities. Taxes and subsidies regulate revenues in the waste sector. Biogas production and composting of biodegradable waste are examples of emerging sectors that are reliant on state regulations and subsidies in order to survive.¹⁹

Waste Costs

Direct expenditures related to waste include the actual management of waste, such as collection, sorting, transport, treatment and disposal. In addition, education measures to raise awareness of waste, technical research and analysis constitute waste costs. While private actors often benefit from waste revenues, these costs are normally borne out by governments. As the waste sector becomes increasingly complex and global, it has become difficult for many governments to keep up with these costs.²⁰

Public health and environmental problems related to waste constitute ‘ghost costs’, or in economic terms ‘negative externalities’. Negative externalities occur when private actors do not carry out the social costs arising from their activities. Examples of negative externalities are the loss of biodiversity, climate change and health costs. While external, these costs are often more difficult to measure; they must nevertheless be taken into account when conducting an audit.²¹

POLICY TOOLS FOR WASTE MANAGEMENT

Waste is associated with external costs (and potential benefits) that are not reflected in the price of the main products. Lack of regulations and standards allows waste market operators to avoid costs related to the safe disposal of waste. In order to correct for these market imperfections, governments may intervene to internalise these costs and benefits. Environmental authorities have a broad range of policy instruments at their disposal to prevent the generation of waste and mitigate the negative environmental impact of waste.²² We usually distinguish between the following policy tools:

18 UK Department and Environment and Rural Affairs (June 2011). The Economics of Waste and Waste Policy. [Online] Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69500/pb13548-economic-principles-wr110613.pdf [Accessed on 15 December 2015]

19 Zoi Environment Network and GRID-Arendal (2012). Vital Waste Graphics 3. [Online] Available at: <http://www.grida.no/publications/vg/waste3/> [Accessed on 15 December 2015]

20 UNEP (2012). Global Environmental Outlook 5. Chapter 6 Chemicals and Waste. [Online] Available at: <http://www.unep.org/geo/geo5.asp> [Accessed on 15 December 2015]

21 Zoi Environment Network and GRID-Arendal (2012). Vital Waste Graphics 3. [Online] Available at: <http://www.grida.no/publications/vg/waste3/> [Accessed on 15 December 2015]

22 See also OECD's Database on instruments used for environmental policy: http://www2.oecd.org/econinst/queries/Query_1.aspx?QryCtx=5

- Direct regulations
- Economic instruments
- Public information
- Physical measures

Direct Regulations

The concept of direct regulation refers to a set of instruments whose common feature is that they entail the direct interference of the authorities in the activities of individuals and groups in society. Generally, these instruments are of a 'command-and-control' character; in other words: they create prohibitions and obligations.

Product bans and limitations

This tool puts bans or restrictions on the manufacture, distribution, use or disposal of products/substances which present unacceptable health or environmental risks.

Standards

Standards set the margins within which actors are permitted to operate. Several kinds of standards can be distinguished:

- *Environmental quality standards* that establish the highest allowable concentration of specified pollutants in the surroundings.
- *Emission standards* state the maximum amount (or concentration) of pollutants which may be emitted by a unit that performs a production process or other activities. Emission standards may be determined generally or in individual licenses.
- *Technology standards* express requirements expressed in terms of state-of-the-art pollution abatement, for example 'best available technology' (BAT) or 'best available technology not entailing excessive costs' (BATNEEC).
- *Process standards* relate to the conditions and circumstances under which certain potentially polluting processes are performed. They prescribe, for instance, the temperature at which the combustion process should take place in a waste incineration plant.
- *Product standards* may determine the maximum allowable content of certain substances in a product, or specify the obligatory composition of a product to allow for safe handling at the waste stage.

Economic Instruments

Charges

Charges provide incentives to reduce emissions without obliging the enterprise/individual to do so. Environmental charges include:

- *Effluent charges* (fee levied on the discharge into the environment resulting from waste management),
- *Product charges* (fee added to the price of the product input that causes waste),
- *User charges* (payment for the costs of waste collection and treatment), and
- *Administrative charges* (fee designed to cover administrative costs related to e.g. issuing licenses or costs associated with control and enforcement).

For household waste the charge could be levied directly on the emission from the treatment facility or on the waste that enters the facility (e.g. per tonne). A charge may also be differentiated according to the environmental characteristics of the facility (energy recovery, collection and energy recovery of methane, degree of control of leachate from landfill plant). Alternatively, waste charges could be aimed at specific fractions of household waste, for example product charges on packaging such as beverage containers. A national effluent charge levied on incineration plants will often be accompanied by a municipal user charge to cover both the municipality's costs of collection, treatment, in addition to the effluent charge.

Subsidies and tax incentives

Subsidies include grants and soft loans that act as incentives to polluters to change their behaviour or reduce the costs of pollution abatement to be borne by the polluters. Subsidies have the advantage of giving the polluter the freedom to choose among alternative means of attaining the emission reduction, and of providing an incentive for further reductions. Subsidies on investments in clean technologies and emission reduction equipment are common, as are direct subsidies for research and development in clean technology. Subsidies could be introduced to stimulate investments in energy recovery from waste treatment facilities or leachate control from landfills.

Tradable emission permits

The basic idea of tradable permits or emission quotas is that the authorities determine a ceiling for the level of the total emissions in a certain area. Parts of this total are then apportioned to individual polluters, either based on some predetermined distribution formula or by means of a bidding process. Actors may then buy and sell emission quotas depending on their individual abatement costs. This could be relevant for emissions of greenhouse gases such as CO₂ emissions from incineration plants or methane from landfills.

Deposit-refund systems

Consumers pay a deposit when purchasing potentially polluting products and receive a refund when they return the product to an approved centre for recycling/disposal. Deposit-refund systems can be applied to products or substances which pose no significant risk to the environment when properly used, but which should be kept out of the waste stream.

Producer responsibility

The extended producer responsibility policy approach implies that producers are given a significant responsibility, either financial and/or physical, for the treatment or disposal of post-consumer products. Assigning such responsibility is meant to provide incentives to prevent wastes at the source, promote product design for the environment, and support the achievement of public recycling and materials management goals.²³

Voluntary agreements

In voluntary agreements the authorities and polluters agree on certain environmental policy targets. These may relate to the amount of waste produced, content of certain substances in particular products or the percentage of a certain product to be recycled. Voluntary agreements are often used as an alternative to direct regulations which may be less flexible and cost efficient. Agreements may serve as a 'carrot' which eventually could be replaced by a 'stick' if the discipline and cooperative behaviour among the polluters are reduced and targets are not met. Agreements are more often used with limited number of firms in a business as this facilitates disciplined collective action.

Public Information

Public information refers to the information activities government authorities undertake to influence public attitudes and encourage environmentally sound behaviour. Such activities could be directed at consumers in order to increase their general ecological awareness or their willingness to sort waste at source and/or deliver certain waste fractions to collection points.

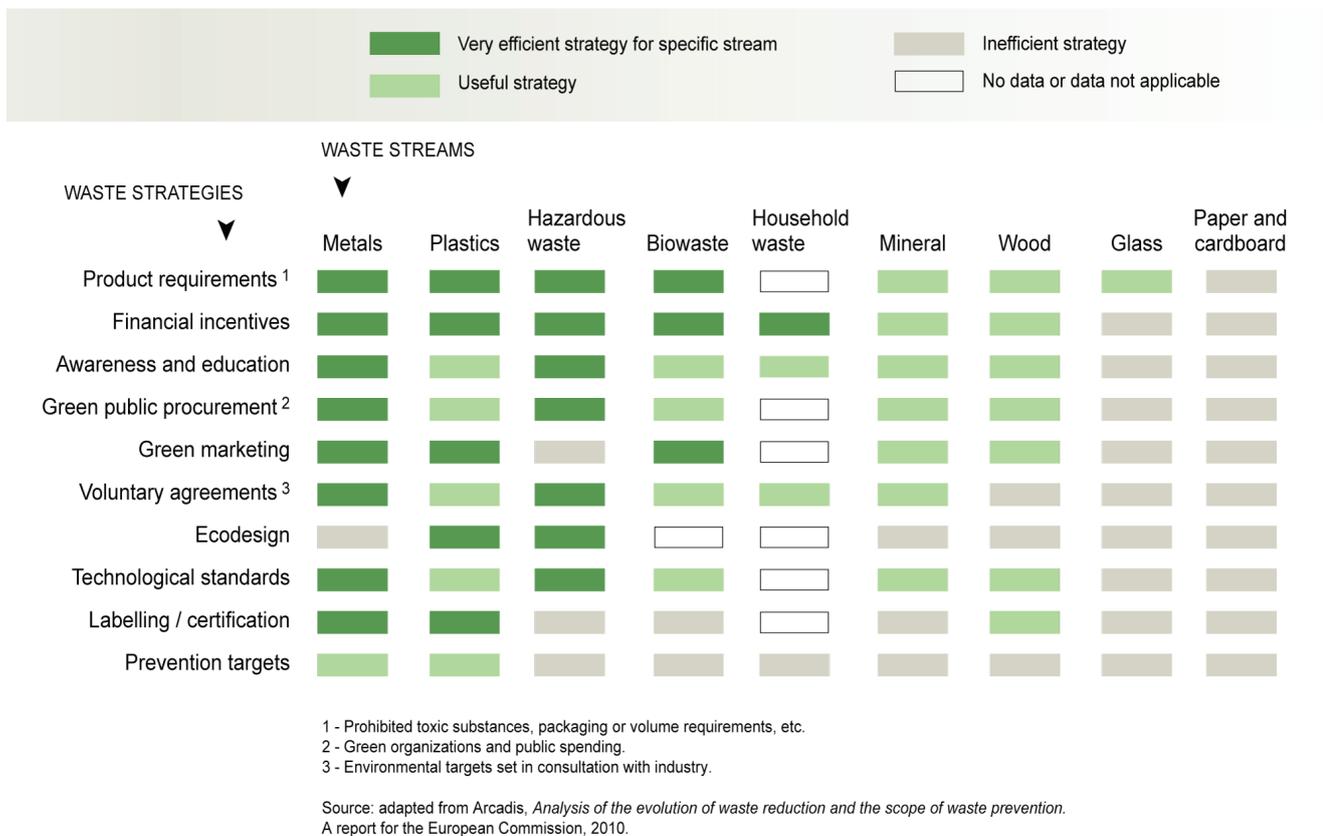
Physical Measures

It seems obvious that landfills or waste incineration plants should not be located near residential areas nor in areas having difficulties to cope with pollution. *Area planning* serves to locate certain activities away from where they otherwise would represent environmental or health risks to the general public. Fences and physical barriers around waste facilities is an example of a physical measure aiming at reducing negative environmental and health effects.

23 OECD. Extended Producer Responsibility. [Online] Available at: <http://www.oecd.org/env/tools-evaluation/extendedproducerresponsibility.htm> [Accessed on 15 December 2015]

The efficiency of the various policy tools depends to a large extent on the waste stream in question. The figure below illustrates the efficiency of selected preventive tools on different waste streams.

Preventive tools for each stream



Cartography by GRID-Arendal, www.grida.no

Step 1

Identifying Environmental and Health Risk Scenarios for Waste Management

Risks to health and the environment are prime concerns in environmental auditing. The first step in planning waste audits therefore consists of creating risk scenarios by identifying risks arising from the generation and management of waste. If there are serious problems at basic levels of waste handling, we argue that this is of national importance and therefore possible for the SAI to address in order to raise consciousness about it.

In order to map out the risks related to waste generation and management, it may be helpful to distinguish between the materiality and the probability of damage from waste. While the materiality of damage is often related to the inherent dangers of different types of waste, the probability of damage often follows from the management of waste.

Assessing the Materiality of the Possible Damage from Waste

The materiality of damage from waste relates to both people and the environment. For people, it may be divided in two aspects: the *number of people* who may be affected and the severity of the harm they may suffer. *Dispersal* is an important factor related to the number of people who may be affected. Harmful chemicals and biological waste are most widely dispersed by water and air.

When determining the materiality of damage to the environment, *reversibility* is a key factor. If the damage is irreversible, it is especially important. *Habitat* is another important dimension for environmental damage. Some species live in, breed in or pass through a few and restricted areas, and may become extinct if these crucial areas are polluted.

When considering risks, the *acuteness of the danger* is also essential. The acute threats need to be addressed first. When these are under control, it is equally important to prevent future acute situations. Foreseeing and preventing potential crises well in advance is better than having to resolve them after they have occurred. This requires risk assessments for industrial plants and infrastructure.

ASSESSING RISKS AND IMPACTS OF CONTAMINATED SITES

In 2012, the Office of the Auditor General of Canada (OAG) conducted a report on Federal contaminated sites and their impacts. As a part of the audit, the OAG examined impacts of the contaminated sites on human health and the environment. The OAG identified that most of the sites had soil contamination, and that the quality of the groundwater and surface water was often affected. As contaminants may penetrate soil, these may migrate into drinking water or spread into lakes, rivers and coastal areas. Another identified risk was the emanation of fumes or dust, which may affect air quality. The report shows that the government has established systems and processes to assess the risks at its individual contaminated sites. It also shows that the government has a process to prioritize sites for action based on the level of concern they pose. However, given the number of sites that remain to be assessed, the OAG concluded that the full extent of potential risks to human health and the environment posed by federal contaminated sites remains unknown.

Reference: Office of the Auditor General of Canada (2012). 2012 Spring Report of the Commissioner of the Environment and Sustainable Development: Chapter 3 Federal Contaminated Sites and Their Impacts. [Online] Available at: http://www.oag-bvg.gc.ca/internet/English/parl_cesd_201205_03_e_36775.html

DISASTER WASTE

Disasters may produce large quantities of hazardous wastes, exposing the population to dangerous substances. Wastes produced during a disaster may therefore contribute to amplify the consequences of the catastrophe. The earthquake in Haiti in 2010 serves as an example as it produced large amounts of medical waste. It is estimated that 15 - 20 per cent of the waste generated from first aid had hazardous characteristics. In addition, the country received large donations of medicine that was either outdated or deemed inappropriate, constituting a major challenge for the country.

Reference:Zoï Environment Network and GRID-Arendal (2012). Vital Waste Graphics 3. [Online] Available at: <http://www.grida.no/publications/vg/waste3/> [Accessed on 15 December 2015]



Photo: Port-au-Prince, Haiti, 2010: An earthquake destroyed the center of Port-au-Prince. People collecting batteries. (iStock/Claudiad)

Assessing the Probability of Damage from Waste

The inherent and/or potential danger of each type of waste is realised when its handling is inadequate. If solid waste is placed indiscriminately in dumps near water sources and flooding rivers, the risk of contamination of the water will be high. Improper handling of waste, waste exports and waste crime may increase the probability of damage from waste. While low-income countries generally produce less waste, these also often lack the ability to collect and dispose waste in a sound manner.

Hazardous waste needs to be handled in compliance with strict quality requirements. The generator of the waste should have an obligation to manage the waste. Treatment procedures such as thermal destruction, neutralisation or physical stabilisation should be in place, and the vehicles that transport this waste must be constructed for this purpose. Storage sites should be safe. If this is not the case, basic safety requirements will not have been met, and the auditor should seek to find a way to raise awareness about these dangers. Efficient control of hazardous waste should also include a plan to reduce the amount of hazardous waste.

If safety requirements for people working in the waste sector are not met, the probability of risks to the environment and to human health are likely to increase. Hazardous waste can pose particularly serious threats to people working with collection, sorting or treatment of waste. Workers who are not wearing protective clothes and a gas mask may run the risk of serious injury, for instance as a result of skin burns from acids or inhaling organic solvents that can injure the lungs, the liver and other internal organs. Explosions are also known to have occurred as a result of handling hazardous waste.

The lack of safe disposal facilities may lead to waste being disposed of on streets, in backyards, or in canals and rivers, increasing the probability of risks to the environment and human health. Since many types of waste contain edibles, it may become a source of food for rodents and dogs and be a breeding ground for insects. Flooding combined with a lack of proper storage bins may provide favourable conditions for bacteria increasing the probability.



Photo: Employees and Scavengers at dump site in Thailand (iStock/kikira123)

In countries with inadequate collection and disposal of waste, most of the waste management is carried out by the informal sector with large safety risks for those who work and live at dumping sites. Scavenging or waste picking provides the income for around 64 million people in low-income countries, and is widespread in areas lacking formal public waste services.²⁴ Vulnerable groups, such as migrants, unemployed, widows, children, elderly and disabled people often work in these sectors, and are therefore particularly exposed to the health risks related to inappropriate recycling methods.²⁵

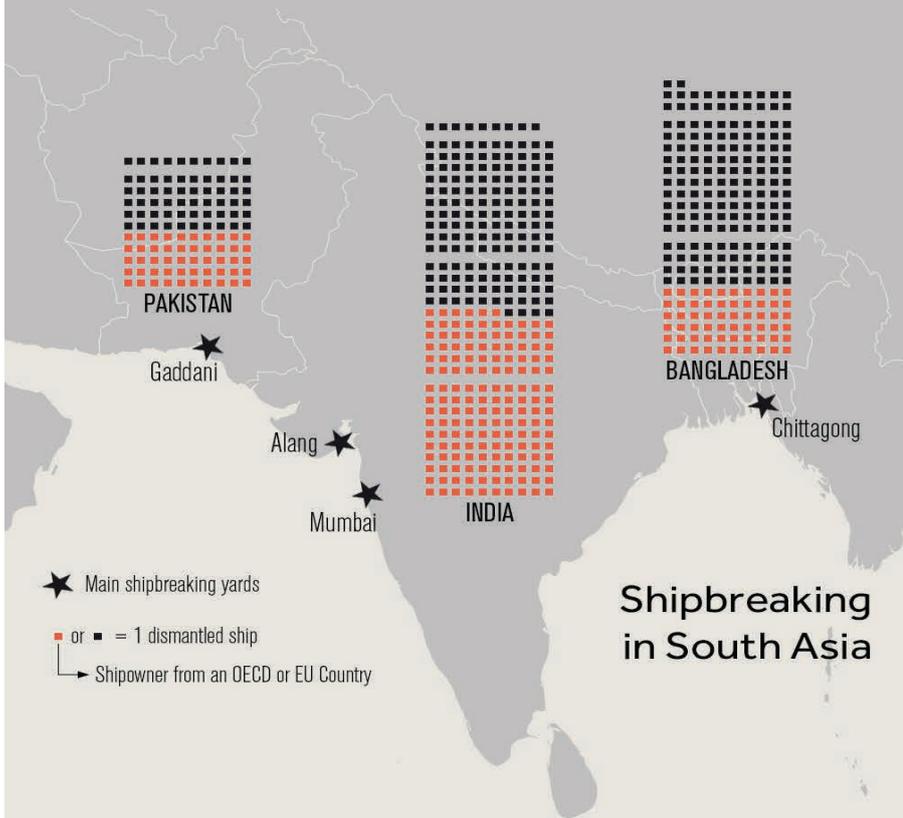
E-waste is commonly dumped at sites in low-income countries where local residents collect pieces of value. Workers extract metals such as gold, silver, platinum, palladium and copper. The leftovers are often dumped, constituting contaminated sites and creating a 'toxic time bomb'. Plastic waste is often handled at family owned-workshops lacking safety equipment and pollution controls. The water and chemicals that are used to rinse the plastic are often released directly into local rivers.²⁶

24 UNEP and GRID-Arendal (2015). Waste Crime - Waste Risks: Gaps in meeting the global waste challenge. [Online] Available at: <http://www.grida.no/publications/rr/waste-crime/> [Accessed on 15 December 2015]

25 UNEP (2012). Global Environmental Outlook 5. Chapter 6 Chemicals and Waste. [Online] Available at: <http://www.unep.org/geo/geo5.asp> [Accessed on 15 December 2015]; Zoï Environment Network and GRID-Arendal (2012). Vital Waste Graphics 3. [Online] Available at: <http://www.grida.no/publications/vg/waste3/> [Accessed on 15 December 2015]

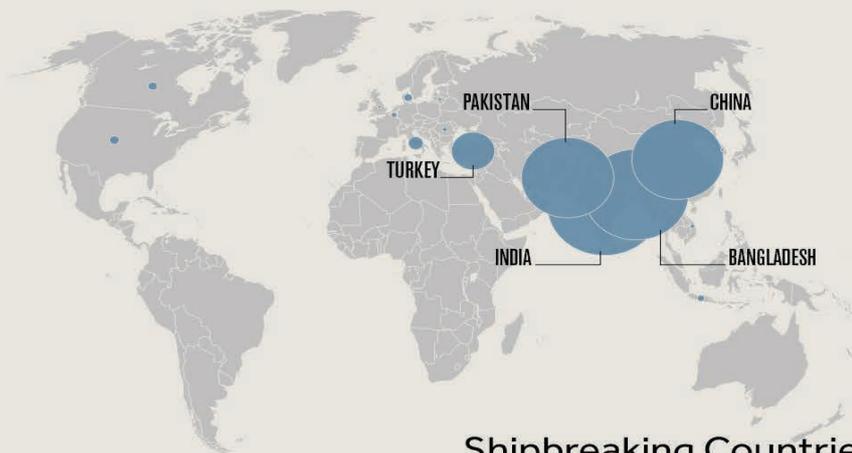
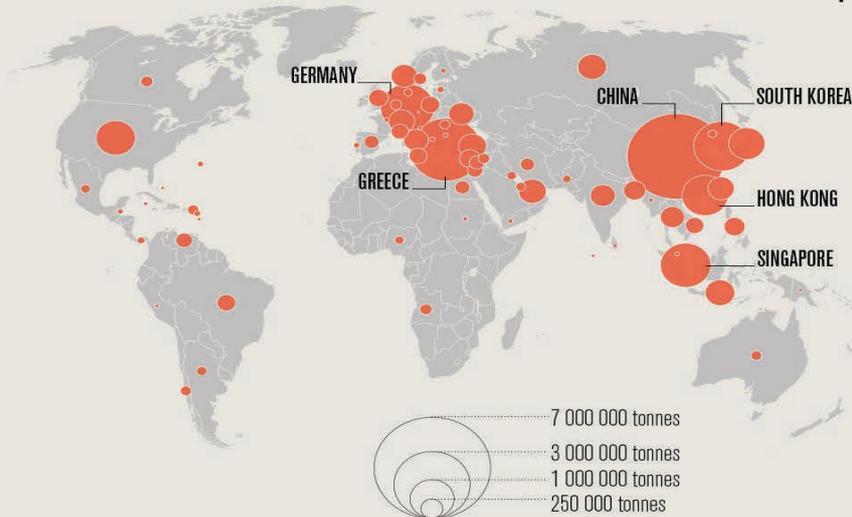
26 UNEP and GRID-Arendal (2015). Waste Crime - Waste Risks: Gaps in meeting the global waste challenge. [Online] Available at: <http://www.grida.no/publications/rr/waste-crime/> [Accessed on 15 December 2015]

SHIPBREAKING in 2014



Shipbreaking in South Asia

Source Countries of Dismantled Ships



Shipbreaking Countries

SHIP BREAKING AND BEACHING

Shipbreaking involves the dismantling of vessels to recover steel and other materials. This activity is mainly carried out in five countries: India, Pakistan, Bangladesh, China and Turkey. The metal scrap recovered from ship breaking accounts for an important part of steel production in these countries. In Bangladesh, steel recovered from vessels accounts for 50 per cent of the nation's steel production. The scrap metal, however, is often contaminated with hazardous substances such as oil asbestos cladding, flame retardants, toxic paints and heavy metals.

Beaching is a method used several places in South East Asia, and consists of demolishing vessels directly in the beach.

Ship breaking and beaching causes numerous preventable accidents and loss of human lives. Migrant workers and child labourers are commonly involved in this practice. Ship breaking leads to marine pollution and the emissions of hazardous materials. In 2014, 641 vessels were beached and deconstructed in India, Pakistan and Bangladesh.

Reference: UNEP and GRID-Arendal (2015). Waste Crime - Waste Risks: Gaps in meeting the global waste challenge. [Online] Available at: <http://www.grida.no/publications/rr/waste-crime/> [Accessed on 15 December 2015]



Photo: Ship breaking in Bangladesh (iStock/suc)

TRANSBOUNDARY SHIPMENT OF WASTE

The amount of waste shipped around the globe is constantly increasing. This is enabled by the containerisation of goods, as the standardised size of containers allows waste to be transported swiftly from one destination to another. Problems arising from waste often do not remain within a country's borders, but are dispersed across countries. Health and environmental problems are therefore exported from one country and subsequently imported into another. In order to capture the international dimension of waste-related issues, this also requires increased cooperation among SAIs.

Statistical Challenges Related to Waste Trade

The extensiveness of waste trading makes controlling and monitoring an extremely difficult task. While the Secretariat of the Basel Convention provides information on hazardous wastes that are exported, the Convention does not oblige member states to control that the data is complete.²⁷ Furthermore, green-listed (non-hazardous) waste is not subject to notification, and therefore not included in the published waste statistics.²⁸ There is therefore a significant shortage of data related to waste generation, treatment and recycling. In addition, classifications of waste often vary from country to country. This complicates the gathering of statistical data, and makes it hard to compare waste across countries.

Official data from the Basel Secretariat suggests that the majority of hazardous waste is traded within OECD-countries. According to official data, countries with specialised waste treatment, such as Germany, stand out as the major importers of waste. Surprisingly, the data also

27 UNEP (2012). Global Environmental Outlook 5. Chapter 6 Chemicals and Waste. [Online] Available at: <http://www.unep.org/geo/geo5.asp> [Accessed on 15 December 2015];

28 OECD. The OECD Control System for waste recovery. [Online] Available at: <http://www.oecd.org/env/waste/theoecdcontrolsystemforwasterecovery.htm> [Accessed on 15 December 2015]

suggests that relatively small European countries such as Netherlands and Belgium are the largest exporters of waste. These results are most likely a reflection of the large amounts of hazardous waste passing through the industrial ports in these countries. Thus, the statistics reflect these countries' role as 'waste dispatchers', rather than providing reliable information about waste exporters.²⁹



Photo: Scrap metal recycling barge (iStock/Maxvis)

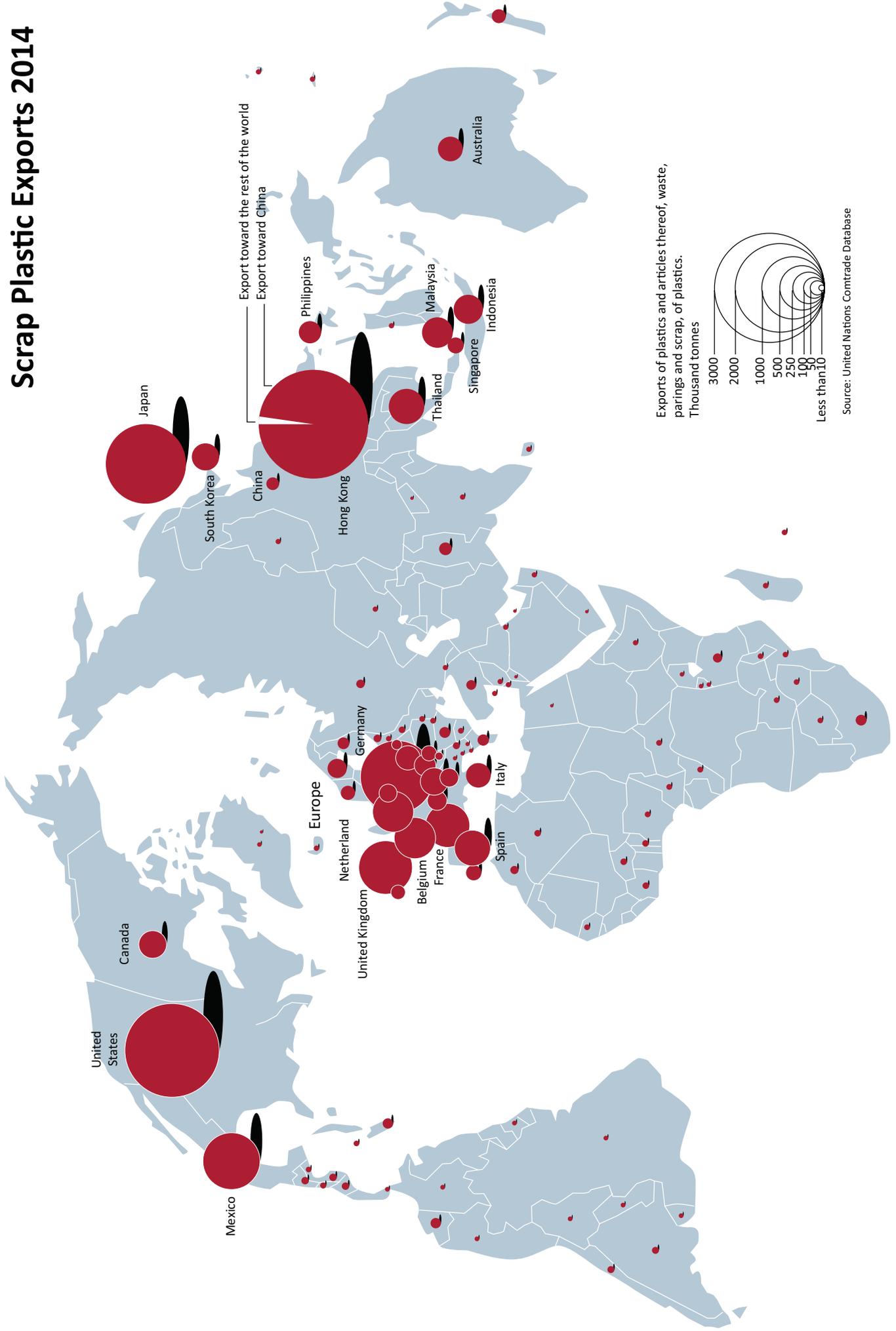
Informal Waste Trade

It is impossible to quantify the scope of informal waste trading. Recent research does suggest that the volume of waste trading is increasing in many countries. In general, waste routes track international shipping routes. A large number of ships carrying goods from Asia to Europe return empty to Asia. This creates opportunities for waste traders who benefit from shipping companies wanting to avoid empty containers, and has contributed to the increase in the export of non-hazardous recyclable waste from Europe to Asia. Exports to the developing world are most often labelled as goods to be recycled. It is estimated that half of all plastics collected for recycling in Europe is exported. Around 87 per cent of this plastic ends up in China, with large volumes of waste entering China's informal recycling sector. The figures below show the key exporting and importing countries of scrap plastic in 2014.³⁰

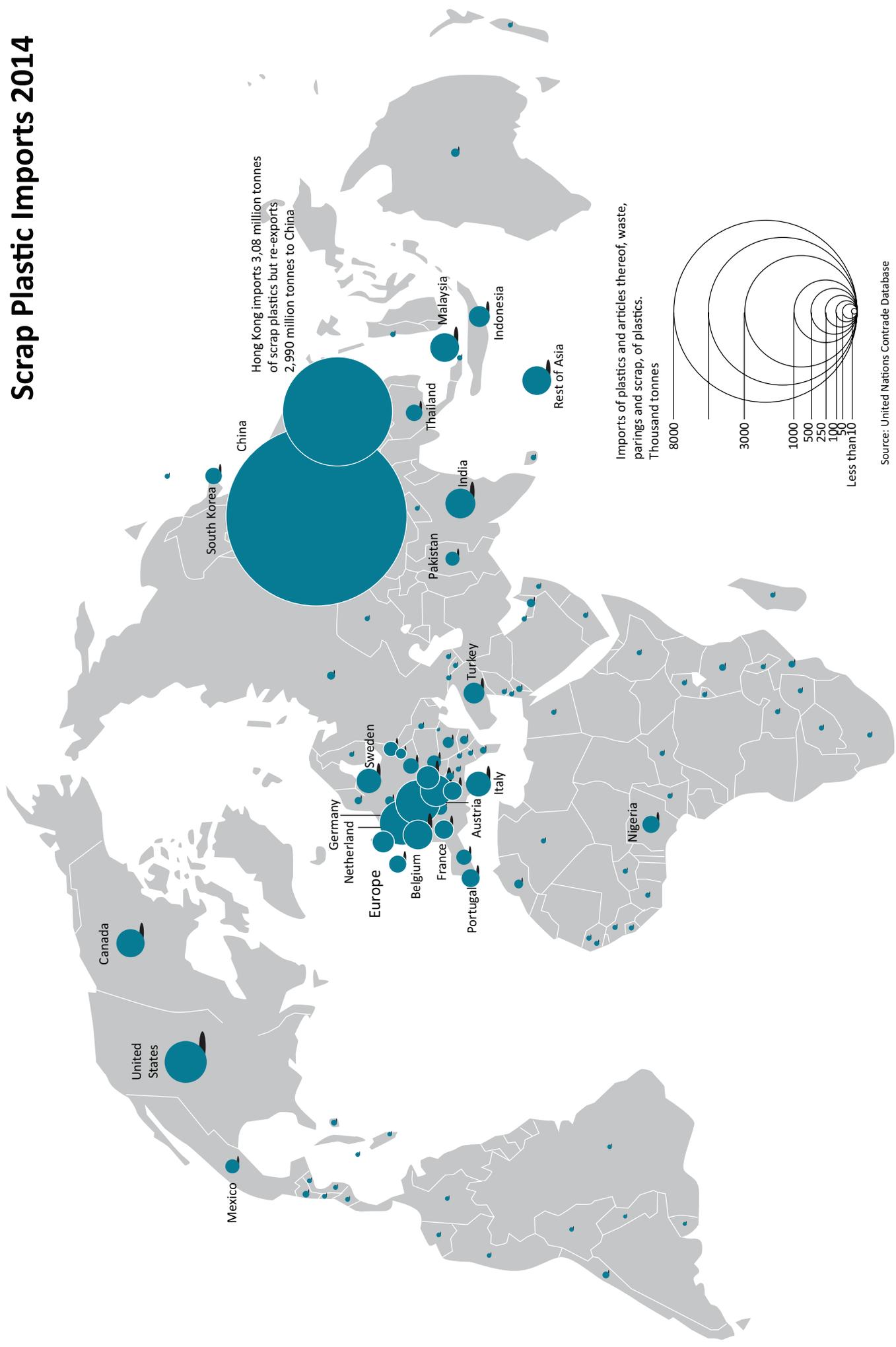
29 UNEP and GRID-Arendal (2006). Vital Waste Graphics 2. [Online] Available at: <http://www.grida.no/publications/vg/waste2/> [Accessed on 15 December 2015]

30 UNEP and GRID-Arendal (2015). Waste Crime - Waste Risks: Gaps in meeting the global waste challenge. [Online] Available at: <http://www.grida.no/publications/rr/waste-crime/> [Accessed on 15 December 2015]

Scrap Plastic Exports 2014

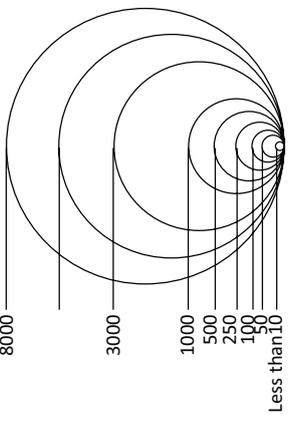


Scrap Plastic Imports 2014



Hong Kong imports 3,08 million tonnes of scrap plastics but re-exports 2,990 million tonnes to China

Imports of plastics and articles thereof, waste, parings and scrap, of plastics. Thousand tonnes

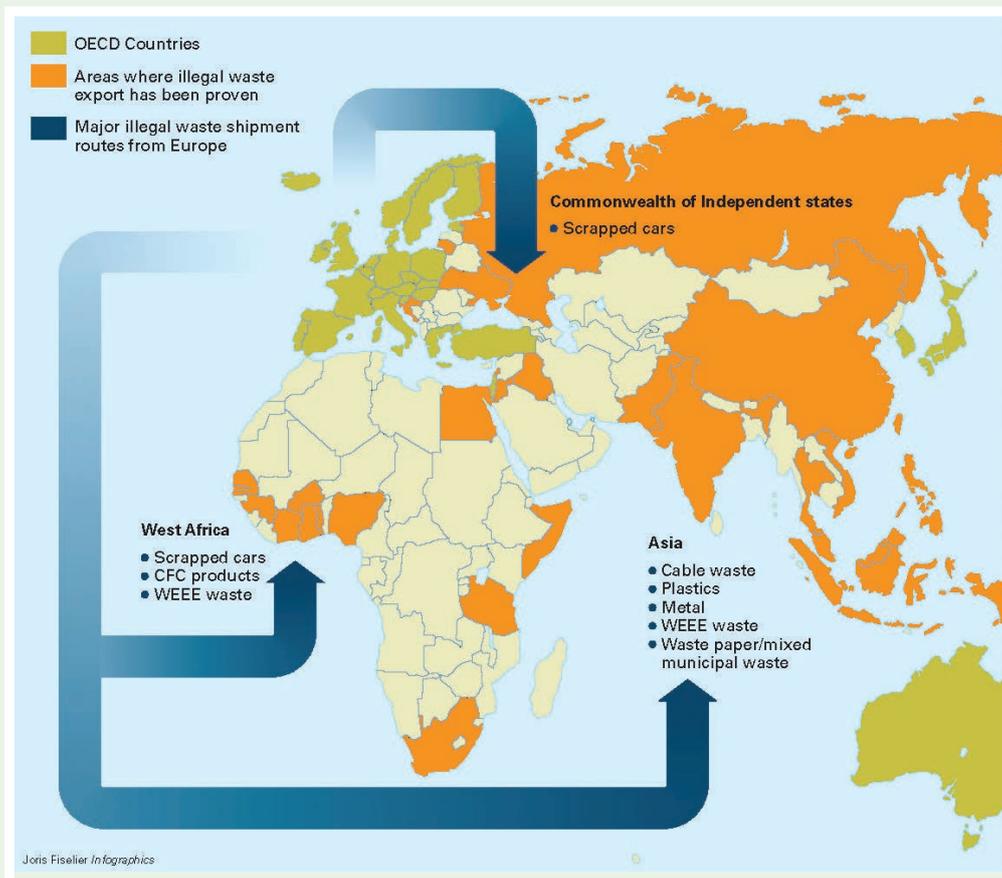


Source: United Nations Comtrade Database

As for hazardous waste, key destinations for large-scale shipments are Africa (Côte d'Ivoire, Ghana, Nigeria, Republic of Congo) and South/Southeast Asia (Bangladesh, China, Hong Kong, India, Pakistan, Vietnam), to mention a few. The Caribbean and Eastern and Central Europe are also important destinations of hazardous wastes.³¹

COORDINATED AUDIT ON THE ENFORCEMENT OF THE EUROPEAN WASTE SHIPMENT REGULATION

The SAI's of Bulgaria, Greece, Hungary, Ireland, Poland, Norway, the Netherlands and Slovenia conducted a coordinated audit addressing the following questions: (1) To what extent do the relevant authorities comply with the requirements arising from the European Waste Shipment Regulation; (2) How do authorities enforce the regulation; and (3) what is known about the effectiveness of the enforcement measures. The audit showed that while all eight countries generally comply with the formal regulations, there are important differences in the enforcement of the regulation, numbers of inspections and the handling of infringements. The audit concluded that the discrepancies related to inspections may encourage businesses to export their waste via countries with less inspection. It is stated that that this cross-border avoidance increases the risk of waste being shipped illegally, which in turn may result in improper waste treatment.



Reference: Supreme Audit Institutions of Bulgaria, Greece, Hungary, Slovenia, Poland, Ireland, Norway and the Netherlands (2013). Coordinated audit on the enforcement of the European Waste Shipment Regulation. [Online] Available at: <http://www.courtfaudit.nl/dsresource?objectid=15556&type=org>

31 UNEP and GRID-Arendal (2015). Waste Crime - Waste Risks: Gaps in meeting the global waste challenge. [Online] Available at: <http://www.grida.no/publications/rr/waste-crime/> [Accessed on 15 December 2015]

WASTE CRIME

The existence of illegal waste trading increases the probability of damage from waste, as criminal actors bypass environmental legislation in order to maximise profit. Waste crime poses a great risk to the environment and to human health, as well as creating opportunities for money laundering and tax fraud. The economic incentives for illegal or unsound waste management are large, while the risks of getting caught are generally low. Illegal waste operators may be paid large sums for disposing hazardous waste in a safe manner, but instead dump the waste. Due to the high costs of securing the sound management of hazardous waste, the illegal disposal of waste may generate up to 200 to 300 per cent compared to safe and legal disposal. Dumping may occur at waste disposal sites, on private or public land or in the sea. Large quantities of waste are dumped in the sea or abandoned in containers at ports across the world.³²

The mixing of waste streams is frequently revealed by environmental authorities. By mixing hazardous and non-hazardous waste streams, waste handlers avoid sorting and treatment costs. Co-mingled waste is often exported as paper waste or plastic, while consisting in reality of mixed household waste. Several cases have revealed that some legal ISO-certified companies promoting green and sustainable management also are engaged in fraudulent activities³³ (see text box on illegal mercury trade).

EXAMPLE OF ILLEGAL MERCURY TRADE

In 2014, a prominent German company which was internationally entrusted with disposing mercury was caught manipulating mercury-waste recycling. In reality it was illegally exporting the mercury. The fraud was discovered during an annual tax audit. From 2011 to 2014 the company had received mercury from around the world, guaranteeing for the safe disposal of the product. Instead, the company deceived the authorities and doubled its profits by selling the mercury back into the market. Up to 1 000 tonnes of metallic mercury were instead exported illegally. As of 2015, the public prosecution office in Bochum, Germany is investigating the case.

Reference: UNEP and GRID-Arendal (2015). Waste Crime - Waste Risks: Gaps in meeting the global waste challenge. [Online] Available at: <http://www.grida.no/publications/rr/waste-crime/> [Accessed on 15 December 2015], p. 33.

Large amounts of e-waste are illegally exported to Asia and Africa, often misdeclared as second-hand goods. The waste often ends up in primitive recycling facilities, as it constitutes a cheaper alternative for disposing of hazardous wastes than complying with regulations. The recycling of e-waste often generates additional revenues, as these contain valuable metals.

32 UNEP and GRID-Arendal (2015). Waste Crime - Waste Risks: Gaps in meeting the global waste challenge. [Online] Available at: <http://www.grida.no/publications/rr/waste-crime/> [Accessed on 15 December 2015]

33 UNEP and GRID-Arendal (2015). Waste Crime - Waste Risks: Gaps in meeting the global waste challenge. [Online] Available at: <http://www.grida.no/publications/rr/waste-crime/> [Accessed on 15 December 2015]

Another emerging source of illegal waste trade is obsolete counterfeit pesticides.³⁴ In most countries, the owners of the counterfeit pesticides are required to store these safely during investigations, and pay the costs of disposal. However, the owners are often eager to evade these costs. Significant amounts of obsolete counterfeit pesticides are therefore relabelled and brought back into the market.³⁵

POWERFUL (MAFIA) ORGANIZATIONS ARE REAPING LUCRATIVE PROFITS FROM 'MANAGING' HAZARDOUS WASTE

It is estimated that 20 000 tonnes of hazardous waste produced by Italian industry disappears annually, either dumped or illegally exported to other countries. As a consequence, large tracts of farmland, lakes and forests around Naples are contaminated by the illegal dumping of waste. High levels of dioxins and toxic substances have been detected in agricultural products. Due to the complexity of waste transports, risk profiling, intelligence-led approaches and good governance are necessary to detect waste-related crime.

References: Zoï Environment Network and GRID-Arendal (2012). Vital Waste Graphics 3. [Online] Available at: <http://www.grida.no/publications/vg/waste3/> [Accessed on 15 December 2015], p. 38-39.

Conditions for Waste Crime

In order to reduce the probability of waste crime, environmental regulations, monitoring and enforcement systems must be in place. The general international lack of monitoring and enforcement incites criminal behaviour, as the risks and consequences of getting caught are low. According to UNEP (2015), the illegal shipment of toxic waste and e-waste constitutes particularly favourable conditions for organised crime. The report states that “[t]here is likely no other area of organized crime that provides such a significant opportunity for money laundering and tax fraud as waste disposal, with its near complete lack of monitoring, statistics or reporting”.³⁶

Unclear international definitions and obligations regarding waste contribute to illegal waste shipments, either intentionally or unintentionally. The problem is amplified by different waste codes and different standards and regulations across countries. While some countries have individual black lists of unwanted profiles, waste traders can avoid controls by shipping waste via another country. Waste operators may also choose ports in countries with less stringent controls. Another well-known practice is ‘port-hopping’, where illegal waste operators move cargo efficiently through ports, depriving inspectors of the opportunity to inspect the containers.

³⁴ See text box on Obsolete Pesticides and Persistent Organic Pollutants (POPs), p. 14.

³⁵ UNEP and GRID-Arendal (2015). Waste Crime - Waste Risks: Gaps in meeting the global waste challenge. [Online] Available at: <http://www.grida.no/publications/rr/waste-crime/> [Accessed on 15 December 2015]

³⁶ UNEP and GRID-Arendal (2015). Waste Crime - Waste Risks: Gaps in meeting the global waste challenge. [Online] Available at: <http://www.grida.no/publications/rr/waste-crime/> [Accessed on 15 December 2015]

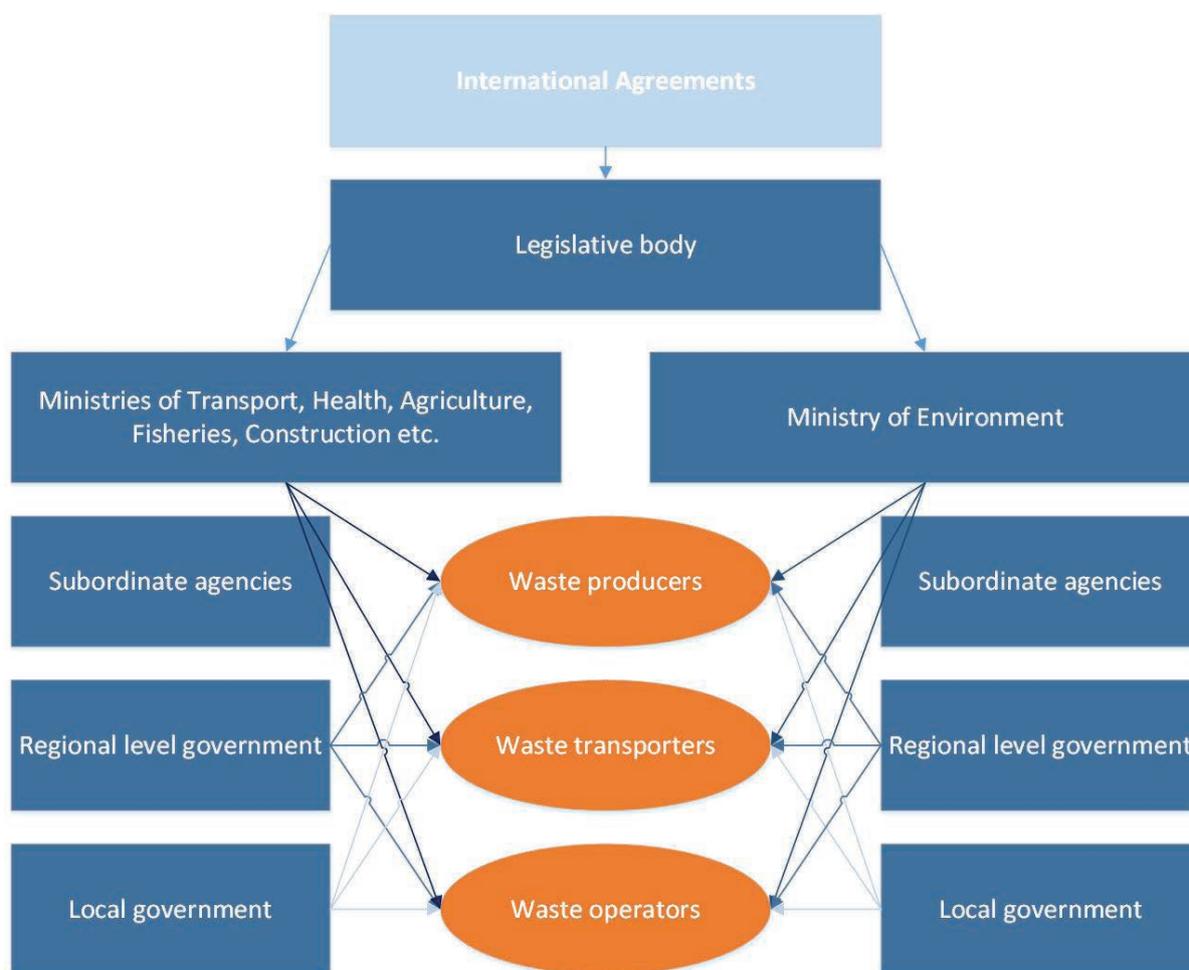
Step 2

Mapping Out the Actors and Their Responsibilities

RESPONSIBLE ACTORS IN THE WASTE MANAGEMENT CHAIN

The second step is to create an overview of the organizational structure of the waste management system. The organizational structure for waste management may vary considerably among different countries, but most of the systems have certain functions that need to be fulfilled. Most likely, there will be different systems for non-hazardous and hazardous waste. It is necessary to map out the appropriate authorities to identify the relevant entities that should be audited. The responsible government bodies and the nature of the accountability relationships between the different actors should be identified.

This overview should include the most important actors: authorities at the national, regional and local levels, the waste generators and other actors that may pose a risk through their handling of waste. The waste management landscape is complex, involving a range of actors such as waste collectors, waste management companies, transport and shipping companies, waste treatment operators, shipping agents, waste brokers and recycling companies. All of these actors may be private and public.



In a basic chart, the inclusion of waste generators, waste transporters and waste operators is sufficient. The figure above is a graphical presentation of relevant actors associated with waste management that should be taken into account. In a factual chart, each actor's functions and responsibilities should be described. The chart should also indicate the feedback obligations and the authority to issue instructions. The arrows illustrate links between actors that the auditor should look for. The boxes show examples of different public entities that may have authority over the way waste handlers conduct their activities. Waste handlers are indicated with circles.

Legislative bodies

Most countries have a legislative body responsible for formulating environmental policies and enacting appurtenant laws. International agreements provide directions for the national legislative work.

Relevant ministries

In many countries one government authority, usually called the Ministry of the Environment, is responsible for all of the environmental policies at the federal or national level, including the management of waste. In other countries, several ministries are responsible for different parts of the waste management system. In these countries, it is important to map

out which parts of the policy each ministry is responsible for and how they coordinate their work.

The relevant ministry (or ministries) are responsible for a number of important functions. In some countries these functions are carried out by subordinate agencies. The important consideration is whether the highest governmental authority (the ministry or ministries) has an overview of the activities and makes sure they are performed well.

Control authorities

Many countries have an authority responsible for controlling pollution and for inspecting and monitoring the environment and activities that have an impact on the environment. In these cases, it is necessary to map out the role it plays in the waste management system. If such an agency does not exist, the SAI should identify the actors performing these functions. If these functions are not discharged, it may be the responsibility of the SAI to inform the appropriate authorities.

Depending on the type of waste, the authorities that administer or regulate the waste may be at the regional or provincial level or at the local or municipal level. All actors should be mapped out, even though some of these actors may fall outside the SAI's auditing mandate.

Waste handlers

The most typical waste handlers should be identified without going into great detail. In most cases, specialised companies owned by, or acting on behalf of the authorities, are responsible for handling waste from collection to disposal. The activities of these actors may produce social costs in terms of health and environmental risk. It is therefore essential that outside evaluators ensure that the service is provided in a fair, effective, efficient and environmentally sustainable manner. Control authorities should have an overview over commercial companies and traders involved in waste management.

SYSTEMS FOR HANDLING WASTE

All countries experience waste-related problems. These, in turn, require policies and practical solutions. A lack of policy in an area may lead to inadequate regulations, which can result in random practices that may be harmful or even dangerous. The solution is a complete waste management system, and good control of the system.

In relation to the establishment of management systems for waste, it is important to take account of the fact that different kinds of waste require different management systems. While waste categorisations often vary across countries, most countries distinguish between hazardous and non-hazardous waste. The categorisation of waste has direct implications for carrying out an audit of the waste management system, because different levels of authority may be responsible for the management or regulation of the different types of waste. While different legislation regulates different types of waste in many countries, this is not necessarily reflected in the organizational structure.

Laws regulating hazardous waste are usually regulated at the national level, whereas non-hazardous waste is regulated at the regional or local levels in many countries. This, in turn, has implications for the feasibility of a SAI carrying out an audit. Whereas some SAIs have a mandate to

audit all levels of administration, many SAIs are limited to fields regulated by national (and international) legislation. All audit activities should be within the SAI's audit mandate.³⁷

The SAIs' opportunity to audit waste management therefore depends on responsibility structures at the national, regional and/or local level.

SOLID WASTE MANAGEMENT SYSTEM IN CHINA

According to the Law on the Prevention and Control of Environmental Pollution by Solid Waste in China, the Ministry of Environmental Protection is in charge of unified supervision and management of the prevention and control of environmental pollution by solid waste throughout the country. Local level environmental protection bureaus are charged with monitoring landfills and incinerators' air emissions, wastewater discharges and fly ash disposal, in addition to enforcing standards. The Ministry of Housing and Urban-Rural Development is responsible for supervision and management with regard to cleaning up, collection, storage, transport and treatment of urban house refuse. Local housing and urban-rural development bureaus are also responsible for the construction and operation of disposal facilities, including landfills and incineration plants.

Source: The National Audit Office of China.

INTERNATIONAL AGREEMENTS AS SOURCES OF AUDIT CRITERIA

During the last few decades a relatively large number of international waste management agreements have been established on different levels. While some agreements have an almost global reach, others cover a more limited number of countries/signatories. Many agreements also constitute a part of a wider institutional cooperation, such as the European Union or OECD. Regardless of their geographical scope, all international agreements may be regarded and used as a source of audit criteria when auditing waste and waste management systems. Some key agreements and examples are presented below.³⁸

Agreements Regarding Hazardous Waste

In the late 1980s, a tightening of environmental regulations in industrialised countries led to a dramatic rise in the cost of hazardous waste disposal. Searching for cheaper ways to get rid of this type of waste, 'toxic traders' began shipping hazardous waste to developing countries and to Eastern Europe. Once this was discovered, international work was started to restrict these activities. The treaties below are some of the most important conventions regarding hazardous wastes and chemicals.

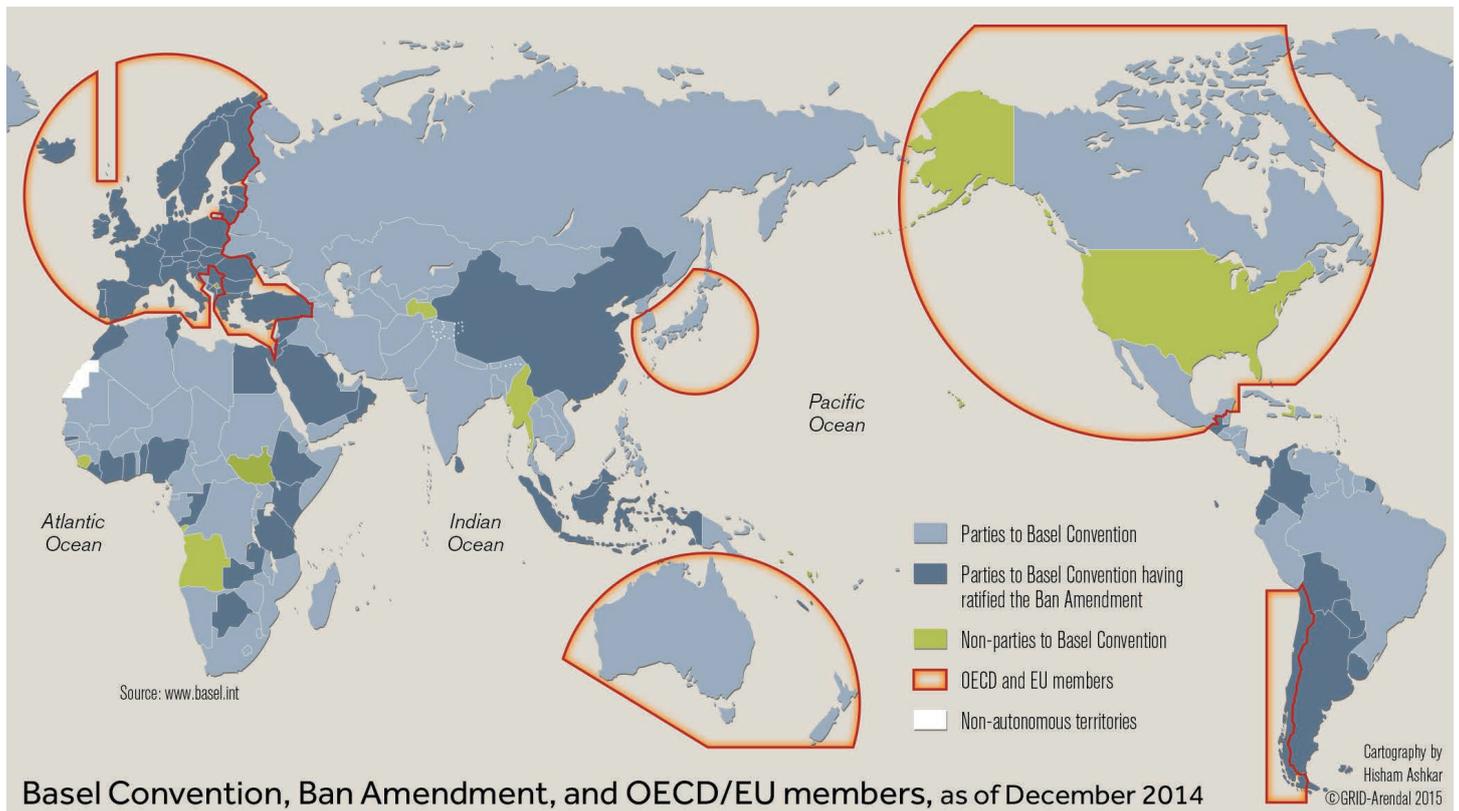
Basel Convention

The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (1989) is a global agreement addressing the problems and challenges posed by hazardous waste. The Convention requires the prior consent of the competent authority of the State of import before the State of export can grant an export permit for the movement of hazardous waste. Notification is therefore a vital document in the transboundary trade of hazardous waste. The member states must ensure that exported waste is handled in an environmentally sound manner. In order to reduce the international movement of hazardous waste as much as possible, the waste shall, as far

³⁷ INTOSAI Auditing Standards Paragraph 1.0.34

³⁸ See also database on multilateral environmental treaties at the following webpage: <http://sedac.ciesin.org/entri/>

as practically possible, be treated in the country where it originates (the principle of self-sufficiency), and as close to its place of origin as possible (the principle of proximity). The parties are also committed to strictly supervising hazardous waste during its storage, treatment, recovery and final disposal. The 'Ban Amendment' to the Basel Convention, prohibits all transboundary movement of hazardous wastes from OECD to non-OECD countries. Eighty-three parties have ratified the amendment, which at December 2015 had not entered into force. As of December 2015, there are 183 parties to the Basel Convention.³⁹



Basel Convention, Ban Amendment, and OECD/EU members, as of December 2014

The EU regulation No 1013/2006 on shipments of waste implements the Basel Convention and is aimed at strengthening, simplifying and specifying the procedures for controlling waste shipments to improve environmental protection. It thus aims to reduce the risk of waste shipments not being controlled. The regulation was amended in Regulation (EU) No 660/2014, strengthening the Member States' inspection systems.

The Bamako Convention⁴⁰ and Waigani Convention⁴¹ have clear links with the Basel Convention. The Bamako Convention (1998) prohibits the import of hazardous waste into Africa, and the Waigani Convention (2001) prohibits the import of hazardous waste into Pacific Island developing countries. These regional regimes were partly established in response to the initial failure of the Basel Convention to ban exports from North to South.

39 Basel Convention (1989). The Basel Convention on the Control of Transboundary Movement of Hazardous Wastes and their Disposal. Available at: <http://www.basel.int> [Accessed on 15 December 2015]

40 Bamako Convention on the ban on the Import into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes within Africa. For more information about the Bamako Convention see: <http://www.unep.org/delc/BamakoConvention>

41 Waigani Convention to Ban the Importation into Forum Island Countries of Hazardous and Radioactive Wastes and to Control the Transboundary Movement and Management of Hazardous Wastes within the South Pacific Region. For more information about The Waigani Convention see: <https://www.sprep.org/legal/waigani-convention>

Other international agreements

The list below gives an overview of other international agreements that may be used as a source of audit criteria when auditing waste management.

Title of agreements	Subject
The OECD Control System for Waste Recovery ⁴³	The OECD Decision on Control of Transboundary Movements of Wastes Destined for Recovery Operations C (2001)107/FINAL aims at facilitating trade of recyclables in an environmentally sound and economically efficient manner. The OECD Control System is based on the Green Control procedure and an Amber Control Procedure. Wastes exported outside the OECD area, whether for recovery or final disposal, do not benefit from this simplified control procedure.
The London Convention ⁴⁴	The London Convention on the Prevention of Marine Pollution by Dumping of Wastes and other Matters (1972) is aimed at limiting the discharge of waste generated on land and disposed at sea. As of December 2015, there were 87 parties to the Convention.
The Stockholm Convention ⁴⁵	The Stockholm Convention on Persistent Organic Pollutants (2001) is a global agreement created in order to protect human health and the environment from persistent organic pollutants (POPs). This agreement commits the parties to phase out 22 of the most dangerous environmental toxins. As of December 2015, there were 179 parties to the Convention.
The Rotterdam Convention ⁴⁶	The Rotterdam Convention of the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade (1998) is aimed at facilitating the sharing of information about hazardous chemicals. The parties exchange information about characteristics of hazardous chemicals and about national decisions on importing and exporting hazardous chemicals. As of December 2015, there were 154 parties to the Convention.
The MARPOL Convention ⁴⁷	The Rotterdam Convention of the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade (1998) is aimed at facilitating the sharing of information about hazardous chemicals. The parties exchange information about characteristics of hazardous chemicals and about national decisions on importing and exporting hazardous chemicals. As of December 2015, there were 154 parties to the Convention.

42 OECD. The OECD Control System for waste recovery. [Online] Available at: <http://www.oecd.org/env/waste/theoecdcontrolsystemforwasterecovery.htm> [Accessed on 15 December 2015]

43 London Convention (1972/96). Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter. Adoption 1972; 1996 Protocol. [Online] Available at: <http://www.imo.org/About/Conventions/ListOfConventions/Pages/Convention-on-the-Prevention-of-Marine-Pollution-by-Dumping-of-Wastes-and-Other-Matter.aspx> [Accessed on 15 December 2015]

44 Stockholm Convention. [Online] Available at: <http://chm.pops.int/TheConvention/Overview/TextoftheConvention/tabid/2232/Default.aspx> [Accessed on 15 December 2015]

45 Rotterdam Convention (2001). Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade. Revised in 2011. [Online] Available at: <http://www.pic.int/TheConvention/Overview/TextoftheConvention/tabid/1048/language/en-US/Default.aspx> [Accessed on 15 December 2015]

46 MARPOL (1973/78). International Convention for the Prevention of Pollution from Ships. Adoption 1973, 1978 Protocol. International Maritime Organization (IMO), London. [Online] Available at: <http://www.imo.org/en/About/Conventions/ListOfConventions/Pages/International-Convention-for-the-Prevention-of-Pollution-from-Ships-%28MARPOL%29.aspx> [Accessed on 15 December 2015]

INTERNATIONAL AGREEMENTS USED AS AUDIT CRITERIA

The Swedish National Audit Office's audit Transport of hazardous waste - effectively supervised (2015) is a good example for both of how international agreements and EU directives and regulations are used as audit criteria. The overall audit question in this audit is whether the Swedish government has oversight and undertakes effective inspection of both transboundary and domestic shipments of hazardous waste.

The report starts out with the Basel Convention as a general audit criterion and how this is implemented in the EU Waste Framework Directive and the EU Regulation no. 1013/2006 on shipments of waste. The regulation is by definition national law in Sweden. Further, the criteria section of the report describes the basic elements on how waste is to be managed and how these obligations and requirements are implemented or fulfilled by national environmental law and the corresponding national waste regulation. The report lays out various requirements which the system of inspections should fulfil in order to be efficiently based on these pieces of laws and regulations.

Apart from criteria that can be based on international agreements and obligations and corresponding national legislation, the report also cites the Swedish annual national budget law and its references to effectiveness and economy in public management. From these principles it is deduced that inspections should be carried out in a cost-effective manner. Furthermore, given the great number of actors on different levels involved in the control and supervision of waste shipments, it is assumed that effective inspections require cooperation and coordination among these actors. This implies exchange of information and clearly defined division of responsibilities.

Reference: Swedish National Audit Office (2015). Transport of hazardous waste - effectively supervised? Report RIR 2015:10. [Online] Available at: <http://www.riksrevisionen.se/sv/rapporter/Rapporter/EFF/2015/Transporter-av-farligt-avfall--fungerar-tillsynen> [Accessed on 15 December 2015]

Agreements including non-hazardous/solid waste

Most legislation concerning waste usually covers hazardous waste streams. However, there are a few international and regional agreements and policies that also cover non-hazardous waste.

OECD and the EU have both adopted policies recommending or prescribing its member countries to establish a framework for a national waste management system. For example, the OECD Recommendation C(2004)100⁴⁷ recommends member countries to elaborate and implement policies and/or programmes to ensure that waste is managed in an environmentally sound and economically efficient manner. More specifically, the recommendation refers to e.g.

- Having a regulatory and enforcement infrastructure at an appropriate governmental level
- Developing practices and instruments for waste management
- Ensuring that facilities are operating according to best available techniques
- Integrating the core performance elements for waste facilities into national policies
- Considering incentives for facilities that fulfill the core performance
- Internalization of environmental and human health costs in waste management
- Providing incentives to take part in environmentally sound recycling schemes

47 Amended on 16 October 2007 - C(2007)97

OECD Recommendation on Resource Productivity C (2008) promulgates international policies to prevent and reduce waste generation and achieve sustainable material management.

The EU Commission has adopted a *Circular Economy Package* with the overall aim of creating a green economy, where the loop is closed in the sense that waste is eliminated and products at the end of their useful lives are put to new use instead of being treated as waste. This process could include the review of existing legislation such as the directives listed below and the introduction of new legislation.⁴⁸

EU directive	Subject
Directive 2002/96/EC Directive 2012/19/EU	Directive on Waste Electrical and Electronic Equipment (WEEE). The Directive was revised in 2012 in order to tackle the fast increase of the waste stream. ⁵⁰
Directive 96/59/EC	PCB and PCT Directive on the disposal of Polychlorinated Biphenyls and polychlorinated terphenyl
Directive 96/59/EC	Spent Batteries Directive on waste batteries and accumulators
Directive 96/59/EC	The EU <i>Waste Framework Directive</i> sets out basic concepts and definitions related to waste management and lays on the 'polluter pays principle' and 'waste hierarchy'.
Directive 2008/1/EC	The <i>IPPC Directive</i> aims to prevent or reduce pollution of the environment and the quantities of waste arising from industrial and agricultural activities. Thus, companies themselves bear the responsibility for preventing and reducing any pollution they may cause. Member states are responsible for inspecting industrial installations and ensuring compliance.
EU Directive 1999/31/EC	The <i>Landfill Directive</i> seeks to prevent or reduce the negative effects on the environment and resulting risks to human health generated by landfills. Landfills are divided into three categories: landfills for hazardous, non-hazardous and inert waste.
EU Directive 2000/59/EC	The Directive pursues the same aim as the MARPOL Convention, but focuses on the regulation of discharges of ship-generated waste and cargo residues into the sea. Member states must ensure that adequate port reception facilities are provided.
Directive 2000/76/EC	The <i>Waste Incineration Directive</i> aims to prevent or minimise the negative effects on the environment and human health resulting from emissions to air, soil and water from the incineration of waste. The Directive includes burning waste for fuel and thus applies to co-incinerators such as combustion plants or cement works.
Directive 94/62/EC	The <i>Packaging Waste Directive</i> requires that member states take measures to prevent the formation of packaging waste, and to develop packaging reuse systems reducing their impact on the environment.
Directive 2000/53/EC	The <i>End-of-Life Vehicles Directive</i> seeks to limit waste production from end-of-life vehicles and increase re-use, recycling and recovery of end-of-life vehicles and their components, meet requirements for waste collection systems, and attain re-use/recycling targets.

48 European Commission. Circular Economy Strategy. [Online] Available at: http://ec.europa.eu/environment/circular-economy/index_en.htm [Accessed on 15 December 2015]

49 European Commission (2015). Waste Electrical & Electronic Equipment (WEEE). [Online] Available at: http://ec.europa.eu/environment/waste/weee/index_en.htm [Accessed on 15. December 2015]

Step 3

Identifying Possible Governance Problems Related to Waste Management

After considering the materiality and probability of health and environmental risks and mapping out relevant actors and legislation, the next step is to identify governance problems related to waste management. There are large differences between the challenges facing low-income and high-income countries. Many low-income countries struggle with establishing basic infrastructure for waste management. When assessing relevant risks, it is therefore important to take account of the local circumstances in the country in question. Nevertheless, many of the following governance problems are faced by countries worldwide.

LACK OF WASTE POLICIES

Many low-income countries lack environmental regulations, and the implementation of existing frameworks is often obstructed by weak governance, or the lack of enforcement, knowledge and technology. In order to secure a well-functioning waste management system, the existence of waste policies for the prevention, reduction, recycling, recovery and disposal of waste is fundamental. Efficient waste policies require specific objectives and targets with adherent information and advisory strategies. It should also be noted that lack of political attention may also undermine existing national waste policies.⁵⁰

⁵⁰ Zoï Environment Network and GRID-Arendal (2012). Vital Waste Graphics 3. [Online] Available at: <http://www.grida.no/publications/vg/waste3/> [Accessed on 15 December 2015]

Potential consequences: The amount of waste generated by citizens and industries will not be reduced. Recycling and recovery are either not carried out, or are carried out in an unsound manner. Disposal of waste is not subject to control, causing damage to the environment and to human health. Lack of waste policies creates loopholes and opportunities for money laundering and tax fraud. An integrated waste management based on the waste management hierarchy is difficult to adopt.

LEGAL AND REGULATORY AMBIGUITY

A common finding in many national audits is the lack of target achievements.⁵¹ However, this is not always due to the lack of effective waste management systems, but also to weaknesses in legislation and regulations. If objectives and strategies are not sufficiently specific, measurable, achievable, feasible, or subject to a realistic time frame, this may lead to unclear policy obligations for governance bodies and agencies. Interpretation of regulations may vary across regions and institutions. For example, many countries have adopted regulations prohibiting the import of hazardous wastes such as e-waste, while allowing the import of second-hand goods. However, most of these countries have not established specific requirements for distinguishing scrap from waste, thereby creating 'grey areas' that non-serious waste actors may take advantage of.⁵²

Potential consequences: The lack of legal clarity may lead to deliberate or undeliberate breaches of regulation by actors in the waste management system. This may create loopholes for criminal actors wishing to avoid sorting and treatment costs. Illegal co-mingling of waste streams may lead to an increase in the amount of hazardous waste, and cause potentially dangerous chemical compounds.

WEAK IMPLEMENTATION OF INTERNATIONAL AND REGIONAL AGREEMENTS

The practical implementation of international and regional agreements may be challenging for many countries, particularly those struggling with establishing appropriate waste infrastructure in the first place. For example, many EU countries struggle with the practical implementation of EU directives and regulations. Waste management audits show that EU countries with less developed waste management infrastructure often struggle in establishing appropriate systems in order to fulfill their obligations.⁵³ Another example may be drawn from the African

51 EUROSAI WGEA (2011). Paper on Auditing Waste Management. [Online] Available at: <http://www.eurosai.org/ru/databases/products/EUROSAI-WGEA-Paper-on-Auditing-Waste-Management/> [Accessed on 15 December 2015]

52 UNEP and GRID-Arendal (2015). Waste Crime - Waste Risks: Gaps in meeting the global waste challenge. [Online] Available at: <http://www.grida.no/publications/rr/waste-crime/> [Accessed on 15 December 2015]

53 EUROSAI WGEA (2011). Paper on Auditing Waste Management. [Online] Available at: <http://www.eurosai.org/ru/databases/products/EUROSAI-WGEA-Paper-on-Auditing-Waste-Management/> [Accessed on 15 December 2015]

region. While many African countries have consolidated agreements on transboundary waste trade, illegal waste trade is nevertheless frequently reported.

Potential consequences: Waste businesses may move to countries that struggle with implementing international and regional regulations, in order to avoid the costs associated with complying with these requirements. This, in turn, increases the probability of waste crime. Weak implementation of international agreements may also affect international monitoring and control systems as waste operators bypass regulations and control regimes.

WEAK COORDINATION BETWEEN RELEVANT AUTHORITIES

Waste types are managed and regulated vertically and horizontally at different levels of government and often by different public agencies. Inconsistencies related to the coordination of public involvement and use of policy instruments is a recurring issue in most countries. At the vertical level, the regional practice may not correspond with national policy targets. At the horizontal level, waste management systems may be undermined by conflicting objectives under a different policy domain.⁵⁴

Potential consequences: The regulation and management of waste may cause potential conflicts of interest between the ministries in question. Furthermore, unclear supervisory responsibilities reduce the risk of criminal waste handlers getting caught. Waste may be subject to illegal export or dumping, creating great hazards to the environment and to people.⁵⁵

INADEQUATE POLICY IMPACT ASSESSMENTS

In order to ensure the efficiency and appropriateness of new policy tools, ex-ante and ex-post regulatory impact assessments are necessary. In the absence of impact assessments, the probability of introducing suboptimal policy measures increases. Audits conducted by European SAIs, reveal that a range of waste policies such as disposal taxes and producer responsibility schemes, were not evaluated according to efficiency, cost-effectiveness and transparency.⁵⁶

Potential consequences: The absence of impact assessments may lead to inefficient use of public resources. Policies are often unsuccessful and do not solve the problems related to waste management. Measures for waste prevention and reduction are likely to prove inefficient, and the

54 UNEP and GRID-Arendal (2015). Waste Crime - Waste Risks: Gaps in meeting the global waste challenge. [Online] Available at: <http://www.grida.no/publications/rr/waste-crime/> [Accessed on 15 December 2015]

55 UNEP and GRID-Arendal (2015). Waste Crime - Waste Risks: Gaps in meeting the global waste challenge. [Online] Available at: <http://www.grida.no/publications/rr/waste-crime/>

56 EUROSAI WGEA (2011). Paper on Auditing Waste Management. [Online] Available at: <http://www.eurosai.org/ru/databases/products/EUROSAI-WGEA-Paper-on-Auditing-Waste-Management/> [Accessed on 15 December 2015]

amount of non-hazardous and hazardous waste will increase. Policies targeted at recycling, recovery and disposal may not be adequate in order to ensure that these processes are carried out in a sound manner.

WEAK MONITORING AND CONTROL SYSTEMS

A premise for reporting on established waste targets is the existence of adequate monitoring systems. However, as stated in the UN-Habitat Report 2010, “waste reduction is desirable but, typically, it is not monitored anywhere”.⁵⁷ Information systems in many countries are inadequate, and there are generally few policies in order to tackle problems with data collection and reporting. This is also reflected in the findings of a number of audits that point out shortcomings related to data gathering, control and monitoring of waste management systems.⁵⁸ While the lack of monitoring and control complicates reporting on policy targets, it also creates a permissive environment for environmental and tax fraud. In order to reveal waste crimes, the scale and routes of hazardous waste must be mapped out. Monitoring and control provide the basis for enforcement, and should be comprehensive, systematic and risk based.⁵⁹

Potential *consequences*: Lack of systematic information about the final destination of waste. The scale routes and state of hazardous waste are not mapped out, complicating enforcement. Organised crime may not be revealed. Statistical information is insufficient.

MONITORING OF LANDFILL MANAGEMENT IN CASABLANCA

In 2013, the Moroccan Court of Accounts audited the management of a disposal site in Casablanca, which had been delegated to a private contracting party. The findings showed that the project was significantly delayed, which led to a large increase in the financial costs. The contracting party had also received excessive remuneration. Furthermore, the company had not fulfilled its obligations related to establishment of systems for waste separation, recovery of biogas and analyses of water and air quality. Systems for treatment of leachate were found insufficient, and medical waste was mixed with household waste. The contractor had not implemented any measures against littering in the area. The audit found that the committee that was supposed to supervise the management of the contract had not entered into force. One of the main recommendations in the report was that municipal authorities should strengthen the monitoring and control of the financial costs and the waste management of the disposal site.

Source: Regional Court of Accounts of Rabat, Morocco.

57 UN-Habitat (2010). Solid Waste Management in the World's Cities: Water and Sanitation in the World's Cities 2010. United Nations Human Settlements Programme and Earthscan, London and Washington, DC

58 EUROSAL WGEA (2011). Paper on Auditing Waste Management. [Online] Available at: <http://www.eurosai.org/ru/databases/products/EUROSAL-WGEA-Paper-on-Auditing-Waste-Management/> [Accessed on 15 December 2015]

59 UNEP and GRID-Arendal (2015). Waste Crime - Waste Risks: Gaps in meeting the global waste challenge. [Online] Available at: <http://www.grida.no/publications/rr/waste-crime/>

WEAK ENFORCEMENT

An effective enforcement is contingent upon the existence of well-functioning monitoring and control systems. An effective enforcement system may rely on sanctions for actors who do not comply with relevant environmental regulations. Relevant law enforcement authorities must be given adequate resources and competences in order to ensure an appropriate enforcement of law and regulations. Due to the complexity of waste crime, systems of risk-profiling and intelligent-led approaches should be implemented. Furthermore, cooperation between enforcement authorities is central in order to ensure adequate enforcement. This requires that building capacities cross the entire enforcement chain, including custom authorities, police, environmental enforcement officers, prosecutors and judges. The degree of collaboration between national regulators varies significantly across countries, also within high-income countries.⁶⁰

Potential consequences: Weak enforcement systems create a permissive environment for waste crime, as the chances of getting caught are low. Weak sanctions do not deter non-serious actors. As a consequence, waste may not be handled in compliance with strict quality requirements. Criminal waste actors are not held responsible for actions that may pose significant environmental and health costs.

LACK OF TECHNICAL INFRASTRUCTURE AND ORGANIZATIONAL CAPACITIES

Technical infrastructure is a key in building efficient waste management systems. Waste infrastructure must be adapted to regional and country-specific conditions, as the composition and amount of waste varies broadly across regions. This, in turn, requires the existence of research and development institutions. In many countries, insufficient resources and the lack of waste management and disposal infrastructure pose great challenges to the sound disposal of waste. Organizational capacities are equally important in order to implement waste policies and enforce regulations. In order to ensure reduction of waste and efficient recycling programmes, governments must be able to carry out awareness and educational measures. Lack of awareness of hazards related to waste and inadequate training in secure waste management may lead to the failure of sound waste management.⁶¹

Potential consequences: Failure of implementing policies for reduction, prevention, recycling, recovery and proper disposal of waste. Lack of awareness of hazards related to waste may lead to unsound and

60 UNEP and GRID-Arendal (2015). Waste Crime - Waste Risks: Gaps in meeting the global waste challenge. [Online] Available at: <http://www.grida.no/publications/rr/waste-crime/>

61 United Nations Economic and Social Council (2011). Report of the Secretary-General: Policy Options and Actions for Expediting Progress in Implementation: Waste Management. Commission on Sustainable Development 19th Session, 2–13 May. Doc. E/CN.17/2011/6. [Online] Available at: http://www.un.org/ga/search/view_doc.asp?symbol=E/CN.17/2011/6&Lang=E; World Health Organization (2015). Health-care waste. Fact sheet N°253. [Online] Available at: <http://www.who.int/mediacentre/factsheets/fs253/en/> [Accessed on 15 December 2015]

potentially dangerous waste management practices. Hazardous waste is not subject to proper treatment, and may pollute soil, air and water, as well as spreading diseases. The lack of technical and organizational capacities for handling waste may also lead to the emergence of an informal waste sector, increasing the risks of damage to the environment and to human health.

PROBLEMS RELATED TO WASTE AT THE INTERNATIONAL LEVEL

Differing Classifications and Lack of Data

Differing definitions and classifications of waste across countries constitute a significant obstacle to monitoring and controlling waste streams. As the Basel Convention allows the parties to have differing definitions of waste, an illegal shipment in one country may be legal in another. This may lead to legal disputes between exporting and importing countries. In many cases, the result is a stalemate where containers with hazardous waste are kept in the country of import until an agreement is reached.⁶² Different code systems and broad definitions may also make it difficult for inspectors to classify waste. While one inspector might classify goods as clean plastic, another inspector may classify it as contaminated plastic.⁶³

Potential consequences: Differences in waste classifications make enforcement a very challenging task. Diverging or unclear definitions may lead to hazardous waste being intentionally or unintentionally classified as non-hazardous waste, and it is also used as an active smuggling method by criminal waste traders. Diverging classifications create great challenges in comparing data on waste across different countries. Lack of reliable statistical data makes it difficult to carry out information-based monitoring and enforcement.⁶⁴

DEFICIENCIES IN DATABASES

The SAI of Norway's investigation into the management of hazardous waste showed that much of the waste was incorrectly declared, and that errors occurred during the manual transfer of data to the national declaration database. The investigation showed that there was no requirement for reporting that hazardous waste has been treated, and that not all of the wastes could be traced to the final destination. The report emphasizes that the material shortcomings in the database has consequences for the statistics and for control of the handling and treatment of waste. Furthermore, the investigation also showed that not all exported waste is registered, and that export figures in the statistics are correspondingly low.

Reference: Office of the Auditor General of Norway (2012). Investigation into the management of hazardous waste, Document 3:7 (2011–2012). [Online] Available at: https://www.riksrevisjonen.no/en/Reports/Documents/Documentbase_3_7_2011_2012.pdf

62 UNEP and GRID-Arendal (2015). Waste Crime - Waste Risks: Gaps in meeting the global waste challenge. [Online] Available at: <http://www.grida.no/publications/rr/waste-crime/>

63 Supreme Audit Institutions of Bulgaria, Greece, Hungary, Slovenia, Poland, Ireland, Norway and the Netherlands (2013). Coordinated audit on the enforcement of the European Waste Shipment Regulation. [Online] Available at: <http://www.courtsofaudit.nl/dsresource?objectid=15556&type=org> [Accessed on 15 December 2015]

64 UNEP and GRID-Arendal (2015). Waste Crime - Waste Risks: Gaps in meeting the global waste challenge. [Online] Available at: <http://www.grida.no/publications/rr/waste-crime/>

Weak International Cooperation

Different regulatory practices and varying priorities across countries complicate the consistent enforcement of waste shipment legislations. This may encourage waste businesses to export waste through countries with less stringent enforcement, and increases the probability of illegal waste exports.⁶⁵ While one country may have a database with profiles on suspicious waste shipments, another country may have another set of profiles. Furthermore, the general lack of cooperation between national authorities makes it difficult to sanction an exporter whose export declaration is registered in another country than the actual country of export. It is next to impossible to enforce illegal exports through a country other than the country of dispatch.⁶⁶

Potential consequences: Insufficient information exchange hampers the efficient enforcement of non-serious actors. Waste businesses move to jurisdictions with less stringent regulations and enforcement, increasing the risk of criminal waste activities.

65 Supreme Audit Institutions of Bulgaria, Greece, Hungary, Slovenia, Poland, Ireland, Norway and the Netherlands (2013). Coordinated audit on the enforcement of the European Waste Shipment Regulation. [Online] Available at: <http://www.courtofaudit.nl/dsresource?objectid=15556&type=org> [Accessed on 15 December 2015] p. 2

66 UNEP and GRID-Arendal (2015). Waste Crime - Waste Risks: Gaps in meeting the global waste challenge. [Online] Available at: <http://www.grida.no/publications/rr/waste-crime/>



Step 4

Selecting an Audit Topic

The selection of audit topics requires a thorough assessment of the relevant risk for damage arising from waste, and assessment of materiality based on the number of people who may be affected and the severity of the harm they may suffer. The greater the risk for consequences in terms of economy, efficiency, and effectiveness or public trust, the more important the problems tend to be.⁶⁷ Auditors should select audit topics that are significant, auditable, and reflect the SAI's mandate.⁶⁸

TYPE OF RISK AND AUDIT APPROACH

According to ISSAI 3000 performance auditing should be directed towards areas where an external, independent audit may add value in promoting economy, efficiency, and effectiveness.⁶⁹ In performance auditing, the specific objective of the audit is often achieved by trying to answer two basic questions: Are things being done in the right way? Are the right things being done?⁷⁰

67 ISSAI 3000. [Online] Available at: http://www.issai.org/media/13224/issai_3000_e.pdf [Accessed 15 December 2015], 3.2.

68 ISSAI 100 [Online] Available at: <http://www.issai.org/media/69909/issai-100-english.pdf> [Accessed 15 December 2015], paragraph 34.

69 ISSAI 3000. [Online] Available at: http://www.issai.org/media/13224/issai_3000_e.pdf [Accessed 15 December 2015], 3.3

70 ISSAI 3000. [Online] Available at: http://www.issai.org/media/13224/issai_3000_e.pdf [Accessed 15 December 2015], 1.4

Compliance audits are carried out by assessing whether activities, financial transactions and information comply, in all material respects, with the authorities who govern the audited entity or subject.⁷¹ A compliance audit may also be a component of a performance audit engagement.⁷²

The auditor should select an audit topic and put the topic in the perspective of effects on local, national or international society by considering which of the three E's (cf. ISSAI 3100) the audit falls within:

- **Economy** of activities in accordance with sound administrative principles and practices, and management policies;
- **Efficiency** of utilization of human, financial and other resources, including examination of information systems, performance measures and monitoring arrangements, and procedures followed by audited entities for remedying identified deficiencies;
- **Effectiveness** of performance in relation to the achievement of the objectives of the audited entity, and the actual impact of activities compared with the intended impact.

The audit approach is an important link between audit objective(s), criteria and the work done to collect evidence. Performance auditing generally follows one of three approaches or a combination of these:⁷³

- *A result-oriented approach*, which assesses whether outcome or output objectives have been achieved as intended or if programmes and services are operating as intended.
- *A problem-oriented approach*, which examines, verifies and analyses the causes of particular problems or deviations from criteria.
- *A system-oriented approach*, which examines the proper functioning of management systems, e.g. financial management systems.

POSSIBLE AUDIT QUESTIONS AND AUDIT APPROACHES

It is good practice for the auditor to find specific audit questions in order to define and structure the audit. The auditor must also define the approach of the study - what kind of study is needed to answer the audit objective.⁷⁴ The figure below is an illustration of possible audit questions and audit approaches when auditing waste management.

71 ISSAI 4000 26.-27 (Draft)

72 ISSAI 4000 34 (Draft)

73 ISSAI 3100 58 (Draft)

74 ISSAI 3200 45 and 49 (Draft)

Possible Topic	Type of risk	Possible audit questions	Audit approach
Waste policy, strategy and political attention	Compliance Economy Efficiency	<p>Is there a waste policy that applies to every level of the waste management hierarchy?</p> <p>Are waste policies targeting prevention, reduction, recycling, recovery and disposal consistent with the general environmental policy?</p> <p>Does the government have an overview of waste-related risks, and are measures being taken in order to manage these?</p> <p>Are there strategies in place in order to attain established goals related to waste?</p>	System-oriented
Policy impact assessments	Efficiency Effectiveness	<p>Has the government conducted sufficient impact assessments or other prior investigations before implementing a new waste initiative?</p> <p>Are policies, regulations, etc. implemented efficiently and effectively?</p> <p>Are measures that are put in place efficient in order to raise awareness about the hazards of waste?</p>	System-oriented
Legal clarity and legislation	Economy Efficiency	<p>Are general environmental policies and waste policies reflected, specified and put in concrete terms in legislation and regulations?</p> <p>Are there any gaps or inconsistencies in the waste legislation?</p> <p>Are the environmental and health risks posed by waste sufficiently addressed in existent legislation?</p>	System-oriented
Implementation of international and regional agreements	Compliance Efficiency	<p>Are the practices relating to waste management in compliance with the national and/or international obligations and commitments to which the region or country has agreed?</p>	Result-oriented

Possible Topic	Type of risk	Possible audit questions	Audit approach
Coordination between relevant authorities	Economy Compliance	<p>Are the actions of government, departments, ministries, relevant agencies and enforcement authorities in compliance with the relevant rules and regulations, specifically financial requirements?</p> <p>Are the supervisory responsibilities of different authorities clear?</p> <p>Is there a distribution of responsibility, and if so, does this influence accountability?</p>	<p>System-oriented</p> <p>Result-oriented</p>
Monitoring and control systems	Compliance	<p>Are there adequate systems for monitoring the handling of waste?</p> <p>Are there systems in place to report incidents from the operating of waste to the executive level?</p> <p>Is relevant information gathered, e.g. through reporting systems or registers, and is that information of good quality?</p> <p>Are control levels adequate?</p> <p>To what extent is hazardous waste collected and declared in an expedient manner?</p> <p>To what extent do the authorities have control of the export of hazardous waste?</p> <p>Are there control and inspection procedures in place to ensure compliance with requirements?</p> <p>To what extent do the supervisory authorities comply with the requirements arising from waste management regulations?</p>	<p>Result-oriented</p>

Possible Topic	Type of risk	Possible audit questions	Audit approach
Enforcement authorities	Efficiency Effectiveness	<p>Do enforcement authorities have an overview and control of the waste value chain?</p> <p>Have necessary sanctions been established, and are they adequately used?</p> <p>Do sanctions deter non-serious and illegal actors?</p> <p>Do enforcement authorities prevent illegal national and international trade of waste?</p>	<p>System-oriented</p> <p>Result-oriented</p>
Technical and organizational capacity	Economy Efficiency	<p>Is there a formal capacity building process with waste-related subjects involving research and education institutions?</p> <p>Is the structure of waste management system appropriate for solving challenges that waste entails?</p> <p>Are all waste activities integrated in a sustainable waste management system?</p> <p>Does the system achieve the optimum output - in terms of quantity and quality - from the inputs and actions?</p> <p>Do the responsible agencies have the necessary instruments for fulfilling their obligations related to the priorities in the waste management hierarchy?</p> <p>Are there measures for raising awareness about waste-related issues?</p>	<p>System-oriented</p> <p>Problem-oriented</p>
International statistical data	Efficiency Effectiveness	<p>Have authorities established measurable waste codes that are comparable with codes used in other countries?</p>	<p>Result-oriented</p> <p>Problem-oriented</p>
International cooperation	Compliance Economy Effectiveness	<p>To what extent do the relevant authorities comply with the international requirements?</p> <p>Are all waste activities and liabilities accurately accounted for in international cooperation?</p>	<p>Result-oriented</p>

Methodology for Waste Audits

This chapter outlines basic and more innovative performance audit methodology. Methodology may be understood as a systematic approach to answering the audit question. The methods applied in an audit should therefore be closely related to the identified risks and the topic of the audit. There are a variety of methods available for auditors for collecting and analysing data.⁷⁵ Most of these methods may also be applied in compliance audits. This chapter does not provide an exhaustive list of methods, but it gives an overview of some of the methodological possibilities when conducting a waste audit.

METHODS FOR COLLECTING DATA

When choosing a methodological design, it is important to get an overview of sources that may provide audit evidence. Does the necessary information exist in order to answer the audit question, and where may the auditor access this information? While in some cases secondary data such as official documents, research, statistics and primary data may be sufficient in order to answer the audit question, first-hand sources may be necessary in other cases. Primary data may be collected through interviews, questionnaires or observations. The following sections outline the most common methods for collecting and analysing data, including examples from waste audits.

⁷⁵ ISSAI 3000A. Appendices to ISSAI 3000 (ISSAI 3000A). [Online] Available at http://www.issai.org/media/13480/appendix_to_issai_3000_e.pdf [Accessed on 15 December], p. 85.

File Examination

Review of documents is an efficient way of collecting data, and may provide important evidence. Relevant files may include decisions of officials, 'case records' of programme beneficiaries, and records of government programmes. Prior to collecting documents, it is important to assess the nature, location and availability of the documents.⁷⁶ The analysis of official files and documents may involve collecting citations and relevant descriptions, and/or systematically analysing the text in view of answering the audit question. However, it is important to bear in mind that document review restricts the analysis to the existing documentation. It will therefore often be necessary to collect data from other sources.⁷⁷

EXAMPLE OF FILE REVIEW

In the SAI of Norway's investigation into the management of hazardous waste (2012), the audit team collected specialist reports, annual reports, studies, governing documents and internal documents from the Norwegian Climate and Pollution Agency. The Agency's information measures and materials were reviewed in order to assess information measures directed at enterprises and the general public. In order to assess whether regulations are complied with, the audit team reviewed individual inspection reports from the Norwegian Climate and Pollution Agency and selected county governor offices. Reports from municipal audit offices were included in the factual basis in order to shed light over the management of hazardous waste at the municipal level. Furthermore, the case files of export cases, waste oil facilities, treatment facilities and reception facilities were reviewed, along with handling plans for Norwegian ports. The investigation shows that many ports lack waste handling plans, and that existing handling plans do not comply with regulatory requirements. Finally, the review of applications of export permits showed that all case files contain notification of export of hazardous waste, but few of the files contain documentation of re-export.

Reference : Office of the Auditor General of Norway (2012). Investigation into the management of hazardous waste, Document 3:7 (2011–2012). [Online] Available at: https://www.riksrevisjonen.no/en/Reports/Documents/Documentbase_3_7_2011_2012.pdf

Interviews

Interviews are normally used to gather specific and detailed information in order to answer the audit topic. This method is commonly used as a supplement to questionnaires, and may be used in order to obtain documents, gather opinions and ideas related to the audit topic, confirm facts, affirm data and explore potential recommendations. Interviews may enter into the planning phase, or the investigation itself. It is important to bear in mind that the interviewees should, as far as possible, represent people with different positions, perspectives and insights.⁷⁸

MEDICAL WASTE MANAGEMENT IN HEALTH INSTITUTIONS IN ZAMBIA

The objective of the audit was to assess to what extent, the management of medical waste was in compliance with laws, rules and regulations, and to identify causes and consequences of the ineffective waste management. Ministry of Health officials, heads of hospitals, clinics, wards and incinerator plant operators were interviewed in order to gather evidence. The interviews were used together with surveys in order to obtain quantitative information from the hospitals and clinics, and observation and photographs of waste were executed for verification with visible evidence.

Reference: Office of the Auditor General of Zambia (2008). Report of the Auditor general on Medical Waste Management in Zambia.

76 ISSAI 3000A.Appendices to ISSAI 3000 (ISSAI 3000A). [Online] Available at http://www.issai.org/media/13480/appendix_to_issai_3000_e.pdf [Accessed on 15 December],p. 96

77 ISSAI 3000A.Appendices to ISSAI 3000 (ISSAI 3000A). [Online] Available at http://www.issai.org/media/13480/appendix_to_issai_3000_e.pdf [Accessed on 15 December],p. 100

78 ISSAI 3000A.Appendices to ISSAI 3000 (ISSAI 3000A). [Online] Available at http://www.issai.org/media/13480/appendix_to_issai_3000_e.pdf [Accessed on 15 December],p. 97-98

Observation

Observation is not amongst the most common methods applied in performance audits. However, it is frequently used in waste audits in order to document the actual handling and control of waste. Observation may therefore provide physical evidence in terms of photos and recordings. Furthermore, observation may be used in order to gain insight into waste management, and understanding the functioning of various waste processes.⁷⁹

USING PHOTOGRAPHY TO DOCUMENT WASTE MANAGEMENT

In a performance audit on the management of healthcare waste, the NAO of Tanzania used physical observation in order to gather evidence of the handling of healthcare waste in health facilities. The findings of the report from 2014 show that more than 50 per cent of visited health facilities did not have waste collection points for storing waste prior to disposal. Rather, the report documents that waste is stored in burning chambers, outside the building and in open areas. The audit team also found that ashes and residue from incinerators were disposed of in open spaces without being covered, which was also documented with photographic evidence.



Reference and photos: National Audit Office of Tanzania (2014). Performance Audit on the management of healthcare waste. [Online]. Available at: <http://www.nao.go.tz/?p=951> [Accessed on 15 December 2015]

79 ISSAI 3000A.Appendices to ISSAI 3000 (ISSAI 3000A). [Online] Available at http://www.issai.org/media/13480/appendix_to_issai_3000_e.pdf [Accessed on 15 December], p. 99

Use of Statistics

Statistics may be retrieved from the databases of the public agencies, or from central institutions producing official statistics. Although databases and statistics from secondary sources may provide valuable information, it is important to assess the reliability and relevance of the content. Is the information objective, and does it cover the audit question?⁸⁰ Statistics retrieved from databases and secondary sources may provide the basis of simple analyses such as frequencies, mean and other types of distribution. Statistics may also provide the basis of impact studies or cost-benefit studies (see text box below). These should both consider tangible and intangible costs (ghost costs). Estimating intangible costs will be relevant in many waste audits, as health costs, biodiversity costs and climate change costs are commonly associated with waste.

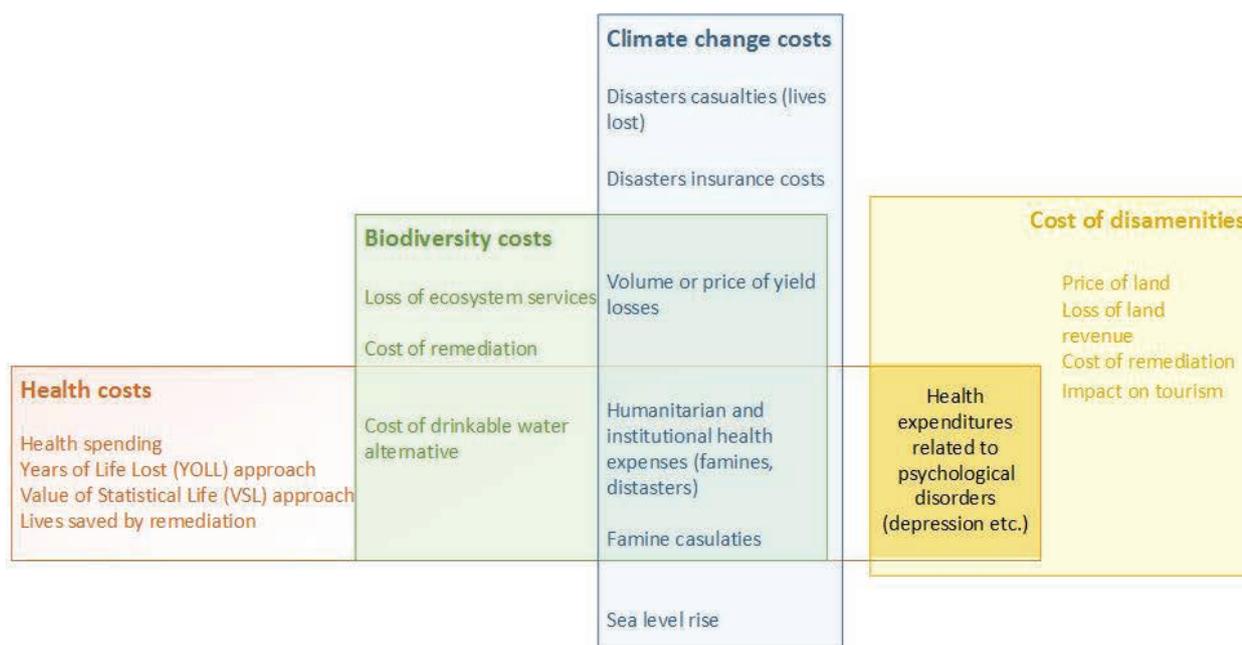


Figure: Possible ways of measuring waste costs. Based on cartography from Zoë Environment Network and GRID-Arendal (2012)

ESTIMATING THE EFFICIENCY OF WASTE PROGRAMMES

In the performance audit report *Reducing the Impact of Business Waste through the Business Resource Efficiency and Waste Programme* (2010), the UK National Audit Office (NAO) examined the impact of the Business Resource Efficiency and Waste Programme. The programme addressed business waste and ran from March 2005 to April 2008 at a cost of £240 million. In addition to conducting a survey, NAO reviewed existing quantitative data on the tonnages of waste produced and the amount of waste sent to landfill. NAO also estimated the possible monetary value of the programme with indicators such as the value of savings to businesses, waste diverted from landfills, raw material savings, hazardous waste savings and greenhouse gas savings. The quantitative data showed that the tonnage of business waste sent to landfill is reduced, but that the rate of decline of commercial and industrial waste lags behind the rate of decline for other types of waste. The report also showed that due to the lack of sufficient data, it is not possible to conclude whether the £240 million of expenditure delivered value for money.

Reference: UK National Audit Office (2010). *Reducing the impact of business waste through the business Resource Efficiency and Waste Programme*. [Online] Available at: <https://www.nao.org.uk/report/defra-reducing-the-impact-of-business-waste-through-the-business-resource-efficiency-and-waste-programme> [Accessed on 15 December 2015]

80 ISSAI 3000A.Appendices to ISSAI 3000 (ISSAI 3000A). [Online] Available at http://www.issai.org/media/13480/appendix_to_issai_3000_e.pdf [Accessed on 15 December], p. 90

QUANTIFYING LOSSES OF WASTE REVENUES

In the audit report *Effectiveness of collection and recovery of packaging waste*, the NAO of Estonia audited whether the state's activities encourage the recovery of as much packaging as possible and meet the target recovery indicators established in the European Union Directive on Packaging and Packaging Waste. The method applied was an estimation of the packaging excise duty that had not been collected from companies. The estimations were based on the waste amounts that were not recycled, which were in turn multiplied with the packaging excise duty. The report showed the amount of money which the state had not received from companies.

Reference: National Audit Office of Estonia (2010). *Effectiveness of Collection and Recovery of Packaging Waste*. [Online] Available at: http://www.environmental-auditing.org/Portals/0/AuditFiles/Estonia_f_eng_Collection-and-Recovery-of-Packaging-Waste.pdf [Accessed on 15 December 2015]

Surveys and Questionnaires

Questionnaires or surveys may provide the means of systematically collecting necessary information. Surveys are useful when quantifying information, and are normally used in cases when the required information is not available from other sources. When preparing a questionnaire, the auditor must decide whether to collect data from a defined population, or a sample of the population.⁸¹

SURVEY ON MUNICIPALITIES' INSPECTIONS OF NATIONAL WASTE TRANSPORTS

In the report *Transport of hazardous waste –effectively supervised?* conducted by the Swedish NAO, a web-based survey was sent to the municipal supervisory authorities in order to gather information on the municipalities' inspections of national waste transports. The survey included questions on the municipalities' supervision of the handling of hazardous waste at the waste facilities and on waste transports. In addition, the survey included questions on the distribution of responsibility and cooperation between municipalities and the County Administrative Boards of Sweden. The response rate of the survey was 60 per cent. The responses showed that few municipalities carry out controls of waste transports. Furthermore, the survey result showed that the County Administrative Boards follow-up of the municipalities' supervision of the waste transport is limited. None of the County Administrative Boards stated that they follow up the controls of national waste transports that have been carried out by the municipalities.

Reference: Swedish National Audit Office (2015). *Transport of hazardous waste - effectively supervised?* Report RIR 2015:10. [Online] Available at: <http://www.riksrevisionen.se/sv/rapporter/Rapporter/EFF/2015/Transporter-av-farligt-avfall--fungerar-tillsynen> [Accessed on 15 December 2015]

Public Opinion

Public opinion may be obtained by the use of several methods. Commonly used methods to measure public opinion are face-to-face interviews, telephone interviews or e-mail/ internet surveys. A panel survey involves measuring the same variables with the same individuals at several points in time, and subsequently measuring changes in public opinion over time. Focus groups may be used in order to prepare the content of the questions, or may provide a unique source of data in order to go into the depth of the question.⁸²

81 ISSAI 3000A. Appendices to ISSAI 3000 (ISSAI 3000A). [Online] Available at http://www.issai.org/media/13480/appendix_to_issai_3000_e.pdf [Accessed on 15 December], p. 93-94

82 Donsbach, Wolfgang, and Traugott, Michael W. (2008) *The SAGE Handbook of Public Opinion Research*, SAGE Publications

CITIZEN PARTICIPATORY AUDIT REPORT, PHILIPPINES (2013)

In the audit report *Implementation of the Solid Waste Management Program of Quezon City*, the SAI of the Philippines conducted a *Citizen participatory Audit Report*. The aim was to identify what the public knows about Quezon city's and contractors' waste activities, and find the level of public satisfaction with overall cleanliness.

Public opinion was obtained through a survey questionnaire, with assistance from civil society partners. A total of 384 households participated in the survey. The households were selected by stratified sampling. The respondents answered questions regarding information campaigns on solid waste management, the promotion of solid waste management segregation, the collection and handling of solid waste and the cleaning of thoroughfares and litter-prone areas

The majority of the respondents were aware of the ongoing campaigns about proper solid waste management within their communities. Likewise, the majority indicated that they practice segregation of biodegradable and non-biodegradable waste, and were aware of the collection of waste. The majority of respondents were satisfied with the way garbage is collected.

Reference: Commission on Audit, Philippines (2013). *Implementation of the solid waste management program of Quezon City*.

Innovative Methods for Data Collection

A variety of methods from different sources may be applied when conducting a waste audit. Due to the global flow of waste and flexible criminal waste actors, waste is becoming an increasingly complex issue. This may in turn require new methods by auditors conducting waste audits. Web-monitoring and tracking systems such as GIS⁸³ may be helpful in order to identify waste smuggling methods and the destination of various wastes. As hazardous waste commonly consists of complex chemical compounds, laboratory analysis may be used as a method in order to identify various types of hazardous and chemical wastes. The use of experts may be a way of gathering information about waste streams and waste crime.

WEB MONITORING THE EXPORT OF ELECTRONIC WASTE

In order to prevent the export of old electronics from the U.S. to developing countries, the Environmental Protection Agency (EPA) began regulating the export of cathode-ray tubes (CRTs), which requires companies to notify EPA before exporting these. In this context, GAO examined in 2008 the fate of exported used electronics and the effectiveness of regulatory controls over the export of these devices. The methods applied involved monitoring e-commerce websites, and posing as foreign buyers of broken CRTs.

By monitoring web pages the GAO obtained data on the volume requested, location of request, price, and quality of equipment sought. GAO deemed the data obtained on e-commerce websites to be adequate to conclude that a significant demand exists for exported used electronics.

In order to determine the effectiveness of regulatory controls, the team also posed as buyers of CRTs from Hong Kong, India, Pakistan, Singapore, and Vietnam, among other countries. The team found 43 electronics recyclers in the United States who were willing to export broken, untested, or nonworking CRTs under conditions which would appear to violate the CRT rule. EPA records show that none of the recyclers willing to sell to the fictitious buyers had filed proper notifications of their intent to export CRTs for recycling, as required by the CRT rule for such shipments.

Reference: US Government Accountability Office (2008). *Electronic Waste: EPA Needs to Better Control Harmful U.S. Exports through Stronger Enforcement and More Comprehensive Regulation*. [Online] Available at: <http://www.gao.gov/products/GAO-08-1044> [Accessed on 15 December 2015]

83 Geographical Information Systems

COOPERATIVE AUDITS

Cooperative audits are audits in which two or more audit institutions are involved, and are suitable for issues affecting several countries. As large quantities of waste are transported across the globe, creating environmental and health problems across whole regions, waste is a highly relevant topic for a cooperative audit. Cooperative audits include parallel audits, joint audits and coordinated audits. While a parallel audit is an audit conducted simultaneously by SAIs with individual teams in each country, a joint audit is a single report conducted by one audit team from different SAIs. A coordinated audit may be a joint audit with separate national reports, or a parallel audit with a mutual audit report in addition to national report.⁸⁴ Cooperative audits may also provide the basis of cross-country comparisons, or between similar areas in different countries. Comparisons between countries may be used in order to establish benchmarks and best practices or different outcomes across units.

COORDINATED AUDIT ON THE ENFORCEMENT OF THE EUROPEAN WASTE SHIPMENT REGULATION

The coordinated audit on the enforcement of the European Shipment Regulation is a joint audit report based on eight national audit reports conducted by the SAIs of Bulgaria, Greece, Hungary, Ireland, the Netherlands, Norway, Poland and Slovenia. The SAI of the Netherlands coordinated the compilation of the findings, and the report was conducted in collaboration with the EUROSAI Working Group in Environmental Auditing. A design matrix was used in order to achieve uniformity among the eight audits, which listed the audit questions and the information that was needed in order to answer them. The report highlights differences, good practices, weaknesses and challenges in the eight countries. As the report is limited to the scope of the national audits, the report does not provide a basis for generalization. However, findings may nevertheless be relevant for other countries.

Reference: Supreme Audit Institutions of Bulgaria, Greece, Hungary, Slovenia, Poland, Ireland, Norway and the Netherlands (2013). Coordinated audit on the enforcement of the European Waste Shipment Regulation. [Online] Available at: <http://www.courtofaudit.nl/dsresource?objectid=15556&type=org> [Accessed on 15 December 2015]

84 ISSAI 5140, draft version, September 2015



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