Guidance Towards Auditing Waste Management

*****DRAFT*****

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0. Introduction

Waste is a continually growing problem, globally, regionally and locally. The handling of waste, which commonly involves incineration or landfills, usually leads to discharges into the soil, air and water, and is a source of global and local pollution. The problem is amplified by trends in consumption and production patterns and by the continuing global urbanisation. 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 has in the recent years been given increased attention by international and national policy making bodies and citizens. From primarily focusing on the output of waste, the concept of life cycle thinking is increasingly widespread. This involves a shift of focus from end-of-pipe solutions to assessing the impacts of a product from cradle to grave. It is now broadly recognized that the most efficient solution to waste-related problems is the prevention of waste. Waste prevention is therefore considered as the favourable waste policy. The next step forward for SAIs should therefore be to take account of the waste generated throughout the entire life-cycle of a product, and assess the implementation of the three R's: Reduce, Recycle and Recover. Waste reducing policies benefit for both high-income and low-income countries, and should therefore be relevant for most SAIs (UNCSD).

0.1. 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 systems is a way to help reduce the problems caused by waste in a country by revealing the shortcomings of the management system and the responsible actors and identifying areas that need improvement. By exposing the insufficiencies, the SAIs may help improve the quality of waste management, and thereby also the national and international environment.

Individual citizens, especially in urban areas, do not handle their own waste all the way to final disposal. In most cases, specialised companies owned by, or acting on behalf of the authorities, do the handling. 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.

However, waste-related risks 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 cooperation in monitoring, control and enforcement creates loopholes for criminal actors. Cooperation between SAIs is therefore important in order to capture risks generated at the international level. This may be done through coordinated or cooperative audits, exchange of information and expertise, or the use of creative and innovative methods. As the illegal transboundary movement of waste continuously adapts to new regulatory environments, SAIs are encouraged to be equally inventive in finding new ways of cooperating.

Based on the paper here presented, The Working Group recommends that the Supreme Audit Institutions of the world consider auditing waste management and the systems used to regulate and monitor this issue. A joint effort will ensure a focus on this world scale problem and will help to improve the environment.

0.2. Content and structure of this paper

This paper is an updated version of the INTOSAI guidance *Towards Auditing Waste Management* from 2004. Distinct from the previous guidance, the paper guides the reader through four recommended steps in auditing waste management. The new guidance includes updated figures, as well as new risk considerations, policy responses and audit approaches. It also includes a new final chapter on audit methodologies[1]

The background chapter provides an overview of the waste field, and various approaches to waste. It also gives an introduction to the economy of waste and the transboundary movement of waste.

Chapter 2 to 6 introduces the five following steps:

[1] Note that the chapter on methodologies is for time being not complete. We appreciate comments and input on this section.

- **Step 1** involves mapping out the risks related to waste. The chapter gives and overview of environmental and health risks related to waste, and risks related to the management of waste. Subsequently, risks related to waste crime are presented. Finally, this chapter presents two approaches to assessing these risks prior to a prospective audit.

- **Step 2** maps out relevant actors and their responsibilities. This part presents national systems of managing waste, including country specific examples. Furthermore, this step includes relevant international audit legislation with which the relevant actors are obliged to comply. These also constitute possible audit criteria.

- **Step 3** consists of identifying governance problems related to the management of waste. In this part, national and international governance problems are treated separately.

- **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.

- **Step 5** involves choosing the appropriate methodology when conducting a waste audit. Choices of method should vary according to which part of value chain the audit covers.

1. Background Orientation on Waste

1.1. What is waste?

Most of us would probably define waste as a product or substance that is either damaged beyond repair or is no longer usable. In other words, waste is something that is no longer of any use to you, so you might just as well part with it. This definition is fine as long as you are only dealing with goods that are intended for consumption, but in the processing and manufacturing industry this definition soon becomes unusable. Here, large quantities of a wide range of substances flow into, out of and between plants, making it difficult to distinguish between raw material, by-product and waste.

To sort this out, a legal definition is needed. Most countries have adopted some form of definition of waste, which varies throughout the world. In general they are all based on the term "discard". In other words, waste is something which the holder intends to get rid of or has got rid of. The legal definition often includes fully usable substances, but defines them as waste if they are to be used in contexts other than their originally intended one. Thus, 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".

Other agreements such as the **Bamako Convention** (African region) and the **Waigani Convention** (South Pacific Region), share this definition

The EU (Directive 2008/98/EC) also uses a similar definition of waste: "'waste' means any substance or object which the holder discards or intends or is required to discard".

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."

1.2. The life cycle of a product

Many of us associate waste with the final disposal of a product. However, waste occurs at every stage in 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.

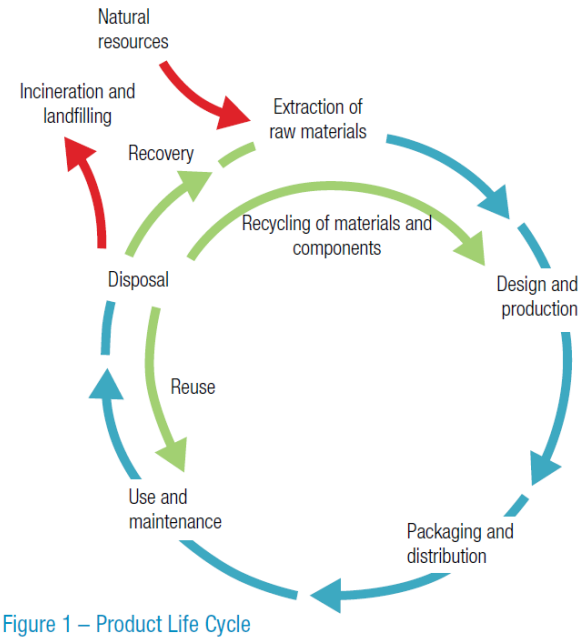


Figure 1 – Product Life Cycle

Source: UNEP/SETAC. Life Cycle Management: A Business Guide to Sustainability. Paris, 2007.

Cartography by UNEP/SETAC

Waste generally occurs from three stages of a product's life cycle: 1) the extraction and transformation of raw materials, 2) manufacturing and production of goods, 3) distribution and disposal of a product[2]. Life cycle thinking implies that we take account of a product's ecological footprint throughout its entire life. This approach allows us to estimate the entire environmental and social impact of the lifespan of a product, and not only the waste ending up in landfills and incinerators.

[2] UNEP/GRID-Arendal, *Vital Waste Graphics 1*, 2004.Available at: http://www.grida.no/publications/vg/waste/

WASTE IN ALL STAGES OF A PRODUCT

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. Secondly, the extraction of the mineral from the raw materials 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.

While it is estimated that the **design** of a product determines 70 - 90 per cent of the environmental impact of a product, the **production phase** involves the generation of waste in form of excess materials.

Packaging represents an increasing share of household waste, which turns into waste the moment it reaches its destination. As well as generating waste, the production of common packaging materials such as plastic, requires large amounts of chemicals. On the other hand, the **distribution** of products involves air emissions.

Use and maintenance of a product, for example a car, generates large amounts of hazardous waste. The use and maintenance of a car requires for instance fuel, oils, lubricants, wax, paint, rubber, washing powder, not to mention acids and chemicals used in batteries, air condition systems, and brake systems.

Life cycle thinking and Life cycle management is increasingly widespread amongst local and national authorities[3]. By taking the entire life cycle into account, policy makers may avoid shifting the environmental impact to another phase of a product's life cycle. Life cycle information also allows consumers to make informed decisions when purchasing a product.

[3] UNEP/SETAC, *Greening the Economy Through Life Cycle Thinking*, available at: http://www.unep.fr/shared/publications/pdf/DTIx1536xPA-GreeningEconomythroughLifeCycleThinking.pdf

1.3. Waste management

Globally, waste management may be characterised as a two-speed situation. In general OECD-countries have sound waste management systems, while non-OECD countries struggle with landfills, and lack systems for separating waste. With the rise of industrialisation, waste policies in most countries have mainly consisted of incineration or disposal in landfills. Over the last 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 Hierarchy, shown in the figure below.

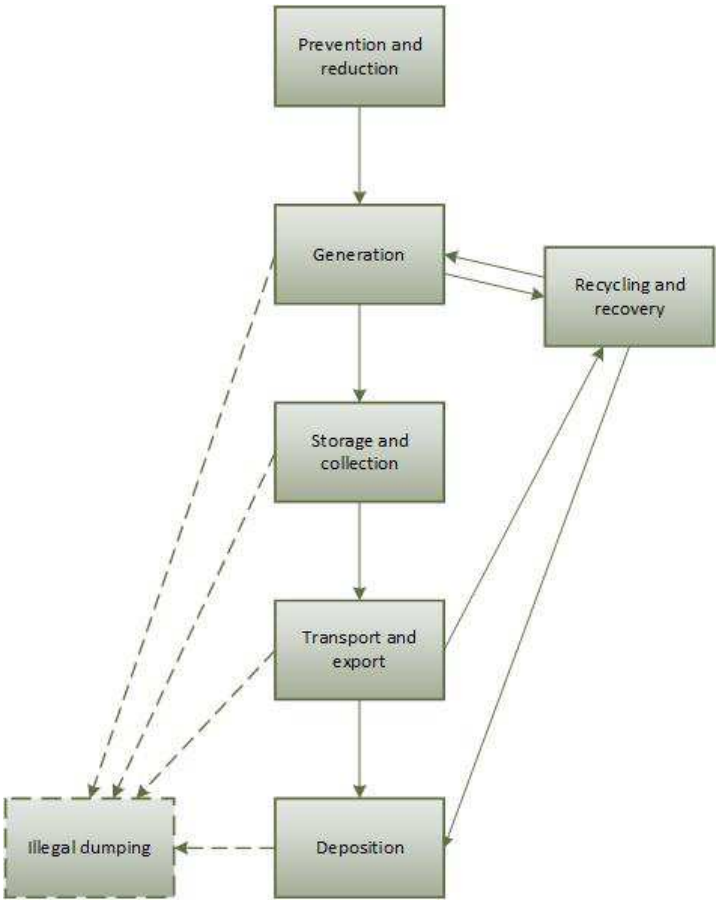
Cartography by UNEP/GRID-Arendal, www.grida.no

While the Waste Hierarchy has been adopted in most countries, the economic feasibility will often decide what actually happens to the waste. In many countries, the price of landfilling (or leaving the waste at open dumps) is low compared with sound waste management. 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.

1.3.1. An introduction to the waste stream

The waste stream, illustrated in the figure below, is a good starting point when searching for defects in the waste management system in order to establish an audit. The arrows indicate the direction between the stages in which waste is handled, while the dotted lines indicate illegal or

unwanted occurrences. The figure shows the physical stages through which waste passes, and is useful in order to gain an overview of the waste management process.



Prevention and reduction

The first stage in the waste stream is prevention. The ambition of preventing waste generation is more linked to waste policy than to actual waste handling, but has a place in the waste stream nonetheless. Prevention may involve reducing the quantity of waste, limiting the adverse impacts generated by waste, and reducing the content of harmful substances in materials[4]. Preventing the amount of waste is deemed as the most efficient solution to the problems caused by waste, and is accordingly placed on the top of the waste hierarchy. Reducing the packaging in a few

[4] This definition is applied in the EU Directive 2008/98/EC: http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32008L0098&from=EN

companies may for example be much more efficient than recycling measures in thousands of households.[5]

The prevention and reduction of waste involves to a large extent altering consumption patterns. Changing consumer patterns may be difficult, due to the social status of possessing the newest electronic products. Other obstacles to prevention of waste, is the strategy of 'planned obsolescence' in the manufacturing industry and the waste market itself, as waste generates revenue for businesses[6].

Generation

The second stage is the generation or production of waste. As we saw in the previous section, waste is generated at every stage of a product's life cycle: the extraction of raw materials, manufacturing; production of goods; distribution; and the final disposal of a product.

Municipal waste constitutes a large portion of the waste generated in a country, and ranges from household rubbish to waste from industries, agriculture and hospitals. They generate different types of waste with regard to composition and substances, which in turn requires complex waste systems at the municipal level.

Storage and Collection

Storage and collection of waste is a stage that mainly applies to municipal waste, i.e. waste from households and small commercial businesses. This is because large generators often transport their waste directly to the production plant. A sound management of municipal waste requires a large part of a municipality's budget[7].

Most countries require that hazardous waste is handled separately from other waste. This involves ensuring that hazardous waste does not come in contact with other wastes during

[5] Zoï Environment Network and GRID-Arendal, *Vital Waste Graphics 3*, 2012. Available at: http://www.grida.no/publications/vg/waste3/

[6] Zoï Environment Network and GRID-Arendal, *Vital Waste Graphics 3*, 2012. Available at: http://www.grida.no/publications/vg/waste3/

[7] UNEP, *Global Environmental Outlook 5. Chapter 6 Chemicals and Waste*, 2012. Available at: http://www.unep.org/geo/geo5.asp

storage. The co-mingling of different waste streams may occur due to lack of an efficient waste management system, or carried out deliberately by actors wishing to avoid sorting and treatment costs[8].

While municipal waste often is collected, many countries have introduced the concept of 'Producer Responsibility', implying that electrical and/or electronic devices with hazardous components (EE-waste) can be returned to the producer or to the shop where the product originally was sold.

Transport and export

This stage involves the transport and export of waste. The waste generators that are not users of waste collection systems, such as large businesses, industries and hospitals, need to transport their waste to a site for safe treatment. The collected waste also needs to be transported. Because of the special properties of hazardous waste, special precautions must be taken during collection and transport, involving the training of the driver and co-driver, the types of packaging to be used, and the labelling of the packaging and the transport vehicle.

Approximately 75 per cent (2004) of waste is the total amount of waste is traded among OECD-countries. Due to incomplete data, the amount of waste exported to other parts of the world is scarcely accounted for. While, export of waste is regulated by regional and international legislation such as the Basel Convention and the OECD Decision, a large informal export sector exists along the official waste trade. Exports to non-OECD countries are often labelled as "goods to be recycled"[9].

Recycling and recovery

This stage of the waste stream involves recovering the material and energy resources of waste. A used beverage bottle serves an example of a waste that can be materially recovered. The bottle may be simply reused for beverages, or melted down for other purposes. Energy recovery, on the

[8] UNEP/GRID-Arendal, *Waste Crime - Waste Risks: Gaps in meeting the global waste challenge*, 2015. Available at: http://www.grida.no/publications/rr/waste-crime/

[9] UNEP/GRID-Arendal, *Vital Waste Graphics 2*, 2006. Available at: http://www.grida.no/publications/vg/waste2/

other hand, involves utilising the energy resources of waste. The energy produced by incineration and gasification may for instance be used to produce hot water, steam or electricity. Some processes, such as composting and bio-methanization, involve the recovery of both raw materials and energy. These processes may provide both cheap fertilizing products for agriculture, produce heat and electricity, and prevent emissions. Recovery of waste may be carried out by the generator of the waste, or organised externally after the collection and transport stages.

There are several reasons for recovering as much of the waste as possible: it reduces the amount of waste sent for final disposal and thereby reduces the need for transport and disposal; it makes use of valuable resources in the waste and thereby reduces the use of virgin raw materials. Material recovery is often preferred to energy recovery, as the latter produces air emissions. However, material recovery may also pose problems. A 'waste of the waste' will always occur after a recycling process, and needs to be disposed of in a sound manner. An example is biodegradable waste which only partly breaks down, creating serious environmental outputs if not handled properly. Studies show that biodegradable waste may contain arsenic and antibiotics, among others. 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. Although recycling is an efficient way of reducing waste, reducing the amount of waste is deemed as the most effective solution.

Deposition

Treatment and disposal often take place at the same physical location, but may also be two (or more) operations that require transport between them. Nevertheless, this is the preferred end station for the waste, and secure handling here is of paramount importance.

Disposal at landfills is the most common solution for handling either all of the waste or the residual waste that cannot be treated as a part of other waste processing methods, such as composting, incineration, recycling etc. There is a wide range of landfills varying 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. The two main approaches are thermal destruction (conversion into harmless components at high temperatures) and chemical treatment (such as the stabilisation of mercury by converting it to a sulphide). Neutralisation is an option in the treatment of acids and alkalis. When mixed in the right proportions acids and alkalis neutralise each other, and the products of this process are often relatively harmless. If the disposal of waste is not conducted properly the result will be contaminated sites. These sites may still be in use or they may have been used for dumping of waste at some earlier time.

Illegal dumping

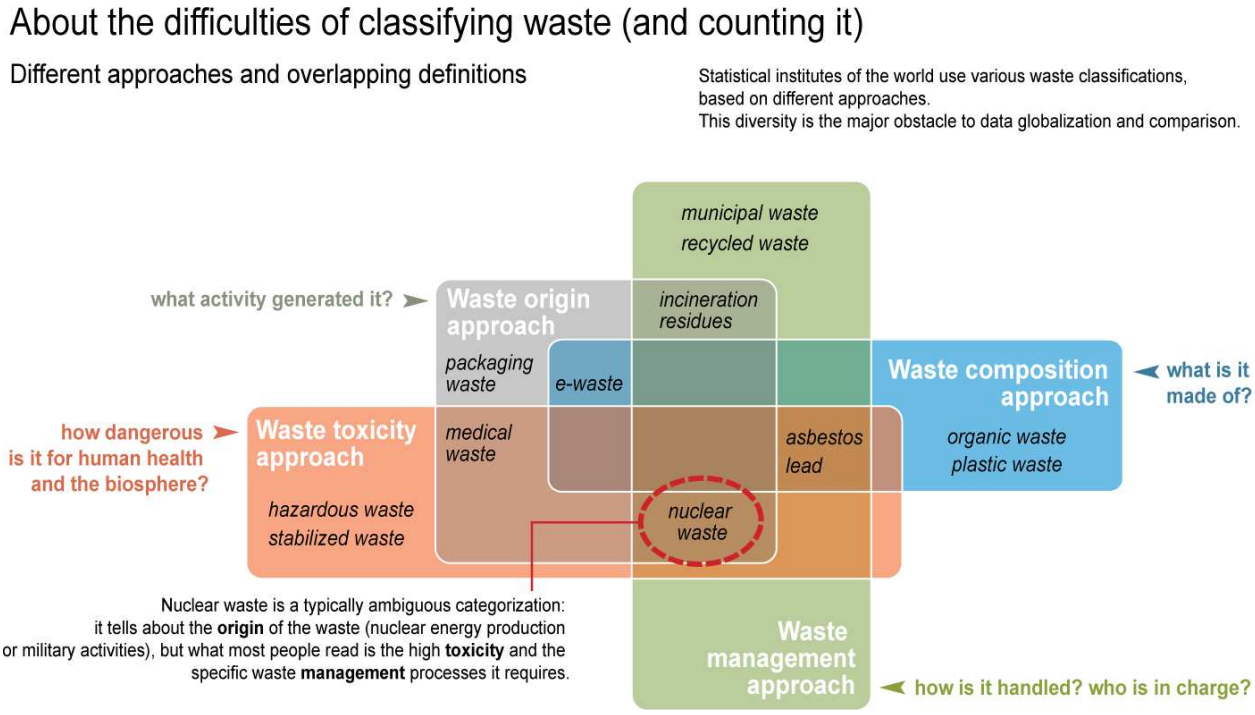
Sometimes the waste is illegally dumped. Pollution from illegal dumping and uncontrolled burning is common and even increasing in some parts of the world. Illegal dumping may involve the large-scale dumping of inert wastes, such as medical waste or chemicals, or litter in the form of small quantities of non-hazardous waste. Dumping may occur at waste disposal sites, on private or public land or in the sea. A large number of abandoned waste containers with unidentified content are stored in ports in Asia and the rest of the world[10].

At each of these stages, the government may intervene to ensure sound management.
A good waste policy should include all of the stages through which waste passes. The waste stream determines the premises for an audit of waste management, as we will return to in step 4.

[10] UNEP/GRID-Arendal, *Waste Crime - Waste Risks: Gaps in meeting the global waste challenge*, 2015. Available at: http://www.grida.no/publications/rr/waste-crime/

1.4. Defining waste

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



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

For a legislator, the distinction between hazardous and non-hazardous waste may be the most important parameter, since legislation relating to hazardous waste is usually stricter than for non-hazardous waste. Likewise, the distinction is useful for auditors because the different legislation is usually accompanied by different organisational structures and different uses of policy instruments.

In this guidance, we use the following three main categories of waste: solid, hazardous and radioactive. Although radioactive waste is hazardous, it is normally covered by separate legislation, and therefore treated separately in this paper.

1.4.1. Solid/ non-hazardous waste

Non-hazardous waste is often called "solid waste". Wastes in the form of powders, fluids and gasses are considered hazardous regardless of its toxic properties because it needs special handling to avoid unwanted dispersal. Thus, all waste that is not included under the classification of hazardous may be labelled solid. Common non-hazardous components are paper, plastics, glass, metals and beverage cans.

Although not considered hazardous, solid waste can cause considerable harm and damage, and may lead to diseases and air pollution. Solid or non-hazardous waste may contaminate drinking water through leachate or flooding, and subsequently poison the water sources for people and animals.

1.4.2. 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[11]. Most hazardous waste originates from industrial production. The figure below lists the most common hazardous wastes generated by manufacturing industry.

[11]) Note that these agreements do not include radioactive waste.

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

The Basel Convention includes a list of 45 waste streams ("Y-numbers") and hazardous constituents that should be controlled (from appendix and UNEP report p. 16). The Convention also covers waste with hazardous properties , such as toxic, poisonous, explosive, corrosive, flammable, ecotoxic and infectious properties (Vital Waste Graphics UNEP/ GRID)

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.

Common hazardous characteristics are:

- **Flammables**[12]**:** Flammable or ignitable wastes may create fires under certain circumstances. Waste oil and used solvents are examples of flammable wastes.
- **Corrosives**: Corrosive wastes are acids and bases which are capable or destroying metals and living tissue. Battery acid is an example of corrosive waste
- **Explosives:** Explosive wastes can cause explosions, toxic fumes, gases or vapors when mixed with water. Examples are lithium-sulfur batteries
- **Toxic:** Toxic wastes are harmful or lethal when inhaled, ingested or if they penetrate the skin. Certain chemical wastes and heavy metals are examples of this.
- **Ecotoxic:** Substances that may present adverse impact on the environment and/or upon biotic systems

The five symbols below are examples that are used to designate products with hazardous properties.

Flammable Corrosive Toxic Ecotoxic Radioactive

Some wastes may need special treatment due to their physical properties, even though they do not have hazardous properties. Three such properties are liquid, gaseous or powder. Such waste needs special handling to avoid unwanted dispersal of the waste. One example is an ordinary household fire extinguisher. It consists of a metal cylinder filled with a non-toxic gas and a powder, which may lead to breathing difficulties and frost injuries. Another example is asbestos. Asbestos is a group of naturally occurring minerals that have none of the hazardous properties mentioned above, and when exposed to sun and rain asbestos minerals will weather away quickly. The real danger with asbestos is that it is fibrous and that the tiny strands of the mineral can cause lung cancer if inhaled.

[12] It may be worth noting that the words "flammable" and "inflammable" have the same meaning in English – they can catch fire and incinerate.

Different hazardous wastes require different treatment and final handling, due to both the physical and chemical composition of the waste and the levels of dangerousness. The composition will have an impact on the collection process and the recycling of the product. Hazardous waste must be controlled from the generation of the waste to the final disposal. While hazardous wastes often can be recycled in a sound manner, wastes that cannot be recycled must be treated to reduce the toxicity, and stored safely in order to avoid leakages. However, efficient control of hazardous waste requires that there exists a plan for reducing the amount of radioactive waste. The amount of hazardous waste may be reduced by not co-mingling hazardous and non-hazardous waste and by using different material in production processes.

Special kinds of hazardous waste include clinical/medical waste, electronic and electrical equipment and radioactive waste, and are presented in the following sections.

Electronic and electrical equipment (EE waste) is a generic term for waste originating from 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 special health risk for sanitary. 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 valuable source of secondary raw materials.

Clinical or medical 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, body fluids and body parts (from amputations and surgery). This type of waste usually contains bacteria and other organisms that can spread harmful diseases if not taken care of properly. It can be said that clinical waste is 'alive' and therefore needs special treatment such as incineration or high-temperature treatment to kill or disable the bacteria. The World Health Organization has graded healthcare waste as the most hazardous waste after radioactive waste.

1.4.3. Radioactive waste

Radioactive waste is a material with a higher concentration of radionuclides than the thresholds determined as safe by national authorities, and which is no longer of use. Radioactivity is a hazardous property, because exposure to radiation can cause serious illness, or even death. Many radioactive substances are also highly toxic. The management of radioactive waste differs significantly from the management of solid and other hazardous waste. For this reason, radioactive substances are dealt with separately in this paper.

In general, radioactive materials are only available to scientists, nuclear power plants and other users who have a specific need for radiation in their work. However, stolen or illegitimately sold nuclear/radioactive waste can be a potent weapon in the wrong hands and necessitates high alertness with regard to security.

Typical sources of radioactive waste are:

- Nuclear warheads
- Waste from nuclear power plants
- Build-up of low-radioactive deposits in tubes (scale)
- Waste from hospitals (cancer treatment, etc.)
- Other scientific and technical uses

DECOMMISSIONING NUCLEAR POWER PLANTS

The decommissioning of nuclear power plants poses a great challenge in many countries. The majority of the facilities worldwide will over the next decades no longer be in use. Decommissioning a power plant and decontaminating the sites produces different types of waste requiring special handling. Only 10 per cent of the plants that are no longer in use have been fully decommissioned, due to the time required and financing. Toxicity may remain in the environment for years. The financing of the decommissioning process poses another risk. The same actors in the nuclear industry provide cost estimates, funds and expertise. This poses an important conflict of interest. Trustworthy numbers may therefore be difficult to obtain.

Source: Zoï Environment Network and GRID-Arendal, Vital Waste Graphics 3, 2012. Available at: http://www.grida.no/publications/vg/waste3/

Radioactive waste may be distinguished according to the level of radioactivity. *High-level* radioactive waste includes spent fuel from the generation of nuclear power, the residual waste from reprocessing the fuel, and military waste. *Low and intermediate level waste* include materials that have been in touch with radiation at sites such as nuclear power plants, hospitals, dentists, research laboratories and waste from uranium mining processes. Radioactive waste has a great damage potential. If released it can contaminate a large number of people, and the injury can be very serious. All parts of the natural environment will be damaged, and the damage may persist for years. Due to the large variety of radioactive waste, some only require storage for a short period, while others remain radioactive for centuries and millenniums.

Statistical challenges related to the classification of waste

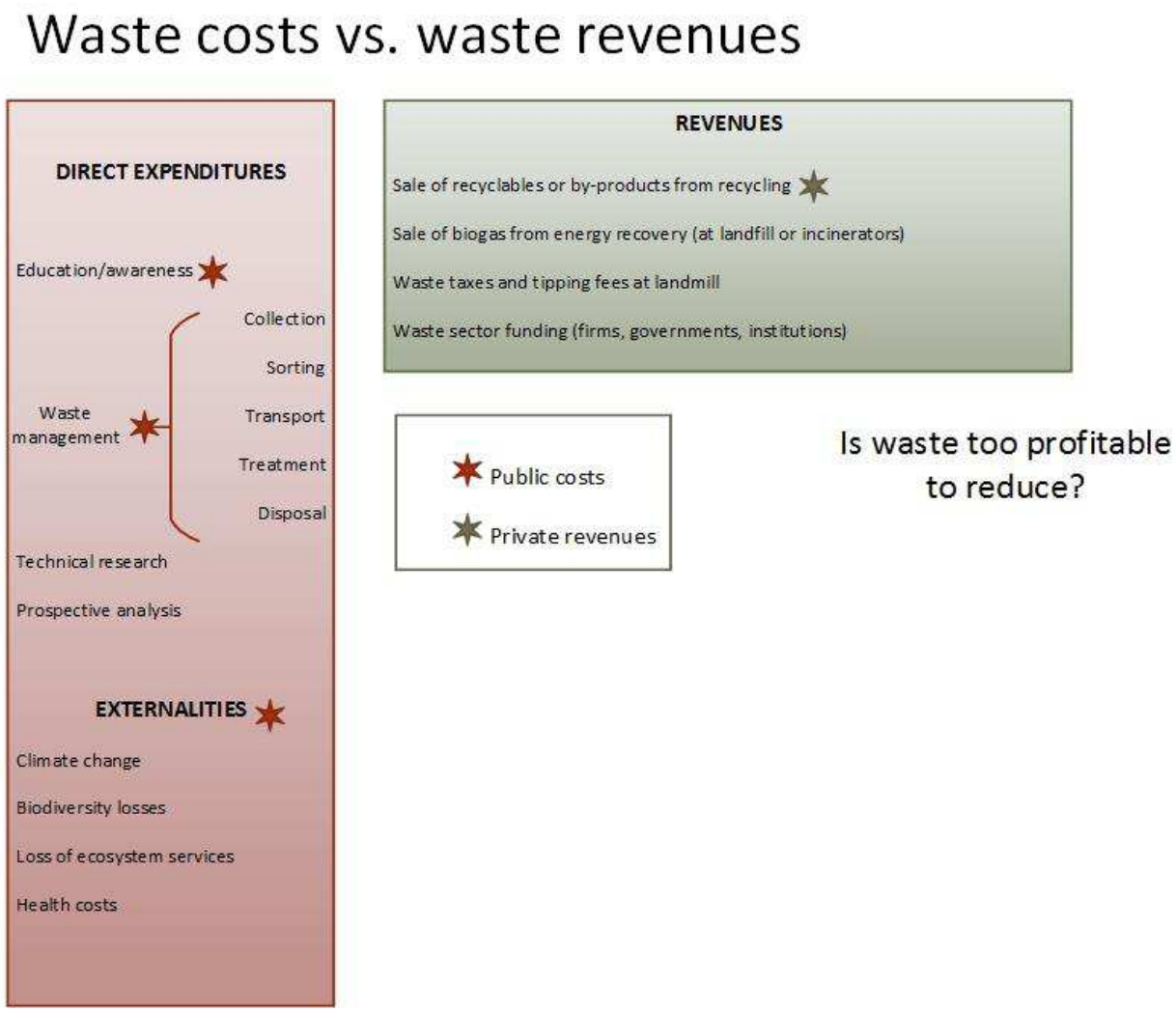
There is a significant shortage of data on waste generation, treatment and recycling. While the Secretariat of the Basel Convention provides information on hazardous wastes that are exported, the Convention does not oblige member states to control that the data is complete[13]. In addition, classifications of waste often vary from country to country. This complicates the gathering of statistical data, and makes it hard to compare waste across countries. Reported waste statistics must therefore be interpreted with caution.

1.5. 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[14]. From an economic point of view, the generation of waste creates both revenues and costs. While waste generators 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.

[13] UNEP, Global Environmental Outlook 5. Chapter 6 Chemicals and Waste, 2012. Available at: http://www.unep.org/geo/geo5.asp

[14] UNEP/GRID-Arendal, *Waste Crime - Waste Risks: Gaps in meeting the global waste challenge*, 2015. Available at: http://www.grida.no/publications/rr/waste-crime/



Cartography based on figure in Zoï Environment Network and GRID-Arendal, *Vital Waste Graphics 3*, 2012.

1.5.1. Waste revenues

State regulations of waste and high commodity prices have created large formal and informal markets of activities benefitting from waste. 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 prices of energy and raw materials increase the revenues from these activities. Scrap metals may for example constitute the main supply source of metal in a country. In addition, taxes and subsidies may increase revenues in the waste sector, or on the other hand reduce the costs of handling waste. State regulations may also oblige waste generators to turn to waste actors in order to comply with these. Biogas production and composting of biodegradable waste are examples of emerging sectors that are reliant on state regulations and subsidies in order to survive. On the other hand, the lack of regulations and

standards allows waste market operators to avoid costs related to the safe disposal of waste. These activities are criminal when carried out in regulated areas. We will return to waste crime issues in the next chapter.

1.5.2. Waste costs

While it is normally private actors that generate revenues from waste, the costs are usually beard by governments. The actual management of waste, including collection, sorting, transport, treatment and disposal constitute public costs. Other direct expenditures related to waste are education measures in order to improve the awareness of waste, technical research and prospective analysis. As the waste sector becomes increasingly complex and global, it has become difficult for many governments to keep up with these costs. Waste also generates external costs in terms of loss of biodiversity, climate change and health costs, which we will return to in the next chapter.

1.6. Transboundary shipment of waste

As the amount of waste travelling around the globe is constantly increasing, waste has to a large extent become a global issue. Health and environmental problems are exported from one country and subsequently imported into another. The containerization of goods has enabled the increase of waste trade, as the standardized size of containers allows waste travelling efficiently from one destination to another. The extensiveness of waste trade makes controlling and monitoring an extremely difficult task, and requires international coordination and cooperation. In order to capture the international dimension of waste related issues, this also requires increased cooperation among SAIs.

1.6.1. Official waste routes

Official data from the Basel Secretariat suggest that the majority of hazardous waste is traded within OECD-countries. In fact, the export of waste from the EU and OECD-countries to non-OECD countrires is banned, and does therefore not subject to notification. Accoring to official data, countries with specialised waste treatment, such as Germany, stands out as the major importers of waste. Surprisingly, the data also 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 may rather reflect these countries' role as "waste dispatchers"[15].

1.6.2. Unofficial waste routes

The scope of informal waste trade is obviously impossible to quantify. Recent research does, however, suggest that the volume is increasing in many countries. In general, waste routes track international shipping routes. A large number of ships with 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 in turn contributed to the increase in the export of non-hazardous recyclable waste from Europe to Asia[16]

Exports to the developping world are most often labled as goods to be recycled. China is the largest importer of recycled goods. While EU member states are not obliged to report non-hazardous shipments, it is estimated that half of all plastic 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[17]

As for hazardous waste, key destinations for large-scale shipments are Africa (Ghana, Nigeria, Côte d'Ivoire, Republic of Congo) and South / Southeast Asia (China, Hong Kong, Pakistan, India, Bangladesh, Vietnam). Caribbean and East and Central Europe are also important destinations of hazardous wastes. Joint controls have revealed that illegal hazardous waste streams often consist of misdeclared e-waste and batteries. It is also found that waste that is declared as non-hazardous is co-mingled with hazardous materials. Co-mingled waste is often exported as paper waste[18].

1.6.3. International cooperation

Unclear international definitions and obligations regarding waste contribute to illegal waste shipments, either intentionally or unintentionally. The problem is amplified by different waste

[15] UNEP/GRID-Arendal, *Vital Waste Graphics 2*, 2006. Available at: http://www.grida.no/publications/vg/waste2/
[16] UNEP/GRID-Arendal, *Waste Crime - Waste Risks: Gaps in meeting the global waste challenge*, 2015. Available at: http://www.grida.no/publications/rr/waste-crime/
[17] UNEP/GRID-Arendal, *Vital Waste Graphics 2*, 2006. Available at: http://www.grida.no/publications/vg/waste2/
[18] UNEP/GRID-Arendal, *Waste Crime - Waste Risks: Gaps in meeting the global waste challenge*, 2015. Available at: http://www.grida.no/publications/rr/waste-crime/

codes and different standards and regulations across countries. While some countries have individual black lists of unwanted profiles, waste traders may avoid control 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, and thereby not giving inspectors the opportunity to control the containers.

Controlling international legal and illegal waste streams require measures at the global and regional level. At the global level, Parties of the Basel Convention exchange information on legislation and best practices, and inform the Secretariat of cases of illegal practices. The Parties also develop guidelines on preventing illegal traffic. In 2011 the Conference of the Parties established the Environmental Network for Optimizing Regulatory Compliance on Illegal Traffic (ENFORCE), with the mandate of improving the Parties' prevention of illegal shipments of hazardous waste. At the regional level, the EU has established the European Union Network for the Implementation and Enforcement of Environmental Law (IMPEL), which has been carrying out shipment inspections since 2003

Several joint operations have been carried out during the last years, such as under the INECE Seaport Environmental Security Network (including the US and China), the China-initiated Demeter III (the World Customs Organization 2014) and INTERPOL operations[19].

2. Step 1 – Identify environmental and health risk scenarios for waste management

In environmental auditing, risks to health and the environment are prime concerns. The first step in the planning of 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.

[19] UNEP/GRID-Arendal, *Waste Crime - Waste Risks: Gaps in meeting the global waste challenge*, 2015. Available at: http://www.grida.no/publications/rr/waste-crime/

As the transboundary movement of waste is increasing, the lack of ability to monitor and regulate waste streams is a regional and international concern. Equally, problems arising from waste do often not remain within a country's borders, but are dispersed across countries. Therefore, deficiencies in waste management and issues shared by neighbouring countries should be considered. It should be possible for SAIs to cooperate in identifying the main problem areas within a region.

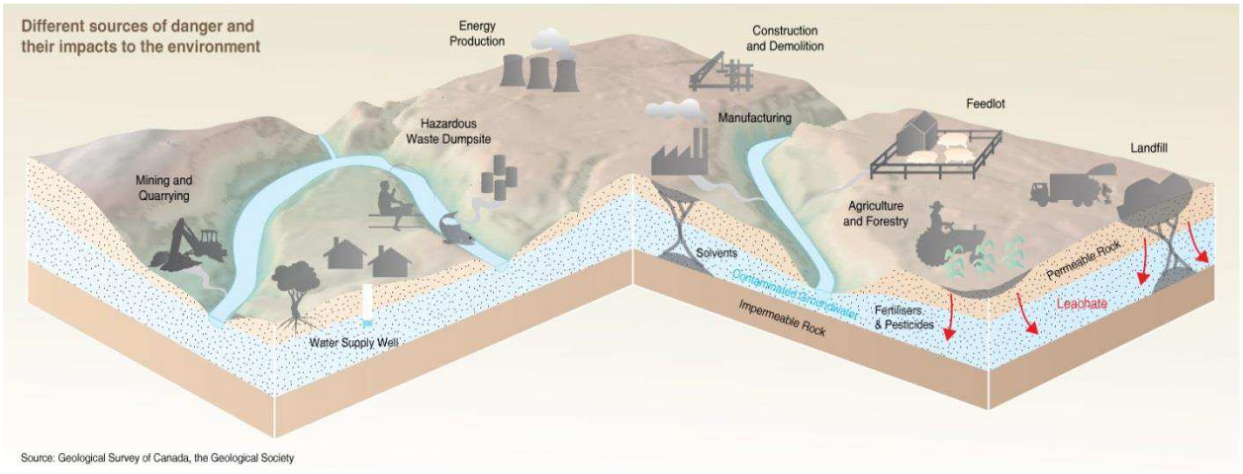
2.1. Negative externalities: The social costs of waste

Public health and environmental risks 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. In terms of waste, we have already seen that private actors often benefit from waste revenues, while the public carries out the costs of waste management and social costs. Examples of negative externalities are the loss of biodiversity, climate change and health costs. It is worth noting that while both high- and low-income countries both bear the social costs of waste, the consequences are often more severe in low-income countries as these lack the resources to reduce the adverse effects from waste.

In order to map out the negative externalities related to waste generation and management, it may be helpful to distinguish between the seriousness and the probability of damage from waste. While the seriousness of damage often is related to the inherent dangers of different types of waste, the probability of damage often follows from the management of waste. First of all, this requires that we map out the risks related to waste.

2.2. Environmental and health risks 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 impact these activities have on the environment.



Cartography by GRID-Arendal: www.grida.no

2.2.1. Soil contamination

Common generators of soil pollutions are industrial activities, municipal waste disposal and accidents. Hazardous substances may enter into soil from incineration ashes or through leachates, as water trickles through contaminated sites leaching out chemicals. In landfills cocktails of chemicals may leak into the soil. In agricultural areas and feedlot, fertilizers and bacteria enter into the soil.

Polluted soil can damage flora and fauna directly, or release toxic components into the food chain. Ingesting, inhaling or touching contaminated soil may have serious adverse impacts on humans and animals. Eating plants from contaminated soil may equally pose health risks, as plants are contaminated through roots. Toxic components such as POPs[20] pose especially great risks human health and the environment as they bioaccumulate through the food chain. Thus, 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. Contaminants may enter into blood and milk, with adverse effects on breast feeding[21].

The leachate of bacteria from feedlot is a growing health concern. Many of the deceases that have emerged over the last decades, such as SARS, Ebola, Mad Cow, High Path Avian Influenza

[20] See text box on Obsolete Pesticides and Persistent Organic Pollutants (POPs)
[21] UNEP/GRID-Arendal, *Vital Waste Graphics 1*, 2004.Available at: http://www.grida.no/publications/vg/waste/

and Lyme, stem from animals or animal products. Ensuring sound management of waste may reduce the spread of such diseases[22]

OBSOLETE PESTICIDES AND PERSISTENT ORGANIC POLLUTANTS (POPS):

The spread of obsolete pesticides is a growing global concern. A large part of the obsolete pesticide 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 be even more toxic than the original product. Due to the immense chemical complexity of pesticides, there is not one single solution on how to handle obsolete pesticides.

Around 30 per cent obsolete pesticides are classified as Persistent Organic Pollutants (POPs). POPs pesticides, known as 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 kilometers from their source. They also accumulate in living organisms and may enter into human tissue (blood and milk). Obsolete pesticides are regulated by the Stockholm, Rotterdam and Basel Conventions.

Sources: UNEP, Global Environmental Outlook 5. Chapter 6 Chemicals and Waste, 2012 &
Food and agriculture organisation of the UN http://www.fao.org/agriculture/crops/obsolete-pesticides/what-dealing/obs-pes/en/

2.2.2. Surface and groundwater

Rain or surface water seeping through waste will absorb hazardous components from landfills, agricultural areas, feedlot etc., and carry them into surface and groundwater. This may lead to changes in the chemistry of water, with large 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 may enter the surface through springs and seeps, and flow into rivers, streams and ponds, or sink deeper into the earth. Contaminated groundwater also poses a great

[22] Zoï Environment Network and GRID-Arendal, Vital Waste Graphics 3, 2012. Available at: http://www.grida.no/publications/vg/waste3/

health risk, as it is often used for drinking, bathing and recreation, as well as in agricultural and industrial activities[23]

2.2.3. Marine pollution

Marine pollution constitutes a large threat to marine life, fisheries, mangroves, coral reefs and costal 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. Where large ocean currents meet plastic waste forms entire islands of debris. Plastic may also transport POP's, such as PCBs, with long-term effects on the environment.

The remaining 20 per cent of marine pollution include oil spills, discharges of oily waste from ships, and untreated sewage. The emission of untreated sewage is one of the greatest dangers to marine life, and its ability to recover from extreme climatic events[24].

2.2.4. Air emissions

Air emissions are mainly produced by fumes from incineration and landfill gases. Incineration fumes may stem from open burning of hazardous wastes, which still is a widespread practice worldwide. Scavengers at landfills often set fire to the waste to make it easier for them to find metals. Uncontrolled fires in landfills due to self-ignition (often caused by illegal dumping of hazardous waste) are also a major source of emissions to air. Old or badly operated incineration plants can also be a source of hazardous emissions such as heavy metals (mercury, cadmium, etc.) and dioxins.

The greenhouse gas emissions related to waste largely stem from methane, which is released during the degradation of organic matter in landfills. It is estimated that emissions of methane from landfill sites in the OECD countries contribute to around 3 per cent of total greenhouse gas

[23] UNEP/GRID-Arendal, *Vital Waste Graphics 1*, 2004.Available at: http://www.grida.no/publications/vg/waste/
[24] UNEP, *Global Environmental Outlook 5. Chapter 6 Chemicals and Waste*, 2012. Available at: http://www.unep.org/geo/geo5.asp

emissions. While methane typically constitutes 55 per cent of the emissions from landfills, carbon dioxide represents around 35 per cent, while nitrogen and a number of other gases are released in smaller amounts. Landfill emissions constitute the second largest source of greenhouse gas emissions in the US[25]

Air pollution may 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. Also plants are affected by exposure to air contaminants.

2.2.5. Odour and littering

Some of the problems entailed by waste are related to nuisance. One example is the bad odours that originate from containers or waste left on streets, which is one of the reasons why waste must be collected frequently. Frequency depends on a number of factors, including climate and type of waste. A warm climate and waste with a high organic content require more frequent collection.

Waste treatment plants, especially landfill sites, can also be a source of odour problems. During decomposition of organic waste, methane, carbon dioxide and a large variety of other gases are released. Some of these are organosulphur compounds, which have a very low threshold for odour. A landfill can cause loss of amenity and nuisance several kilometres away from where it is located.

While littering often is an aesthetic problem, it may also constitute an environmental risk. While marine litter may carry POP's, littering on land may lead to the blocking drainage pipes and causing secondary environmental problems such as flooding.

2.3. Waste management risks

Waste that is not properly collected stored or treated poses a risk to public health. Improper handling of waste causes a large number of casualties each year. This holds especially true for hazardous waste. Lack of awareness of environmental and health problems may be one reason

[25] UNEP/GRID-Arendal, *Vital Waste Graphics 2*, 2006. Available at: http://www.grida.no/publications/vg/waste2/

why waste is not managed better in many countries. While low-income countries generally produce less waste, these also often lack the ability to collect and dispose waste in a sound manner. In these countries, 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. The majority of costs related to waste are therefore most often carried out by people in poverty. Vulnerable groups, such as children, are especially affected[26].

2.3.1. Waste collection and diseases

In most developing countries, waste collection is inadequate. This leads to waste being disposed of on streets, in backyards, in canals/rivers, etc. Since many types of waste contain edibles, it will be a source of food for rodents and dogs and also be a breeding ground for insects. Rats for instance, have a long history of spreading serious infections. Untreated excreta and toilet paper in the waste can spread infections such as parasites and worms. Flooding combined with a lack of proper storage bins may provide favourable conditions for bacteria in the streets in which the children play.

Healthcare waste is as an example of a waste stream with a high potential for spreading diseases. It contains a wide range of hazardous and toxic materials as well as infectious materials.

2.3.2. Working conditions

People working with collection, sorting or treatment of waste are naturally more likely to be exposed by infections and diseases than others. Collection of waste entails hard physical work, and workers are often exposed to cuts and bruises from sharp objects, as well as back and joint injuries from heavy lifting. Hazardous waste can pose an especially serious threat to the working environment. 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.

[26] Zoï Environment Network and GRID-Arendal, *Vital Waste Graphics 3*, 2012. Available at: http://www.grida.no/publications/vg/waste3/

2.3.3. Informal recycling

Scavanging 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[27]. Although some waste picking occurs in the formal waste sector (such as Brazil and the Philippines), waste pickers are often part of an informal recycling sector giving larger potential incomes. Vulnerable groups, such as migrants, unemployed, widows, children, elderly and disabled people often work in these sectors, and are therefore especially exposed to the health risks related to inappropriate recycling methods[28]

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 release directly into local rivers. Equally, the informal recycling of hazardous e-waste constitutes significant environmental and health risks. E-waste is commonly dumped at sites in low-income countries where local residents collect parts of value. The recycling is often carried out in workshops where workers extract metals such as gold, silver, platinum, palladium and copper. The left-overs are often dumped, constituting contaminated sites and what is labelled as a "toxic time bomb"[29].

2.4. Waste Crime

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 management are large, while the risks of getting caught are generally low. It is estimated that national and international crime networks earn USD 20 000 - 30 000 million by the dumping and smuggling of hazardous wastes, and exploiting and trafficking protected natural resources[30]. Meanwhile, the general lack of monitoring and enforcement minimizes the risk of

[27] UNEP/GRID-Arendal, *Waste Crime - Waste Risks: Gaps in meeting the global waste challenge*, 2015. Available at: http://www.grida.no/publications/rr/waste-crime/
[28] Zoï Environment Network and GRID-Arendal, *Vital Waste Graphics 3*, 2012. Available at: http://www.grida.no/publications/vg/waste3/
[29] UNEP/GRID-Arendal, *Waste Crime - Waste Risks: Gaps in meeting the global waste challenge*, 2015. Available at: http://www.grida.no/publications/rr/waste-crime/
[30] Zoï Environment Network and GRID-Arendal, *Vital Waste Graphics 3*, 2012. Available at: http://www.grida.no/publications/vg/waste3/

getting caught. When considering the risk picture, the probability of criminal behaviour should be included in every stage of the management of waste.

2.4.1. Environmental crime

Due to the high costs of securing the sound management of hazardous waste, the economic gains of waste crime are significant. Illegal disposal of waste may generate up to 200 to 300 per cent, compared to safe and legal disposal. Illegal waste operators may be paid large sums for disposing hazardous waste in a safe manner, but instead dump the waste. Large quantities of waste are dumped in the sea or abandoned in containers at ports across the world. Waste is also often illegally exported to primitive recycling facilities, as this in many cases constitutes a cheaper alternative for disposing hazardous wastes than complying with regulations[31] .

Two problematic waste streams involved in environmental crime are e-waste and waste lead-acid batteries. Large amounts of e-waste are illegally exported to Asia and Africa, often misdeclared as second-hand goods. The recycling of e-waste often generates additional revenues, as these contain valuable metals. Another emerging source of illegal waste trade is obsolete counterfeit pesticides[32]. While it is difficult to determine the global scope, it is estimated that the trade in illegal pesticides represents accounts for over 10 per cent of the total world market. 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 to the market.

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 in reality consisting of mixed household waste. Several cases have revealed that some legal ISO-certified companies promoting green and sustainable management also are engaged in fraudulent activities[33].

[31] UNEP/GRID-Arendal, *Waste Crime - Waste Risks: Gaps in meeting the global waste challenge*, 2015. Available at: http://www.grida.no/publications/rr/waste-crime/
[32] See text box on Obsolete Pesticides and Persistent Organic Pollutants (POPs)
[33] UNEP/GRID-Arendal, *Waste Crime - Waste Risks: Gaps in meeting the global waste challenge*, 2015. Available at: http://www.grida.no/publications/rr/waste-crime/

EXAMPLE OF ILLEGAL MERCURY TRADE

In 2014, a prominent German company which was internationally entrusted in disposing mercury was caught in manipulating mercury-waste recycling, while in reality illegally exporting the mercury. The fraud was discovered during an annual tax investigating. From 2011 to 2014 the company had received mercury from around the world, guaranteeing for the safe disposal of the product. Up to 1 000 tons of metallic mercury were instead exported illegally, mostly to transit countries: Switzerland and, in smaller amounts, Greece and the Netherlands. The public prosecution office at Bochum in Germany is investigating the case.

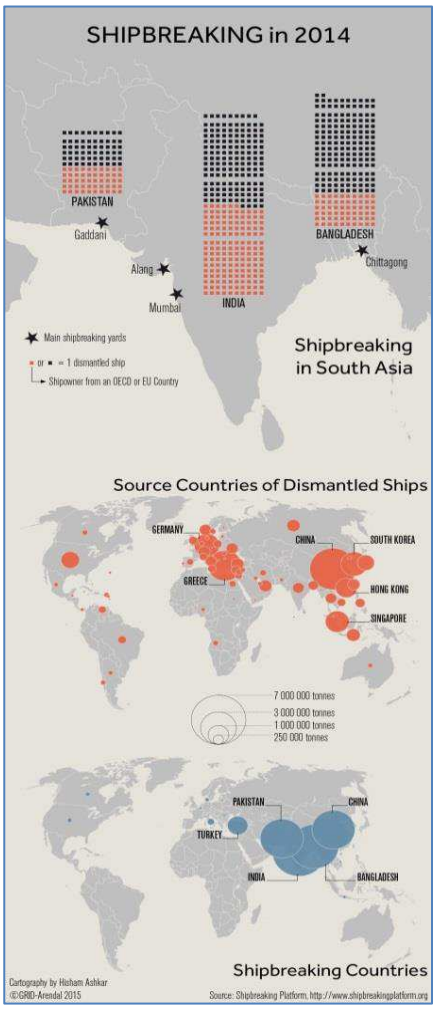
Source: UNEP/GRID-Arendal, *Waste Crime - Waste Risks: Gaps in meeting the global waste challenge*, 2015.

SHIP BREAKING AND BEACHING

Shipbreaking involves the dismantling vessels in order 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 account for 50 per cent of national steel production. The scrap metal, however, is often contaminated with hazardous substances such as oil asbestos cladding, flame retardants, toxic paints and heavy metals.

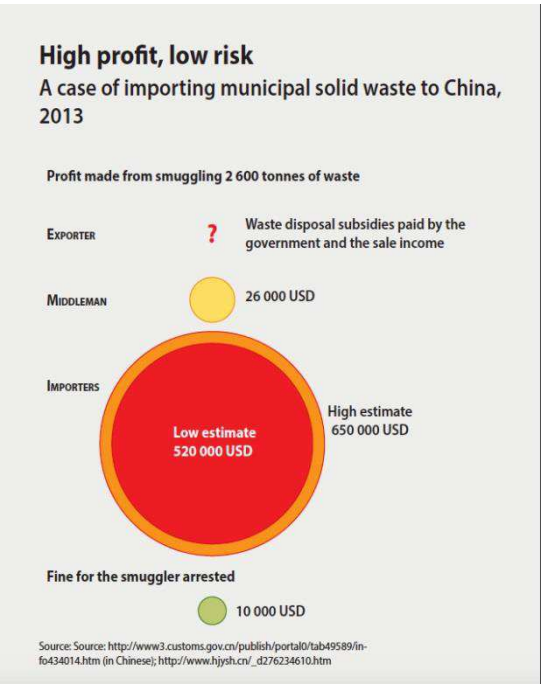
Beaching is a method used several places in South East Asia, and consists of demolishing vessels directly in the beach. Ship breaking and beaching causes numerous of preventable accidents and loss of human lives, as well as marine pollution and the emissions of hazardous materials.

Sources: UNEP/GRID-Arendal, Waste Crime - Waste Risks: Gaps in meeting the global waste challenge, 2015 & Zoï Environment Network and GRID-Arendal, Vital Waste Graphics 3, 2012.



2.4.2. Waste and organized crime

According to UNEP (2015), the illegal shipment of toxic waste and e-waste constitutes especially favorable conditions for organized crime. In the report it is stated 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"[34]. In other words, the general international lack of monitoring and enforcement strengthen the incentives for criminal behavior, as the risks and consequences of getting caught are low. The relatively low attention given to waste crime creates a permissive environment for economic crime. The figure below illustrates the profit of smuggling municipal waste to China, relative to the prospective fine.



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

2.4.3. Assessing the seriousness of the possible damage from waste

The seriousness 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

[34] UNEP/GRID-Arendal, *Waste Crime - Waste Risks: Gaps in meeting the global waste challenge*, 2015. Available at: http://www.grida.no/publications/rr/waste-crime/

be affected. Harmful chemicals and biological waste are most widely dispersed by water and air[35].

When determining the seriousness of damage to the environment, *reversibility* is a key factor. If the damage is irreversible, it is especially grave. *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 solve them after they have occurred. This requires risk assessments for industrial plants and infrastructure.

DISTASTER WASTE

Disasters may produce large quantities of hazardous wastes, exposing the population for 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

Source: Zoï Environment Network and GRID-Arendal, Vital Waste Graphics 3, 2012. Available at: http://www.grida.no/publications/vg/waste3/

2.4.4. Detecting the probability of damage from waste

The inherent and/or potential danger of each type of waste is realised if the waste 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. If dumps are located far from water and people, the immediate risks for public health will be lower. The risks of damage to health and the environment will be low if solid waste is burned at incinerators that have equipment for purifying the emissions.

[35] See text box on Obsolete Pesticides and Persistent Organic Pollutants (POPs)

Hazardous waste needs to be handled in compliance with strict quality requirements. The waste generator should have obligations for managing 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 get management and politicians to focus on these dangers. The best solution to minimize the probability of damage from waste is reducing the amount of hazardous waste in the first place. An efficient control of hazardous waste should therefore include a plan to reduce the amount of hazardous waste.

Radioactive waste is potentially the most dangerous waste as it has the potential to kill all organisms and remain radioactive in many years. In most countries radioactive waste is handled by a small number of actors and restrictions are tight. Usually the systems relating to radioactive waste are of high quality, but small faults in the systems can have grave consequences. System requirements must therefore be accordingly high.

The existence for illegal waste trade increases the probability of damage from waste, as criminal actors bypass environmental legislation in order to maximize profit. In order to reduce this risk, environmental regulations must be in place. Securing the sound management of waste also requires monitoring of waste streams, as well as enforcement capacity in order to target criminal waste operators.

3. Step 2 - Mapping out the players and their responsibilities

3.1. Responsible players in the waste management chain

The second step is to create an overview of the organisational structure of the waste management system. Most likely, there will be different systems for radioactive, hazardous and solid waste. 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.

The organisational structure for waste management may vary considerably among different countries, but most of the systems have certain functions that need to be fulfilled. 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.

Most countries have a legislative body responsible for formulating environmental policies and enacting appurtenant laws. International agreements provide directions for the national legislative work. In many countries one government authority, usually called the Ministry of the Environment, is responsible for all of the environmental policy 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.

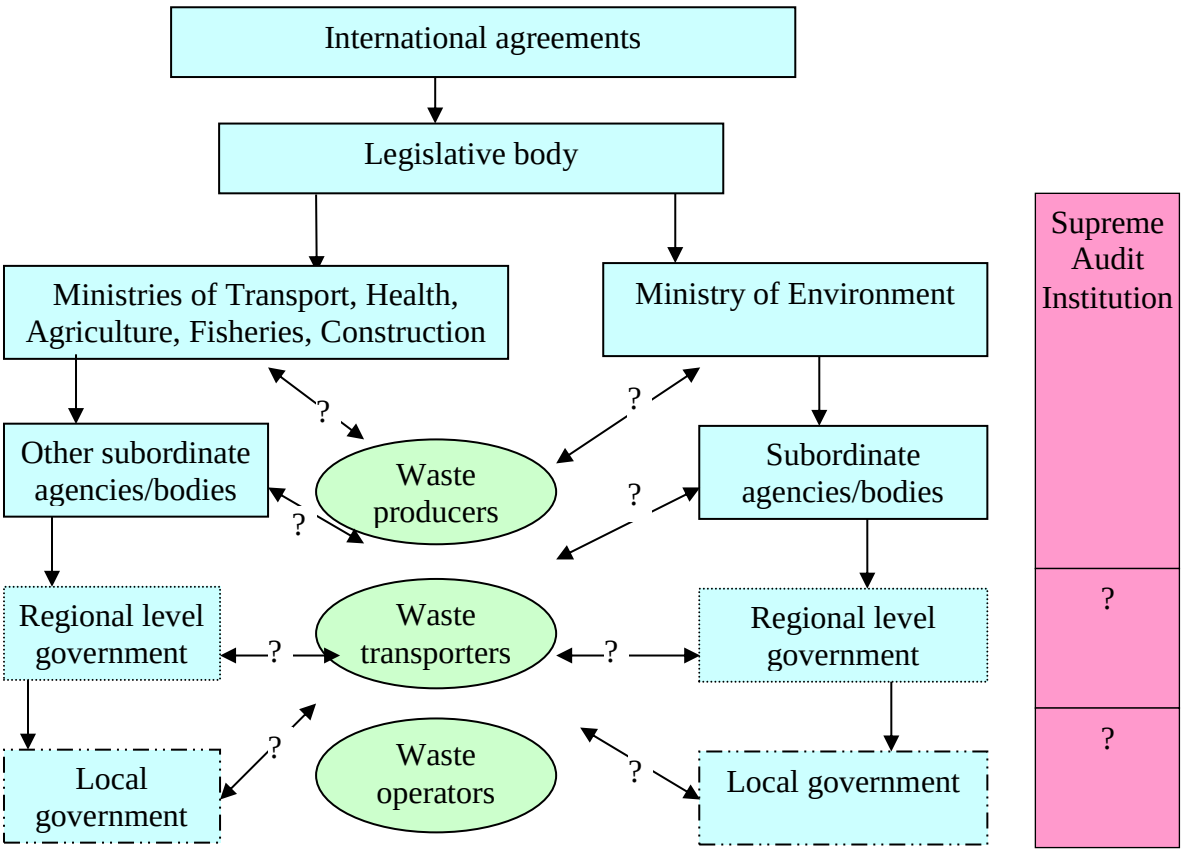
The relevant ministry (or ministries) are responsible for a number of important functions. In some countries these functions are carried out by subordinate agencies. The important consideration is whether the highest governmental authority (the ministry or ministries) has an overview of the activities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

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 taken care of, 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 of the SAI's mandate to audit.

The most typical waste handlers should be identified without going into great detail. In a basic chart, the inclusion of waste generators, waste transporters and waste operators is sufficient.[36] All of these actors may be private and public.

The figure below is a graphical presentation of relevant actors associated with waste management. It gives a visual depiction of the actors 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 with question marks 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. In this chart, the role of the SAI is not identified as it varies greatly among different countries and depends on the type of waste in question.



[36] A thorough understanding of the waste handlers is obtained when looking closer at the waste stream, which will be suggested under step 3.

3.2. 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 management 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 categorizations often vary across countries, most countries distinguish between hazardous and non-hazardous waste. The categorization 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 organisational structure. For instance, in China the same organisational structure applies to both hazardous and non-hazardous waste streams.

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' possibility of auditing waste management therefore depends on structures of responsibility at the national, regional and/or local level. The national management of solid waste in Canada, China, and hazardous waste in Norway are presented in the text boxes below[38].

[37] INTOSAI Auditing Standards Paragraph 1.0.34

[38] **We appreciate the verification of the information in the text boxes by the SAIs of the countries in question**

SOLID WASTE MANAGEMENT SYSTEM IN CANADA

In Canada, most of the activities related to non-hazardous waste management are regulated at regional level by the provinces and territories. These bodies or agencies issue certificates of approval (permits) to operate waste disposal sites, which define the types of waste the facility can accept and the conditions for environmentally sound waste disposal. All waste disposal sites must have a permit and comply with its conditions for operating. The agencies develop a waste exchange programme (policy, not a legislated requirement), which is a database listing waste generators and the types and quantities of waste materials produced, so potential users of waste products can contact them to reuse or recycle their waste. Furthermore, the agencies develop off-site recycling programmes that divert recyclables from the waste stream to recycling facilities. Authority is delegated to municipalities through legislation, byelaws and boards of health.

Agencies at the municipal or local level in Canada provide some waste management services or oversee the contracting of specific services (e.g. residential curb-side waste collection). Private companies operate waste disposal facilities and facilities for composting organic materials. The private sector in Canada carries out most of the collection and transportation of waste and recyclables. Private actors may also operate disposal facilities, transfer stations and recycling facilities.

The waste management industry or the private sector may perform services for commercial/industrial waste generators and/or perform services for the local waste management authority National and local waste policies constitute therefore important frameworks for this industry, as these policies can serve as a basis for improvements and investment in waste management systems.

This information needs to be verified with the SAI of Canada

SOLID WASTE MANAGEMENT SYSTEM IN CHINA

At the national level, solid waste management is under the responsibility of the Ministry of Housing, Urban and Rural Development. At the municipal level, urban management bureaus are responsible for collection, transportation and disposal of municipal solid waste. These bureaus are also responsible for the construction and operation of disposal facilities, including landfills and incineration plants. The Ministry of Environmental Protection issues standards for water, air and soil pollutant discharges/emissions. District level environmental protection bureaus under the Ministry of Environmental Protection are charged with monitoring landfills and incinerators' air emissions, wastewater discharges and fly ash disposal, in addition to enforcing standards.

In order to reduce waste and increase recycling, the Chinese Government has formulated a number of important laws and development plans including sections in the Five Year Plans, the 'Solid Waste Pollution Prevention and Control Law' (2005), the 'Circular Economy Promotion Law (2009) and the 12th Five Year Plan (FYP).

The following description is adapted from CH GEF Municipal Solid Waste Management Project (P126832, Project Appraisal Document. http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2014/11/04/000470435_20141104091549/Rendered/PDF/PAD3880PAD0P12010Box385354B00OUO090.pdf

The information needs to be completed and verified by the SAI of China.

HAZARDOUS WASTE MANAGEMENT SYSTEM IN NORWAY

A performance audit report by the Office of the Auditor General of Norway on management of hazardous waste maps out the public administration in this field and the responsibilities of the various relevant agencies:

The Ministry of the Environment has the overall responsibility for ensuring that hazardous waste is handled properly. This involves coordinating the work of establishing quantifiable targets and assessing whether the development in an area is satisfactory. The Ministry shall also ensure that there are suitable systems in place for monitoring the state of the environment and for performance reporting and follow-up.

The Environment Agency is responsible for the implementation of the pollution policy by managing goals and policy instrument in the field of hazardous waste.[19] The Environment Agency administers the applicable hazardous waste legislation, including the Pollution Control Act and corresponding Waste Regulations. The authority to process applications for permits for the handling of hazardous waste is delegated to the Environment Agency and the county governors, cf. the Waste Regulations.

Below the national level there are two political-administrative levels: county level (19 in total) and municipalities (430). The county governors are the national Government's representatives and are tasked with ensuring that decisions, goals and guidelines of the Parliament and the Government are followed up by counties and municipalities. According to the Instructions to county governors, the county governors shall work to ensure the best possible cooperation between the municipalities, the county authority and the local state administration. The county governors shall also provide guidance to the municipalities and county authorities.

The municipalities function as pollution control authorities at the municipal level. According to the Waste Regulations, municipalities are responsible for monitoring the pollution situation in their municipality, assessing whether hazardous waste is handled in accordance with applicable regulations, and following up illegal handling of waste. The municipalities also have a particular responsibility for construction waste in their processing of building applications and supervision.

The Norwegian Maritime Directorate is responsible for monitoring foreign ships calling at Norwegian ports. The directorate is subordinate to the Ministry of the Environment in cases concerning environmental matters relating to individual ships and protection of the marine environment. One of the main objectives of the directorate is to contribute to ensuring that shipping is an environmentally friendly form of transport. The Directorate is to help prevent pollution through effective supervision of Norwegian ships and port state control of foreign ships.

Norwegian Customs and Excise is tasked with preventing the illegal import and export of goods and inspecting goods, travellers and means of transport in order to uncover instances of smuggling.

Source: The Office of the Auditor General's Investigation into the Management of Hazardous Waste. Document 3:7 (2011–2012).
Available at: https://www.riksrevisjonen.no/en/Reports/Pages/hazardouswaste.aspx

3.3. Radioactive waste management systems

Radioactive waste could be conceived as a special case of hazardous waste. The agencies that manage radioactive waste are usually at the national level, making them natural targets for scrutiny by SAIs.

Radioactive waste is usually divided into two categories: low-level waste and high-level waste, where the latter has a much longer life expectancy (see background chapter). High-level waste from nuclear warheads and waste from nuclear plants are normally under tight political and regulatory control, and most countries have established systems not only to take care of the waste, but also to guarantee that radioactive materials will not get into the wrong hands.

Legislation regarding the low- intermediate-level waste, such as waste from hospitals, can vary from country to country. In most countries however, all activities associated with radioactive materials (production, ownership, usage, storage, etc.) require a permit from the competent authorities. People who possess radioactive materials are also required to take necessary steps to prevent radiation. This includes proper storage and handling of waste.

RADIOACTIVE WASTE MANAGEMENT SYSTEM IN CANADA

As a country that mines and uses radioactive substances, Canada has for a long time had mechanisms to control radioactive waste. Canada practises the principle that the owners or generators of the nuclear waste are responsible for the final disposal. The producers of high-level nuclear waste in Canada are mainly the provincially owned power generators.

A number of federal agencies and departments or ministries share the responsibility for the different functions that need to be covered in connection with radioactive waste. An independent agency of the Government of Canada is responsible for regulating the nuclear industry, granting licences to nuclear facilities, carrying out environmental assessments in collaboration with an agency specialised in assessments, and working with the Ministry of Transportation to regulate safe transport of nuclear waste across the country.

A designated office is responsible for the establishment of national policies for low-level waste management. It offers a disposal service (user-paid), carries out the clean-up and remediation of historic waste and uranium tailings, and provides support for clean-up and planning.

Another governmental organisation offers its services to each nuclear energy corporation for the management of high-level nuclear waste disposal. This organisation reports to the Minister of Natural Resources.

Finally, there is a federal corporation that serves as an international nuclear technology and engineering company. Its responsibilities include managing most of the nuclear low-level waste programmes in Canada, owning and operating some nuclear facilities, conducting research and receiving reports from the waste management organisations.

Source: UN http://www.un.org/esa/agenda21/natlinfo/index.html

The information needs to be completed and verified by the SAI of Canada

3.4. Examples of policy tools

Waste is a by-product of economic activity, by businesses, government and households. Waste is also an input to economic activity –either through recovery of material or energy.[39] The waste is associated with social costs (and potential benefits) that are not reflected in the price of the main products (see chapter 2 on negative externalities). In order to correct for these market imperfections, governments may intervene to internalize 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[40]. We usually distinguish between the following policy tools:

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

Direct regulation

The concept of direct regulation refers to a set of instruments which have in common that they imply a direct interference of the authorities with 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 allowed to pollute. Several kinds of standards can be distinguished:

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[39] The Economics of Waste and Waste Policy, UK Department og Environment and Rural Affairs, June 2011. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69500/pb13548-economic-principles-wr110613.pdf

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

- *Environmental quality standards* which establish the highest allowable concentration of specified pollutants in the ambient.

- *Emission standards* state the maximum amount (or concentration) of pollutants which may be emitted by a unit which 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 of 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 being 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.

3.4.1. 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*, 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, on the waste that enters the facility (e.g. per ton), and eventually differentiated according to the environmental characteristics of the facility (energy recovery, collection and flaring/energy recovery of methane, degree of control of leachate from landfills plant). Alternatively, waste charges could be aimed at specific fractions of household waste such as product charges on packaging such as beverage containers. A national effluent charge levied on incineration plants will often be accompanied with 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 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 (e.g. membrane).

Tradable emission permits

The basic idea of tradable permits/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 gasessuch as CO_2-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.[41]

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, the percentage of a certain product to be recycled, etc. 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 is 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

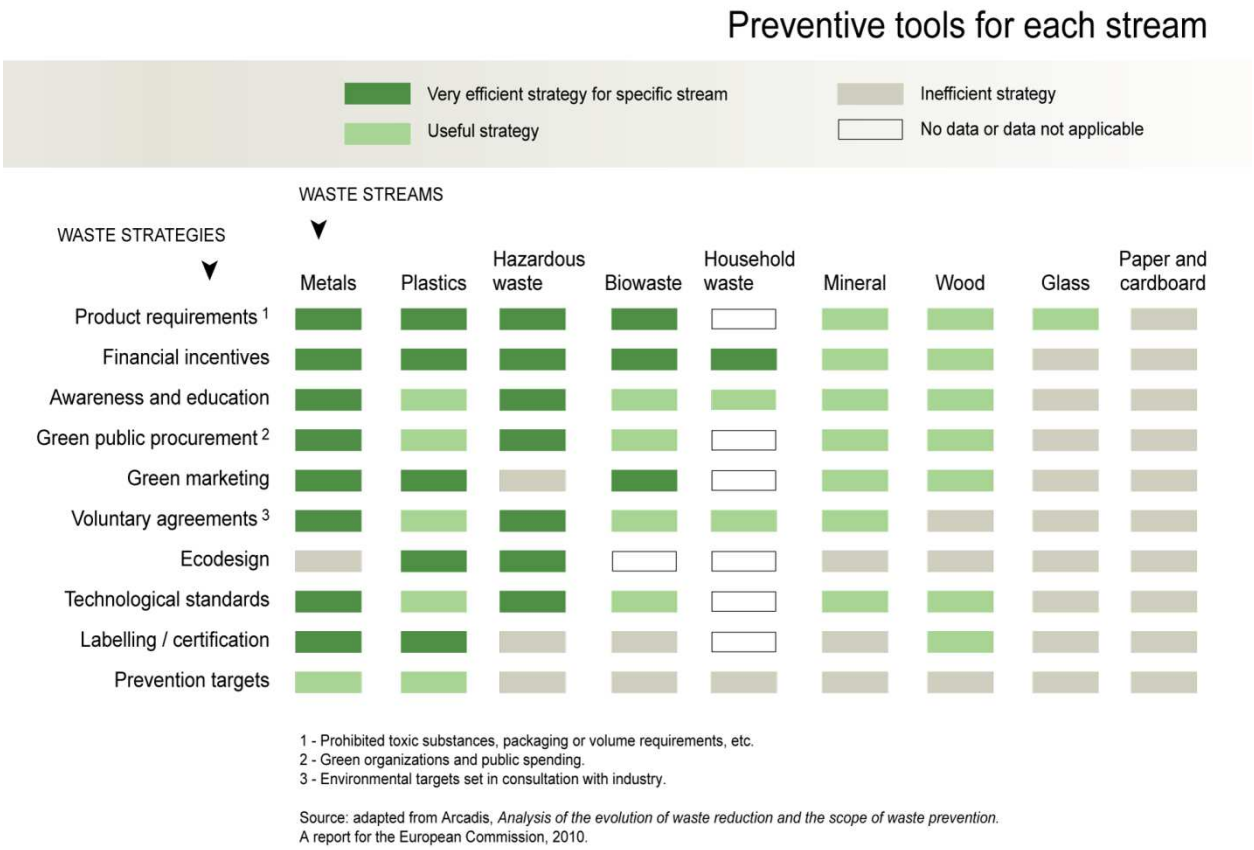
Public information refers to the information activities government authorities undertake to influence public attitudes and encourage environmentally sound behaviour. Such activities could be directed at consumersin order to increase the general ecological awareness or their willingness to sort waste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

Physical measures

It seems obvious that landfills or waste incineration plants should preferably not be located near residential areas nor in areas which are not subject to air inversions or trapping of pollutants. *Area planning* thus 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.

[41] OECD *Extended Producer Responsibility*, http://www.oecd.org/env/tools-evaluation/extendedproducerresponsibility.htm

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.



Cartography by GRID-Arendal, www.grida.no

AUDIT CASE: ASSESSMENT OF PRODUCER RESPONSIBILITY AND DEPOSIT-REFUND SCHEMES IN NORWAY

In an audit of management of hazardous waste the Norwegian OAG describes in detail the relevant policy instruments and regulations in the criteria section for each of the different waste fractions covered by the audit: EE waste, waste oil, batteries, discarded insulating glass (PCB) and construction waste. For EE waste and batteries a central piece of the regulatory framework is a responsibility for producers and importers of these products to be members of a take-back company scheme approved by the environment directorate. The producers and the take-back company have a duty to provide information to the effect that EE waste should not be disposed of together with other waste. The report describes the detailed obligations which producers, importers and tack-back companies must comply with, e.g. the share of batteries sold that must be collected and handed in for recovery or environmentally sound disposal (95 per cent). The report then goes on to assess how well this policy instrument scores in terms of compliance and effectiveness. It concludes that the producer responsibility schemes have a high level of participation and help to increase the amounts collected. However, it questions whether the Ministry of the Environment and the Environment Directorate have been sufficiently active in their follow-up of the collection of EE waste in relation to how much waste is produced, and whether they have adequately checked whether the take-back companies have fulfilled their obligations pursuant to the Waste Regulations.

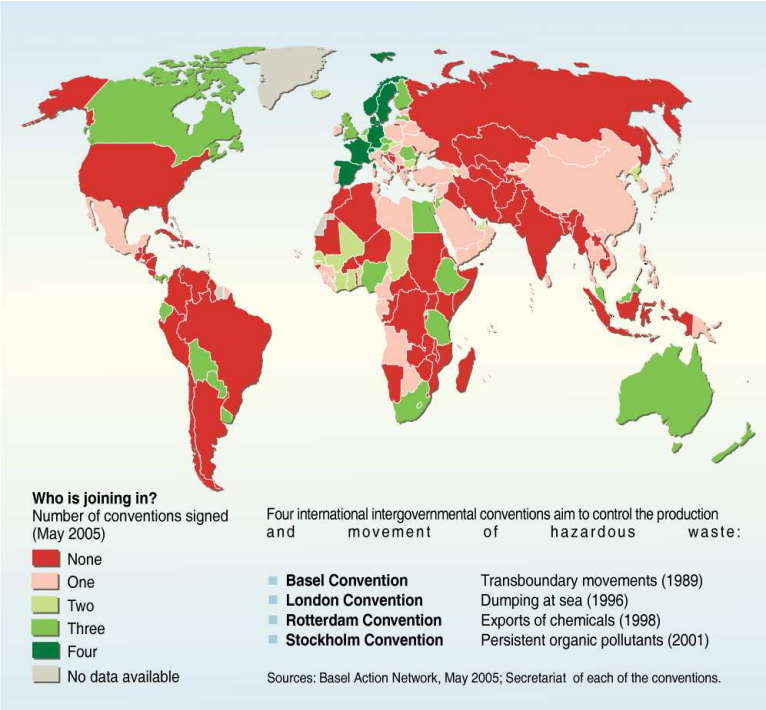
Another policy instrument is deposit-refund schemes. Although it is not strictly a deposit-refund scheme, Norway has a reimbursement scheme for waste oil in order to encourage handing-in of waste oil for approved treatment. Lubricating oils are subject to a lubricating oil charge that finances the reimbursement scheme. The reimbursement is to be paid to a large reception facility (tank facility) that has been approved in advance by the Environment Directorate. The audit report concludes that waste containing oil is the largest quantity of hazardous subject to unknown handling. It can be difficult to determine whether the oil is waste or a product, and thus under which regulations it falls. The report questions whether the directorate has helped to clarify how the regulatory framework should be interpreted in practice.

3.5. International agreements about handling waste and for import and export of waste

During the last few decades a relatively large number of international agreements on different levels relevant for managing of waste have been established. Their geographical scope vary, from having an almost global reach to 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. However, they may all 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[42].

3.5.1. 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 (see also chapter on waste crime, page X).The map below gives and overview of parties to four important conventions regarding hazardous wastes and chemicals; the Basel Convention, the London Convention, the Rotterdam Convention and the Stockholm Convention.



[42] For a useful source to multilateral environmental treaties see http://sedac.ciesin.org/entri/.

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 key objectives of the Basel Convention are to minimise the generation of hazardous waste in terms of quantity and hazardousness, to dispose of them as close to the source of generation as possible and to reduce the movement of hazardous waste. As of September 2015, there were 183 Parties to the Basel Convention.

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. The member states must have their own regulations concerning the transboundary movement of waste, and they 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 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 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 (OECD 2015) facilitates transboundary movements of waste/trade of recyclables by using a simplified procedure combined with a risk-based approach, introducing green-listed and amber-listed wastes. Waste exported outside the OECD area do not benefit from the simplified procedure. The control of waste shipments is carried out by national authorities.

[43] OECD Decision C (2001) 107 Final: *Control System for Waste Recovery*

The EU Regulation no 1013/2006 on shipments of waste

The EU regulation on shipments of waste implements the Basel Convention and aims 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 Bamako and Waigani Convention[44]

The Basel Convention has clear links with regional hazardous-waste regimes, in particular the 1991 Bamako Convention and the 1995 Waigani[45] Convention (which came into force in 1998 and 2001 respectively). The Bamako Convention prohibits the import of hazardous waste into Africa, and the Waigani Convention 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. The Basel Secretariat co-operates with the secretariats of these regional regimes and shares knowledge about institutional procedures and functions. These regional agreements may also assist national implementation of environmentally sound waste management strategies.

The London Convention

The London Convention (1972) covers waste that is liable to create hazards to human health, to harm living resources and marine life, harm recreational areas or to interfere with other legitimate uses of the sea. The principle of the Convention is that dumping of specific types of waste is prohibited, and that permits are required for dumping other types of waste. The London Protocol prohibits all dumping of waste, except for specific types which are explicitly permitted. As of September 2015, there were 154 Parties to the Convention.

The Stockholm Convention

The Stockholm Convention (2001) is a global agreement created in order to protect human health and the environment from persistent organic pollutants (POPs). This agreement commits

[44] Yearbook of International Co-operation on Environment and Development 2001/2002, Earthscan Publications Ltd, London, page 47
[45] For more information about The Waigani Convention see; http://sprep.org.ws

the parties to phase out 22 of the most dangerous environmental toxins. The Parties are also under a commitment to develop strategies to identify products and waste that contains these environmental toxins, and handle this waste in an environmentally sound manner. As of September 2015, there were 179 Parties to the Convention.

The Rotterdam Convention

The Rotterdam Convention of the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade (1998) aims at facilitating the sharing of information about hazardous chemicals by providing for national decision-making processes on imports and exports. These decisions are, in turn, shared with the Parties.

The MARPOL Convention

The MARPOL Convention[46] (1973) for the Prevention of Pollution from Ships is the main international convention covering prevention of pollution of the marine environment by ships from operational or accidental causes. It is a combination of two treaties adopted in 1973 and 1978, and has been updated by amendments over the years. The key objectives of the Convention are:

- To eliminate pollution of the sea by oil, chemicals, harmful substances in packaged form, sewage, garbage and other harmful substances that might be discharged in the course of operations;
- To minimise the amount of oil that could be released accidentally by ships, including also fixed or floating platforms.
- To improve further the prevention and control of marine pollution from ships, particularly oil tankers[47].

[46] International Maritime Organization (IMO) home page, http://www.imo.org/home.asp
[47] Yearbook of International Co-operation on Environment and Development 2002/2003, Earthscan Publications Ltd, London, page 123

3.5.1.1. EU Directive 2000/59/EC

EU Directive 2000/59/EC 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.

The EU has several other directives relevant for specific fractions of hazardous waste, such as

- Directive on Waste Electrical and Electronic Equipment (Directive 2002/96/EC)
- PCB and PCT Directive: (Directive 96/59/EC) on the disposal of Polychlorinated Biphenyls and polychlorinated terphenyls
- Spent Batteries Directive (Directive 2006/66/EC) on waste batteries and accumulators

3.5.2. Agreements regulating radioactive waste

Radioactive waste is in an exceptional position, being fatal if not handled properly. Despite this fact, which is generally acknowledged, there is still no widely endorsed convention that explicitly addresses the issue of nuclear waste.

Joint Convention

The Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management[48] is a global agreement, which addresses the safety of spent fuel management and the safety of radioactive waste management. The Convention entered into force on 18 June 2001. The objectives of this Convention are:[49]

- To achieve and maintain a high level of safety worldwide in spent fuel and radioactive waste management, through the enhancement of national measures and international co-operation, including safety-related technical co-operation where appropriate
- To ensure that during all stages of spent fuel and radioactive waste management there are effective defences against potential hazards. This is to ensure thatindividuals, society and the environment are protected from the harmful effects of ionising radiation, now and in the future, in such a way that the needs and aspirations of the present generation

[48] IAEA home page; http://www.iaea.org
[49] Joint Convention, chapter 1, article 1

are met without compromising the ability of future generations to meet their needs and aspirations

- To prevent accidents with radiological consequences and to mitigate their consequences should they occur during any stage of spent fuel or radioactive waste management

The Joint Convention applies to spent fuel and radioactive waste resulting from civilian nuclear reactors and applications and to spent fuel and radioactive waste from military or defence programmes if and when such materials are transferred permanently to and managed within exclusively civilian programmes, or when declared as spent fuel or radioactive waste for the purpose of the Convention by the contracting party. The Convention also applies to planned and controlled releases into the environment of liquid or gaseous radioactive materials from regulated nuclear facilities.

The obligations of the contracting parties with respect to the safety of spent fuel and radioactive waste management are based to a large extent on the principles contained in the International Atomic Energy Agency (IAEA) Safety Fundamentals document "The Principles of Radioactive Waste Management", published in 1995. They include, in particular, the obligation to establish and maintain a legislative and regulatory framework to govern the safety of spent fuel and radioactive waste management and the obligation to ensure that individuals, society and the environment are adequately protected against radiological and other hazards, by appropriate siting, design and construction of facilities and by making provisions for ensuring the safety of facilities both during their operation and after their closure, etc. The Convention imposes obligations on contracting parties in relation to the transboundary movement of spent fuel and radioactive waste based on the concepts contained in the IAEA Code of Practice on the International Transboundary Movement of Radioactive Waste. In addition, contracting parties are obligated to take appropriate steps to ensure that disused sealed sources are managed safely.

Convention on Nuclear Safety

The Convention on Nuclear Safety[50] is a global agreement that was adopted in Vienna in 1994. Its aim is to legally commit participating states that operate land-based nuclear power plants to

[50] IAEA home page; http://www.iaea.org

maintain a high level of safety by setting international benchmarks to which states would subscribe. The Convention entered into force in 1996.

In the Preamble, the Convention states that the contracting parties affirm the need to begin promptly the development of an international convention on the safety of radioactive waste management as soon as the ongoing process to develop waste management safety fundamentals has resulted in broad international agreement.[51]

The Convention is an incentive instrument. It is not designed to ensure fulfilment of obligations by parties through control and sanctions, but is based on their common interest in achieving higher levels of safety.

The specific safety obligations in the Convention are based on what are termed "fundamental safety provisions" rather than on highly detailed standards. Yet the Convention also includes a series of more detailed obligations. With regard to waste, article 19 of the Convention states: Each Contracting Party shall take the appropriate steps to ensure that the generation of radioactive waste resulting from the operation of a nuclear installation is kept to the minimum practicable for the process concerned, both in activity and in volume, and any necessary treatment and storage of spent fuel and waste directly related to the operation and on the same site as that of the nuclear installation take into consideration conditioning and disposal.

For EU/EEA members, the following policies are relevant:

- Council Regulation (Euratom) No 1493/93 on shipments of radioactive substances between Member States
- Council directive 2006/117 Euratom on the supervision and control of shipments of radioactive waste and spent fuel

Agreements including non-hazardous/solid waste

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

[51] The Convention on Nuclear Safety, preamble viii

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)100[52], recommends member countries to elaborate and implement policies and/or programs to ensure that waste be 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 into national policies the core performance elements for waste facilities
- Considering incentives for facilities that fulfil the core performance
- Internalisation of environmental and human health costs in waste management
- Providing incentives to take part in environmentally sound recycling schemes

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

3.5.3. EU directives

The EU *Waste Framework Directive* (Directive 2008/98/EC) on waste establishes a legal framework for the treatment of waste within the EU. It sets out basic concepts and definitions related to waste management and lays own the "polluter pays principle" and "waste hierarchy" (waste prevention, reuse, recycling, recovery).

The *IPPC Directive* (Directive 2008/1/EC) aims to prevent or reduce pollution of the environment and the quantities of waste arising from industrial and agricultural activities. It requires industrial or agricultural activities with a high pollution potential to have a permit which defines basic obligations and specific requirements. Thus, companies bear themselves the responsibility for preventing and reducing any pollution they may cause. In order to receive a permit, companies must comply with certain basic obligations. Member states are responsible for inspecting industrial installations and ensuring compliance.

[52] Amended on 16 October 2007 - C(2007)97

The *Landfill* Directive (EU Directive 1999/31/EC) 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. The directive sets up stringent technical requirements for operating permits of landfill sites.

The *Waste Incineration Directive* (Directive 2000/76/EC) aims to prevent or minimize 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. Incineration plants are to comply with stringent operational conditions and technical requirements.

The *Packaging Waste Directive* (Directive 94/62/EC) 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. The Directive specifies targets that member states should attain.

End-of-life vehicles Directive (Directive 2000/53/EC) seeks to limit waste production from end-of-life vehicles and to increase re-use, recycling and recovery of end-of-life vehicles and their components t waste collection systems, re-use/recycling targets.

The EU Commission is currently working on a *Circular Economy Strategy* with the overall aim to create 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 above and introducing new legislation.[53]

[53] http://ec.europa.eu/environment/circular-economy/index_en.htm

SHIPMENTS OF WASTE: THE FUNCTIONING OF THE SYSTEM FOR INSPECTIONS IN SWEDEN

Swedish National Audit Office's audit on *Shipments of waste: the functioning of the system for inspections* (published in 2015) is a good example both of how international agreements and EU directives and regulations are used as audit criteria. The audit is also a good example on how to identify relevant actors early on in the report.

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 the national environmental law (Miljöbalken) 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 control and supervision of waste shipments, it is assumed that effective inspections requires cooperation and coordination among these actors. This implies exchange of information and clearly defined division of responsibilities.

Availible at: http://www.riksrevisionen.se/sv/rapporter/Rapporter/EFF/2015/Transporter-av-farligt-avfall--fungerar-tillsynen/

AUDIT CASE: JOINT REPORT OF HAZARDOUS WASTES BY THE CHECK AND SLOVAK STATE AUDIT OFFICES

A coordinated audit of the Check and Slovak State Audit Offices builds on international obligations with respect to hazardous waste management. This report starts out with the obligations in the Basel convention with respect to minimize generation of hazardous waste, the subsequent OECD Council Decision C(92)39FINAL on the Control of Transfrontier Movements of Wastes Destined for Recovery Operations, and finally how both countries since accession to EU membership in 2004 have been bound by the EU regulation (Council Regulation (EEC) No. 259/93 on the supervision and control of shipments of waste within, into and out of the European Community).

The audit report then moves on to evaluate how these criteria have been implemented into national law and policies thus establishing the link between international obligations and national law and further, how these are enforced in the two respective countries.

Available at: http://www.environmental-auditing.org/Portals/0/AuditFiles/Joint%20Report_eng.pdf

4. Step 3 - Identifying possible governance problems related to waste management

Having considered the seriousness and probability of health and environmental risks, and mapped out relevant actors and legislation, the next step is to identify governance problems related to waste management. The following sections give an overview over common governance problems. While some issues have already been subject to audits, others have been raised by researchers in the field.

4.1. Common governance problems related to poor waste management at the national level

The following sections give an overview of common governance problems related to waste management at the national level. It is important to note 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, the following governance problems are faced by countries worldwide.

4.1.1. Lack of waste policies

In order to secure a well-functioning waste management system, the existence of waste policies is fundamental. As waste-related problems may occur in every step of the waste stream, relevant policies should be established for each step. Efficient waste policies require specific objectives and targets with adherent information and advisory strategies. Many low-income countries lack environmental regulations, and the implementation of existent frameworks is often obstructed by corruption, or the lack of enforcement, knowledge and technology. It should be noted that lack of political attention may also undermine existing national waste policies.

4.1.2. Lack of legal clarity

A common findings in many national audits, is the lack of target achievements[54]. However, this is not always due to the lack of effective waste management systems, but to weaknesses in legislation. If objectives and strategies are not sufficiently specific, measurable, achievable, feasible, or subject to a realistic time frame, this may lead to policy obligations for governance bodies and agencies. The lack of legal clarity may also lead to deliberate or undeliberate breaches of regulation by actors in the waste management system. 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 have not established specific requirements for distinguishing scraps from waste, and thereby creating "grey areas"[55].

[54] See EUROSAI WGEA Paper on Auditing Waste Management
[55] UNEP/GRID-Arendal, *Waste Crime - Waste Risks: Gaps in meeting the global waste challenge*, 2015. Available at: http://www.grida.no/publications/rr/waste-crime/

4.1.3. Weak implementation of international and regional agreements

The practical implementation of international and regional agreements may be challenge for many countries, especially those struggling with establishing appropriate waste infrastructure in the first place. For example, many countries in the EU with established landfill systems have encountered problems in fulfilling their obligations according to EU directives[56] (EUROSAI WGEA Paper).

4.1.4. 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 belonging to another policy domain. The regulation and management of waste may be spread across several ministries, causing potential conflicts of interest between the ministries in question. Furthermore, resolving issues related to waste crime requires the cooperation between environmental authorities and custom authorities. Weak cooperation between these authorities contributes in creating loopholes for criminal waste operators[57].

4.1.5. 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 waste policies, such as disposal taxes and produces responsibility schemes, were not evaluated according to efficiency, cost-effectiveness and transparency[58].

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[56] EUROSAI WGEA, *Paper on Auditing Waste Management*, 2011. Available at: http://www.eurosai.org/ru/databases/products/EUROSAI-WGEA-Paper-on-Auditing-Waste-Management/

[57] UNEP, Global Environmental Outlook 5. Chapter 6 Chemicals and Waste, 2012. Available at: http://www.unep.org/geo/geo5.asp & UNEP/GRID-Arendal, Waste Crime - Waste Risks: Gaps in meeting the global waste challenge, 2015. Available at: http://www.grida.no/publications/rr/waste-crime/

[58] EUROSAI WGEA, *Paper on Auditing Waste Management*, 2011. Available at: http://www.eurosai.org/ru/databases/products/EUROSAI-WGEA-Paper-on-Auditing-Waste-Management/

4.1.6. 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"[59]. 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[60]. While the lack of monitoring and control complicates the 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[61]. Monitoring and control provide the basis for enforcement, and should be comprehensive, systematic and risk based.

AUDIT CASE: ORGANIZATION OF SHIP WASTE MANAGEMENT IN PORTS IN ESTONIA

In 2004, the National Audit Office in Estonia conducted an audit on the facilities for the reception of ship waste in Estonian ports. The findings in the report showed unclear roles of port authorities, and the lack of a harmonized system of port fees for waste disposal. The lack of monitoring and control allowed ships to leave ports without having disposed of the waste in accordance with regulations, entailing discharge of the waste at sea.

Source: EUROSAI WGEA, Paper on Auditing Waste Management, 2011. Available at: http://www.eurosai.org/ru/databases/products/EUROSAI-WGEA-Paper-on-Auditing-Waste-Management/

4.1.7. Weak enforcement

As mentioned above, 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

[59] UN, *UN-Habitat Annual Report 2010*, 2011. Available at: http://unhabitat.org/un-habitat-annual-report-2010/
[60] EUROSAI WGEA, Paper on Auditing Waste Management, 2011. Available at: http://www.eurosai.org/ru/databases/products/EUROSAI-WGEA-Paper-on-Auditing-Waste-Management/
[61] UNEP/GRID-Arendal, Waste Crime - Waste Risks: Gaps in meeting the global waste challenge, 2015. Available at: http://www.grida.no/publications/rr/waste-crime/

appropriate enforcement of law and regulations (waste crime, p. 8). Due to the complexity of waste crime, systems of risk-profiling and intelligent-led approaches should be implemented (Vital waste graphics, p. 38). Furthermore, cooperation between enforcement authorities is also central in order to secure adequate enforcement. This requires building capacities cross the entire enforcement chain, including custom authorities, police, environmental enforcement officers, prosecutors and judges (waste crime, p. 9). The degree of collaboration between national regulators varies significantly across countries, also within high-income countries (waste crime, p. 59).

4.1.8. Lack of technical capacities

As the amounts and characteristics of waste vary across countries and regions, waste-related technologies must be adapted to local conditions. Developing region and country specific technologies are central in building efficient waste management systems, and requires the existence of research and development institutions[62]. Raising awareness about waste and recycling programs among the populations is an equally important task in order to ensure the reduction of waste and sound disposal of waste.

4.2. International governance problems

4.2.1. Differing definitions and lack of comparable data

Differing definitions and classifications of waste across countries constitute a significant obstacle to preventing waste crime. The Basel Convention allows the Parties to have differing definitions of waste. Thus, an illegal shipment in one country may be legal in another. This may lead to legal disputes between exporting and importing countries, resulting in a stalemate. This, in turn, may lead to the disposal of containers with hazardous waste in the country of import until an agreement is reached[63]. While definitions vary across countries, so do monitoring systems. Although international organizations such as the Basel Secretariat, has taken measures in order

[62] United National Economic and Social Council, *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. United Nations Economic and Social Council.* 2011. Available at: http://www.un.org/esa/dsd/csd/csd_pdfs/csd-19/sg-reports/CSD-19-SG-report-wastemanagement-final-single-spaced.pdf

[63] UNEP/GRID-Arendal, Waste Crime - Waste Risks: Gaps in meeting the global waste challenge, 2015. Available at: http://www.grida.no/publications/rr/waste-crime/

to facilitate the comparison of cross-country statistics, caution is required in interpreting these data. The lack of comparable statistics makes it difficult to monitor the quantity and characteristics of waste across countries.

4.2.2. Weak international cooperation

Different regulatory practices across countries complicate the consistent enforcement of waste shipment legislation. Agencies in different countries may have varying priorities of waste streams, as well as different views on waste classifications. Another obstacle to international cooperation is the lack of information exchange. While one country may have a database with profiles on suspicious waste shipments, another country may have another set of profiles. If an illegal exporter has a profile in one country, he can avoid this simply by exporting through another country. Furthermore, it is difficult to sanction an exporter whose export declaration is registered in another country than the actual country of export. The general lack of cooperation between national authorities makes it next to impossible to enforce illegal exports through a Country other than the country of dispatch[64].

[64] UNEP/GRID-Arendal, *Waste Crime - Waste Risks: Gaps in meeting the global waste challenge*, 2015. Available at: http://www.grida.no/publications/rr/waste-crime/

AUDIT CASE: COORDINATED AUDIT ON THE ENFORCEMENT OF THE EUROPEAN WASTE SHIPMENT REGULATION

A joint report based on eight national audits by the SAIs of Bulgaria, Greece, Hungary, Ireland, Netherlands, Norway, Poland and Slovenia from 2013, concludes that the countries have implemented EU regulation on waste shipments and generally comply with the implementation requirements. However, the report also concludes that enforcement strategies, numbers of inspections, interpretation of regulations and the handling of infringements varied significantly across the countries. The audit points out that these differences are not in accordance with the principle of a level playing field, and that this may encourage businesses to export waste via countries with few inspections. This, in turn, may result in the unsound treatment of waste.

Available at:
http://www.courtofaudit.nl/english/Publications/Audits/Introductions/2013/10/Coordinated_audit_on_the_enforcement_of_the_European_Waste_Shipment_Regulation

5. Step 4: Select an audit topic

Please note that the following chapters only contain bullet points and are at the time being not completed.

However, we do appreciate your feedback on the structure of these chapters.

- Selecting an audit topic requires an thorough assessment of the relevant risks
- The auditor should consider which of the three E's (cf. ISSAI 3100) the audit falls within
    - **Economy** - covers compliance audits, as well as audits assessing the appropriateness of policy tools in order to manage waste
    - **Efficiency** - includes e.g. audits evaluating the efficiency of policy tools
    - **Effectiveness** - covers audits investigating the achievement of broader policy goals, such as reduction of GHG emissions, securing the environment, ensuring safe working conditions, preventing waste crime etc.

5.1. Possible audit topics

The following section provides an overview of possible approaches for audits, focusing on lines of inquiries and introducing possible audit questions.

Topic 1 – Existence of waste policy

Is there a waste policy that applies to every stage of the waste stream? Is the waste policy at different stages consistent with the general environmental policy?

Topic 2 – Compliance with national environmental policy

Have the general environmental policy and the waste policy been reflected, specified, and put in concrete terms in instruments such as legislation, plans, budgets and financial tools? Are there any gaps or inconsistencies in the waste legislation?

Topic 3 – Risk management

Are the risks posed by waste for the environment and health being sufficiently managed? Does the government have an overview of these risks and are measures being taken to manage them? For instance, are there reporting systems for incidents from the operating to the executive level?

Topic 4 – Quality of the implementation process

Have policies, regulations, etc. been implemented efficiently and effectively? Have there been delays in the implementation and have the resources been well-spent? Did the government conduct sufficient impact assessments or other prior investigations before implementing a new waste initiative?

Topic 5 – Performance of the waste management system

Is the structure of the waste management system appropriate for solving the challenges that waste entails? Is there a distribution of responsibility, and, if so, does this influence accountability? Do the responsible agencies have the necessary instruments for fulfilling their obligations regarding waste management? Do the chosen instruments such as legislation, plans,

budgets and financial tools ensure the achievement of the policy objectives? Does the system achieve the optimum output – in terms of quantity and quality – from the inputs and actions?[65]

Topic 6 – Compliance with national law and regulations

Are the actions of the government departments, ministries and other relevant agencies in compliance with the relevant rules and regulations, specifically financial requirements? Are all waste activities and liabilities accurately accounted for? Are there any illegal practices in connection with the waste handling?

Topic 7 – Compliance with international obligations

Are the policies, legislation and practises relating to waste management in compliance with the international obligations and commitments to which the country has agreed?

Topic 8 – Monitoring

Are there adequate systems for monitoring the waste handling? Is there a system that ensures a necessary overview of the waste handling? Is relevant information gathered, e.g. through reporting systems or registers, and is that information of good quality? Are there control and inspection procedures in place to ensure compliance with requirements, and do these work well? Have necessary sanctions been established, and are they adequately used?

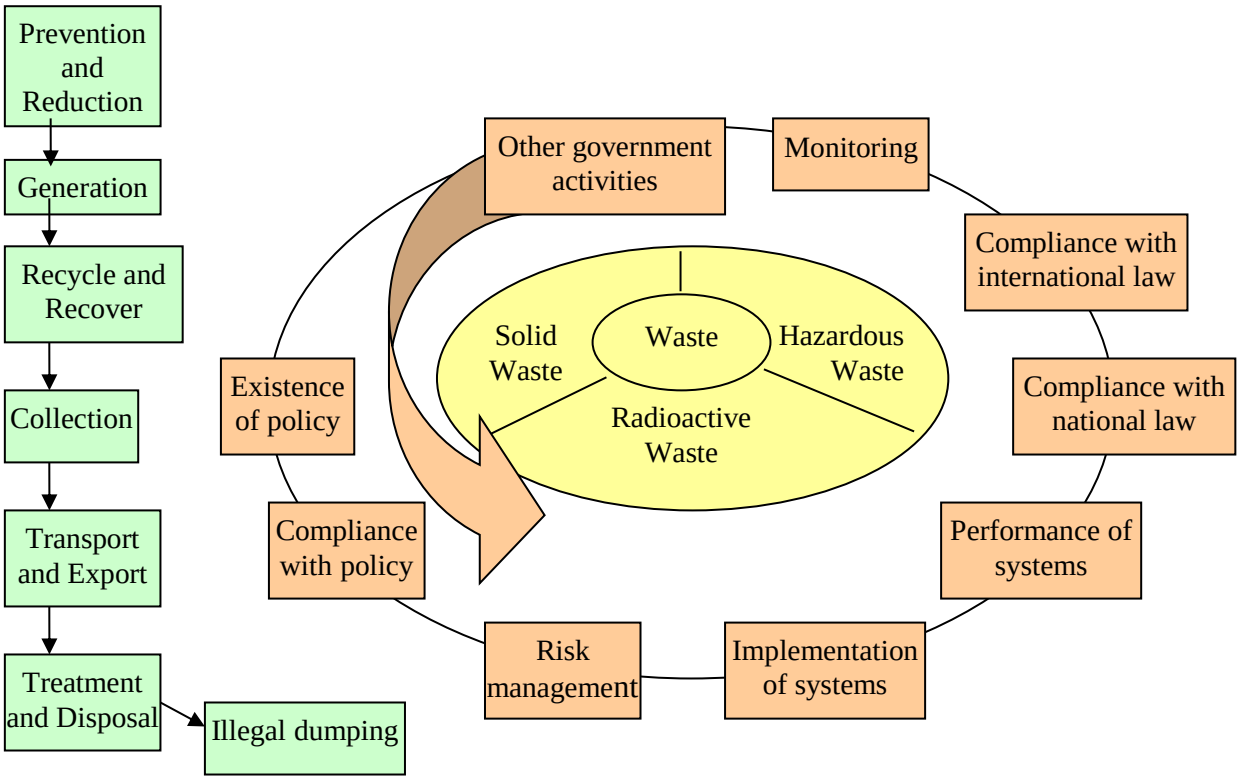
Topic 9 – Effects of other government activities

Is the waste from other government environmental or non-environmental activities or programmes properly managed? Do the public ministries, departments and agencies manage the waste created by activities under their authority?

[65] Implementation Guidelines for Performance Auditing Standards Exposure draft, page 10

5.2. Choose a focus

When choosing a focus for the audit, the type of waste, stage in the waste stream and the audit topic should be taken into account. This gives three dimensions to the choice of focus of an audit topic, illustrated in the figure below.



Graphic depiction of the three dimensions behind an audit focus

The figure gives the auditors an overview of the most pressing areas to look at and of possible approaches. Examples of questions derived from these three dimensions are:

- Is there a policy in our country for the prevention of hazardous waste?
- Is the legislation relating to the treatment of solid waste in compliance with the environmental policy?
- Is there adequate monitoring of the disposal of radioactive waste?

5.3. Next step of auditing waste: the life cycle approach

- As waste policies in many countries are increasingly targeted towards the entire life-cycle of a product, sustainable waste management with a life-cycle approach will for many SAIs constitute the next step of focus for auditing waste management.

6. Step 5 - Possible audit methodology for carrying out a waste audit

6.1. Basic audit methodologies applied on waste management

6.1.1. Analysis government documents

6.1.2. Statistical/quantitative analysis

- E.g. financial analysis of feasibility studies

6.1.3. Interviews

6.1.4. Questionnaires

6.1.5. Comparative analysis

- Useful tool to establish benchmarks. May be used to compare regions within a country, or compare national waste management with other countries.
- Random selection of object of investigation: (mainly used when comparing units at regional level). Leads to the inclusion of regions with limited activity and which normally are excluded from audits.

6.2. Innovative methods

6.2.1. Twinning projects:

- Participation of an experienced auditor from another SAI

6.2.2. Delphi method:

- Consulting an expert panel in order to identify/ predict future developments.

6.2.3. Public opinion

6.2.4. Project management analysis:

- E.g. Analysis of cost calculations applied to selection of projects, compliance with legal obligations in procurement processes, risk factors associated with project implementation and goal attainment.
- Life Cycle Assesments (LCA), Material Flow Analysis (MFA) and the principle of 'industrial synergies'

6.2.5. Web-monitoring

6.2.6. Tracking

6.2.7. GIS?

6.2.8. Crowd-sourcing