

Guidelines for Framework Legislation for Integrated Waste Management

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Guidelines for Framework Legislation for Integrated Waste Management

PART 1: GUIDELINES

Introduction

The purpose of these Guidelines is to support countries with clear advice for their efforts to introduce or enhance their waste management legislation. The principles these the Guidelines are based on consider ways that waste can be diverted from release into the environment while providing for economic development that enhances social development to reinforce good environmental management within a supportive governance framework.

The Guidelines are not designed to be an exhaustive list of legislation from around the world. Instead, the Guidelines introduce a legislative framework for integrated waste management in Part 1, illustrated by some relevant examples in Part 2. The examples in Part 2 are chosen from the existing and tested practice (legislation), with the intent to demonstrate how some countries manage their legislative issues, and to provide discussion on aspects of different approaches. It is up to each country to devise legislation that is appropriate to their own situation. A wholesale 'cut and paste' is not recommended since it has been shown that it is doomed to failure.

It is paramount that each country embarking on development of the legislation goes through a process of establishing:

- The reason for development of the legislation (Why do we need it?)
- The purpose of the legislation (What do we want to achieve?)
- The best approach as appropriate for that country (How do we frame it best for OUR situation?)

It is hoped that the examples presented in part 2 might help to avoid the pitfalls that other countries have experienced in their journey towards sustainable waste management and a circular economy.

These legislative framework Guidelines can be used by countries at any stage of development of their legislative programme, from the very initial move from 'dumping to disposal', through to implementing a circular economy.

The Guidelines are presented in a way that mirrors sections commonly found in this type of legislation. The Definition section is in alphabetical order and the other sections have provisions listed in a suggested order of appearance in legislation.

A fuller discussion of the definitions and provisions introduced in Part 1 of the Guidelines is given in Part 2: Technical Reference Material. The material in both parts is set out in an order that mirrors recommended order for potential sections in legislation.

These Guidelines were produced with the input from legal and policy experts from the following countries: Bhutan, Cambodia, Ghana, Honduras, Jamaica, Mauritius, Mongolia, Myanmar, Nepal, St Lucia, Thailand, Uganda and Uruguay.

Objective of the Guidelines

To build capacity in legislative development in the critical area of integrated waste management leading to a circular economy.

Scope

These Guidelines take an integrated approach by including solid, liquid, gaseous and energy wastes.

Target Group

The target group for these Guidelines are those responsible for development of waste legislation, as well as everyone involved in the life cycle of products: politicians and officials in national and local government; non-government organisations; manufacturers and importers; consumers; and the waste industry.

Principles

These Guidelines adopt the following principles, guided by the United Nations Sustainable Development Goals¹, especially Goal 12 (Sustainable Consumption and Production):

- Adopting a **sustainable development** approach including climate change considerations and implementation of cleaner production;
- Taking actions that move society towards a **circular economy**;
- Operating proactively by using the **precautionary principle** – “*where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation*”²;
- Embracing **intergenerational equity** so that the Earth is held in trust for future generations while, at the same time, current beneficiaries are entitled to use and benefit from it;
- Supporting **polluter pays**, so that those who cause pollution pay for it;
- **Internalising externalities** by paying for all the associated environmental costs of polluting activities;
- Encouraging **stakeholder participation** to give those who are affected by actions a voice to influence decisions;

¹ <https://sustainabledevelopment.un.org/?menu=1300>

² <http://www.unep.org/Documents.multilingual/Default.asp?DocumentID=78&ArticleID=1163>

- Enabling increased **access to information** for people to be better informed about waste management activities in the country;
- Supporting **environmental justice** with respect to the development, implementation, and enforcement of waste management laws; and
- Adopting a **life cycle approach** to waste management.

For a full listing of the contribution of integrated waste management legislation to the sustainable development goals see Appendix 1.

Definitions

Definitions are a cornerstone in the development of legislation and regulations. Hence, definitions need to be clear, certain and precise. Definitions vary between legislation between countries, and even within a country, depending on the needs of the legislators. For example, the definition of waste is crucial to applicability of proposed legislative coverage. The definition also needs to ensure compliance with relevant international conventions and treaties. Different countries have defined waste in different ways to minimise the problems in the areas they find important. An extensive discussion on waste and other definitions is found in Part 2.

Provisions

Waste Strategy

States should include provisions for mechanisms to manage implementation of their waste strategy. A waste strategy is a policy document designed to foster a move to sustainability in waste management. The salient provisions cover: responsibility and content; consultation; environmental protection; infrastructure requirements; transboundary considerations; the waste management hierarchy; and information.

1. Responsibility for strategy preparation rests with national government officials or the minister and the strategy should include details on the waste(s) to be managed, technical requirements and special requirements for particular wastes.
2. Consultation during the development of the strategy is vital for developing a coherent and workable strategy. Dialogue needs to include stakeholders in the sectors contributing to waste management, including non-traditional actors (e.g. criminal elements where they are significant contributors).
3. Environmental protection should be included encompassing all media as well as climate change considerations.
4. The infrastructure needed to deliver on the strategy is an important aspect.
5. Transboundary considerations are relevant where countries border one another or are close to one another. This not only includes forests and rivers, but also consideration of economies of scale to process materials (e.g. e-waste) regionally in accordance with relevant international treaties and conventions.

6. Waste strategy actions should be considered according to the waste management hierarchy³ preferring waste minimisation processes before disposal options.
7. The availability of information on the results of the waste strategy outcomes is important. The use of targets and monitoring progress towards reaching them is encouraged. An appropriate publically searchable database should be part of information availability to provide transparency to the process as well as providing identification of barriers to reaching targets.

Infrastructure Planning

States should undertake infrastructure planning to provide the setting for waste management planning in their areas so that activities that produce harmful environmental effects and the effects of major accidents are separated from the zones used for residential and recreational purposes.

Waste Management Plans

States should encourage local government to develop waste management plans to provide national-local continuity and act as a blueprint to achieve waste management aims in a structured way. The plans should be arrived at through a consultative process and provide an assessment of the current situation as well as planning for future needs and actions based on consideration of the waste management hierarchy. It is important to have timely, relevant plans detailing responsibilities and inbuilt monitoring and evaluation processes.

Waste Management Hierarchy

The waste management hierarchy should be included in legislation to give a common language for a state or group of states. A waste management hierarchy is a prioritising mechanism to encourage business to move their management from products to cleaner production measures. There is no single hierarchy but the UNEP hierarchy⁴ of prevention, reduction, recycling, recovery and disposal is a suitable default one. The guiding philosophy for waste management hierarchies is that those actions at the top are preferable to those lower down. Adoption of cleaner production principles by industry can assist achievement of waste minimisation.

States should encourage business to adopt best available technologies best suited to their situation, to reduce or effectively manage waste materials. For developing states these technologies are often low cost and low maintenance.

Prevention

Prevention is the most desirable waste option since, if waste is not generated it does not need to be managed.

³<http://www.unep.org/ietc/Portals/136/Publications/Waste%20Management/UNEP%20NWMS%20English.pdf> p18

⁴<http://www.unep.org/ietc/Portals/136/Publications/Waste%20Management/UNEP%20NWMS%20English.pdf> p18

Reduction

Business should be encouraged to adopt cleaner production practices to reduce waste. Waste reduction is the second most desirable option since this results in less waste needing to be managed.

Reuse

Business should be encouraged to adopt durability in the design phase of products to increase reuse of those products. Consumption-based societies rely on a high throughput of products to maintain the standard of living resulting in higher waste quantities.

Recycling

States should promote recycling of products whereby old products are remanufactured to produce new ones. State procurement can provide a significant lever to encourage the recycling industry. The saving in material and energy resources through recycling can be considerable.

Recovery

States should promote the recovery of materials by separation before disposal operations. Energy recovery comes under this category whereby materials are combusted, pyrolysed or gasified. An alternative to combustion is anaerobic digestion to produce methane which can be used as an energy source.

Treatment

States should promote treatment of waste before disposal. Treatment includes any physical, biological or chemical process to change a waste's volume or character so the waste can be disposed of with no or reduced environmental effects, but does not include dilution of waste.

Disposal

States should promote environmentally sound disposal for unwanted materials when all other waste minimisation options are exhausted. The object of disposal is to remove all unwanted materials from the circular economy for a final, safe storage or release into the environment.

All three media (solid, liquid and gas) should be included in disposal activities which ensure that the transfer of pollutants from one medium to another cannot be a claim for good practice.

Environmentally sound disposal should be priced since a pricing signal is necessary to incentivise waste minimisation by the waste generator. A further measure to encourage environmentally sound disposal is to licence facilities and operators.

Extended Producer Responsibility & Product Stewardship

States should promote extended producer responsibility and/or product stewardship programmes to recognise that someone or group has responsibility for waste and its management. These sorts of programmes provide an opportunity to use multiple tools to best manage products at the end of their lives.

Use of Economic Measures

States should use a variety of economic measures in waste management to improve the efficiency of the system and internalise the costs so that they are borne by those who create the waste, and therefore move towards a sustainable waste management system.

Typical economic measures provide for disposal levies and funding mechanisms which work synchronously to deter waste production and fund waste minimisation programmes.

Environmental Aspects of Waste

States should strive to reduce the environmental burden of business activities. Legislation covering the reduction of adverse environmental effects caused by waste is commonly included in more broad-based legislation, but if not, can be included in specialised waste legislation.

Performance of environmental impact assessments for proposed activities is critical to enable decision-makers in local or national government to assess the potential environmental effects and assist planning for environmental emergencies and disasters, particularly where hazardous substances are involved.

States should be particularly vigilant in managing transboundary waste to eliminate dumping of waste, which often ends up in developing countries producing long term environmental and economic costs on those countries.

Responsibilities in Waste Management

States should ensure that they encourage mobilisation of abilities to address challenges, recognise opportunities and reap the benefits of environmentally sound waste management. Critical to improving waste management capacity is cooperation between national and local government and recognition that the private sector is a key actor.

Auditing and Reporting

States should set up a comprehensive auditing and reporting system to evaluate the effectiveness of programmes and controls and provide data to enable decision-makers to make better choices. Ongoing monitoring of activities provides for timely data which can translate into effective measures to improve the efficiency of the system.

Measures for Compliance and Enforcement

States should set up comprehensive compliance and enforcement measures to ensure that integrated waste management systems are effective. Compliance includes licensing of operators and premises to ensure that best practices are adopted. Enforcement results when compliance measures fail and can include abatement notices, court orders, fines and remediation costs.

PART 2: TECHNICAL REFERENCE MATERIAL

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PURPOSE OF PART 2

The June 2012 United Nations Conference on Sustainable Development adopted a call for countries to develop and enforce comprehensive national and local waste management policies, strategies, laws, and regulations⁵. The call was a response to the challenges presented by unsustainable production and consumption, including the unsustainability in waste generation. Increasingly, that challenge will need to be faced most acutely in developing countries.

The 2013 United Nations Environment Programme publication *Guidelines for National Waste Management Strategies: Moving from Challenges to Opportunities*⁶ provided a conceptual and methodological framework for national planning that countries may adapt to their particular circumstances. The document makes the strong case for the development and adoption of national waste management policies. The Guidelines consider the various policy tools:

- executive decision-making;
- regulation and enforcement;
- the application of economic instruments;
- education of producers, consumers, the general public, and others;
- voluntary understandings with groups in industry and the commercial sector;
- the harnessing of the energy and commitment of the community and the non-government sector; and
- collection of information and data;

A resultant strategy is the combination of the above tools. Inevitably, a legislative response is needed to provide clarification on: authorisation, prohibition, funding, sanctions, declarations or restrictions of practices.

The Guidelines were written with the following factors in mind:

- Legislation is one component of the policy toolbox and needs to be used in conjunction with the other tools as outlined in the UNEP Guidelines⁷.
- There is a progression in waste management that starts at disposal goes on to single medium integration, multimedia integration and then to a circular economy.
- The guidelines are a set of building blocks. The components can be used individually as well as a stepping stones for countries such as:
 - Initial waste management legislation;
 - Adding new Acts to a suite of current legislation;
 - Supplementing current legislation with added clauses and parts; and
 - Developing a circular economy for where there is no waste legislation.
- Countries have different approaches that must fit in to their culture.

⁵ http://www.un.org/disabilities/documents/rio20_outcome_document_complete.pdf

⁶ <http://www.unep.org/ietc/Portals/136/Publications/Waste%20Management/UNEP%20NWMS%20English.pdf>

⁷ <http://www.unep.org/ietc/Portals/136/Publications/Waste%20Management/UNEP%20NWMS%20English.pdf>

- Local government is a key implementer of waste management. They should strive towards urban environments that are agents to balance emissions within an urban area. For this to occur economic development must enhance social development to reinforce environmental management within a supportive urban governance framework.
- Each sector in a country has a different perspective to legislative provisions and they should be involved in the decision-making process.

These technical guidelines draw on 15 pieces of legislation that have been developed by seven countries in their efforts to provide a more holistic solution to interrelated waste problems that have been seen in their own countries. A number of the pieces of legislation do not, in themselves, take a multi-media approach. However, when examined as a package with other legislation, they provide a basket that encompasses all media. Some of the legislation is process oriented and others are effects based. Both approaches can be utilised and successful implementation is mainly dependent on the cultural context to which it is introduced. The countries and the legislation summarised in these guidelines are:

- Brazil – National Solid Waste Policy (2010);
- Canada – Environmental Protection Act (1999);
- Germany – Circular Economy Act (2012); Federal Immission Control Act (2002);
- Japan – Basic Act for Establishing a Sound Material-Cycle Society (2000)
- Netherlands – Environmental Management Act (2004);
- New Zealand – Resource Management Act (1991); Waste Minimisation Act (2008); Hazardous Substances and New Organisms Act (1996); Resource Management (National Environmental Standards for Air Quality) Regulations (2004);
- United Kingdom – Clean Air Act (1993); Environmental Protection Act (1990); Pollution Prevention and Control Act (1999)
- United States of America – Pollution Prevention Act (1990); Resource Conservation and Recovery Act (1976).

HOW TO USE THE GUIDELINES

Legislation can either provide the foundation to integrated waste management or as a supplement to a strategy with voluntary, informational and educational programmes that are already running in a country. Waste legislation should be recognised as being one tool and not a silver bullet. It must be formulated within the political, economic, social, cultural, institutional and environmental constraints of a country.

These guidelines are not designed to be an exhaustive list of legislation from around the world. Instead they are designed to give examples of how some countries have managed their legislative issues and provide discussion on some of the points for each approach. It is up to each country to devise legislation that is appropriate to their own situation and it cannot be stressed enough that a wholesale 'cut and paste' is doomed to failure. It is paramount that each country embarking on the legislative process goes through a process of:

- Why do we need it?
- What do we need?
- How do we frame it best for OUR situation?

and using the examples, try to avoid the pitfalls that other countries have experienced in their journey towards a circular economy.

To get consistency within these guidelines, a number of terms have been used to define responsibilities or waste management responses that may differ from those used in some countries. The terms are shown in the text as '[term]'. Countries wanting to adopt or adapt relevant clauses can then add in their own appropriate label. The terms are:

- **National government:** national government departments, agencies, entities, chief executive, minister.
- **Local government:** anything less than national government (e.g. state, province, region, municipality)
- **Waste minimisation or minimisation or minimise:** a collective term for prevention, reduction, recycling or recovery. Also recovery and reclamation become minimisation when not used in the sense of the UNEP Guidelines⁸.
- **Waste Management Hierarchy:** The one used in these guidelines conforms to the definition used in the UNEP Guidelines⁹.

These legislative framework guidelines can be used by countries at any stage of development of their legislative programme from the very initial move from dumping to disposal, through to implementing a circular economy. The guidelines are set out in a way that mirrors sections found in legislation. The definition section is in alphabetical order and the other sections have provisions listed in a suggested order of appearance in legislation. The ten sections are:

⁸<http://www.unep.org/ietc/Portals/136/Publications/Waste%20Management/UNEP%20NWMS%20English.pdf> p51

⁹<http://www.unep.org/ietc/Portals/136/Publications/Waste%20Management/UNEP%20NWMS%20English.pdf> p18

- Definitions
- General Provisions
- Circular Economy
- Extended Producer Responsibility / Product Stewardship
- Use of Economic Instruments
- Environmental Aspects of Waste
- Responsibilities in Waste Management
- Auditing and Reporting
- Measures for Compliance and Enforcement

At the end of each definition is a list of related terms to give guidance to policymakers on how terms relate to one another. At the end of each provision is a list of definitions that relate to that provision as well as a list of international conventions that relate to the topic above.

It is anticipated that countries will use the clauses within sections as ideas for building blocks to craft legislation that meets their own needs. Figure 1 below shows the concept of the progression of waste from disposal to a circular economy.

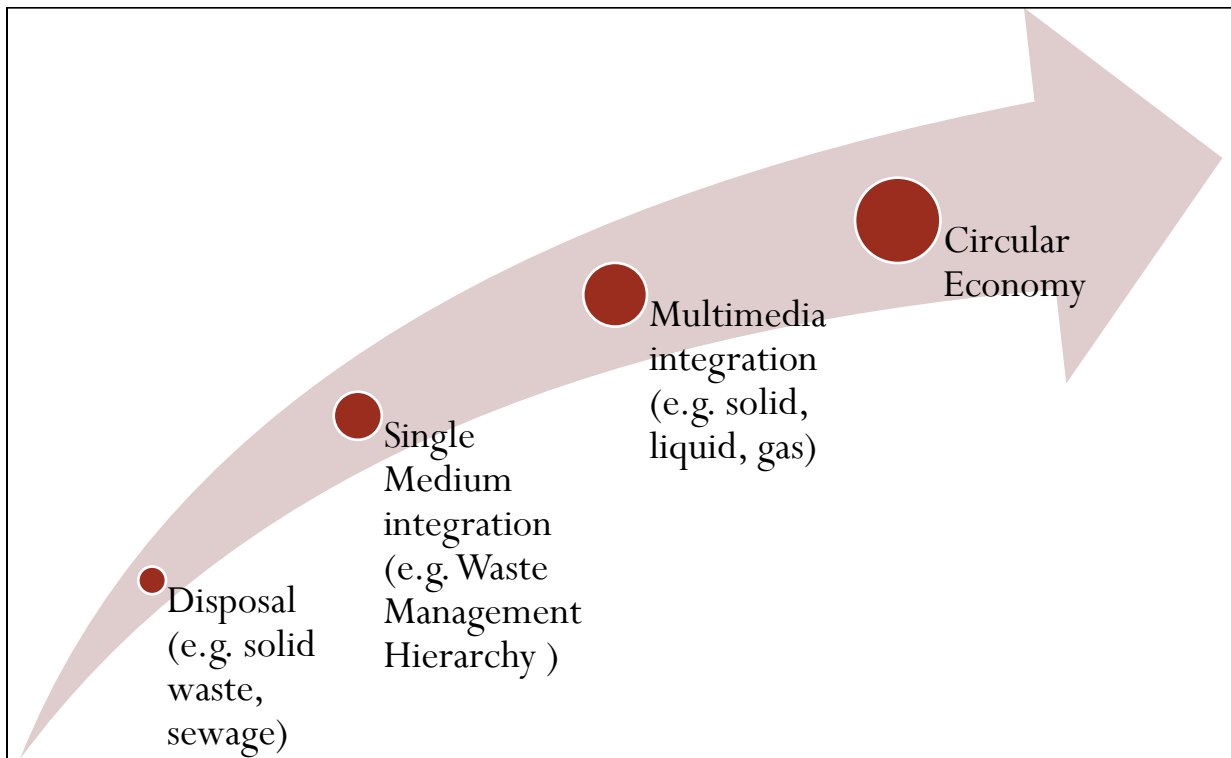


Figure 1: The progression of waste from disposal to a circular economy

DEFINITIONS

Definitions are a cornerstone in the development of legislation and regulations. In defining a word or phrase legislators provide scope to the application of the word or phrase. Definitions can vary between legislation and even within the same piece of legislation. Hence their application is crucial to legislators, implementers and those affected by the legislation.

The definitions below provide some guidance to common waste-related definitions as well as discussion on the effects of the definitions adopted in different jurisdictions.

Air

Consideration of air as one of the three media is fundamental to integrated waste management. While it is obvious that air is the invisible gaseous mixture that surrounds the earth, a useful definition of air from a legislative perspective defines air as being the mixture of gases both inside and outside buildings as well as above and below ground. This sort of definition enables monitoring and control of substances emitted into the atmosphere, regardless of their origin and location, thus providing for environmental and health benefits. An example of such a definition is found in the UK Pollution Prevention and Control Act (1999)¹⁰, shown below.

Air includes air within buildings and air within other natural or man-made structures above or below ground.

Related Definitions: Air Pollution, Best Available Techniques, Cleanfill, Contaminant, Contaminated Land, Dark Smoke, Disposal, Dumping, Emissions, Environment, Environmental Pollution, Harm, Hazardous Waste, Immissions, Industrial Waste, Land-based Sources, Landfills, Multimedia, Preparing for reuse, Recycling, Release, Reuse, Sustainable Management, Waste.

Air Pollution

The presence of pollutants in the air can have environmental, social and economic effects. Due to the wide ranging effects of air pollution and the often lengthy period between exposure and the emergence of effects, making the case for priority actions on air pollution can be difficult. Studies continue to confirm the costs of the economic impact due to the health effects (e.g. premature deaths cost Europe US\$ 1.4 trillion and the overall economic costs of health impacts and mortality from air pollution, including morbidity costs, are US\$ 1.6 trillion¹¹). Furthermore, UNEP estimates urban air pollution costs 2% of GDP in developed countries and 5% in developing countries¹². Hence, the economic costs are well established.

¹⁰ <http://www.legislation.gov.uk/ukpga/1990/43/data.pdf>

¹¹ http://www.euro.who.int/_data/assets/pdf_file/0004/276772/Economic-cost-health-impact-air-pollution-en.pdf

¹² http://www.unep.org/urban_environment/Issues/urban_air.asp

Air pollution can be defined as any change from natural conditions taking into account the sorts of emissions that are most likely to cause air pollution. The two approaches to a definition for air pollution are substances based or effects based. An example of a substances-based approach is found in the German Federal Immission Control Act (2002)¹³ below. The advantage of this definition is that it is specific in that it targets the pollutants that are most likely to necessitate action from authorities and emitters.

Air pollution means any change in the natural composition of the air, especially through smoke, soot, dust, gases, aerosols, steam or odorous substances.

The disadvantage of the above definition is that it does not allow for future types of emissions that the legislators did not think about when the legislation was enacted. An example of a definition that focuses on the effects of the pollutants such as health, safety, welfare, enjoyment, damage and ecosystem change is found in the Canadian Environmental Protection Act (1999)¹⁴ shown below. The advantage of this definition is that it accentuates the effects on the planet, making it easier for the public to emotionally engage. However, the difficulty in this definition is that it gives no indication what substances can cause these effects and relies on scientific expertise to determine the inclusion or exclusion of substances.

Air pollution means a condition of the air, arising wholly or partly from the presence in the air of any substance, that directly or indirectly:

- endangers the health, safety or welfare of humans;
- interferes with the normal enjoyment of life or property;
- endangers the health of animal life;
- causes damage to plant life or to property; or
- degrades or alters, or forms part of a process of degradation or alteration of, an ecosystem to an extent that is detrimental to its use by humans, animals or plants.

Related Definitions: Air, Emissions, Immissions, Recycling, Waste.

Best Available Techniques / Best Practical Option

Best available techniques and best practical options are, for all practical purposes, synonyms. Both are used when the intention is to protect the environment in a way that can be economically justified.

Both consider the technology as well as the life cycle of the installation (design, build, operate, maintain, decommission) that is in operation. The practicality or availability refers to the technology being developed to a scale that allows for industrial implementation and being technically viable to the conditions that it is being deployed into. The last factor is particularly important, since what is normal practice in one country may not be in another (e.g. maintenance of machinery). The technology has to be manageable in the context to which it is introduced in a

¹³ http://www.bmub.bund.de/fileadmin/bmu-import/files/english/pdf/application/pdf/bimschg_en_bf.pdf

¹⁴ <http://laws-lois.justice.gc.ca/PDF/C-15.31.pdf>

way that is most effective to achieve a high level of protection for air, water and soil. This may mean not installing the latest technology on the market, but rather something that is easy to construct, operate and maintain (especially the ready availability of spare parts).

An example of a definition for best available techniques is found in the German Circular Economy Act (2012)¹⁵ shown below.

Best available techniques means the level of development of advanced processes, installations or modes of operation that gives a general reliable, positive indication of the practical suitability of relevant measures for limiting emissions into the air, water and soil, for protecting installation safety, for ensuring that waste management is environmentally compatible or for preventing or reducing environmental impacts in other respects, in the interest of achieving a generally high level of overall environmental protection.

A definition can also consider what happens from discharge of a contaminant (including noise emissions) when the focus is to minimise any adverse effects on the environment. The four operational aspects of: the sensitivity of the receiving environment; the financial implications; the state of knowledge; and the likelihood of successfully implementing a proposed option need consideration. An example of this is found in the NZ Resource Management Act (1991)¹⁶ shown below.

Best practicable option, in relation to a discharge of a contaminant or an emission of noise, means the best method for preventing or minimising the adverse effects on the environment having regard, among other things, to:

- the nature of the discharge or emission and the sensitivity of the receiving environment to adverse effects; and
- the financial implications, and the effects on the environment, of that option when compared with other options; and
- the current state of technical knowledge and the likelihood that the option can be successfully applied.

The German definition focuses on the techniques while the NZ definition highlights the effects on the environment. Both can achieve the same result.

Related Definitions: Air, Contaminant, Effect on the Environment, Emissions, Immissions.

Biowaste

A major component of the waste stream is biodegradable material, principally consisting of garden and kitchen waste. Biowaste in a landfill produces environmentally harmful substances such as leachate and the global warming gas methane. Removal of biowaste from the waste

¹⁵ http://www.bmub.bund.de/fileadmin/Daten_BMU/Download_PDF/Abfallwirtschaft/kreislaufwirtschaftsgesetz_en_bf.pdf

¹⁶ <http://www.legislation.govt.nz/act/public/1991/0069/latest/DLM230265.html>

stream to produce, for example compost, provides a useful input to the circular economy. A useful side effect of removal of biowaste is that it also removes the odorous part of the waste stream which can mean that the remaining part does not need to be collected as often. A definition of biowaste is found in the German Circular Economy Act (2012)¹⁷ as shown below.

Bio-waste shall be biodegradable plant or animal waste or biodegradable waste consisting of fungoid material, such as:

- garden and park waste;
- landscape management waste;
- food and kitchen waste from households, restaurants, caterers and retail premises and comparable waste from food processing plants; and
- waste from other areas of origin comparable to the [above] waste, by type, nature or material characteristics.

Related Definitions: Waste Collection.

Certified Waste Management Company

Regulation of the end-of-life processing of unwanted materials is a sound step to move from a dumping society to a disposal society. For developing countries regulation can mean a significant step forward in the control of the final destination of waste. Regulating the industry means regulating the whole end-of-life network from collection, transportation, processing and disposal. It should be noted that waste management companies can operate in the whole network or only some parts of it.

Enforcement of these regulations can be by national government, local government, trade associations or some combination. The advantage of national government managing the process is that it provides consistency across the country, but the scale of monitoring large numbers of individual companies requires significant deployment of resources. The monitoring and administration of the processes are best carried out by either local government or the industry itself, depending on the trustworthiness and maturity of the industry.

National government needs to set the standards. Allowing local government or a trade association to regulate waste management companies without national government setting the standards opens up the potential for undesirable practices like neighbouring local governments having different standards of certification and trade industries having a very low hurdle for acceptance. In the first case, waste companies are likely to engage in waste flight – where they will transport waste across local government jurisdictions to where it is most economic to dispose of the waste (and may have the lowest standards). With trade industries operating the certification system there can be a tendency to fix the standard based on the pressure exerted by the largest company or companies to suit their own needs.

¹⁷http://www.bmub.bund.de/fileadmin/Daten_BMU/Download_PDF/Abfallwirtschaft/kreislaufwirtschaftsgesetz_en_bf.pdf

A definition of a certified waste management company is found in the German Circular Economy Act (2012)¹⁸ shown below. Note that local or national government can be substituted for 'certified waste management company/companies' in the second bullet point in the definition to provide for more control by government.

Certified waste management company means a company which:

- collects, transports, stores, treats, recovers, disposes of, trades or deals in waste on a commercial basis, in the context of economic enterprises or public facilities, and
- is certified in relation to one or several of the activities as a Certified Waste Management Company by a technical supervisory organisation or a Community of Certified Waste Management Companies.

Related Definitions: Disposal, Recovery, Treatment, Waste, Waste Management.

Circular Economy

The development of a circular economy is an aspirational target for many countries. To achieve a circular economy requires that the economy is restorative to the earth which means allowing for organics to safely re-enter the biosphere and other products are of such high quality that they continually circulate without impacting the biosphere. The German Circular Economy Act (2012)¹⁹ definition focuses on the waste aspect of circular economy, as shown below.

Circular economy means the [minimisation] of waste.

The Japanese Basic Act for the Establishment of a Sound Material-Cycle Society (2000)²⁰ describes a circular economy in terms of a sound material-cycle society and provides a more descriptive definition as shown below.

[Circular economy] means a society in which the consumption of natural resources will be conserved and the environmental load will be reduced to the greatest extent possible, by preventing or reducing the generation of wastes, etc. from products, etc., by promoting proper cyclical use of products, etc. when these products, etc. have become circulative resources, and by ensuring proper disposal of circulative resources not put into cyclical use.

Both definitions can provide the same outcome with the Japanese definition more explicit on the factors that make up a circular economy.

Related Definitions: Best Available Techniques/Best Practical Option, Biowaste, Certified Waste Management Company, Circulative Resources, Cyclical Use, Discarding, Disposal, Inert

¹⁸ http://www.bmub.bund.de/fileadmin/Daten_BMU/Download_PDF/Abfallwirtschaft/kreislaufwirtschaftsgesetz_en_bf.pdf

¹⁹ http://www.bmub.bund.de/fileadmin/Daten_BMU/Download_PDF/Abfallwirtschaft/kreislaufwirtschaftsgesetz_en_bf.pdf

²⁰ <https://www.env.go.jp/en/laws/recycle/12.pdf>

Waste, Effect on the Environment, Landfills, Preparing for reuse, Prevention, Recovery, Recycling, Resource Conservation, Reuse, Treatment, Waste, Waste Management.

Circulative Resources

These are defined as resources that can be extracted from waste materials with the intention that they will recirculate through the economy through the waste minimisation processes of reduction, recycling or recovery. An example of this is found in the Japanese Basic Act for the Establishment of a Sound Material-Cycle Society (2000)²¹ shown below.

Circulative Resources means useful things among wastes. (JB)

Related Definitions: Air, Air Pollution, Circular Economy, Cyclical Use, Discarding, Diverted Material, Preparing for Reuse, Recovery, Recycling, Reduction, Reuse, Waste, Waste Minimisation.

Cleanfill

Cleanfills can be used as low-cost alternatives to landfills for “inert” waste that will have potentially no adverse environmental effect, or only minor effects. The lack of an environmental effect is the crucial difference to landfills. Since the disposal site will have a much lower impact on the environment, a cleanfill site selection process can be less stringent. Liner construction, leachate collection systems and gas control systems are unnecessary so environmental monitoring can be reduced to checking on the materials that come into the cleanfill. Thus, the cost of establishing and operating a cleanfill is much lower compared to a landfill.

Some materials from construction and demolition activities typically meet the criteria to have a low to no environmental impact. Acceptable materials generally comprise soil, rock, concrete, bricks and similar inert material.

The criteria that limit the waste that is accepted provides the primary environmental control for a cleanfill. Waste acceptance must be actively monitored and enforced for effective control during the operational period of the cleanfill. One drawback is that without effective control, irresponsible waste operators can dispose of non-cleanfill waste at a low dumping cost resulting in much greater costs to society for later clean up.

An example of a cleanfill definition is found in the NZ Resource Management (National Environmental Standards for Air Quality) Regulations (2004)²², shown below.

Cleanfill means a landfill that accepts only material that, when buried or placed, will not have an adverse effect on the environment; but does not include a landfill that contains 5% or more (by weight) putrescible matter.

²¹ <https://www.env.go.jp/en/laws/recycle/12.pdf>

²² <http://www.legislation.govt.nz/regulation/public/2004/0309/latest/DLM286835.html>

Related Definitions: Air, Effect on the Environment, Inert Waste, Landfill.

Cleaning Product

Nutrient enrichment has arguably become the planet's most widespread water quality problem²³. Nitrogen and phosphorus compounds are typically the agents increasing the rates of production of plant matter through photosynthesis. This starts a cycle of overgrowth of vascular plants, algal blooms and dissolved oxygen depletion, stressing and killing organisms. In addition, some algae and cyanobacteria can produce toxins that can affect humans, livestock and wildlife. The results are that over the long term species requiring higher levels of oxygen can be eliminated from bodies of water.

Cleaning products, in particular, are artificial substances that can contain high levels of phosphates in the form of water softeners and surfactants to assist removal of soil, oil and grease. Identification and elimination of the widespread use of products containing phosphates has been high on the agenda of industrialised countries wanting to reduce environmental impacts. An example of a definition of cleaning product is found in the Canadian Environmental Protection Act (1999)²⁴, shown below.

Cleaning product means a phosphate compound or other substance that is intended to be used for cleaning purposes, and includes laundry detergents, dish-washing compounds, metal cleaners, de-greasing compounds and household, commercial and industrial cleaners. (CC)

Related Definitions: n/a

Climate Change

The earth's climate is constantly changing. What has become important in recent years is the climate change that can be attributed to human activity and consequently measures to reduce the impacts of humans on the change. Estimates show that waste is responsible for about 5% of global carbon emissions²⁵. A definition of climate change that focuses on human activity is found in the NZ Resource Management Act (1991)²⁶, shown below.

Climate change means a change of climate that is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and that is in addition to natural climate variability observed over comparable time periods.

Related Definitions: Emissions, Immissions, Waste.

²³ http://www.unep.org/PDF/Clearing_the_Waters.pdf

²⁴ <http://laws-lois.justice.gc.ca/PDF/C-15.31.pdf>

²⁵ <http://www.unep.org/climatechange/mitigation/Waste/tabid/104349/Default.aspx>

²⁶ <http://www.legislation.govt.nz/act/public/1991/0069/latest/DLM230265.html>

Commercial Waste

Commercial waste tends to be the waste associated with waste from shops and offices. A study from the United States²⁷ showed that commercial waste tends to have high levels of paper, organics and plastics in the 18 – 21% range for each. By comparison, household wastes tended to have higher organic content (29%) and lower paper (17%) and plastics (13%). Industrial wastes tend to be more homogenous with often only one or two types of waste involved.

An example of a definition for commercial waste is found in the UK Environmental Protection Act (1990)²⁸, shown below.

Commercial Waste means waste from premises used wholly or mainly for the purposes of a trade or business or the purposes of sport, recreation or entertainment excluding:

- household waste;
- industrial waste; and
- waste of any other description prescribed by regulations made by [national government].

Related Definitions: Biowaste, Controlled Waste, Household Waste, Industrial Waste, Waste.

Contaminant

Contaminants, for example some chemicals, are being found in the biosphere in small quantities, but sufficient to cause concern due to their environmental effects (e.g. polybrominated diphenyl ethers which act as endocrine disruptors²⁹). Contaminants can exhibit a wide range of effects (e.g. endocrine disruption, land acidification and water temperature elevation) as well as having a wide range of concentrations (from parts per trillion to mega-parts per unit). A wide ranging definition of contaminant ensures the ability to capture all potential targets. An example of such a definition is found in the NZ Resource Management Act (1991)³⁰ shown below.

Contaminant includes any substance (including gases, odorous compounds, liquids, solids, and micro-organisms) or energy (excluding noise) or heat, that either by itself or in combination with the same, similar, or other substances, energy, or heat:

- when discharged into water, changes or is likely to change the physical, chemical, or biological condition of water; or
- when discharged onto or into land or into air, changes or is likely to change the physical, chemical, or biological condition of the land or air onto or into which it is discharged.

²⁷ <http://www.co.thurston.wa.us/solidwaste/regulations/docs/ThurstonCountyWasteComp-08-09.pdf>

²⁸ http://www.legislation.gov.uk/ukpga/1990/43/pdfs/ukpga_19900043_en.pdf

²⁹ <http://water.epa.gov/scitech/cec/>

³⁰ <http://www.legislation.govt.nz/act/public/1991/0069/latest/DLM230265.html>

Rather than specify the types of compounds, the definition above approaches the definition from the point of view of what the potential effects on the environment will be if the contaminant is released.

Related Definitions: Air, Air Pollution, Best Available Techniques, Discharge, Effect on the Environment, Reduction, Release.

Contaminated Land

Contaminated land contains substances on or below the land that are hazardous to health or the environment. Typical contaminated land can have a history of agricultural use or industrial production such as mining, industry, chemical and oil spills as well as dumping sites. These places are commonly known as brownfield sites. It should be noted that contamination can also occur naturally due to the geology of the area.

The definitions below do not differentiate between natural and human contamination. The first definition from the NZ Resource Management Act (1991)³¹, shown below, refers to hazardous substances and the effects on the environment (land, water or air).

Contaminated land means land that has a hazardous substance in or on it that:

- has significant adverse effects on the environment; or
- is reasonably likely to have significant adverse effects on the environment.

In this definition there is an obligation to show that a hazardous substance is present (in concentrations that are potentially hazardous).

A slightly different definition is found in the UK Environmental Protection Act (1990)³², shown below, where local government determines that the presence of hazardous substances causes harm to the land or pollutes water.

Contaminated land is any land which appears to [local government] in whose area it is situated to be in such a condition, by reason of substances in, on or under the land, that:

- significant harm is being caused or there is a significant possibility of such harm being caused; or
- pollution of controlled waters is being, or is likely to be, caused.

it should be noted here that controlled waters in this context include territorial, coastal, inland and ground waters and that the definition is silent on atmospheric effects from the substances.

Related Definitions: Air, Effect on the Environment, Environment, Harm, Remediation.

³¹ <http://www.legislation.govt.nz/act/public/1991/0069/latest/DLM230265.html>

³² http://www.legislation.gov.uk/ukpga/1990/43/pdfs/ukpga_19900043_en.pdf

Controlled Waste

Under this definition wastes are regulated due to their toxicity, their hazardous nature or their capability to do harm to human health or the environment. The effects can show up either immediately or in the future. A prime concern is the effects of degradation from biological or biochemical sources and the by-products generated. A definition from the UK Environmental Protection Act (1990)³³ is shown below.

Controlled Waste means household, industrial and commercial waste or any such waste.

While this definition is found in the United Kingdom, many other countries have different terms for the same intent.

Related Definitions: Commercial Waste, Household Waste, Special Waste, Waste.

Cyclical Use

The idea of cyclical use is the ability for a product (or part of a product) to be used more than once at potentially different categories in the waste management hierarchy. As such, cyclical use encompasses the reuse part of reduction, recycling and recovery in the UNEP Guidelines³⁴. Cyclical use fits in well with the concept of a circular economy and associated words. An example of the definition is found in the Japanese Basic Act for the Establishment of a Sound Material-Cycle Society (2000)³⁵

Cyclical Use means reuse, reclamation [recycling], and heat recovery.

Related Definitions: Circular Economy, Circulative Resources, Reduction, Recovery, Recycling, Reuse, Waste Management Hierarchy, Waste.

Dark Smoke

Dark smoke comes from burning particularly fossil-fuel derived manufactured materials and items. Examples of such materials include coal, plastics, tyres, foams, paints and bituminous materials. The black smoke which is produced can be carcinogenic and is due to the incomplete combustion of the carbon. An example of a definition is found in the UK Clean Air Act (1993)³⁶, shown below.

Dark smoke means smoke that would be darker than shade 2 on the Ringelmann chart.

³³ http://www.legislation.gov.uk/ukpga/1990/43/pdfs/ukpga_19900043_en.pdf

³⁴ <http://www.unep.org/ietc/Portals/136/Publications/Waste%20Management/UNEP%20NWMS%20English.pdf> p51-52

³⁵ <https://www.env.go.jp/en/laws/recycle/12.pdf>

³⁶ http://www.legislation.gov.uk/ukpga/1993/11/pdfs/ukpga_19930011_en.pdf

The Ringelmann Smoke Chart, gives shades of grey (in 20% gradations, so 2 equates to 40% blackout) by which the density of columns of smoke rising from stacks may be compared³⁷.

There are many limitations to the use of the chart, as interpretation depends on the concentration of the particulate matter in the effluent, the size of the particles, the depth of the smoke column being viewed, natural lighting conditions such as the direction of the sun relative to the observer, and the colour of the particles.

While more sophisticated (and expensive) detection devices are available, the Ringelmann chart provides a quick, cheap indication of the density of smoke pollution.

Related Definitions: Air, Air Pollution.

Demonstration

A demonstration project is often part of the introduction of a new concept or artefact to the marketplace. It occurs after the development stage and before full-scale marketing for proving technological and economic feasibility. Governments have often encouraged innovation uptake by supporting demonstration projects and presenting them as case studies for general distribution and (hopefully) industry adoption. An example of a definition for demonstration is found in the US Resource Conservation and Recovery Act (1976)³⁸ shown below.

Demonstration means the initial exhibition of a new technology process or practice or a significantly new combination or use of technologies, processes or practices, subsequent to the development stage, for proving technological feasibility and cost effectiveness.

Related Definitions: n/a

³⁷ <http://www.cdc.gov/niosh/mining/userfiles/works/pdfs/ic8333.pdf>

³⁸ <https://www.law.cornell.edu/uscode/text/42/chapter-82>

Discarding

The act of releasing ownership of property can be a source of dispute, particularly if there is the perception or actualisation of value for goods. It is therefore necessary to define when ownership is relinquished.

Placing objects on the roadside for waste collection is one possible determinant, but it becomes more uncertain if the waste is collected from inside a property. The German Circular Economy Act (2012)³⁹, shown below, provides an example of a definition.

Discarding means that the holder presents substances or objects for recovering or for disposal or when the holder gives up actual physical control over the property and it no longer serves any purpose.

A wider definition of discarding can encompass activities higher up the waste management hierarchy including reuse, recycling, recovery as well as disposal, when the objects are transferred to premises owned by the same person. This could be used to potentially stop someone from stockpiling waste in, for example, warehouses or shipping containers where it can create a nuisance.

An example of this sort of definition is found in the Netherlands Environmental Management Act (2004)⁴⁰ shown below.

Discarding waste substances shall include:

- the [minimisation] or disposal of waste substances within the establishment where they originate;
- moving waste substances, for [minimisation] or disposal purposes, from an establishment to one situated elsewhere belonging to the same natural or legal person;
- transferring waste substances temporarily for [minimisation] purposes.

Related Definitions: Commercial Waste, Controlled Waste, Discharge, Disposal Facility, Diverted Material, Certified Waste Management Company, Cyclical Use, Deposit Scheme, Drop Off System, Dumping, Household Waste, Industrial Waste, Inert Waste, Landfills, Life cycle, Local Government, Recovery, Recycling, Reduction, Release, Reuse, Special Waste, Storage, Treatment, Waste Management, Waste Minimisation, Waste.

Discharge

Discharge is another form of discarding and disposal. It is sometimes useful to talk about discharges when referring to substances being emitted from a source either intentionally or

³⁹http://www.bmub.bund.de/fileadmin/Daten_BMU/Download_PDF/Abfallwirtschaft/kreislaufwirtschaftsgesetz_en_bf.pdf

⁴⁰<http://www.asser.nl/upload/eel-webroot/www/documents/national/netherlands/EMA052004.pdf>

accidentally. An example of how the term is defined is found in the NZ Resource Management Act (1991)⁴¹ shown below.

Discharge includes emit, deposit, and allow to escape.

Related Definitions: Circular Economy, Circulative Resources, Discard, Discharge, Diverted Material, Emissions, Immissions, Waste.

Disposal/Environmentally Sound Disposal

The lowest category (and therefore the least desirable) on the Waste Management Hierarchy is disposal. Disposal can be broadly separated into unregulated and regulated. When unregulated (particularly applying to solids and liquids) it is classed as dumping. Disposal in this section refers to a regulated operation.

One of the difficulties in defining disposal is whether it is classed as storage (with the intention of doing something with it later) and when it is disposal. The importance of the difference comes in that some countries have implemented levies for disposal operations, but do not levy material that is diverted from landfills or wastewater treatment plants. Storage can be quite legitimate to, for example, stockpile until enough has accumulated for economic waste minimisation or until the price of the material makes it economic to sell.

Dishonest operators can play on the ambiguity. While time is a good indicator of whether a pile of material is being stored or dumped, a wrong decision either way can be costly. If local government (generally since they are usually responsible for waste in their area) errs on the side of caution by labelling the material pile a dump, then well-intentioned operators can suffer loss of revenue from diverted material, and it can even cost them further to have the material transported to a regulated disposal site. This sort of action discourages legitimate operators to engage in diversion. Alternately, leaving a pile of undetermined material for too long may leave local government with the costs of clean-up if the operator suddenly abandons the site.

One definition that tries to allow for storage, but not dumping is found in the NZ Waste Minimisation Act (2008)⁴² shown below.

Disposal means the final (or more than short-term) deposit of waste into or onto land set apart for that purpose or the incineration of waste.

Short-term in the NZ definition is not defined, but would be left up to the local government inspector to interpret, which in itself can cause problems. However, if the operator is unhappy with the local government decision, then it is open to appeal through the court system (though that process can be costly).

⁴¹ <http://www.legislation.govt.nz/act/public/1991/0069/latest/DLM230265.html>

⁴² <http://www.legislation.govt.nz/act/public/2008/0089/latest/DLM999802.html>

A more general definition is found in the German Circular Economy Act (2012)⁴³, shown below, which says that if the operation is not actually minimisation, then it is disposal, even if it can be minimised later. The definition below can apply to more than solid waste.

Disposal means any operation which does not constitute [minimisation] even where the operation has as a secondary consequence the [minimisation] of substances or energy.

A similar stand is taken in the UK Environmental Protection Act (1990)⁴⁴, shown below, but the UK restricts the definition to solid and liquid waste by virtue of depositing onto land.

Disposal of waste includes its disposal by way of deposit in or on land and waste is treated when it is subjected to any process, including making it re-usable or reclaiming substances from it and recycle (and cognate expressions) shall be construed accordingly.

Disposal is explained more explicitly in the US Resource Conservation and Recovery Act (1976)⁴⁵, shown below, which relates to solid waste or hazardous waste.

Disposal means the discharge, deposit, injection, dumping, spilling, leaking, or placing of any solid waste or hazardous waste into or on any land or water so that such solid waste or hazardous waste or any constituent thereof may enter the environment or be emitted into the air or discharged into any waters, including ground waters.

The US definition lists a broader range of situations that are classified as disposal, including injecting the waste into underground caverns or wells. It should be noted that this definition includes consideration of water and air emissions, thus covering all vectors into the environment.

The following three definitions refer to specialised disposal situations; the first is for hazardous substances, the second for environmentally sound disposal of persistent organic pollutants and the third for disposal at sea.

Hazardous substances are often difficult to manage and can sometimes require transportation to facilities external to countries of origin (due to technical requirements) for disposal. The Waste Management Hierarchy was initially designed to provide guidance for hazardous substances, so is ideally suited for application to those substances. It is useful for hazardous substances to have provisions for treatment and/or exportation as well as final disposal. Note that treatment is defined as a disposal operation, not a minimisation process. An example of this is found in the NZ Hazardous Substances and New Organisms Act (1996)⁴⁶, shown below.

Disposal means in relation to a hazardous substance:

- treating the substance in such a way that it is no longer a hazardous substance; or

⁴³ http://www.bmub.bund.de/fileadmin/Daten_BMU/Download_PDF/Abfallwirtschaft/kreislaufwirtschaftsgesetz_en_bf.pdf

⁴⁴ http://www.legislation.gov.uk/ukpga/1990/43/pdfs/ukpga_19900043_en.pdf

⁴⁵ <https://www.law.cornell.edu/uscode/text/42/chapter-82>

⁴⁶ <http://www.legislation.govt.nz/act/public/1996/0030/latest/DLM381222.html>

- discharging the substance into the environment as waste; or
- exporting the substance as waste from New Zealand.

A refinement for persistent organic pollutants is provided in the definition for 'environmentally sound disposal' found in the NZ Hazardous Substances and New Organisms Act (1996)⁴⁷, shown below.

Environmentally sound disposal, in relation to a substance that is a persistent organic pollutant, means disposal in accordance with directions given by [national government], being directions that are not inconsistent with Article 6 of the Stockholm Convention (Measures to reduce or eliminate releases from stockpiles and wastes).

The above definition provides for national government (or one of its agencies) to stipulate how specific persistent organic pollutants must be disposed of.

Disposal at sea is governed by the London Convention and Protocol and is expected to be enshrined in local legislation by signatories to the Convention. The Canadian Environmental Protection Act (1999)⁴⁸ definition of disposal at sea is shown below.

Disposal (at sea) means

- the disposal of a substance at sea from a ship, an aircraft, a platform or another structure;
- the disposal of dredged material into the sea from any source not mentioned above;
- the storage on the seabed, in the subsoil of the seabed or on the ice in any area of the sea of a substance that comes from a ship, an aircraft, a platform or another structure;
- the deposit of a substance on the ice in an area of the sea;
- the disposal at sea of a ship or aircraft;
- the disposal or abandonment at sea of a platform or another structure; and
- any other act or omission that constitutes a disposal under regulations

but does not include

- a disposal of a substance that is incidental to or derived from the normal operations of a ship, an aircraft, a platform or another structure or of any equipment on a ship, an aircraft, a platform or another structure, other than the disposal of substances from a ship, an aircraft, a platform or another structure operated for the purpose of disposing of such substances at sea;
- the placement of a substance for a purpose other than its mere disposal if the placement is not contrary to the purposes of this Division and the aims of the Convention or the Protocol;
- the abandonment of any matter, such as a cable, pipeline or research device, placed on the seabed or in the subsoil of the seabed for a purpose other than its mere disposal; or

⁴⁷ <http://www.legislation.govt.nz/act/public/1996/0030/latest/DLM381222.html>

⁴⁸ <http://laws-lois.justice.gc.ca/PDF/C-15.31.pdf>

- a discharge or storage directly arising from, or directly related to, the exploration for, exploitation of and associated off-shore processing of seabed mineral resources.

The definition covers all modes of disposal from the surface or the air, including structures fixed or floating on the sea. A couple of interesting inclusions are:

- dredged material, which may sometimes contain highly toxic substances or other human-derived matter. From the Canadian perspective, this material cannot be discharged into deeper waters or onto an iceflow (which eventually achieves the same result); and
- abandoned structures that cannot just be left to ‘disappear’.

Related Definitions: Air, Biowaste, Certified Waste Management Company, Circular Economy, Cleanfill, Commercial Waste, Controlled Waste, Cyclical Use, Discarding, Discharge, Disposal Facility, Diverted Material, Dumping, Hazardous Waste, Hazardous Waste Management, Household Waste, Incineration, Industrial Waste, Landfills, Life cycle, Multimedia, Pollution Prevention, Preparing for Reuse, Recovery, Recycling, Reduction, Release, Resource Conservation, Reuse, Storage, Waste, Waste Management, Waste Minimisation.

Disposal Facility

A definition for disposal facility is useful for determining what sorts of places are required to fulfil regulatory obligations. The definition below from the NZ Waste Minimisation Act (2008)⁴⁹ seeks to exclude those sites that contain disposed inert material including manufacturing companies that have their own sites for disposal of mainly homogeneous material. This definition was used in particular to determine which facilities would be subjected to a landfill levy hence the inclusion of household waste. The waste management companies responded by seeking to remove household waste as criterion in their landfill consent and thus avoid the having to pay the levy.

Disposal facility means a facility, including a landfill at which waste is disposed of, and at which the waste disposed of includes household waste, and operates, at least in part, as a business to dispose of waste. This also includes any other facility or class of facility at which waste is disposed of that is prescribed as a disposal facility.

Related Definitions: Certified Waste Management Company, Cleanfill, Commercial Waste, Controlled Waste, Discarding, Discharge, Diverted Material, Household Waste, Industrial Waste, Waste Management, Waste.

⁴⁹ <http://www.legislation.govt.nz/act/public/2008/0089/latest/DLM999802.html>

Diverted Material

A definition of material (including products) that is not disposed to landfill (or elsewhere), but can be a generic term to describe reuse, recycling and recovery can be useful. An example of a definition is found in the NZ Waste Minimisation Act (2008)⁵⁰, shown below.

Diverted material means anything that is no longer required for its original purpose and, but for commercial or other waste minimisation activities, would be disposed of or discarded.

Related Definitions: Circular Economy, Circulative Resources, Cyclical Use, Discharge, Disposal Facility, Pollution Prevention, Preparing for Reuse, Prevention, Recovery, Recycling, Reduction, Reuse, Special Waste, Waste Management, Waste Minimisation, Waste.

Dumping

The act of uncontrolled disposal of material is commonly referred to as dumping. The term is not to be confused with disposal which tends to refer to material ending up in a facility able to handle the properties of the materials or emissions from them. Dumping is a generic term that can be applied to solid, liquid or gaseous wastes. An example of a definition is found in the NZ Resource Management Act (1991)⁵¹, shown below.

Dumping means:

- in relation to waste or other matter, its deliberate disposal; and
- in relation to a ship, an aircraft, or an offshore installation, its deliberate disposal or abandonment, but does not include the disposal of waste or other matter incidental to, or derived from, the normal operations of a ship, aircraft, or offshore installation, if those operations are prescribed as the normal operations of a ship, aircraft, or offshore installation, or if the purpose of those operations does not include the disposal, or the treatment or transportation for disposal, of that waste or other matter.

Related Definitions: Commercial Waste, Controlled Waste, Discarding, Discharge, Disposal Facility, Disposal, Effect on the Environment, Emissions, Environmental Pollution, Harm, Industrial Waste, Landfills, Liability Defence, Marine Pollution, Protecting the Environment, Waste, Waste Management.

Effect on the Environment / Environmental Load

A major thrust of waste legislation is to reduce the effects on the environment produced by waste. Another way of describing this is to refer to the effects as being an environmental load, giving the impression that activities that produce adverse environmental effects produce a burden on the environment. The Japanese Basic Act for the Establishment of a Sound Material-

⁵⁰ <http://www.legislation.govt.nz/act/public/2008/0089/latest/DLM999802.html>

⁵¹ <http://www.legislation.govt.nz/act/public/1991/0069/latest/DLM230265.html>

Cycle Society (2000)⁵² definition shown below refers to the loads being generated by human activities. This quite clearly rules out non-human activities (e.g. culling of one species due to disease resulting in explosion in another species further down the food chain, producing a stress on the environment).

Environmental Load means any adverse effects on the environment generated by human activities which may cause interference with environmental conservation.

The Netherlands definition (Environmental Management Act (2004)⁵³) shown below, includes the waste management process, even where it is efficient and the transportation of people and goods. This definition means that, for example, waste collection processes are included in the environmental effects and so requires collections services to consider their impact when routing vehicles and sending multiple vehicles to collect different waste streams. Improving the logistics of waste collection can reduce the environmental load considerably through less fuel use, easier access or quicker collections.

Effects on the environment shall include effects relating to efficient waste management or efficient wastewater management, effects relating to the consumption of energy and raw materials, and effects relating to the transport of persons or goods to and from the establishment.

A more explicit definition of environmental effect that unfolds what needs to be considered is found in the NZ Resource Management Act (1991)⁵⁴, shown below. Within this definition positive effects are included as are considerations of how long the effect will last. Short term effects may have long term consequences and effects can become cumulative, or even not show up for a long time (e.g. plastic pollution of the seas). The definition also brings in a risk management framework by considering the probability of effects happening and the scale of potential impacts.

Effect includes:

- any positive or adverse effect; and
- any temporary or permanent effect; and
- any past, present, or future effect; and
- any cumulative effect which arises over time or in combination with other effects

regardless of the scale, intensity, duration, or frequency of the effect, and also includes:

- any potential effect of high probability; and
- any potential effect of low probability which has a high potential impact.

Related Definitions: Air Pollution, Best Available Techniques, Biowaste, Certified Waste Management Company, Controlled Waste, Discarding, Disposal, Effect on the Environment,

⁵² <https://www.env.go.jp/en/laws/recycle/12.pdf>

⁵³ <http://www.asser.nl/upload/eel-webroot/www/documents/national/netherlands/EMA052004.pdf>

⁵⁴ <http://www.legislation.govt.nz/act/public/1991/0069/latest/DLM230265.html>

Emissions, Environmental Pollution, Hazardous Waste, Hazardous Waste Management, Household Waste, Immissions, Industrial Waste, Landfills, Waste Management, Waste.

Emissions

Emissions are an indicator of inefficient processes from which waste emanates. The definition below from the German Federal Immission Control Act (2002)⁵⁵ highlights a number of areas that produce waste (noise, vibration, light, heat and radiation) that can be significant waste sources, but are often not considered when considering waste. Consideration of those waste sources will lead to improvement of the efficiency of households and businesses resulting in a reduced environmental effect.

Emissions mean any air pollution, noise, vibration, light, heat, radiation and similar phenomena originating from an installation.

Related Definitions: Air, Air Pollution, Best Available Techniques, Climate Change, Disposal, Effect on the Environment, Environment, Environmental Pollution, Immissions, Pollution Prevention, Reduction, Statutory Nuisances, Sustainable Management, Waste Minimisation.

Environment

Environment is one of those terms that people inherently have a definition for. However, for legislative purposes a definition is often necessary. A very generic definition is found in the UK Environmental Protection Act (1990)⁵⁶, shown below.

Environment consists of all, or any, of the following media, namely, the air, water and land; and the medium of air includes the air within buildings and the air within other natural or man-made structures above or below ground.

A more detailed definition of environment is found in the Canadian Environmental Protection Act (1999)⁵⁷, shown below. As well as air, water and land, the Canadian definition specifies all layers of the atmosphere (giving coverage beyond the usual boundary layer of the atmosphere), all matter and living organisms and ecosystems. This means that the Canadian specifically includes living beings and the interactions between them as part of the environment.

Environment means the components of the Earth and includes:

- air, land and water;
- all layers of the atmosphere;
- all organic and inorganic matter and living organisms; and
- the interacting natural systems that include components referred to above.

⁵⁵ http://www.bmub.bund.de/fileadmin/bmu-import/files/english/pdf/application/pdf/bimschg_en_bf.pdf

⁵⁶ http://www.legislation.gov.uk/ukpga/1990/43/pdfs/ukpga_19900043_en.pdf

⁵⁷ <http://laws-lois.justice.gc.ca/PDF/C-15.31.pdf>

A further specification can include what people perceive and feel about their surroundings as well as accommodating for different cultural values, particularly for indigenous people where those people are not the majority in a country. An example of this is found in the NZ Resource Management Act (1991)⁵⁸ shown below.

Environment includes:

- ecosystems and their constituent parts, including people and communities; and
- all natural and physical resources; and
- amenity values; and
- the social, economic, aesthetic, and cultural conditions which affect the matters stated above or which are affected by those matters.

Related Definitions: Air, Best Available Techniques, Cleanfill, Contaminant, Contaminated Land, Controlled Waste, Disposal, Effect on the Environment, Environmental Emergency, Environmental Pollution, Harm, Hazardous Waste, Household Waste, Immissions, Inert Waste, Industrial Waste, Land-based Sources, Landfills, Marine Pollution, Multimedia, Pollution Prevention, Prevention, Protecting the Environment, Reduction, Release, Sustainable Management, Treatment, Waste.

Environmental Emergency

When situations that are out of the ordinary arise that can affect the environment, actions to reverse, mitigate or control the emergency are needed. Environmental emergencies of concern to the waste sector involve the unplanned or illegal release of substances into the environment that affect the environment, and hence need to be managed. An environmental emergency can also arise when there is a reasonable potential for a release of a substance that has environmental effects. An example of a definition for environmental emergency is found in the Canadian Environmental Protection Act (1999)⁵⁹ shown below. A very useful planning tool for assessing potential environmental emergencies is to conduct an environmental impact assessment.

Environmental emergency means:

- an uncontrolled, unplanned or accidental release, or release in contravention of regulations of a substance into the environment; or
- the reasonable likelihood of such a release into the environment.

Related Definitions: Air Pollution, Discarding, Discharge, Effect on the Environment, Emissions, Environment, Environmental Pollution, Hazardous Waste, Hazardous Waste Management, Marine Environment, Marine Pollution, Protecting the Environment, Resource Conservation, Sustainable Management.

⁵⁸ <http://www.legislation.govt.nz/act/public/1991/0069/latest/DLM230265.html>

⁵⁹ <http://laws-lois.justice.gc.ca/PDF/C-15.31.pdf>

Environmental Pollution

Pollution of the environment has increased considerably since the start of the industrial revolution. Environmental pollution comes in five basic forms: air, water, land, noise and light. In more urbanised societies, noise and light pollution have a greater impact on humans and can significantly impact their health and quality of life. With the rapid increase in urbanisation, definitions of environmental pollution need to encompass the wider aspects as well as the three media: air, land and water. An example of a definition of environmental pollution is found in the UK Pollution Prevention and Control Act (1999)⁶⁰ shown below.

Environmental pollution means pollution of the air, water or land which may give rise to any harm; and for the purposes of this definition:

- pollution includes pollution caused by noise, heat or vibrations or any other kind of release of energy, and
- air includes air within buildings and air within other natural or man-made structures above or below ground.

Conserving the environment is important in world that has eroded so much of it and the Brundtland concept of sustainable development⁶¹ is targeted at future generations being able to enjoy the earth that the current generations enjoy.

It is not intended to cover intentional ground subsidence through mining and construction under a definition of environmental pollution, but actions that lead to non-intended subsidences (e.g. removing tree cover from a hillside when then has a landslide when heavy rains come) can be part of environmental pollution. The result of such subsidences is the production of waste which can be inert, which then has to be managed appropriately.

Offensive odours, particularly from business operations, can be regarded as environmental pollution. This is particularly apparent when the odours spread over areas that are some distance from manufacturing facilities. The effects of these odours on people can range from sickness (and even death) to loss of enjoyment of their houses.

An example where the above environmental pollutants are defined is found in the Japanese Basic Act for the Establishment of a Sound Material-Cycle Society (2000)⁶² shown below.

Environmental pollution means, among interference with environmental conservation, air pollution, water pollution (including a deterioration of water's unadulterated state other than the water quality and the quality of the bottom), soil contamination, noise, vibration, ground subsidence (excluding subsidence caused from land excavation for mineral exploitation) and offensive odours affecting an extensive area as a result of business and other human activities, which cause damage to human health or the living environment (including property closely

⁶⁰ <http://www.legislation.gov.uk/ukpga/1990/43/data.pdf>

⁶¹ <http://www.un-documents.net/our-common-future.pdf>

⁶² <https://www.env.go.jp/en/laws/recycle/12.pdf>

related to human life, as well as fauna and flora closely related to human life and their living environment).

Related Definitions: Air Pollution, Cleanfill, Disposal, Disposal Facility, Effect on the Environment,

Environmental Emergency, Harm, Inert Waste, Land-based Sources, Marine Pollution, Protecting the Environment, Remediation, Resource Conservation, Statutory Nuisances, Sustainable Management.

Harm / Harmful Effects on the Environment

There are two parts to harmful effects on the environment; the first is harm and the second are the effects on the environment.

Harm causes damage to the environment. In its simplest sense harm affects the health of living organisms or interfering with ecological systems and for humans, property is also included. An example of a definition of harm is found in the UK Environmental Protection Act (1990)⁶³ shown below.

Harm means harm to the health of living organisms or other interference with the ecological systems of which they form part and, in the case of man, includes harm to his property.

A slightly more explicit definition of harm is found in the UK Pollution Prevention and Control Act (1999)⁶⁴ shown below. This definition expands the above one in the UK Environmental Protection Act (1990)⁶⁵ to specify harm to the quality of the environment including the environment as a whole, as well as singular parts. Other additions are offences to human senses (expanding on the health aspect) and intrusions with amenities or other legitimate uses of the environment. This last one goes beyond the commonly understood health aspects and introduces mental health aspects.

Harm means:

- harm to the health of human beings or other living organisms; and
- harm to the quality of the environment, including:
 - harm to the quality of the environment taken as a whole;
 - harm to the quality of the air, water or land; and
 - other impairment of, or interference with, the ecological systems of which any living organisms form part;
- offence to the senses of human beings;
- damage to property; or

⁶³ http://www.legislation.gov.uk/ukpga/1990/43/pdfs/ukpga_19900043_en.pdf

⁶⁴ <http://www.legislation.gov.uk/ukpga/1990/43/data.pdf>

⁶⁵ http://www.legislation.gov.uk/ukpga/1990/43/pdfs/ukpga_19900043_en.pdf

- impairment of, or interference with, amenities or other legitimate uses of the environment.

The other part of harm – the effects on the environment are very similar to the above definitions. An example is found in the German Federal Immission Control Act (2002)⁶⁶ shown below where the threshold is the effects on the public or the neighbourhood.

Harmful effects on the environment mean any immissions which, because of their nature, extent or duration, are likely to cause hazards, significant disadvantages or significant nuisances to the general public or the neighbourhood.

Related Definitions: Air, Air Pollution, Biowaste, Contaminant, Contaminated Land, Controlled Waste, Dumping, Effect on the Environment, Emissions, Environment, Environmental Emergency, Environmental Pollution, Immissions, Marine Pollution, Nutrients, Prevention, Protecting the Environment, Remediation, Resource Conservation, Statutory Nuisances, Sustainable Management.

Hazardous Waste

Definitions of hazardous waste vary between countries. The tighter regulatory environment for hazardous waste means that a clear definition is needed for each country. Hazardous wastes are generally ones that pose a hazard to humans or the environment and exhibit at least one of physical, chemical and biological hazards. Due to the ever-changing wastes that become hazardous and to bring certainty on identification (at least for the majority of hazardous wastes), countries often produce lists of compounds that are or produce hazardous wastes, particularly to manage the risks of contamination.

An example of such an approach is found in the NZ Resource Management (National Environmental Standards for Air Quality) Regulations (2004)⁶⁷ shown below.

Hazardous waste means waste that belongs to 1 or more of the categories in Annex I of the Basel Convention; and has 1 or more of the characteristics in Annex III of that Convention

The reference to the Basel Convention ensures that enforcement is in line with best international knowledge.

A similar definition is found in the Netherlands Environmental Management Act (2004)⁶⁸ shown below, where national government makes lists that are consistent with international treaties and best practice. This second step in the process can mean a delay in enforcement, but where governments identify a looming and major need, they can move quickly.

⁶⁶ http://www.bmub.bund.de/fileadmin/bmu-import/files/english/pdf/application/pdf/bimschg_en_bf.pdf

⁶⁷ <http://www.legislation.govt.nz/regulation/public/2004/0309/latest/DLM286835.html>

⁶⁸ <http://www.asser.nl/upload/eel-webroot/www/documents/national/netherlands/EMA052004.pdf>

Hazardous waste means waste substances designated as such by [national government], in accordance with relevant treaties and decisions of international organisations which are binding upon the Netherlands.

A different approach is exhibited by the US in the Resource Conservation and Recovery Act (1976)⁶⁹ shown below. Firstly it specifically mentions solid waste (though this could be easily expanded to other media). The definition does include combinations of wastes which would be useful as, in some cases, two wastes kept separately are not hazardous, but when combined can become hazardous. Concentration is also important because many substances when dilute enough are not hazardous, but increasing concentration exceeds the hazardous threshold.

The inclusion of health effects are factors taken into account in international lists. To be effective, not only is mortality taken into account, but permanent or disabling illnesses are included.

Finally, the wastes must be handled appropriately throughout the life cycle of the waste.

Hazardous waste means a solid waste, or combination of solid wastes, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may cause, or significantly contribute to an increase in mortality or an increase in serious irreversible, or incapacitating reversible, illness; or pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed.

The use of lists is very handy in that it clearly states for enforcers and those who have to comply what is covered, but depends on keeping the lists up to date. The use of descriptors, as in the US legislation provides a more agile system, but relies on enforcers and those who have to comply, to have a much greater depth of knowledge and understanding to ensure good compliance and fewer environmental emergencies.

Related Definitions: Air, Air Pollution, Contaminant, Disposal, Effect on the Environment, Environment, Environmental Emergency, Environmental Pollution, Harm, Hazardous Waste Management, Household Waste, Industrial Waste, Storage, Treatment, Waste.

Hazardous Waste Management

Hazardous waste needs to be properly managed due to the damage it may cause during its life cycle. The management needs a standardised methodology where the roles of each stakeholder are clearly defined. This reduces the potential for overlap and thus assumptions of what has or has not been done and diminishes the potential for accidental discharges or reactions. Integration of the supply chain is also an important aspect to avoid fragmentation and

⁶⁹ <https://www.law.cornell.edu/uscode/text/42/chapter-82>

the abovementioned results. An example of a definition for hazardous waste management is found in the Resource Conservation and Recovery Act (1976)⁷⁰ shown below.

Hazardous waste management means the systematic control of the collection, source separation, storage, transportation, processing, treatment, recovery, and disposal of hazardous wastes.

Related Definitions: Certified Waste Management Company, Controlled Waste, Discarding, Disposal, Disposal Facility, Effect on the Environment, Environmental Emergency, Environmental Pollution, Hazardous Waste, Special Waste, Waste.

Household Waste

A definition for household waste is useful since householders are often serviced by local government or contractors to local government. Compared to other waste producers, householders tend to be more dispersed and produce smaller quantities of waste. An example of a definition is found in the Netherlands Environmental Management Act (2004)⁷¹ shown below, which excludes hazardous waste. This is a useful exclusion as a different approach is needed for collecting hazardous waste (as well as the rest of the life cycle).

Household waste means waste substances from private households, except in so far as transferred or collected components of these waste substances are concerned which have been designated as hazardous waste.

The UK Environmental Protection Act (1990)⁷² definition, shown below, clusters premises that have similar waste profiles as households as being household waste.

Household Waste means waste from:

- domestic property, that is to say, a building or self-contained part of a building which is used wholly for the purposes of living accommodation;
- a caravan which usually and for the time being is situated on a caravan site;
- a residential home;
- premises forming part of a university or school or other educational establishment;
- premises forming part of a hospital or nursing home.

Related Definitions: Biowaste, Certified Waste Management Company, Commercial Waste, Controlled Waste, Discarding, Disposal, Disposal Facility, Dumping, Environment, Hazardous Waste, Hazardous Waste Management, Industrial Waste, Inert Waste, Recycling, Reuse, Statutory Nuisances, Waste.

⁷⁰ <https://www.law.cornell.edu/uscode/text/42/chapter-82>

⁷¹ <http://www.asser.nl/upload/eel-webroot/www/documents/national/netherlands/EMA052004.pdf>

⁷² http://www.legislation.gov.uk/ukpga/1990/43/pdfs/ukpga_19900043_en.pdf

Immissions

Immissions indicate the environmental concentration of a pollutant, resulting from a combination of injecting substances into the environment and dispersals. Note that emissions relate to the amount or concentration of substances as they come out of a facility and immissions relate to the concentration of the substances once they are in the environment. An example of a legislative meaning is found in the German Federal Immission Control Act (2002)⁷³ shown below.

Immissions mean any air pollution, noise, vibration, light, heat, radiation and similar effects on the environment which affect human beings, animals and plants, soil, water, the atmosphere as well as cultural objects and other material goods.

Related Definitions: Air Pollution, Climate Change, Contaminant, Dark Smoke, Discharge, Disposal, Effect on the Environment, Emissions, Environmental Pollution, Harm, Incineration, Marine Pollution, Protecting the Environment, Release, Waste, Waste Management.

Incineration

Incineration is a disposal process that burns the organic substances in waste materials. These processes are sometimes described as "thermal treatment". Incineration converts the waste into ash, flue gas, and heat. Typically, the remaining ash from urban waste is 10 – 30%⁷⁴, by weight, of the original waste material which then still has to be disposed of into a landfill. An example of a definition of incineration is found in the NZ Resource Management Act (1991)⁷⁵ shown below.

Incineration, in relation to waste or other matter, means its deliberate combustion for the purpose of its thermal destruction.

Related Definitions: Air, Air Pollution, Climate Change, Dark Smoke, Discharge, Emissions, Immissions, Release, Waste.

Industrial Waste

Industrial waste and commercial waste are sometimes bundled together, and other times separated out. Both types of waste tend to rely on commercial collection organised by the producers, compared to household waste where collection is often organised by the local authority. How each country defines industrial waste is dependent on what its legislation is trying to achieve. For example, in the Netherlands Environmental Management Act (2004)⁷⁶

⁷³ http://www.bmub.bund.de/fileadmin/bmu-import/files/english/pdf/application/pdf/bimschg_en_bf.pdf

⁷⁴ Park, YJ and Heo, J. (2002). "Vitrification of fly ash from municipal solid waste incinerator". Journal of Hazardous Materials, B91, pp 83–93

⁷⁵ <http://www.legislation.govt.nz/act/public/1991/0069/latest/DLM230265.html>

⁷⁶ <http://www.asser.nl/upload/eel-webroot/www/documents/national/netherlands/EMA052004.pdf>

industrial waste is classified as everything that is not household or hazardous waste, as shown below.

Industrial waste means waste substances that are not household waste or hazardous waste.

Alternately, industrial waste can be defined more specifically as that which results from industries including material from a manufacturing process such as that of factories, mills, and mining operations. The example below from the UK Environmental Protection Act (1990)⁷⁷ makes a differentiation between industrial and commercial waste that tends to be derived from offices.

Industrial Waste means waste from any of the following premises:

- any factory;
- any premises used for the purposes of, or in connection with, the provision to the public of transport services by land, water or air;
- any premises used for the purposes of, or in connection with, the supply to the public of gas, water or electricity or the provision of sewerage services;
- any premises used for the purposes of, or in connection with, the provision to the public of postal or telecommunications services;
- any mine or quarry or any premises used for agriculture.

Related Definitions: Commercial Waste, Controlled Waste, Discarding, Discharge, Disposal, Hazardous Waste, Household Waste, Special Waste, Waste, Waste Management.

Inert Waste

Inert waste is waste which is unreactive (e.g. sand, rock, soil and concrete). Due to its unreactive nature, inert waste requires lower levels of protection (cleanfill) when it is discarded as it has no or very low environmental impact. The environmental impacts from inert waste are mainly due to the physical changes to the land (or water) where it is deposited. Because of the lower level of environmental impact, there is no need for protection like landfill liners and leachate collection systems. A definition of inert waste is found in the German Circular Economy Act (2012)⁷⁸ shown below.

Inert waste means mineral waste that does not:

- undergo any significant physical, chemical or biological transformations;
- dissolve, burn or otherwise react physically or chemically;
- biodegrade;
- adversely affect other materials with which it comes into contact in a manner that could lead to detrimental impacts on human health or on the environment.

⁷⁷ http://www.legislation.gov.uk/ukpga/1990/43/pdfs/ukpga_19900043_en.pdf

⁷⁸ http://www.bmub.bund.de/fileadmin/Daten_BMU/Download_PDF/Abfallwirtschaft/kreislaufwirtschaftsgesetz_en_bf.pdf

Related Definitions: Cleanfill, Commercial Waste, Controlled Waste, Discarding, Disposal, Disposal Facility, Dumping, Environmental Pollution, Hazardous Waste, Industrial Waste, Landfills, Protecting the Environment, Storage, Waste, Waste Management.

Installation

Installations normally refer to pieces of equipment, systems or devices. Many installations produce emissions, which can be solids, liquids and gases, but can also include, for example, noise, vibrations, light and heat. An integrated waste management approach seeks to minimise all wastes to improve the efficiency of a circular economy. A particular focal point for efficiency improvement is the industrial facility that has a combination of machinery or materials that are likely to produce emissions – an installation. A definition of installation is found in the German Federal Immission Control Act (2002)⁷⁹ shown below.

Installations mean:

- any operating plants and other stationary facilities;
- any machines, equipment and other non-stationary technical facilities as well as vehicles and craft; and
- any premises used to store or deposit materials or to carry out work likely to cause emissions, with the exception of routes used for public transport.

Related Definitions: Company Waste Management Officer, Controlled Waste, Discarding, Discharge, Disposal, Emissions, Immissions, Industrial Waste, Inert Waste, Multimedia, Pollution Prevention, Prevention, Recovery, Recycling, Reduction, Release, Reuse, Special Waste, Statutory Nuisances, Storage, Treatment, Waste, Waste Management, Waste Minimisation.

Land-based Sources

The natural flow of materials is from the land to the sea and waste is no exception. Municipal, industrial and agricultural wastes and run-off account for as much as 80% of all marine pollution⁸⁰. Common pollutants include sewage and waste water, persistent organic pollutants (including pesticides), heavy metals, oils, nutrients and sediments. These pollutants can enter through rivers or discharged directly into coastal waters and can affect human health and well-being as well as coastal ecosystems.

Discharge of materials into the oceans merely transfers the problems of waste from local to being global. The land-based sources can be point sources (e.g. factories) or non-point (e.g. agricultural animals). The pollutants can be emitted through waterways, piped or travel through the air and depositing into the oceans. In addition to physical substances affecting ecosystems,

⁷⁹ http://www.bmub.bund.de/fileadmin/bmu-import/files/english/pdf/application/pdf/bimschg_en_bf.pdf

⁸⁰ <http://www.unep.ch/regionalseas/home/lbppl.htm>

energy discharges can severely affect ecosystems (for example heated cooling water discharged from power stations into rivers).

Identification and labelling land-based sources is an important step in the prevention of the problem. An example of a definition of land-based sources is found in the Canadian Environmental Protection Act (1999)⁸¹ shown below.

Land-based sources means point and diffuse sources on land from which substances or energy reach the sea by water, through the air or directly from the coast. It includes any sources under the sea bed made accessible from land by tunnel, pipeline or other means.

Related Definitions: Air Pollution, Contaminated Land, Discharge, Disposal, Dumping, Effect on the Environment, Emissions, Environmental Pollution, Harm, Hazardous Waste, Immissions, Marine Pollution, Nutrients, Protecting the Environment, Waste, Waste Management, Water Pollution.

Landfill (Sanitary)

Landfills are not to be confused with dumpsites. Dumpsites come in two categories – uncontrolled (where anything is disposed) and controlled (which have some of the characteristics of landfills like siting with respect to hydrogeological suitability, grading, compaction in some cases, leachate control, partial gas management, regular (not usually daily) cover, access control, basic recordkeeping and controlled scavenging).

To be designated as a landfill (or sanitary landfill) requires a low permeability liner, compaction of the wastes, daily covering of the wastes (with soil or other material) to remove them from the influence of the outside environment, and control and prevention of negative impacts on the public health and the environment (e.g. odours and contaminated water supplies).

Definitions of landfill are often trying to enable monitoring and enforcement of various conditions like protection of the environment and the ability to levy depositors or deposits. Where a levy process is anticipated it is sometimes better to have a staged implementation which gradually brings in different types of waste facilities. The staging allows the process to be rolled out as the enforcing agency gains experience and confidence. A definition that is quite general is found in the US Resource Conservation and Recovery Act (1976)⁸² shown below.

Sanitary landfill means a facility for the disposal of solid waste.

A little more detail is provided in the definition found in the NZ Resource Management (National Environmental Standards for Air Quality) Regulations (2004)⁸³ shown below, which specifies above ground and below ground facilities as well as putting it on other waste.

⁸¹ <http://laws-lois.justice.gc.ca/PDF/C-15.31.pdf>

⁸² <https://www.law.cornell.edu/uscode/text/42/chapter-82>

⁸³ <http://www.legislation.govt.nz/regulation/public/2004/0309/latest/DLM286835.html>

Landfill means a site where waste is disposed of by burying it, or placing it upon land or other waste.

A further level of detail is provided in the German Circular Economy Act (2012)⁸⁴ shown below, which includes a company's own sites for disposal (e.g. a slag heap from an ore refinery).

Landfill means waste disposal installations for storage of waste above ground (above-ground landfills) or below ground (below-ground landfills). Landfills shall also include companies' own internal waste storage facilities for waste disposal, at which a waste producer carries out waste disposal at the waste production site.

Related Definitions: Cleanfill, Commercial Waste, Discarding, Discharge, Disposal, Disposal Facility, Dumping, Hazardous Waste, Hazardous Waste Management, Household Waste, Industrial Waste, Inert Waste, Waste, Waste Management.

Lifecycle

Life cycle thinking is fundamental to integrated waste management. The definition of lifecycle is particularly relevant when products are controlled (e.g. handling restrictions, container deposits and disposal protocols) in some or all of their life cycle.

The choice for products is that they are either manufactured in the country or they are imported. The level of influence that business can exert on foreign manufacturers is very slight particularly in small economies. Therefore, to provide a level playing field for business, the following definition, shown below, from the NZ Hazardous Substances and New Organisms Act (1996)⁸⁵ considers that the life cycle starts at the time when it first 'arrives' in the country.

Lifecycle, in relation to a substance, means the time for which the substance is in existence from (and including) its manufacture or importation to its disposal.

Related Definitions: Best Available Techniques, Circular Economy, Circulative Resources, Controlled Waste, Disposal, Effect on the Environment, Hazardous Waste Management, Pollution Prevention, Resource Conservation, Sustainable Management, Waste, Waste Management, Waste Minimisation.

Marine Pollution

⁸⁴http://www.bmub.bund.de/fileadmin/Daten_BMU/Download_PDF/Abfallwirtschaft/kreislaufwirtschaftsgesetz_en_bf.pdf

⁸⁵<http://www.legislation.govt.nz/act/public/1996/0030/latest/DLM381222.html>

Abatement of marine pollution is a part of integrated waste management. It is estimated that there are now close to 500 dead zones covering more than 245,000 km² globally⁸⁶, which is equivalent to the surface area of the 77th largest country in the world⁸⁷.

Generation of marine pollution is caused by substances or energy release into the sea. Marine pollution focuses on the effects of humans on the marine environment. These effects impact on both humans and the environment. The Canadian Environmental Protection Act (1999)⁸⁸ definition below provide for more than just the basic life-supporting functions of the sea by including damage to facilities and interference to legitimate users.

Marine pollution means the introduction by humans, directly or indirectly, of substances or energy into the sea that results, or is likely to result, in:

- hazards to human health;
- harm to living resources or marine ecosystems;
- damage to amenities; or
- interference with other legitimate uses of the sea.

Related Definitions: Discharge, Dumping, Effect on the Environment, Emissions, Environment, Environmental Emergency, Environmental Pollution, Hazardous Waste Management, Land-based Sources, Nutrients, Protecting the Environment, Resource Conservation, Sustainable Management, Water Pollution.

Multimedia

Integrated waste management requires consideration of all media – air, water and land so that transfer from one medium to another (e.g. incinerating solid waste) does not imply solving the waste problem. A definition of multimedia is found in the UK Pollution Prevention and Control Act (1999)⁸⁹ shown below.

Multi-media means water, air, and land.

Related Definitions: Air, Air Pollution, Effect on the Environment, Emissions, Environment, Environmental Pollution, Immissions, Incineration, Land-based Sources, Marine Pollution, Nutrients, Pollution Prevention, Protecting the Environment, Remediation, Resource Conservation, Sustainable Management, Waste, Waste Management, Water Pollution.

Nutrient

⁸⁶ <http://www.unesco.org/new/en/natural-sciences/ioc-oceans/priority-areas/rio-20-ocean/blueprint-for-the-future-we-want/marine-pollution/facts-and-figures-on-marine-pollution/>

⁸⁷ https://en.wikipedia.org/wiki/List_of_countries_and_dependencies_by_area

⁸⁸ <http://laws-lois.justice.gc.ca/PDF/C-15.31.pdf>

⁸⁹ <http://www.legislation.gov.uk/ukpga/1990/43/data.pdf>

Nutrient enrichment has arguably become the planet's most widespread water quality problem⁹⁰. Typically, nitrogen and phosphorus compounds increase production rates of plant matter by photosynthesis promoting a cycle of overgrowth in vascular plants, algal blooms and dissolved oxygen depletion, stressing and killing organisms. Nutrient enrichment can result in enhanced growth of cyanobacteria whose toxins can affect humans, livestock and wildlife.

The nutrients can be either nitrogen or phosphorus soluble substances, or combinations of substances that make nutrients available through their interactions. A definition of nutrient is found in the Canadian Environmental Protection Act (1999)⁹¹ shown below.

Nutrient means a substance or combination of substances that, if released in any waters, provides nourishment that promotes the growth of aquatic vegetation.

Related Definitions: Discharge, Effect on the Environment, Emissions, Environment, Environmental Emergency, Environmental Pollution, Harm, Land-based Sources, Marine Pollution, Pollution Prevention, Protecting the Environment, Remediation, Resource Conservation, Sustainable Management, Waste, Waste Management, Water Pollution.

Pollution Prevention

Pollution prevention aims at the top of the waste management hierarchy instead of the end-of-pipe solutions. Pollution prevention is a generic term like waste minimisation that covers all non-disposal end-of-life activities. Pollution prevention normally requires more innovative thinking, but the rewards can be much greater from economic, social and environmental perspectives. Engaging in pollution prevention occurs by utilising resources more efficiently by examining procedures, methods and goods including energy usage with an aim to reduce overall environmental and health risks.

Pollution prevention looks to the source of problems and not just at the 'low hanging fruit' for easy or quick wins (that corporate or government stakeholders often aim for). A definition of pollution prevention is found in the Canadian Environmental Protection Act (1999)⁹² shown below.

Pollution prevention means the use of processes, practices, materials, products, substances or energy that avoid or minimise the creation of pollutants and waste and reduce the overall risk to the environment or human health.

Related Definitions: Circular Economy, Circulative Resources, Cyclical Use, Diverted Material, Effect on the Environment, Emissions, Environment, Environmental Pollution, Harm, Land-based Sources, Life cycle, Marine Pollution, Multimedia, Prevention, Recovery, Recycling, Reduction, Reuse, Statutory Nuisances, Sustainable Management, Treatment, Waste, Waste Management, Waste Minimisation.

⁹⁰ http://www.unep.org/PDF/Clearing_the_Waters.pdf

⁹¹ <http://laws-lois.justice.gc.ca/PDF/C-15.31.pdf>

⁹² <http://laws-lois.justice.gc.ca/PDF/C-15.31.pdf>

Preparing for Reuse

Reuse is high on the waste management hierarchy (part of reduction in the UNEP Guidelines⁹³). On some occasions products may need restoration before they can be reused which may include operations that produce waste (e.g. cleaning fluids). A waste product generated as part of preparing an object for reuse is still regarded as a waste, and must be treated accordingly.

Some restoration (and recycling) operators try to argue that the environmental 'bad' created as part of doing environmental 'good' should not be subjected to, for example, levies as there is the potential that charging for the wastes can make the whole waste minimisation process uneconomic. To allow for this situation opens the door to allow a multitude of exceptions resulting in an unenforceable provision.

The key elements about reuse are that the product will be used for its original purpose and that some maintenance-type work may be needed to make the product fully serviceable. A definition of preparing for reuse is found in the German Circular Economy Act (2012)⁹⁴ shown below.

Preparing for re-use means any checking, cleaning or repairing [minimisation] operations by which products or components of products that have become waste are prepared so that they can be re-used without any other pre-processing for the same purpose for which they were originally conceived.

Related Definitions: Circular Economy, Circulative Resources, Discarding, Discharge, Disposal, Diverted Material, Pollution Prevention, Recovery, Recycling, Reduction, Reuse, Treatment, Waste, Waste Management, Waste Minimisation.

Prevention

Prevention is at the top of the waste management hierarchy. By not generating waste in the first place, there is no need to manage the outputs and the environment is not harmed. Some actions that can be taken to prevent waste are to design out waste at the inception stage, providing a pathway for the products to be easily reused and increasing the durability of products. The current economic infrastructure is built on a disposable consumer society so increasing durability can affect businesses dependent on high levels of repeat customers. This means that business models may need to change to accommodate more durable products. A definition of prevention is found in the German Circular Economy Act (2012)⁹⁵ shown below.

⁹³ <http://www.unep.org/ietc/Portals/136/Publications/Waste%20Management/UNEP%20NWMS%20Englis h.pdf> p18

⁹⁴ http://www.bmub.bund.de/fileadmin/Daten_BMU/Download_PDF/Abfallwirtschaft/kreislaufwirtschaftsges etz_en_bf.pdf

⁹⁵ http://www.bmub.bund.de/fileadmin/Daten_BMU/Download_PDF/Abfallwirtschaft/kreislaufwirtschaftsges etz_en_bf.pdf

Prevention means any measure taken before a substance, material or product has become waste and that serves to reduce the quantity of waste, the adverse impacts of waste on human health and on the environment or the content of harmful substances in materials and products. This shall include in particular the internal cycle of substances within plants, low-waste product design, the re-use of products or the extension of the life span of products, as well as a consumption pattern aimed at the acquisition of low-pollution and low-waste products, and at the use of reusable packaging.

Related Definitions: Best Available Techniques, Circular Economy, Circulative Resources, Cyclical Use, Discarding, Disposal, Life cycle, Pollution Prevention, Recovery, Recycling, Reduction, Reuse, Treatment, Waste, Waste Management, Waste Minimisation.

Protecting the Environment

Environmental protection can be conducted at the individual, organisational or governmental level for the benefit of both the natural environment and human beings. It should be noted that protection can include environmental enhancement. Other constituents of environmental protection are the economic use of resources throughout the lifecycle of a product, efficient waste management (for all media) to minimise adverse effects on the environment. An example of a definition is found in the Netherlands Environmental Management Act (2004)⁹⁶ shown below.

Protecting the environment shall include the improvement of the environment, ensuring efficient waste management and efficient wastewater management, ensuring economical use of energy and raw materials, and ensuring the limitation of the adverse effects on the environment of the transport of persons or goods to and from the establishment.

Related Definitions: Circulative Resources, Discarding, Discharge, Disposal, Diverted Material, Effect on the Environment, Emissions, Environment, Environmental Pollution, Harm, Immissions, Incineration, Life cycle, Marine Pollution, Pollution Prevention, Prevention, Recovery, Recycling, Reduction, Reuse, Treatment, Waste, Waste Management, Waste Minimisation.

Recovery (Material, Resource, Heat)

Recovery has different definitions in different countries. Recovery is the separation of materials from waste to allow for further processing or the combustion of materials to produce heat to offset energy that would normally come from other sources (e.g. fossil fuels). A concise definition is found in the US Resource Conservation and Recovery Act (1976)⁹⁷ shown below which terms it 'resource recovery'.

⁹⁶ <http://www.asser.nl/upload/eel-webroot/www/documents/national/netherlands/EMA052004.pdf>

⁹⁷ <https://www.law.cornell.edu/uscode/text/42/chapter-82>

Resource recovery means the recovery of material or energy from solid waste.

Recovered materials, as defined in the same legislation (shown below), includes by-products as well as waste material, but not from the original manufacturing process. One of the difficulties of this definition is that creating usable by-products is an action that should be much higher on the waste management hierarchy than recovery suggests.

Recovered material means waste material and by-products which have been recovered or diverted from solid waste, but such term does not include those materials and by-products generated from, and commonly reused within, an original manufacturing process.

A wider definition is found in the German Circular Economy Act (2012)⁹⁸ shown below. Recovery in the German definition is a replacement of materials that would be otherwise needed to accomplish a specified role. This definition is labelled minimisation in other countries.

Recovery means any operation the principal result of which is waste within the plant or in the wider economy serving a useful purpose, either by replacing other materials which would otherwise have been used to fulfil a particular function, or waste being prepared to fulfil that function.

The Japanese Basic Act for the Establishment of a Sound Material-Cycle Society (2000)⁹⁹ definition of recovery (shown below) is applied to heat, with the intention that the heat is used for combustion, thus retaining some use from what would otherwise be waste.

Heat Recovery means to use for obtaining heat things that are circulative resources in their entirety or in part and that can be used for combustion, or that potentially have such use.

Another definition is found in the NZ Waste Minimisation Act (2008)¹⁰⁰, shown below, where making compost is defined as recovery. Many other countries define compost as a recycling activity. A rationale for including composting in recovery is that making compost generates heat which may be recoverable.

Recovery means extraction of materials or energy from waste or diverted material for further use or processing and includes making waste or diverted material into compost.

Related Definitions: Biowaste, Circular Economy, Circulative Resources, Cyclical Use, Diverted Material, Emissions, Incineration, Pollution Prevention, Preparing for Reuse, Prevention, Recycling, Reduction, Reuse, Treatment, Waste, Waste Management, Waste Minimisation.

Recycling

⁹⁸ http://www.bmub.bund.de/fileadmin/Daten_BMU/Download_PDF/Abfallwirtschaft/kreislaufwirtschaftsgesetz_en_bf.pdf

⁹⁹ <https://www.env.go.jp/en/laws/recycle/12.pdf>

¹⁰⁰ <http://www.legislation.govt.nz/act/public/2008/0089/latest/DLM999802.html>

Recycling is a process that is conducted externally to any manufacturing process. Recycling converts waste materials into new products, reducing the waste of potentially useful materials. Other benefits to recycling are that it reduces raw material consumption, energy usage, air pollution due to incineration and water pollution from landfilling.

The definitions of recycling centre on waste materials being processed in some way to produce either the same products (e.g. glass bottles reduced to glass cullet that is fed into a furnace to produce glass bottles) or new products (e.g. polyethylene terephthalate (PET) bottles shredded and extruded to become polyester fibre). Recycling does not include energy recovery, which is under recovery. An example of a definition is found in the NZ Waste Minimisation Act (2008)¹⁰¹ shown below.

Recycling means the reprocessing of waste or diverted material to produce new materials.

The German Circular Economy Act (2012)¹⁰² definition, shown below, covers several other conditions to the New Zealand one. The German definition follows the UNEP Guidelines¹⁰³ definition in that reprocessing organic material (e.g. composting) is included in recycling, but combusting it to produce energy is not. Backfilling¹⁰⁴ is also excluded from recycling as the material is only used for landscaping or land reclamation processes and hence moves out of the economy.

Recycling means any [minimisation] operation by which waste is reprocessed into products, materials or substances, whether for the original or other purposes; it shall include the reprocessing of organic material but shall not include energy recovery and reprocessing into materials that are to be used as fuels or for backfilling operations.

Related Definitions: Circular Economy, Circulative Resources, Cyclical Use, Discarding, Disposal, Diverted Material, Life Cycle, Pollution Prevention, Preparing for Reuse, Prevention, Recovery, Recycling, Reduction, Reuse, Storage, Treatment, Waste, Waste Management, Waste Minimisation.

Reduction (Source)

The reduction of waste through, for example, reuse, is near the top of the waste management hierarchy¹⁰⁵ as most of the material is removed from the waste cycle and put back into the

¹⁰¹ <http://www.legislation.govt.nz/act/public/2008/0089/latest/DLM999802.html>

¹⁰² http://www.bmub.bund.de/fileadmin/Daten_BMU/Download_PDF/Abfallwirtschaft/kreislaufwirtschaftsge setz_en_bf.pdf

¹⁰³ <http://www.unep.org/ietc/Portals/136/Publications/Waste%20Management/UNEP%20NWMS%20Englis h.pdf> p18

¹⁰⁴ <http://ec.europa.eu/eurostat/documents/342366/4953052/Guidance-on-Backfilling.pdf/c18d330c-97f2-4f8c-badd-ba446491b47e>

¹⁰⁵ <http://www.unep.org/ietc/Portals/136/Publications/Waste%20Management/UNEP%20NWMS%20Englis h.pdf> p18

economy. A small amount of waste can be generated in, for example, reusing a product may require maintenance that can produce waste. However, this is preferable to the whole product being disposed of. An example of a definition for reduction is found in the NZ Waste Minimisation Act (2008)¹⁰⁶ shown below. In the NZ legislation there is no category for prevention (with the rationalisation that the 4-Rs (reduce, reuse, recycle, recover) are easy to remember and the ultimate of reduction is prevention).

Reduction means lessening waste generation, including by using products more efficiently or by redesigning products and, in relation to a product, lessening waste generation in relation to the product.

An alternative definition (source reduction) is found in the UK Environmental Protection Act (1990)¹⁰⁷, shown below, which focuses on hazard reduction. Reduction of hazardous substances entering the environment covers all media and the intention is that the hazardous substance/pollutant will achieve this by recycling, treatment or disposal.

The second form of hazard is that created by modifications in design, manufacture or operation of products, processes or procedures to reduce hazards to human health and the environment. Reduction in the UK definition specifically leaves out actions like physical alteration that are more appropriately termed treatment.

Source reduction means any practice which:

- reduces the amount of any hazardous substance, pollutant, or contaminant entering any waste stream or otherwise released into the environment (including fugitive emissions) prior to recycling, treatment, or disposal; and
- reduces the hazards to public health and the environment associated with the release of such substances, pollutants, or contaminants. The term includes equipment or technology modifications, process or procedure modifications, reformulation or redesign of products, substitution of raw materials, and improvements in housekeeping, maintenance, training, or inventory control.

The term “source reduction” does not include any practice which alters the physical, chemical, or biological characteristics or the volume of a hazardous substance, pollutant, or contaminant through a process or activity which itself is not integral to and necessary for the production of a product or the providing of a service.

Related Definitions: Circulative Resources, Cyclical Use, Disposal, Diverted Material, Effect on the Environment, Emissions, Environment, Environmental Pollution, Harm, Hazardous Waste, Hazardous Waste Management, Immissions, Life Cycle, Multimedia, Pollution Prevention, Protecting the Environment, Recovery, Resource Conservation, Reuse, Sustainable Management, Treatment, Waste, Waste Management, Waste Minimisation.

¹⁰⁶ <http://www.legislation.govt.nz/act/public/2008/0089/latest/DLM999802.html>

¹⁰⁷ http://www.legislation.gov.uk/ukpga/1990/43/pdfs/ukpga_19900043_en.pdf

Release

The point of release of a pollutant into the environment is a critical one in terms of enforcement. Enforcement of a pollutant while it is contained is a different operation to enforcing it after release. Pollutants released into water and air can travel great distances and cause widespread environmental problems. Hence, a definition for the point that a pollutant transitions from contained to emission is needed. An example of a definition is found in the UK Environmental Protection Act (1990)¹⁰⁸ shown below.

Released means a substance is “released” into any environmental medium whenever it is released directly into that medium whether it is released into it within or outside [the country] and “release” includes:

- in relation to air, any emission of the substance into the air;
- in relation to water, any entry (including any discharge) of the substance into water;
- in relation to land, any deposit, keeping or disposal of the substance in or on land.

Related Definitions: Air, Air Pollution, Contaminant, Controlled Waste, Discarding, Discharge, Disposal, Dumping, Emissions, Environment, Environmental Pollution, Harm, Hazardous Waste, Hazardous Waste Management, Immissions, Incineration, Land-based Sources, Marine Pollution, Nutrients, Resource Conservation, Treatment, Waste, Waste Management, Water Pollution.

Remediation

Remediation of environmentally damaged land and/or water is a two-step process. The first step is assessment of the damage and preparation for the works to remediate the land or water. Often contaminated land can pollute surrounding land or water, so a remediation assessment would need to cover those situations.

The works process of remediation can include harm reduction by prevention, minimisation, mitigation, or reversing the damage through restoration. An additional feature of the works part of remediation is the ongoing inspections of the remediated site to ensure the condition of the works conducted does not lead to more environmental harm being caused. An example of a definition is found in the UK Environmental Protection Act (1990)¹⁰⁹ shown below.

Remediation means:

- the doing of anything for the purpose of assessing the condition of:
 - the contaminated land in question;
 - any controlled waters affected by that land; or
 - any land adjoining or adjacent to that land;

¹⁰⁸ http://www.legislation.gov.uk/ukpga/1990/43/pdfs/ukpga_19900043_en.pdf

¹⁰⁹ http://www.legislation.gov.uk/ukpga/1990/43/pdfs/ukpga_19900043_en.pdf

- the doing of any works, the carrying out of any operations or the taking of any steps in relation to any such land or waters for the purpose of:
 - preventing or minimising, or remedying or mitigating the effects of, any significant harm, or any pollution of controlled waters, by reason of which the contaminated land is such land; or
 - restoring the land or waters to their former state; or
 - the making of subsequent inspections from time to time for the purpose of keeping under review the condition of the land or waters.

Related Definitions: Contaminant, Contaminated Land, Discharge, Effect on the Environment, Emissions, Environment, Environmental Pollution, Harm, Hazardous Waste, Hazardous Waste Management, Land-based Sources, Marine Pollution, Nutrients, Pollution Prevention, Protecting the Environment, Sustainable Management, Waste, Waste Management, Waste Minimisation, Water Pollution.

Resource Conservation

Conservation of resources is fundamental to integrated waste management. It can be achieved in three ways: reducing waste produced; reducing the need to use new resources; and diverting resources before they are destined for disposal. Diversion of resources to produce new ones is one way that both reduces waste volumes and the need for new resources. However, a bigger question is whether the items are needed at all. The answer to that question is what could be at the heart of a transition to a real circular economy.

An example of a definition for resource economy is found in the US Resource Conservation and Recovery Act (1976)¹¹⁰ shown below. While the definition is aimed at solid waste, it would be equally applicable for liquid, gas and energy wastes.

Resource conservation means reduction of the amounts of solid waste that are generated, reduction of overall resource consumption, and utilisation of [minimised] resources.

Related Definitions: Best Available Techniques, Circular Economy, Circulative Resources, Emissions, Environment, Environmental Pollution, Harm, Immissions, Life Cycle, Pollution Prevention, Prevention, Protecting the Environment, Recovery, Recycling, Reduction, Reuse, Storage, Treatment, Waste, Waste Management, Waste Minimisation.

Reuse

Reuse is a subset of reduction in the UNEP Guidelines¹¹¹. Reuse can be a highly efficient way of reducing waste since prolonging the life of a product diminishes the need for new products.

¹¹⁰ <https://www.law.cornell.edu/uscode/text/42/chapter-82>

¹¹¹ <http://www.unep.org/ietc/Portals/136/Publications/Waste%20Management/UNEP%20NWMS%20English.pdf> p18

The negative element in this is that in an economy that is based on increasing consumption to be buoyant, reuse slows that economy.

Reuse is a very efficient cyclical process that prolongs the usefulness of products or their components, only requiring maintenance during use and between cycles. An important aspect for reuse is that the components or products are used for the same purpose they were initially developed for. If they are used for a different purpose (e.g. newspapers for insulation), that is recycling. A definition of reuse is found in the German Circular Economy Act (2012)¹¹² shown below.

Reuse means any operation by which products or components that are not waste are used again for the same purpose for which they were originally conceived.

A definition that describes reuse in circular economy terminology is found in the Japanese Basic Act for the Establishment of a Sound Material-Cycle Society (2000)¹¹³ shown below where the descriptor refers to circulative resources.

Reuse means:

- To use circulative resources as is, as products (including using them after conducting repairs);
- To use circulative resources in their entirety or in part as components or parts of products.

Related Definitions: Circular Economy, Circulative Resources, Cyclical Use, Diverted Material, Life Cycle, Pollution Prevention, Preparing for Reuse, Prevention, Recovery, Reduction, Reuse, Treatment, Waste, Waste Management, Waste Minimisation.

Special Waste

Special waste is often a term used for wastes that have hazardous properties of some sort and hence controls need to be put on it, for example e-waste. An example of a definition of special waste is found in the UK Environmental Protection Act (1990)¹¹⁴ shown below, where they are specified according to lists produced in regulations.

Special Waste means controlled waste as specified in regulations.

Related Definitions: Contaminant, Controlled Waste, Harm, Hazardous Waste, Hazardous Waste Management, Waste Management, Waste Minimisation.

¹¹² http://www.bmub.bund.de/fileadmin/Daten_BMU/Download_PDF/Abfallwirtschaft/kreislaufwirtschaftsgesetz_en_bf.pdf

¹¹³ <https://www.env.go.jp/en/laws/recycle/12.pdf>

¹¹⁴ http://www.legislation.gov.uk/ukpga/1990/43/pdfs/ukpga_19900043_en.pdf

Statutory Nuisances

An urbanised society increases the possibility that nuisances can arise that affect other people or property. Nuisance is divided into private and public¹¹⁵ where a private nuisance is encroaching on a neighbour's land; causing physical damage to anything on a neighbour's property; or interfering with a neighbour's enjoyment of their land. A public nuisance is one where people are adversely affected by something that comes within the sphere or neighbourhood of its operation.

Health effects are a significant indicator of statutory nuisances as can be seen in the example below found in the UK Environmental Protection Act (1990)¹¹⁶.

Statutory nuisances means:

- any premises that are prejudicial to health or a nuisance;
- smoke, fumes or gases that are prejudicial to health or a nuisance;
- any dust, steam, smell or other effluvia from industrial, trade or business premises that are prejudicial to health or a nuisance;
- any accumulation or deposit which is prejudicial to health or a nuisance;
- any water covering land which is prejudicial to health or a nuisance;
- any animal kept in such a place or manner prejudicial to health or a nuisance;
- any insects emanating from premises being prejudicial to health or a nuisance;
- artificial light emitted from premises or any stationary object that is prejudicial to health or a nuisance;
- noise that is prejudicial to health or a nuisance and is emitted from, or caused by, a vehicle, machinery or equipment in a street; or
- any other matter declared by any enactment to be a statutory nuisance.

Related Definitions: Air, Air Pollution, Contaminant, Controlled Waste, Discarding, Discharge, Disposal, Dumping, Emissions, Harm, Immissions, Land-based Sources, Release, Storage, Waste, Waste Management.

Storage

The differentiation between storage and disposal is a difficult one. One of the difficulties in defining storage is whether it is classed by the owner as storage (with the intention of doing something with it later) and when it is disposal. The crucial difference comes in that some countries have implemented levies for disposal operations, but do not levy material that is diverted from landfills or wastewater treatment plants. Storage can be quite legitimate to, for example, stockpile material until enough has accumulated for treatment, minimisation or until a treatment or minimisation process is available. A lot depends on the judgement of the person making the decisions and what guidance they have regarding the definitions. An example of a

¹¹⁵ http://portal.nasstar.com/33/files/articles/Birtles_StatutoryNuisance.pdf

¹¹⁶ http://www.legislation.gov.uk/ukpga/1990/43/pdfs/ukpga_19900043_en.pdf

definition for storage is found in the US Resource Conservation and Recovery Act (1976)¹¹⁷ shown below, which focuses on hazardous waste. The definition could equally apply to non-hazardous waste by removing 'hazardous' from the definition.

Storage, when used in connection with hazardous waste, means the containment of hazardous waste, either on a temporary basis or for a period of years, in such a manner as not to constitute disposal of such hazardous waste.

Related Definitions: Circulative Resources, Contaminant, Cyclical Use, Discarding, Disposal, Diverted Material, Dumping, Emissions, Hazardous Waste, Hazardous Waste Management, Landfills, Pollution Prevention, Preparing for Reuse, Recovery, Recycling, Reuse, Treatment, Waste, Waste Management, Waste Minimisation.

Sustainable Management

Sustainable management arises out of the Brundtland definition for sustainable development¹¹⁸. Sustainable management establishes the mechanism to keep a system operating perpetually without diminishing resources while retaining economic viability, and attending to the needs of the present and future generations. The needs of the generations go beyond the physical needs and include providing for social, economic and cultural needs of communities. An example of this sort of definition is found in the NZ Resource Management Act (1991)¹¹⁹ shown below. Note that minerals are omitted from sustainable management as they are non-renewable resources.

Sustainable management means managing the use, development, and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic, and cultural well-being and for their health and safety while:

- sustaining the potential of natural and physical resources (excluding minerals) to meet the reasonably foreseeable needs of future generations; and
- safeguarding the life-supporting capacity of air, water, soil, and ecosystems; and
- avoiding, remedying, or mitigating any adverse effects of activities on the environment.

Related Definitions: Circular Economy, Circulative Resources, Diverted Material, Effect on the Environment, Environment, Environmental Pollution, Harm, Life Cycle, Pollution Prevention, Resource Conservation, Waste, Waste Management, Waste Minimisation.

Treatment (Waste)

Originally the waste management hierarchy was set up to manage hazardous waste and was later adapted as a guideline for all waste. In the original setting treatment was designed to make

¹¹⁷ <https://www.law.cornell.edu/uscode/text/42/chapter-82>

¹¹⁸ <http://www.un-documents.net/our-common-future.pdf>

¹¹⁹ <http://www.legislation.govt.nz/act/public/1991/0069/latest/DLM230265.html>

the substance less hazardous or non-hazardous. Hence, treatment encompasses biological, chemical or physical processes as well as volume or character changes to reduce the environmental impact of the waste prior to disposal. Treatment can be applied to solid, liquid or gaseous wastes.

An example of a definition of treatment being applied specifically to hazardous waste is found in the US Resource Conservation and Recovery Act (1976)¹²⁰ shown below.

Treatment, when used in connection with hazardous waste, means any method, technique, or process, including neutralization, designed to change the physical, chemical, or biological character or composition of any hazardous waste so as to neutralise such waste or so as to render such waste non-hazardous, safer for transport, amenable for [minimisation], amenable for storage, or reduced in volume. Such term includes any activity or processing designed to change the physical form or chemical composition of hazardous waste so as to render it non-hazardous.

A more general definition is found in the German Circular Economy Act (2012)¹²¹ shown below. The German definition covers both treatment and disposal, hazardous and non-hazardous, in keeping with the idea that treatment is a disposal operation not a minimisation operation. However, the definition does provide for subsequent minimisation if desired.

Waste treatment means [minimisation] and disposal operations, including preparation prior to [minimisation] or disposal.

A further definition is found in the NZ Waste Minimisation Act (2008)¹²² shown below, which also includes hazardous and non-hazardous waste. In addition, dilution (for solids, liquids or gases) is not regarded as a treatment process, but is a disposal operation. This is specified as dilution only temporarily spreads the problem, eventually causing the same problems, but on a wider scale if action is not taken.

Treatment means subjecting waste to any physical, biological, or chemical process to change its volume or character so that it may be disposed of with no or reduced adverse effect on the environment but does not include dilution of waste.

Related Definitions: Air Pollution, Contaminant, Controlled Waste, Disposal, Diverted Material, Dumping, Emissions, Environment, Environmental Pollution, Harm, Hazardous Waste, Hazardous Waste Management, Immissions, Marine Pollution, Multimedia, Pollution Prevention, Preparing for Reuse, Prevention, Protecting the Environment, Recovery, Recycling, Reduction, Release, Resource Conservation, Reuse, Storage, Waste, Waste Management, Waste Minimisation, Water Pollution.

¹²⁰ <https://www.law.cornell.edu/uscode/text/42/chapter-82>

¹²¹ http://www.bmub.bund.de/fileadmin/Daten_BMU/Download_PDF/Abfallwirtschaft/kreislaufwirtschaftsgesetz_en_bf.pdf

¹²² <http://www.legislation.govt.nz/act/public/2008/0089/latest/DLM999802.html>

Waste (Solid, or other Matter, Substances)

Every definition of waste produces problems of one sort or another because waste in one context is a raw material in another. Attempts to avoid a specific definition in law built around a rationale of using a dictionary definition and the expectation that everyone has a sense of what waste meets with opposition from local government, industry and even the waste industry as they are all looking for clarity (and possible loopholes to benefit from).

Court cases inevitably involve the definition of waste as to whether an entity has transgressed the law or not. Some sort of definition will be necessary for regulatory purposes and to ensure compliance with relevant international conventions and treaties. Different countries have defined waste in different ways to minimise the problems in the areas they find important. Definitions of waste should not be seen on their own, but the effects should be considered in the context of the clauses that draw on the definition.

For the purpose of these guidelines, the following examples are reviewed in terms of the difficulties associated with each definition and the need for each country to articulate their own need in their context and then formulate their own definitions.

A less problematic definition is if a country needs to differentiate between solid and other wastes. An example of this is found in the US Resource Conservation and Recovery Act (1976)¹²³ shown below.

Solid waste means any garbage, refuse, sludge from a waste treatment plant, water supply treatment plant, or air pollution control facility and other discarded material, including solid, liquid, semisolid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations, and from community activities, but does not include solid or dissolved material in domestic sewage, or solid or dissolved materials in irrigation return flows or industrial discharges which are point sources.

Sludges from waste treatment plants often present a dilemma as to whether they are solids or liquids since their solid content can be very low (e.g. 10% by volume). The US defined them as solids since the water can readily evaporate leaving the solid material behind. In a similar way, waste from a facility is not defined according to the facility, but according to the waste medium (e.g. solid waste from a water treatment facility is defined as solid waste). While this may seem obvious, it removes from contention that, for example, waste from a water treatment plant should be classified as liquid waste. The motivation for such an argument could be in a situation where say, regulations for liquid waste are less stringent than those for solid waste leading to a cost saving on disposal of anything that could be classed as a liquid waste.

Most definitions of waste try to discern between what trash is and what is minimised (or potentially minimised) material. The UK Environmental Protection Act (1990)¹²⁴, shown below, itemises a list of the sorts of materials that are defined as waste.

Waste means any substance or object resulting from:

¹²³ <https://www.law.cornell.edu/uscode/text/42/chapter-82>

¹²⁴ http://www.legislation.gov.uk/ukpga/1990/43/pdfs/ukpga_19900043_en.pdf

- Production or consumption residues not otherwise specified below;
- Off-specification products;
- Products whose date for appropriate use has expired;
- Materials spilled, lost or having undergone other mishap, including any materials, equipment, etc, contaminated as a result of the mishap;
- Materials contaminated or soiled from planned actions (e.g. residues from cleaning operations, packing materials, containers, etc.);
- Unusable parts (e.g. reject batteries, exhausted catalysts, etc.);
- Substances which no longer perform satisfactorily (e.g. contaminated solvents, exhausted tempering salts, etc.);
- Residues of industrial processes (e.g. slags, still bottoms, etc.);
- Residues from pollution abatement processes (e.g. scrubber sludges, baghouse dusts, spent filters, etc.);
- Machining or finishing residues (e.g. lathe turnings, mill scales, etc.);
- Residues from raw materials extraction and processing (e.g. mining residues, oil field slops, etc.);
- Adulterated materials (e.g. oils contaminated with PCBs, etc.);
- Any materials, substances or products whose use has been banned by law;
- Products for which the holder has no further use (e.g. agricultural, household, office, commercial and shop discards, etc.);
- Contaminated materials, substances or products resulting from remedial action with respect to land;
- Any materials, substances or products which are not contained in the above categories.

The first and last bullet points in the definition above allow for anything that is not included in the other bullet points, which can compound the problem of discerning waste as it still leaves the interpretation to the individual. Consideration of the other bullet points reveals:

- Off-specification products can be sold on a secondary market, thus just because they are not the specifications required does not automatically make them waste.
- Contaminated or soiled materials can be reused (e.g. counter-current rinsing can use contaminated acid baths as the first step in dissolving heavy soiling before going on to cleaner batches of acid for subsequent rinsing).
- Technology is available for refurbishing or minimising many catalysts and batteries, hence a blanket statement may not be appropriate – it may depend on what is available in or to the country in question.
- Many substances that do not perform satisfactorily (e.g. solvents) can be easily recycled.
- Residues from industrial processes can undergo further refinement to extract valuable materials. A stockpile may be needed to make the refinement economically viable and/or further research may be needed to utilise the stockpile.
- Residues from pollution abatement processes may hold valuable materials that may need action similar to the residues from industrial processes.
- Machining or finishing residues may hold valuable materials that could be recycled after perhaps treatment.

- Residues from raw materials' extraction and processing are being reprocessed on a regular and worldwide basis, dependent on the price of the extracted material and the technology available to undertake the extraction.
- Adulterated materials can be re-refined in some cases so can be used again.
- Materials banned by law may be one way of defining waste but thought should be given to the ability of the law to change quickly enough to either remove or add materials to the list.
- Products for which the owner has no further use may be interpreted in a number of ways. An owner may use a product for more than just its intended use (e.g. an old car becomes an art object), so classifying products under this category would generally require the owner to agree that he/she has no further use for it. Often these products can be put into recycling, so the owner may argue that the waste pile is actually a storage pile.
- Contaminated materials from, for example, land remediation can sometimes be reprocessed and produce valuable products.

As can be seen from the list above, there are many possible exceptions to the rule. One way to test whether an owner has an exception or is trying to get around the rules is for the enforcement authority to put the burden of proof onto the owner.

A similar approach to the lists above is taken by the Netherlands in their Environmental Management Act (2004)¹²⁵ shown below, where reference is made to an international list. The same questions apply as to the UK example above.

Waste substances means all substances, preparations or other products belonging to the categories referred to in annex I to Council Directive no. 75/442/EEC of 15 July 1975 on waste, which the holder thereof discards, intends to discard or must discard.

A similar approach is taken in the German Circular Economy Act (2012)¹²⁶, shown below, but without the reference to the Council Directive.

Waste means all substances or objects which the holder discards, or intends or is required to discard. Waste for [minimisation] shall be deemed waste that is [minimised]; waste that is not [minimised] shall be deemed waste for disposal.

The difficulties with this definition are showing that an owner intends to discard and is not just stockpiling for future use. One of the conditions for waste in the German definition is the requirement to discard substances and objects. This provision is further defined as shown below. The requirement to discard is based on the product not being used for its original purpose and posing a danger to the public, especially the environment. The discard provision becomes operational if only minimisation or disposal removes the danger.

¹²⁵ <http://www.asser.nl/upload/eel-webroot/www/documents/national/netherlands/EMA052004.pdf>

¹²⁶ http://www.bmub.bund.de/fileadmin/Daten_BMU/Download_PDF/Abfallwirtschaft/kreislaufwirtschaftsgesetz_en_bf.pdf

The holder must discard substances or objects ... when these are no longer used in keeping with their original purpose, and when, due to their specific state, they could endanger, either in the present or the future, the public interest, especially the environment, and when its potential danger can be ruled out only through proper and safe [minimisation], or disposal that is compatible with the public interest.

A further element of waste is demonstrated in the NZ Waste Minimisation Act (2008)¹²⁷, shown below, which adds the classification of waste defined according to its composition or source. Some wastes are not individual defined objects, but collections of objects (e.g. construction waste that is predominantly a mixture of wood, plasterboard, concrete, soil and rock and a large number of other wastes) and identification of the source of the waste may be more valuable in terms of, for example, targeting particular large or difficult to manage waste streams than the individual components. Once again, with this definition the question of whether the materials are a waste or in storage comes up.

Waste means any thing disposed of or discarded and includes a type of waste that is defined by its composition or source (for example, organic waste, electronic waste, or construction and demolition waste) and includes any component or element of minimised material, if the component or element is disposed of or discarded.

A very broad definition of waste may at first reading seem to make everything on the planet waste. However, when taken in the context of the legislation, such a broad definition is entirely applicable. An example of this sort of definition is found in the NZ Resource Management Act (1991)¹²⁸ shown below.

Waste or other matter means materials and substances of any kind, form, or description.

The context in the legislation is always to do with products and wastes being discarded, or incinerated or discarded. Hence, the definition is appropriate in that context as it removes the argument that the goods that are thrown away are covered under the provisions of the Act because they are, for example, a random pile of materials and not materials as specified.

Related Definitions: Air Pollution, Biowaste, Circulative Resources, Commercial Waste, Controlled Waste, Discarding, Discharge, Disposal, Diverted Material, Emissions, Environment, Hazardous Waste, Hazardous Waste Management, Household Waste, Immissions, Industrial Waste, Inert Waste, Landfills, Marine Pollution, Multimedia, Pollution Prevention, Preparing for Reuse, Prevention, Recovery, Recycling, Reduction, Release, Reuse, Special Waste, Storage, Treatment, Waste Management, Waste Minimisation.

Waste Management (Solid)

Waste management or solid waste management starts at the point the material(s) become waste and goes through to the end-of-life of those materials. An important aspect of waste

¹²⁷ <http://www.legislation.govt.nz/act/public/2008/0089/latest/DLM999802.html>

¹²⁸ <http://www.legislation.govt.nz/act/public/1991/0069/latest/DLM230265.html>

management is that the process is an organised one and that systems are in place to track the waste in some way so that the destination of any particular waste is known. One representation of the processes needed is found in the US Resource Conservation and Recovery Act (1976)¹²⁹ shown below. In this definition, export is taken to be the removal of the waste from its place of origin, and not the transboundary movement of the waste.

Solid waste management means the systematic administration of activities which provide for the export, source separation, storage, transportation, transfer, processing, treatment, and disposal of solid waste.

From an integrated waste management perspective arrival at the disposal site does not represent the end of responsibility for that waste. Over time the disposal site will fill up and eventually no more waste can be put there. At that stage the site is closed and waste goes to a new site. The old site needs monitoring and after-life care, which can be included in the definition of waste management as shown below in the German Circular Economy Act (2012)¹³⁰. It should be noted that in the definition actions as dealers and brokers do not exempt such groups from responsibility under these provisions.

Waste management means the provision of, the surrender, collection, transport, recovery and disposal of waste, including the supervision of such operations and the after-care of disposal installations, and including actions taken as a dealer or broker.

Related Definitions: Biowaste, Certified Waste Management Company, Commercial Waste, Controlled Waste, Discarding, Discharge, Disposal, Disposal Facility, Dumping, Hazardous Waste, Hazardous Waste Management, Household Waste, Industrial Waste, Inert Waste, Landfills, Release, Special Waste, Waste.

Waste Minimisation

Waste minimisation is a term used to cover all activities from prevention to recovery in the UNEP waste management hierarchy¹³¹ that are classified as disposal. In the NZ Waste Minimisation Act (2008)¹³² definition shown below, it is used to differentiate between activities that diminish waste production and disposal activities (treatment and disposal).

Waste minimisation means the reduction of waste and the reuse, recycling, and recovery of waste and diverted material.

Related Definitions: Biowaste, Circulative Resources, Commercial Waste, Controlled Waste, Cyclical Use, Discarding, Discharge, Disposal, Diverted Material, Hazardous Waste, Hazardous Waste Management, Household Waste, Industrial Waste, Inert Waste, Pollution Prevention,

¹²⁹ <https://www.law.cornell.edu/uscode/text/42/chapter-82>

¹³⁰ http://www.bmub.bund.de/fileadmin/Daten_BMU/Download_PDF/Abfallwirtschaft/kreislaufwirtschaftsgesetz_en_bf.pdf

¹³¹ <http://www.unep.org/ietc/Portals/136/Publications/Waste%20Management/UNEP%20NWMS%20English.pdf> p18

¹³² <http://www.legislation.govt.nz/act/public/2008/0089/latest/DLM999802.html>

Prevention, Recovery, Recycling, Reduction, Reuse, Special Waste, Statutory Nuisances, Treatment, Waste, Waste Management.

Water Pollution

Direct or indirect discharge of pollutants into water bodies contaminates those bodies. It is very convenient for local government and industry to discharge pollutants into water bodies as this is very cost effective and the problem 'disappears' into the water. However, the problem accumulates over time requiring a far more expensive intervention to remediate the damage than it would have been to manage the pollutant(s) at source. Often the remediation required is more than can be handled by the polluter (if they are still in business when remediation is needed) or local government and the expense of decontamination can fall to national government or even international agencies.

A definition of water pollution needs to incorporate more than just actions to degrade a water body. It is important to include health, safety and welfare of humans and animals as well as damage to property and vegetation. It is also useful to include interference to the normal pleasures of life or property. An example of a definition of this sort is found in the Canadian Environmental Protection Act (1999)¹³³ shown below.

Water pollution means a condition of water, arising wholly or partly from the presence in water of any substance, that directly or indirectly:

- endangers the health, safety or welfare of humans;
- interferes with the normal enjoyment of life or property;
- endangers the health of animal life;
- causes damage to plant life or to property; or
- degrades or alters, or forms part of a process of degrading or altering, an ecosystem to an extent that is detrimental to its use by humans, animals or plants.

Related Definitions: Biowaste, Discarding, Discharge, Disposal, Dumping, Land-based Sources, Marine Pollution, Nutrients, Protecting the Environment, Release, Sustainable Management, Waste, Waste Management.

¹³³ <http://laws-lois.justice.gc.ca/PDF/C-15.31.pdf>

IMPLEMENTATION

The table below suggest provisions for countries to use at various stages of integrated waste legislation development. It is assumed that each category below is in addition to those above, though the earlier ones may need to be updated to provide for the expanded categories.

Table 1: Legislation Development

Disposal	
General Provisions	Use of Economic Instruments
Waste Strategy Infrastructure Planning Waste Management Plan Treatment Disposal Household Waste Waste Collection Landfills Sewage Hazardous Waste Litter	Levies Grants
Environmental Aspects of Waste	Responsibilities in Waste Management
Adverse Effects Discharge of Contaminants Environmental Emergencies and Disasters Environmental Impact Assessment Import/Export/Transboundary Waste	National Government Advisory Committee Local Government Non-Government Organisations Citizens Private Sector
Auditing and Reporting	Compliance and Enforcement
Audit Data/Information Monitoring Reporting	Licensing Liability Enforcement Offences and Penalties
Single Medium Integration	
General Provisions	Circular Economy
Waste Management Hierarchy Prevention Reduction Reuse Recycling Recovery Disposal Ban Separation Biowaste Burning Mining/Mineral Waste Tyres	Best Available Technology Procurement
Environmental Aspects of Waste	Extended Producer Responsibility/ Product

Contaminated Land	Stewardship Extended Producer Responsibility Product Stewardship Drop-off Systems Deposit Scheme
Multimedia Integration	
General Provisions Smoke	Environmental Aspects of Waste Air Quality
Responsibilities in Waste Management Traffic Fuels	Compliance and Enforcement Company Waste Management Officer Immission Control Officer
Circular Economy	
Circular Economy Circular Economy Requirements and Obligations	

GENERAL PROVISIONS

This section covers general provisions for legislation. The section covers the following provisions:

- Waste Strategy;
- Infrastructure Planning;
- Waste Management Plan;
- Waste Management Hierarchy;
- Prevention;
- Reduction;
- Reuse
- Recycling;
- Recovery;
- Treatment;
- Disposal;
- Separation;
- Waste Collection;
- Household Waste;
- Biowaste;
- Sewage;
- Hazardous Waste;
- Burning;
- Smoke;
- Litter;
- Mining / Mineral Waste;
- Tyres; and
- Landfills.

Waste Strategy

Waste strategies are often formed as part of the policy-making process and extensive guidance is provided in the UNEP Guidelines¹³⁴. The advice provided in the Guidelines will not be repeated here.

Legislation on waste strategy can deal with the mechanisms for implementing the strategy. The important parts of the mechanisms are: responsibility and content; consultation; environmental protection; infrastructure requirements; transboundary considerations; the waste management hierarchy; and information

Responsibility and Content

¹³⁴ <http://www.unep.org/ietc/Portals/136/Publications/Waste%20Management/UNEP%20NWMS%20English.pdf>

Responsibility for preparing the strategy normally rests with a senior official or the cabinet minister in charge of the portfolio. It is possible to set a date by which the strategy development needs to be completed, however determining how long is needed can prove difficult in allowing sufficient time for development and consultation at various stages, but not so long that impetus is lost. Guidance on the length of time taken to develop similar strategies could provide assistance on an appropriate period to allow for the process. Alternately, a suitably open term like ‘as soon as possible’ can indicate the priority nature of developing the strategy. An example is found in the UK Environmental Protection Act (1990)¹³⁵ is shown below where the cabinet minister is responsible.

[National Government] shall as soon as possible prepare a statement (“the strategy”) containing his policies in relation to the [minimisation] and disposal of waste.

Along with the responsibility and timing comes a general description of the content of the strategy. Most countries have targets within their strategies that will specify types and quantities of waste to be minimised, technical requirements to deliver on the strategy and other activities to be undertaken (e.g. education programmes). An example from the UK Environmental Protection Act (1990)¹³⁶ is shown below.

It shall contain provisions for:

- the type, quantity and origin of waste to be recovered or disposed of
- general technical requirements; and
- any special requirements for particular wastes.

Consultation

Consultation is vital for developing a coherent and workable strategy. If a cabinet minister is charged with completing the process, then it is beneficial if that minister consults with the ministry as well as other agencies across national government so that conflicts in competing priorities are defined early on and minimised. Local government, as a major deliverer of the strategy, need to be part of the consultation process as successful delivery of the strategy depends on cooperation between national and local government. Other groups that can provide important input to the process are: the business sector; the waste management sector including the informal waste sector; non-government organisations; community groups and their leaders; academics; mass media; and the general public. The UNEP Guidelines¹³⁷ suggest that in some cases it might be appropriate to consult with criminal elements where these have been identified as significant participants in the waste sector. An example on consultation clauses from the UK Environmental Protection Act (1990)¹³⁸ is shown below.

In preparing the strategy [national government] shall consult the Environment Agency, representatives of local government, industry and other bodies or persons as he considers appropriate.

¹³⁵ http://www.legislation.gov.uk/ukpga/1990/43/pdfs/ukpga_19900043_en.pdf s.44.A

¹³⁶ http://www.legislation.gov.uk/ukpga/1990/43/pdfs/ukpga_19900043_en.pdf s.44.A

¹³⁷ <http://www.unep.org/ietc/Portals/136/Publications/Waste%20Management/UNEP%20NWMS%20English.pdf> p 40-41

¹³⁸ http://www.legislation.gov.uk/ukpga/1990/43/pdfs/ukpga_19900043_en.pdf s.44.A.5

Environmental Protection

The other requirement is to broadly lay out the health and environmental expectations especially climate change considerations. For an integrated waste management strategy solid, liquid and gaseous emissions need consideration. An example from the UK Environmental Protection Act (1990)¹³⁹ is shown below.

The Strategy should ensure that waste is recovered or disposed of without endangering human health and without using processes or methods which could harm the environment and, in particular, without:

- risk to water, air, soil, plants or animals;
- causing nuisance through noise or odours; or
- adversely affecting the countryside or places of special interest.

Infrastructure Requirements

The infrastructure needed to deliver on the strategy is an important aspect. Consideration of the infrastructure needs provides knowledge on the scale of resources that will be required and therefore enable entities to plan their contributions. An example of the consideration of infrastructural needs from the UK Environmental Protection Act (1990)¹⁴⁰ is shown below.

Establish an integrated and adequate network of waste disposal installations, taking account of the best available technology not involving excessive costs.

Waste Management Hierarchy

The actions in a waste strategy are best considered according to the waste management hierarchy. At the top of the hierarchy are the waste minimisation processes of prevention and reduction, followed by recycling and recovery, and then disposal (UNEP Guidelines¹⁴¹). The focus on prevention and reduction are to use natural resources used in and for products more efficiently and extend the life of products, while recycling and recovery aim to make better use of the product or part of the product. An example of incorporating the waste management hierarchy thinking is found in the UK Environmental Protection Act (1990)¹⁴² shown below.

Encourage the prevention or reduction of waste production and its harmfulness, in particular by the:

- development of clean technologies more sparing in their use of natural resources;
- technical development and marketing of products designed to make no contribution or the smallest possible contribution, by the nature of their manufacture, use or final disposal, to increasing the amount or harmfulness of waste and pollution hazards; and

¹³⁹ http://www.legislation.gov.uk/ukpga/1990/43/pdfs/ukpga_19900043_en.pdf schedule.2A

¹⁴⁰ http://www.legislation.gov.uk/ukpga/1990/43/pdfs/ukpga_19900043_en.pdf schedule.2A

¹⁴¹ <http://www.unep.org/ietc/Portals/136/Publications/Waste%20Management/UNEP%20NWMS%20English.pdf> p18

¹⁴² http://www.legislation.gov.uk/ukpga/1990/43/pdfs/ukpga_19900043_en.pdf schedule.2A

- development of appropriate techniques for the final disposal of dangerous substances contained in waste destined for recovery.

Encourage:

- the recovery of waste by recycling, reuse or reclamation or any other process with a view to extracting secondary raw materials; and
- the use of waste as a source of energy.

Information

One of the nodal points to motivate waste minimisation in the strategy is information. Several actions can be used as drivers to improve the uptake of waste minimisation. These include:

- Comparable measurements on demonstration projects showing the before and after situations;
- Internal agency integration avoids duplication and increases the buying power, thus providing an economic argument as well;
- A whole of government approach so that gains made in one area are notified across government so that each agency can benefit;
- Transparency provides the opportunity to learn from the successes and the mistakes;
- Financial grants derisk industry to do the research and development necessary to test out new waste minimisation programmes;
- Measurable goals give all sectors something to aim for in a tangible way and are therefore more likely to achieve change than vague aspirations;
- Interacting with industry through formation of a wide industry and local government expert group as a sounding board and to provide advice;
- Training in how to implement programmes is a necessary step to providing sufficient expertise for successful adoption of those programmes;
- Identifying and removing barriers that would otherwise hinder implementation;
- Government procurement decisions are a significant driver in any economy due to the scale of government services in most economies;
- Auditing ensures that accountability for (generally) public money is maintained which provides robustness for the programmes; and
- Publicity gives pride to those receiving the publicity for a job well done and provides encouragement for them to do better as well as showcasing the success to other industries.

An example of this is found in the US Pollution Prevention Act (1990)¹⁴³ shown below.

Development and implementation of a strategy to:

- establish standard methods of measurement of source reduction;
- (internal to the [agency]) consider the effect of its existing and proposed programs on source reduction efforts and review regulations prior and subsequent to their proposal to determine their effect on source reduction;

¹⁴³ <http://www.epw.senate.gov/PPA90.pdf> s.6604.b

- coordinate source reduction activities across other [national government] agencies, and generic research and development on techniques and processes which have broad applicability;
- develop improved methods of coordinating, streamlining and assuring public access to data collected under [national government] environmental statutes;
- facilitate the adoption of source reduction techniques by businesses. It sets up a national database and financial grants to foster the exchange of information to businesses, and provide technical assistance to businesses;
- establish measurable goals with the tasks necessary to achieve the goals, dates for principal task accomplishment, required resources, organisational responsibilities, and the means to measure progress;
- establish an expert technical advisory panel comprised of representatives from industry, state government and public interest groups, to advise on ways to improve data collection and dissemination;
- establish training programmes (including workshops and guidance documents) on source reduction opportunities covering permit issuance, enforcement, and inspection officials working within the [agency];
- identify and make legislative recommendations to eliminate barriers to source reduction including the use of incentives and disincentives;
- identify opportunities for government procurement to encourage source reduction;
- develop, test and disseminate model source reduction auditing procedures that highlight source reduction opportunities; and
- establish an annual award programme to recognise companies that have outstanding or innovative source reduction programmes.

Relevant Definitions: Air, Demonstration, Disposal, Emissions, Environment, Environmental Pollution, Harm, Installation, Multimedia, Preparing for Reuse, Prevention, Recovery, Recycling, Reduction, Reuse, Statutory Nuisances, Treatment, Waste, Waste Management, Waste Minimisation

Relevant International Agreements:

- OECD Decision C(92)39/FINAL on the Control of Transfrontier Movements of Wastes Destined for Recovery Operations

Infrastructure Planning

The adverse effects of poorly operated waste management facilities impose economic costs on the community and those affected are likely to be disadvantaged in education and employment. It is essential that the negative impacts of waste facilities are mitigated through planning.

Effective land use planning policies provide the setting for waste management planning in their areas (e.g. street width and layout, which influence collection choices, temporary waste storage options, as well as siting of landfills, waste transfer stations and other waste management

facilities). It is incumbent on the responsible government authority to minimise harmful environmental effects, both in the land used for waste management activities and separating those activities from residential, conservation and publicly used areas. All media emissions (solid, liquid and gas) need consideration in these land use planning decisions. An example of such planning clauses is found in the German Federal Immission Control Act (2002)¹⁴⁴ shown below.

In the case of [local] planning projects and associated measures, the land earmarked for specific types of use shall be zoned in such a manner that harmful environmental effects and the effects of major accidents in establishments are kept to a minimum on areas that are exclusively or predominantly used for residential purposes as well as on any other areas worthy of protection, in particular publicly used areas, important transport infrastructure, areas used for recreation and areas that are particularly valuable or sensitive with respect to nature conservation and publicly used buildings. In the case of [local] planning projects and associated measures carried out in areas in which the immission limits specified in ordinances [bylaws] are not exceeded, one aspect to be taken into account shall be maintenance of optimum air quality.

Relevant Definitions: Effect on the Environment, Emissions, Harm, Landfill, Multimedia, Storage, Waste Management

Relevant International Agreements:

- Convention for the Protection and Development of the Marine Environment in the Wider Caribbean Region (Cartagena Convention, 1983)
- Convention for the Protection of the Natural Resources and Environment of the South Pacific Region 1986
- Convention on the Transboundary Effects of Industrial Accidents, Helsinki, 1992
- European Agreement Concerning the International Carriage of Dangerous Goods by Inland Waterways (AND), Geneva, 2000. Including the Annex Regulation (2011)
- Kyoto Protocol 1997
- Strategic Approach to International Chemicals Management 2006
- United Nations Convention on the Law of the Sea (UNCLOS) 1982

Waste Management Plan

Waste management plans provide a blueprint for local government to achieve its waste management aims in a structured way. A typical plan will contain descriptions of what the plan is trying to achieve broken into the categories of the waste management hierarchy. This forms a useful categorisation for waste management planning.

¹⁴⁴ http://www.bmub.bund.de/fileadmin/bmu-import/files/english/pdf/application/pdf/bimschg_en_bf.pdf
s.50

Further elements in a typical plan are an assessment of the existing situation, the future needs and the infrastructure needed to deliver on the plan. An example of the legislation that sets up the categories is found in the German Circular Economy Act (2012)¹⁴⁵ shown below.

The waste management plans shall include descriptions of:

- the aims of waste prevention and recovery, and in particular preparation for re-use and recycling, as well as waste disposal;
- the existing situation in waste management;
- the necessary activities to improve the [minimisation] of waste and waste disposal, including an evaluation of their aptitude to achieve the objectives; and
- the waste treatment installations to ensure waste disposal, as well as the [minimisation] of mixed waste from private households including that which is collected in other areas of origin within the national borders.

Plan Review

Plans can be reviewed at any time, but a regular review should be considered. Many countries use review periods of four to six years. The advantage of more frequent reviews is to keep the issues front of mind for the politicians, officials and the public. The disadvantages are that a lot of resources are needed to conduct an effective review and longer term planning can give way to short term tweaking. An example of a clause requiring plan review is found in the German Circular Economy Act (2012)¹⁴⁶ shown below.

The plans shall be evaluated at least every six years and updated where necessary.

National-Local Continuity

It is important that there is continuity between what is decided nationally and locally, so that national government's priorities are, to some extent, reflected at the local level where appropriate. An example of a clause requiring national government priorities to be reflected at local government level is found in the UK Environmental Protection Act (1990)¹⁴⁷ shown below.

An integrated waste management plan is a plan which sets out, by reference to policies contained in the national waste management plan, how the local [government] intends to carry out its functions as waste disposal authority and waste collection authority.

The feedback loop on this one can be provided by national government regulating procedures for plan preparation and requiring plans to be mandatory. This ensures that there is some degree of accountability. An example of this is found in the German Circular Economy Act (2012)¹⁴⁸ shown below.

¹⁴⁵ http://www.bmub.bund.de/fileadmin/Daten_BMU/Download_PDF/Abfallwirtschaft/kreislaufwirtschaftsge setz_en_bf.pdf s.30

¹⁴⁶ http://www.bmub.bund.de/fileadmin/Daten_BMU/Download_PDF/Abfallwirtschaft/kreislaufwirtschaftsge setz_en_bf.pdf s.31

¹⁴⁷ http://www.legislation.gov.uk/ukpga/1990/43/pdfs/ukpga_19900043_en.pdf s.44ZA

¹⁴⁸ http://www.bmub.bund.de/fileadmin/Daten_BMU/Download_PDF/Abfallwirtschaft/kreislaufwirtschaftsge setz_en_bf.pdf s.31

[National government] shall regulate procedures for preparation of plans and for declaring them to be binding.

The responsible cabinet minister can assist the consistency of waste management plans across the country through instituting an approval process. While this may be perceived as national government interference in local government affairs, if the authority is used appropriately it can provide some degree of national consistency. An example defining the minister's role is found in the UK Environmental Protection Act (1990)¹⁴⁹ shown below.

Local [government] must prepare an integrated waste management plan which contains statements on such matters relating to the carrying out of those functions as the Minister may specify in directions.

The Minister shall:

- approve the plan without modifications; or
- approve the plan with such modifications as they consider appropriate; or
- refuse to approve the plan and require the local authority to prepare and submit, a further integrated waste management plan.

National government also has a role in defining the outlines of the plans and may require sign off at that level.

As has been noted above, in bringing together a plan, it is necessary to understand what is happening in neighbouring constituencies. Many waste activities cross local government boundaries (e.g. processing plants and disposal sites may draw materials from a wide area). Note that waste that travels across international borders is normally considered a national government responsibility (and covered separately in these guidelines). An example of legislation requiring local governments to cooperate is found in the German Circular Economy Act (2012)¹⁵⁰ shown below.

The [local governments] are to co-ordinate their waste management planning towards one another and amongst themselves. If planning is required that extends beyond a [local government] boundary, the affected [local government] should reach agreement when preparing waste management plans concerning relevant requirements and measures.

An alternative approach is for a more formal process whereby national government provides guidelines to local government on how to identify the areas which have shared waste management issues and are appropriate groupings for planning zonal waste management services. While this adds more formality to the process, local government often welcome guidance as, in some cases, experience in supra-local activities may be lacking. An example of legislation requiring local governments to cooperate is found in the US Resource Conservation and Recovery Act (1976)¹⁵¹ shown below.

¹⁴⁹ http://www.legislation.gov.uk/ukpga/1990/43/pdfs/ukpga_19900043_en.pdf s.44ZB

¹⁵⁰ http://www.bmub.bund.de/fileadmin/Daten_BMU/Download_PDF/Abfallwirtschaft/kreislaufwirtschaftsgesetz_en_bf.pdf s.31

¹⁵¹ <https://www.law.cornell.edu/uscode/text/42/chapter-82> s.4002.a

[National government] shall publish guidelines for the identification of those areas which have common solid waste management problems and are appropriate units for planning regional solid waste management services. Such guidelines shall consider:

- the size and location of areas which should be included,
- the volume of solid waste which should be included, and
- the available means of coordinating [local government] planning with other related [local government] planning and for coordination of such [local government] planning into the [wider] plan.

Current State of Affairs

The waste management plan needs to consider the current state of affairs. The plan should firstly consider the demographics of the area. An example of this is found in the US Resource Conservation and Recovery Act (1976)¹⁵² shown below.

- population density, distribution, and projected growth;
- geographic, geologic, climatic, and hydrologic characteristics;
- the type and location of transportation;
- the profile of industries;
- the constituents and generation rates of waste;
- the political, economic, organizational, financial, and management problems affecting [integrated] waste management;
- types of [waste minimisation] facilities and resource conservation systems which are appropriate; and
- the varying regional, geologic, hydrologic, climatic, and other circumstances under which different ... waste practices are required in order to insure the reasonable protection of the quality of the ground and surface waters from leachate contamination, the reasonable protection of the quality of the surface waters from surface runoff contamination, and the reasonable protection of ambient air quality.

Secondly is an assessment of the current waste facilities. An example of this is found in the US Resource Conservation and Recovery Act (1976)¹⁵³ shown below.

Characteristics and conditions of collection, storage, processing, and disposal operating methods, techniques and practices, and location of facilities where such operating methods, techniques, and practices are conducted, taking into account the nature of the material to be disposed.

¹⁵² <https://www.law.cornell.edu/uscode/text/42/chapter-82> s.4002.a

¹⁵³ <https://www.law.cornell.edu/uscode/text/42/chapter-82> s.4002.a

Future Needs

The plan also needs to consider the future capacity needed to cope with anticipated changes in the locality. An example of this is found in the Netherlands Environmental Management Act (2004)¹⁵⁴ shown below.

The waste management plan shall also include the capacity required for the [minimisation] or disposal of waste substances in establishments belonging to a category or a category of cases over the four-year¹⁵⁵ period concerned and, as far as possible, over the next six years¹⁵⁶ thereafter.

A slightly different way of forecasting future demand is found in the German Circular Economy Act (2012)¹⁵⁷, shown below, in which the method of arriving at the outcome is expanded on.

Description of demand must take into account future developments expected within a period of at least ten years. To the extent that this is necessary for description of demand, waste management concepts and waste balance sheets must be evaluated.

The waste management plans shall contain:

- sufficient information on the criteria for determining the location and on the capacity of future waste disposal installations or major recovery installations; and
- general waste management strategies, including planned waste management technologies and operations, or strategies for waste giving rise to particular management-related problems.

Once the demand analysis is completed an analysis of the market opportunities and needs helps to close the loop for utilising waste more fully in the economy. An example of this is found in the US Resource Conservation and Recovery Act (1976)¹⁵⁸ shown below.

Waste management plans shall consider available new and additional markets for recovered material and energy and energy resources recovered from solid waste as well as methods for conserving such materials and energy.

Responsibilities

Organisational aspects of the plan including the clarity of responsibilities are necessary in a waste management plan. The allocation of responsibilities is open to comment during the consultation period which provides the opportunity for discussion on the apportionment. There are some responsibilities that naturally fall to local government and some to other stakeholders. By defining the allocation the waste management plan process can build a common

¹⁵⁴ <http://www.asser.nl/upload/eel-webroot/www/documents/national/netherlands/EMA052004.pdf> s.10.7.2

¹⁵⁵ Time period between reviews

¹⁵⁶ Some time period that is appropriate for long term thinking.

¹⁵⁷ http://www.bmub.bund.de/fileadmin/Daten_BMU/Download_PDF/Abfallwirtschaft/kreislaufwirtschaftsgesetz_en_bf.pdf s.30

¹⁵⁸ <https://www.law.cornell.edu/uscode/text/42/chapter-82> s.4002.c

understanding. An example of this is found in the German Circular Economy Act (2012)¹⁵⁹ shown below.

Waste management plans may furthermore contain information on organisational aspects of waste management, including a description of the breakdown of responsibilities between public and private stakeholders who execute waste management.

Consultation

Consultation with stakeholders is a vital step in waste management plan development. Stakeholders are able to pick out strengths and deficiencies as well as potential perverse outcomes, in addition to showing where they may be reluctant to change practices. Often different groups will see the same provisions doing different things and it will then be up to local government to decide how it wants to proceed given the new information. Examples of legislation requiring consultation from the German Circular Economy Act (2012)¹⁶⁰ are shown below.

- The local [government] and the administrative districts and their respective associations, and the public bodies responsible for waste management, shall be involved in the preparation of waste management plans
- The [local government] shall permit the public to participate in the preparation or modification of waste management plans, including special chapters, or separate sub-plans, especially referring to the treatment of hazardous waste, used batteries and accumulators or packaging and packing waste. Preparation or modification of waste management plans, and information regarding the participation procedure, shall be announced in an official gazette and by other suitable means.
- The drafts of the new or modified waste management plan, as well as the reasons and considerations on which the draft is based, shall be posted for inspection for a one-month period. Statements may be submitted to [local government] in writing. Opinions received in good time shall be taken appropriately into account by [local government] in its decision regarding acceptance of the plan.

Implementation

Implementing a waste management plan requires more than goodwill and agreement amongst stakeholders. A variety of instruments are needed to achieve effective realisation of the goals including economic, voluntary and educational ones. These need consideration as part of the development process of the plan. An example of this is found in the German Circular Economy Act (2012)¹⁶¹ shown below.

¹⁵⁹ http://www.bmub.bund.de/fileadmin/Daten_BMU/Download_PDF/Abfallwirtschaft/kreislaufwirtschaftsgesetz_en_bf.pdf s.30

¹⁶⁰ http://www.bmub.bund.de/fileadmin/Daten_BMU/Download_PDF/Abfallwirtschaft/kreislaufwirtschaftsgesetz_en_bf.pdf s.31 & 32

¹⁶¹ http://www.bmub.bund.de/fileadmin/Daten_BMU/Download_PDF/Abfallwirtschaft/kreislaufwirtschaftsgesetz_en_bf.pdf s.30

Waste management plans may furthermore contain an evaluation of the benefit and aptitude of the use of economic and other instruments to overcome various waste-related problems, taking account of the need to maintain trouble-free functioning of the market.

One of the goals that is normally included are performance targets which in some way quantify how the implementation of the plan is judged as being successful over time. These can be such things as: money collected or spent; quantities of waste minimised; number of educational programmes completed; and number of people participating in programmes to name a few. An example requiring targets is found in the UK Environmental Protection Act (1990)¹⁶² shown below.

Local authorities must prepare an integrated waste management plan which include statements on:

- performance targets which [local government] shall endeavour to meet; and
- steps the [local government] proposes to take to meet performance targets.

Waste Management Hierarchy

One of the significant features of a waste management plan as a vehicle to move toward a circular economy is to consider the wastes produced in relation to the waste management hierarchy. Just as a waste management plan is a guide of what to do for an area, so the waste management hierarchy is a guide of what to consider for products. An example of incorporating the waste management hierarchy into the waste management plan thinking is found in the Netherlands Environmental Management Act (2004)¹⁶³ shown below.

In adopting the waste management plan, the [local government] shall take account of the fact that the protection of the environment requires, in descending order of preference, that:

- the generation of waste substances be prevented or limited wherever possible;
- when manufacturing substances, preparations or other products, use be made of substances and materials which, after use, cause no damage, or as little damage as possible, to the environment;
- substances, preparations or other products be used as such more than once;
- the substances and materials of which a product is made be reused after the product has been used;
- waste substances be used primarily as fuel or to generate energy in another way; and
- waste substances be disposed.

The process of waste management needs to be carried out efficiently so that the waste is managed competently and for the longer term. An example of this is found in the Netherlands Environmental Management Act (2004)¹⁶⁴ shown below.

Efficient waste management requires that:

¹⁶² http://www.legislation.gov.uk/ukpga/1990/43/pdfs/ukpga_19900043_en.pdf s.44.ZA

¹⁶³ <http://www.asser.nl/upload/eel-webroot/www/documents/national/netherlands/EMA052004.pdf> s.10.4.1

¹⁶⁴ <http://www.asser.nl/upload/eel-webroot/www/documents/national/netherlands/EMA052004.pdf> s.10.5.1&2

- waste substances be managed effectively and efficiently;
- effective supervision of waste management be possible.

With regard to a decision on a licence efficient waste management requires that:

- the continuity of waste management be ensured;
- the capacity of the facilities for waste management be geared to the supply of waste substances.

Long Term Effects

Waste management does not finish with disposal. Some of the effects of some waste management processes are long lived, particularly those associated with bound environments like landfills, lakes and air emission settlement sites. A waste management plan should also provide information on the locations of these sites and proposed activities for rehabilitation. An example of this is found in the German Circular Economy Act (2012)¹⁶⁵ shown below.

Waste management plans may furthermore contain information on closed contaminated waste disposal locations and activities for their restoration.

Relevant Definitions: Disposal, Environment, Hazardous Waste, Installation, Landfill, Preparing for Reuse, Prevention, Recovery, Recycling, Reuse, Storage, Treatment, Waste, Waste Management, Waste Management Hierarchy, Waste Minimisation

Waste Management Hierarchy

The waste management hierarchy can be included in legislation to give a common language for a country or a group of countries. With the increase in environmental awareness and the calls to action it is useful for countries to consider the most appropriate waste management hierarchy for them. Two possibilities are to align it with the UNEP definitions, or to align it with major trading partners where environmental aspects are regarded as important or gaining importance for trade.

The waste management hierarchy is a waste prioritising mechanism. There is no single version of the waste management hierarchy. However, among the many versions in operation the guiding philosophy is that those actions described at the top of the hierarchy are preferable to those described lower down. Regardless of the actual components in the hierarchies, the value of them is that they provide a guiding framework to consider waste minimisation in a systematic manner. The waste management hierarchy used in these guidelines is the one adopted in the UNEP Guidelines¹⁶⁶: prevention; reduction; recycling; recovery; and disposal.

The implementation of a waste management hierarchy requires a combination of approaches. For those elements that are higher up the hierarchy (prevention or reduction) where there are

¹⁶⁵ http://www.bmub.bund.de/fileadmin/Daten_BMU/Download_PDF/Abfallwirtschaft/kreislaufwirtschaftsgesetz_en_bf.pdf s.30

¹⁶⁶ <http://www.unep.org/ietc/Portals/136/Publications/Waste%20Management/UNEP%20NWMS%20English.pdf> p18

multiple suppliers, significant results can only be achieved by taking a nationwide approach, especially in a small economy.

National government leadership is needed to set the direction and to encourage the commitment that is needed because working at the top of the hierarchy requires a greater effort to change behaviour. However, the benefit is that working at that level is an approach that generates lower consumption and produces more durable materials. The top categories in the waste management hierarchy, prevention and reduction, prevent emissions to the environment, whereas all the others still result in emissions.

The initiatives at national government level also need to be complemented by others at the local level. Initiatives that are lower down the hierarchy, like recycling and recovery, depend on adequate resources at the local level, particularly for collection.

Consideration of the measures to take to reduce disposal can change from one circumstance to another. In general these considerations should take into account that the public and the environment need protection from exposure to harm especially where a plausible risk may exist. In addition, communities comprise social, economic, and environmental systems that must function now and in the future and the economic viability and social endorsement need deliberation. An example of encapsulating these concepts in legislation is found in the German Circular Economy Act (2012)¹⁶⁷ shown below.

Activities for prevention and waste management shall be in the following order:

- prevention,
- preparing for re-use,
- recycling,
- other recovery, in particular energy recovery and backfilling operations,
- disposal.

The measure that shall take priority is the one which best guarantees the protection of human health and the environment in the production and management of waste, account being taken of the precautionary principle and of the sustainability principle. The entire life-cycle of the waste shall be taken as a basis for the observation of the impact on human health and the environment. The following must especially be taken into account in this connection:

- the expected emissions,
- the degree of the conservation of natural resources,
- the energy to be consumed or yielded, as well as
- the accumulation of harmful substances in products, in waste for recovery or in products made from such waste.

The technical possibilities with regard to economic acceptability and the social consequences of the activity shall be taken into account.

¹⁶⁷ http://www.bmub.bund.de/fileadmin/Daten_BMU/Download_PDF/Abfallwirtschaft/kreislaufwirtschaftsgesetz_en_bf.pdf s.6

Relevant Definitions: Disposal, Emissions, Environment, Harm, Prevention, Recovery, Recycling, Reduction, Sustainable Management, Treatment, Waste, Waste Management, Waste Minimisation

Prevention

Prevention is the most desirable waste option since if waste is not generated, it does not need to be managed. Promotion of cleaner production techniques can assist achievement of waste prevention. Often prevention of waste is bundled with the other components of the waste management hierarchy in legislation. However, a focus on prevention can assist a country to consider it more seriously. The legislative elements can be similar to setting up a waste management plan.

The goals are defined, particularly to separate economic growth from impacting human health and the environment. Following the goals is an analysis of the current waste prevention measures, their benefits and any further measures to increase prevention. Finally, the legislation needs to provide for measurement of progress. An example of this legislation is found in the German Circular Economy Act (2012)¹⁶⁸ shown below.

The Federation shall draw up a waste prevention programme.

The waste prevention programme shall:

- define the waste prevention goals; the goals shall aim to decouple economic growth from the impact on human health and the environment caused by the generation of waste,
- describe the existing waste prevention measures and evaluate the expedience of the waste prevention activities;
- establish, where necessary, further waste prevention measures, and
- define expedient, specific, qualitative or quantitative standards for established waste prevention activities, by means of which the progress made in the activities shall be monitored and evaluated; indicators or other suitable specific qualitative or quantitative goals may be used as a standard.

An Annex to the German Circular Economy Act (2012)¹⁶⁹ provides a useful set of examples for waste prevention measures. They are shown below.

Measures that can affect the framework conditions related to the generation of waste:

- the use of planning measures, or other economic instruments promoting the efficient use of resources;

¹⁶⁸ http://www.bmub.bund.de/fileadmin/Daten_BMU/Download_PDF/Abfallwirtschaft/kreislaufwirtschaftsgesetz_en_bf.pdf s.33

¹⁶⁹ http://www.bmub.bund.de/fileadmin/Daten_BMU/Download_PDF/Abfallwirtschaft/kreislaufwirtschaftsgesetz_en_bf.pdf Annex 4

- the promotion of research and development into the area of achieving cleaner and less wasteful products and technologies and the dissemination and use of the results of such research and development;
- the development of effective and meaningful indicators of the environmental pressures associated with the generation of waste aimed at contributing to the prevention of waste generation at all levels, from product comparisons at Community level through action by local authorities to national measures.

Measures that can affect the design and production and distribution phase:

- the promotion of eco-design (the systematic integration of environmental aspects into product design with the aim to improve the environmental performance of the product throughout its whole life cycle);
- the provision of information on waste prevention techniques with a view to facilitating the implementation of best available techniques by industry;
- training of competent authorities as regards the consideration of waste prevention requirements when awarding licences on the basis of this Act;
- the inclusion of measures to prevent waste production at installations not requiring a licence. Where appropriate, such measures could include waste prevention assessments or plans;
- the use of awareness campaigns or the provision of financial or decision making support to businesses. Such measures are likely to be particularly effective where they are aimed at, and adapted to, small and medium sized enterprises and work through established business networks;
- the use of voluntary agreements, consumer/producer panels or sectoral negotiations in order that the relevant businesses or industrial sectors set their own waste prevention plans or objectives or correct wasteful products or packaging;
- the promotion of creditable environmental management systems.

Measures that can affect the consumption and use phase:

- economic instruments such as incentives for clean purchases or the institution of an obligatory payment by consumers for a given article or element of packaging that would otherwise be provided free of charge;
- the use of awareness campaigns and information provision directed at the public or a specific set of consumers;
- the promotion of eco-labels;
- agreements with industry, such as the use of product panels such as those being carried out within the framework of Integrated Product Policies or with retailers on the availability of waste prevention information and products with a lower environmental impact;
- in the context of public and corporate procurement, the integration of environmental and waste prevention criteria into calls for tenders and contracts;
- the promotion of the reuse and repair of appropriate discarded products or of their components, notably through the use of educational, economic, logistic or other

measures such as support to or establishment of accredited repair and reuse-centres and networks especially in densely populated regions.

Material and Product Controls

It is sometimes useful to put controls on products or materials during stages (or their whole) life cycle to prevent waste. Prohibitions can be part of the provisions but limitations need to be put in place to ensure that these measures are only applied only when it is necessary. An example of this legislation is found in the Netherlands Environmental Management Act (2004)¹⁷⁰ shown below. The legislation is slightly modified in order to accentuate the prevention of waste.

In the interests of preventing the generation of waste substances, rules may be laid down by order in council in respect of the manufacture, import, use, possession, supply or receipt of categories of substances, preparations or other products designated therein.

These rules shall in any event include rules which:

- prohibit one or more of the acts referred to above with respect to such substances, preparations or other products;
- prohibit such actions from being carried out with respect to such substances, preparations or other products:
 - in a manner indicated in the order in council;
 - under circumstances indicated therein; or
 - for purposes indicated therein;
- prohibit such actions if the requirements laid down in the order in council are not satisfied in respect of such substances, preparations or other products;
- prohibit the manufacture or supply of such substances, preparations or other products if the requirements laid down in the order in council are not, or have not been, satisfied in their manufacture.

Rules as referred to above shall be laid down for establishments only if this is especially appropriate in the interests of efficient regulation.

Relevant Definitions: Best Available Techniques, Controlled Waste, Environment, Installation, Lifecycle, Preparing for Reuse, Prevention, Reuse, Waste, Waste Management

Relevant International Agreements:

- ASEAN Agreement on the Conservation of Nature and Natural Resources 1985
- Bamako Convention on the ban on the Import into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes within Africa 1998
- Basel Convention on the Transboundary Movement of Hazardous Wastes 1989
- Convention for the Protection of the Natural Resources and Environment of the South Pacific Region 1986, Convention on the Transboundary Effects of Industrial Accidents, Helsinki 1992
- Convention to Combat Desertification (UNCCD) 1996

¹⁷⁰ <http://www.asser.nl/upload/eel-webroot/www/documents/national/netherlands/EMA052004.pdf> s.10.15

- European Agreement Concerning the International Carriage of Dangerous Goods by Inland Waterways (AND), Geneva, 2000. Including the Annex Regulation (2011)
- FAO International Code of Conduct on the distribution and use of Pesticides, Rome, 1985. (Revised Version 2005, Rome)
- Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships, 2009
- International Convention for the Prevention of Pollution from Ships (MARPOL 1973) and 1978 Protocol
- International Convention on Civil Liability for Bunker Oil Pollution Damage, 2001
- London Convention - Protocol on London Convention 1996
- Minamata Convention on Mercury 2013
- Montreal Protocol on Substances that Deplete the Ozone Layer 1989
- OECD Decision C(92)39/FINAL on the Control of Transfrontier Movements of Wastes Destined for Recovery Operations
- Rotterdam Convention 1998
- Strategic Approach to International Chemicals Management 2006
- The Convention for Protection of the Mediterranean Sea against Pollution (Barcelona Convention) 1976
- The Global Programme of Action for the Protection of the Marine Environment from Land Based Activities 1995
- United Nations Convention on the Law of the Sea (UNCLOS) 1982
- Wagani Convention 1995
- Working Environment (Air Pollution, Noise and Vibration) Convention, 1977

Reduction

Reduction, as the second most desirable component in the Waste Management Hierarchy (UNEP Guidelines¹⁷¹) means that less material has to be managed by processes further down the hierarchy. The idea with reduction is that products are designed so that throughout their life cycle they minimise waste by firstly not generating so much in the manufacturing stage and later that they are durable so that they can be reused many times before their end-of-life. An example of this in legislation is found in the Japanese Basic Act for the Establishment of a Sound Material-Cycle Society (2000)¹⁷² shown below. It should be noted that prevention is also mentioned in this context.

Raw materials and products becoming wastes must be prevented or reduced to the greatest extent possible by means of the efficient use of raw materials and the longest possible use of products, in light of the necessity of minimizing the environmental load resulting from the cyclical use or disposal of raw materials, products, etc. when they have become circulative resources.

¹⁷¹ <http://www.unep.org/ietc/Portals/136/Publications/Waste%20Management/UNEP%20NWMS%20English.pdf> p18

¹⁷² <https://www.env.go.jp/en/laws/recycle/12.pdf> Art.6

Relevant Definitions: Circulative Resources, Cyclical Use, Disposal, Lifecycle, Preparing for Reuse, Prevention, Reduction, Reuse, Waste, Waste Management, Waste Minimisation

Relevant International Agreements:

- ASEAN Agreement on the Conservation of Nature and Natural Resources 1985
- Bamako Convention on the ban on the Import into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes within Africa 1998
- Basel Convention on the Transboundary Movement of Hazardous Wastes 1989
- Convention for the Protection of the Natural Resources and Environment of the South Pacific Region 1986, Convention on Biological Diversity (CBD) 1992
- Convention on Long-Range Trans-Boundary Air Pollution (LRTAP), Geneva 1979
- European Agreement Concerning the International Carriage of Dangerous Goods by Inland Waterways (AND), Geneva, 2000. Including the Annex Regulation (2011)
- FAO International Code of Conduct on the distribution and use of Pesticides, Rome, 1985. (Revised Version 2005, Rome)
- Gothenburg Protocol on the reduction of acidification, eutrophication and ground-level, 1999
- Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships, 2009
- International Convention for the Prevention of Pollution from Ships (MARPOL 1973) and 1978 Protocol
- London Convention - Protocol on London Convention 1996
- Minamata Convention on Mercury 2013
- Montreal Protocol on Substances that Deplete the Ozone Layer 1989
- OECD Decision C(92)39/FINAL on the Control of Transfrontier Movements of Wastes Destined for Recovery Operations
- Rotterdam Convention 1998
- Strategic Approach to International Chemicals Management 2006
- The Convention for Protection of the Mediterranean Sea against Pollution (Barcelona Convention) 1976
- The Global Programme of Action for the Protection of the Marine Environment from Land Based Activities 1995
- United Nations Convention on the Law of the Sea (UNCLOS) 1982
- Working Environment (Air Pollution, Noise and Vibration) Convention, 1977

Reuse

Promotion of reuse requires intervention at the design phase of a product to make it more durable. Consumer-based societies often try to increase the quantity of goods in the economy to boost production and hence gross domestic product. Making goods less durable increases demand but also increases wastage.

An area of significant potential for reuse is in packaging around products. In many cases packaging is essential to protect and/or increase the life of the product. However, packaging can be also used as a marketing tool to give the impression of containing more product than they actually do or to grab the consumer's attention by making it larger than competitors' products. The packaging industry needs to develop packaging that produces less waste by minimising the amount of packaging and making it easily reusable e.g. collapsible into a flat package for easy return without destroying the characteristics of the packing. An example requiring this is found in the Brazilian National Solid Waste Policy (2010)¹⁷³ shown below.

It is the duty of respective responsible parties to ensure that packages are:

- Restricted in volume and weight to the dimensions required for content protection and commercialisation of the product;
- Designed to be reused in a technically feasible manner and compatible with the requirements applicable to the product they contain.

Relevant Definitions: Circulative Resources, Cyclical Use, Disposal, Lifecycle, Preparing for Reuse, Prevention, Reduction, Waste, Waste Management, Waste Minimisation

Relevant International Agreements:

- ASEAN Agreement on the Conservation of Nature and Natural Resources 1985
- Bamako Convention on the ban on the Import into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes within Africa 1998
- Basel Convention on the Transboundary Movement of Hazardous Wastes 1989
- Convention for the Protection of the Natural Resources and Environment of the South Pacific Region 1986, Convention on Biological Diversity (CBD) 1992
- Convention on Long-Range Trans-Boundary Air Pollution (LRTAP), Geneva 1979
- European Agreement Concerning the International Carriage of Dangerous Goods by Inland Waterways (AND), Geneva, 2000. Including the Annex Regulation (2011)
- FAO International Code of Conduct on the distribution and use of Pesticides, Rome, 1985. (Revised Version 2005, Rome)
- Gothenburg Protocol on the reduction of acidification, eutrophication and ground-level, 1999
- Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships, 2009
- International Convention for the Prevention of Pollution from Ships (MARPOL 1973) and 1978 Protocol

¹⁷³ <http://wiego.org/sites/wiego.org/files/resources/files/Pereira-Brazilian-Waste-Policy.pdf> s.32.1.1 & 2

- London Convention - Protocol on London Convention 1996
- Minamata Convention on Mercury 2013
- Montreal Protocol on Substances that Deplete the Ozone Layer 1989
- OECD Decision C(92)39/FINAL on the Control of Transfrontier Movements of Wastes Destined for Recovery Operations
- Rotterdam Convention 1998
- Strategic Approach to International Chemicals Management 2006
- The Convention for Protection of the Mediterranean Sea against Pollution (Barcelona Convention) 1976
- The Global Programme of Action for the Protection of the Marine Environment from Land Based Activities 1995
- United Nations Convention on the Law of the Sea (UNCLOS) 1982
- Working Environment (Air Pollution, Noise and Vibration) Convention, 1977

Recycling

There is little disagreement in most waste management hierarchies that recycling appears in the middle. Studies have shown that recycling has twice the economic impact of landfilling the materials, plus provide a range of new employment opportunities for low to high-skilled workers¹⁷⁴. Recycling, particularly collections, can be undertaken by either local government or private industry. Collections from private households are often the responsibility of local government which contracts out the service to private industry. Commercial collections are generally the domain of private industry. Recycling is heavily favoured by politicians at both national and local government because it is a high visibility environmental activity and easy to institute. Householders also support recycling for the same reasons. Where household recycling schemes have been under threat by local government as a cost saving measure, householders have been adamant about keeping the service and are prepared to pay the extra cost (e.g. New York¹⁷⁵).

Even where there are no organised local government schemes, the benefits of recycling are such that informal schemes flourish. For example, in Jakarta informal recycling reduces the volume of waste by about 30%, which saves on collection and disposal costs, and extends the life of landfills¹⁷⁶.

The role of national government is to remove roadblocks to the establishment of recycling and, where appropriate, support the establishment and functioning of the markets. Some of the roadblocks include the cost of technology to convert the materials into useful products, the size of the demand market and the cost of getting recyclables to the processor. Some solutions to

¹⁷⁴ <http://www.unep.org/ietc/Portals/136/Publications/Waste%20Management/UNEP%20NWMS%20English.pdf> p29

¹⁷⁵ Clarke, M.J., Read, A.D., Phillips, P.S., 1999. Integrated waste management planning in New York City. *Resources, Conservation and Recycling* 26, 125–141.

¹⁷⁶ <http://www.unep.org/ietc/Portals/136/Publications/Waste%20Management/UNEP%20NWMS%20English.pdf> p31

these roadblocks are to provide funding through, for example, levies on waste, growing the market size by making government procurement decisions based partly on recycled content in supplies, and extended producer responsibility or product stewardship schemes. An example of legislation enabling these sorts of actions is found in the Japanese Basic Act for the Establishment of a Sound Material-Cycle Society (2000)¹⁷⁷ shown below. In this legislation national government has an enabling role to empower business to move towards a circular economy, to energise citizens to participate and to encourage local government, business and citizens to coordinate programmes.

- [National government] shall take regulatory and other necessary measures so that business operators may themselves, in their business activities, conduct appropriate cyclical use of the circulative resources resulting from such activities, or promote their appropriate cyclical use, or dispose on their own responsibility circulative resources not recycled.
- [National government] shall take necessary measures so that citizens may promote the appropriate cyclical use and disposal of circulative resources through cooperation in separate collection of their used products, etc. which have become circulative resources, cooperation in the appropriate and smooth execution of such collection, delivery and recycling of circulative resources as stipulated in the following paragraph, and other cooperative actions.
- In order to promote the appropriate and smooth cyclical use of products, containers, etc. when they have become circulative resources, with regard to the products, containers, etc. for which it is deemed necessary for [national government], local governments, business operators and citizens to share their respective roles properly, and for which the roles of the business operators concerned are deemed important in establishing a [circular economy] from the viewpoints of the design of such products, containers, etc., the selection of their raw materials, and the collection, etc. of such products, containers, etc. when they have become circulative resources, [national government] shall, after taking into consideration the technological difficulty in disposing of the circulative resources concerned, the possibility of cyclical use of such resources, etc., take necessary measures so that business operators engaged in manufacturing, selling, etc. of such products, containers, etc. may collect such products, containers, etc. which have become circulative resources, or deliver such circulative resources collected, or make appropriate cyclical use of such circulative resources collected.
- [National government] shall, with regard to the circulative resources the cyclical use of which is technologically and economically possible and for which the promotion of cyclical use is deemed important in establishing a [Circular Economy], take regulatory and other necessary measures so that the business operators be able to implement cyclical use of such circulative resources in their business activities may conduct this cyclical use appropriately.

Government Procurement

¹⁷⁷ <https://www.env.go.jp/en/laws/recycle/12.pdf> Art.18

As mentioned above, government procurement decisions can assist in building a market. An example is found in the Japanese Basic Act for the Establishment of a Sound Material-Cycle Society (2000)¹⁷⁸ shown below.

In order to contribute to the increase in demand for recycled articles, [national government] shall take the lead in making use of recycled articles and take necessary measures so that the use of recycled articles by local governments, business operators and citizens may be promoted.

Targets

Setting targets is a useful mechanism to focus attention on action. While recycling targets are normally set within a waste strategy or waste management plan, they can appear in legislation. An example is found in the German Circular Economy Act (2012)¹⁷⁹ shown below. Diversion rates of 65% for municipal waste and 70% for construction and demolition waste are achievable in developed countries. Higher recycling rates could be achieved in developing nations depending on the building materials used or the composition of the waste.

Promotion of recycling and other material recovery

- In the interest of proper, safe and high-quality recycling, paper, metal, plastic and glass waste shall be collected separately where this is technically possible and economically reasonable.
- The preparation for re-use and recycling of municipal waste should be at least overall 65% by weight.
- The preparation for re-use, recycling and the other material recovery of non-hazardous construction and demolition waste, excluding naturally occurring material should be a minimum of 70% by weight. Other material recovery shall include backfilling operations using waste to substitute other materials.

Relevant Definitions: Circular Economy, Circulative Resources, Cyclical Use, Disposal, Landfill, Recovery, Recycling, Waste, Waste Management

Relevant International Agreements:

- Bamako Convention on the ban on the Import into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes within Africa 1998
- Basel Convention on the Transboundary Movement of Hazardous Wastes 1989
- Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships, 2009
- London Convention - Protocol on London Convention 1996
- Minamata Convention on Mercury 2013
- Montreal Protocol on Substances that Deplete the Ozone Layer 1989
- OECD Decision C(92)39/FINAL on the Control of Transfrontier Movements of Wastes Destined for Recovery Operations

¹⁷⁸ <https://www.env.go.jp/en/laws/recycle/12.pdf> Art.19

¹⁷⁹ http://www.bmub.bund.de/fileadmin/Daten_BMU/Download_PDF/Abfallwirtschaft/kreislaufwirtschaftsgesetz_en_bf.pdf s.14

- Strategic Approach to International Chemicals Management 2006
- The Global Programme of Action for the Protection of the Marine Environment from Land Based Activities 1995
- Wagani Convention 1995

Recovery

Recovery is normally considered a subsidiary or initial operation for components that are higher up the waste management hierarchy. Used as an initial action, recovery is the separation of materials from a pile of waste. As a subsidiary action, recovery is often combustion or pyrolysis or gasification of the mixed waste to provide energy. An alternative to combustion is anaerobic digestion of organic material which produces methane that can be used as an energy source.

Recovery is often bundled with recycling, as can be seen in the preceding section. A useful list of recovery activities is provided in the German Circular Economy Act (2012)¹⁸⁰ shown below. The list has been amended to be consistent with the UNEP Guidelines¹⁸¹ definitions.

Recovery Operations

- Use principally as a fuel or other means to generate energy
- Utilisation of organic substances which are not used as solvents (including composting and other biological transformation processes)
- Regeneration of acids or bases
- Recovery of components used for pollution abatement
- Recovery of components from catalysts
- Land treatment resulting in benefit to agriculture or ecological improvement
- Use of wastes obtained from any of the operations above
- Exchange of waste for purposes of submission to any of the operations
- Storage of waste, for purposes of submission to any of the recovery operations (excluding temporary storage, pending collection, on the site where the waste is produced)

Relevant Definitions: Environmental Pollution, Recovery, Recycling, Storage, Treatment, Waste, Waste Management

Relevant International Agreements:

- Bamako Convention on the ban on the Import into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes within Africa 1998
- Basel Convention on the Transboundary Movement of Hazardous Wastes 1989
- Convention on Biological Diversity (CBD) 1992

¹⁸⁰ http://www.bmub.bund.de/fileadmin/Daten_BMU/Download_PDF/Abfallwirtschaft/kreislaufwirtschaftsgesetz_en_bf.pdf Annex 2

¹⁸¹ <http://www.unep.org/ietc/Portals/136/Publications/Waste%20Management/UNEP%20NWMS%20English.pdf> p18

- European Agreement Concerning the International Carriage of Dangerous Goods by Inland Waterways (AND), Geneva, 2000. Including the Annex Regulation (2011)
- Gothenburg Protocol on the reduction of acidification, eutrophication and ground-level, 1999
- Kyoto Protocol 1997
- London Convention - Protocol on London Convention 1996
- Minamata Convention on Mercury 2013
- Montreal Protocol on Substances that Deplete the Ozone Layer 1989
- OECD Decision C(92)39/FINAL on the Control of Transfrontier Movements of Wastes Destined for Recovery Operations
- Strategic Approach to International Chemicals Management 2006
- The Global Programme of Action for the Protection of the Marine Environment from Land Based Activities 1995
- United Nations Convention on the Law of the Sea (UNCLOS) 1982

Treatment

Treatment is part of the disposal process. Waste treatment facility operators are often required to manage wastes that, if emitted into the environment, would have severe environmental impacts. In addition, many of the activities engaged in at treatment facilities present significant health and safety issues. It is for these reasons that licensing of (proposed) facilities is beneficial. The instigation of monitoring, reporting and auditing conditions as part of the licensing process will provide added confidence for the waste treatment facility to act in a manner that will minimise the health and environmental impacts of the operation. An example of legislation that requires waste treatment facilities to be licensed is found in the German Circular Economy Act (2012)¹⁸² shown below.

The construction and operation of installations in which waste treatment is implemented, and significant changes in such installations or their operation, shall be subject to permission.

Relevant Definitions: Installation, Treatment, Waste, Waste Minimisation

Disposal

Disposal, at the bottom of the hierarchy, is the management option used for the remaining fraction of waste when all forms of waste minimisation are exhausted. The objective of disposal is to remove all unwanted materials from the life-cycle for a final, safe storage or release into the environment. There is a hierarchy of disposal options listed in the table below going from the most environmentally sound to the least.

Table 2: Disposal Options

¹⁸² http://www.bmub.bund.de/fileadmin/Daten_BMU/Download_PDF/Abfallwirtschaft/kreislaufwirtschaftsge_setz_en_bf.pdf s.35

Solid	Liquid (treatment before disposal)	Gas
<ul style="list-style-type: none"> • Landfill: an engineered facility featuring various controls¹⁸³ installed to prevent releases of pollutants to soil, water and air. • Controlled disposal site: fenced and access controlled, with some form of control and registration of incoming waste, and basic site operations management. • Uncontrolled dumpsite: no controls or management. 	<ul style="list-style-type: none"> • Quaternary: removal of micropollutants. • Tertiary: sand and/or activated carbon filtration; pond storage; biological nutrient removal; disinfection. • Secondary: Fixed film or suspended growth systems. • Primary: Sedimentation • Pre-treatment: large object removal; grit removal. • No treatment: discharge raw sewage. 	<ul style="list-style-type: none"> • Control devices: particulate controls; scrubbers; catalysts; • Land Use Planning: zoning for polluting industries • No controls: discharge polluted air.

Countries need to consider what is best suited to their circumstances. For developing countries this may mean low cost, low maintenance technologies. The 'higher' the technology, the higher the maintenance requirements and therefore the longer it will be out of operation when it fails.

Costs

Environmentally sound disposal should be priced. A price signal is necessary to incentivise waste minimisation by the generator. In the early stages it can be expected that illegal disposal (e.g. fly tipping) may be a problem, but if the convenience of the disposal system outweighs the effort for illegal disposal (including penalties) then the initial heightened levels of illegal disposal will diminish. The implementation of pay-as-you-throw (PAYT) schemes for solid waste, in which non-recyclable household waste is charged more than recyclable waste fractions, has led to impressive results in those high-income regions where it has been applied.

Storage and Disposal

Build-up of waste outside facilities to cater for it should be avoided. Questions about whether the material is stored for further use or waiting for disposal can arise and managed appropriately. Waste should be put into an appropriate facility once waste minimisation and treatment have been carried out. An example of provision for this is found in the German Circular Economy Act (2012)¹⁸⁴ shown below.

¹⁸³ Bottom and top liners with layers of low hydraulic permeability and adequate chemical resistance, a leachate collection and removal system, a landfill gas extraction and utilisation system and a drainage system for rainwater.

¹⁸⁴ http://www.bmub.bund.de/fileadmin/Daten_BMU/Download_PDF/Abfallwirtschaft/kreislaufwirtschaftsgesetz_en_bf.pdf s.15

Producers or holders of waste that is not recovered shall be obliged to dispose of such waste. The amount and noxiousness of waste shall be reduced through treatment. Any energy or waste occurring in connection with disposal shall be exploited to the maximum extent possible.

Government Role

The role of national government (or local government) is to provide the conditions so that stakeholders at the local level can institute effective disposal techniques. National (local) government can play a coordinating role over an area to ensure that the best available techniques are used to determine requirements for waste disposal and specify the requirements for pre-disposal management. It is important in this process that communication lines are open between government, industry and the community to ensure that the result is practical and (at some level) acceptable. It would be unusual for all sectors to agree totally, but compromises should enable acceptance of the demands put onto stakeholders. An example of this is found in the German Circular Economy Act (2012)¹⁸⁵ shown below.

[National/Local Government] shall be empowered, after consulting the parties concerned, meet the obligations in line with the best available techniques to determine requirements of the disposal of waste by area of origin, place of occurrence, as well as by type, quantity and nature, in particular:

- requirements regarding the separation and the treatment of waste,
- requirements regarding the provision, handover, gathering and collection, the transport, storage and deposit of waste, and
- provisions to review the requirements.

While local government may be responsible for waste in their area, it does not mean that they must collect the waste themselves. It can prove useful to outsource the waste disposal operations, while retaining overall control of the enterprise. Where local government has done this some jurisdictions have found that they have lost control of knowledge of the waste stream which makes it harder to undertake long term planning.

If local government does contract out the service (and it is often only the household part of the waste stream since the commercial and industrial streams are often already the domain of private enterprise), then it should make sure that the information the contractor supplies is sufficient to enable it to undertake long term planning.

[Local government] may transfer to the operator of a waste disposal installation who is able to dispose of waste more economically than the public bodies responsible for waste management, on the application of such an operator, responsibility for disposal of such waste. Such transfer can in particular be made contingent on the requirement that the applicant dispose of all waste occurring in the area covered by the public bodies responsible for waste management, in return for reimbursement of costs, if the public bodies responsible for waste management cannot dispose of the remaining waste, or only at a disproportionately high cost; this shall not apply if

¹⁸⁵ http://www.bmub.bund.de/fileadmin/Daten_BMU/Download_PDF/Abfallwirtschaft/kreislaufwirtschaftsgesetz_en_bf.pdf s.16

the applicant shows that assumption of additional responsibility for the disposal of such remaining waste is unreasonable.

Efficient Waste Disposal

Efficient waste disposal means that waste is put into the most appropriate facility which should be guided technically by maximising cleaner technologies, rather than necessarily a facility operated by a particular party. The most significant driver for waste disposal is economics. Some operations may be shut out of a market because the economics of transportation do not make it worthwhile. Where this is the case, it can be beneficial for waste disposal operators to share facilities. Such a provision is found in the German Circular Economy Act (2012)¹⁸⁶ shown below.

The competent authority may require the operator of a waste disposal installation to permit a party obliged to carry out disposal, and the public bodies responsible for waste management, to also use the relevant waste disposal installation, for an appropriate fee, to the extent that such a party or parties cannot meaningfully dispose of the waste by other means, or only at a considerable additional cost, and that such shared use is not unreasonable for the operator.

Inappropriate waste disposal can create significant health and environmental impacts. So it is important that people are conscientious in managing waste in their control and that transfers only occur to authorised people in order to stop illegal dumping. An example of legislation covering this is found in the UK Environmental Protection Act (1990)¹⁸⁷ shown below.

People in possession of waste have a duty of care to:

- Prevent the escape of waste from their control;
- Transfer the waste (except householders producing domestic waste) so that:
 - the transfer is only to an authorised person;
 - provide a written description of the waste to subsequent possessors

A useful list of disposal operations is found in the German Circular Economy Act (2012)¹⁸⁸ shown below. Some additions have been made to allow for all media.

Disposal Operations

- Deposit into or on to land (e.g. landfill, [spraying], etc.)
- Land treatment (e.g. biodegradation of liquid or sludge discards in soils, etc.)
- Deep injection (e.g. injection of pumpable discards into wells, salt domes or naturally occurring repositories, etc.)
- Surface impoundment (e.g. placement of liquid or sludgy discards into pits, ponds or lagoons, etc.)

¹⁸⁶ http://www.bmub.bund.de/fileadmin/Daten_BMU/Download_PDF/Abfallwirtschaft/kreislaufwirtschaftsgesetz_en_bf.pdf s. 29

¹⁸⁷ http://www.legislation.gov.uk/ukpga/1990/43/pdfs/ukpga_19900043_en.pdf s. 34

¹⁸⁸ http://www.bmub.bund.de/fileadmin/Daten_BMU/Download_PDF/Abfallwirtschaft/kreislaufwirtschaftsgesetz_en_bf.pdf Annex 1

- Specially engineered landfills (e.g. placement into lined discrete cells which are capped and isolated from one another and the environment)
- Release into a water body except seas/oceans
- Release to seas/oceans including seabed insertion
- Biological treatment not specified elsewhere which results in final compounds or mixtures which are disposed of by means of any of the operations
- Physico-chemical treatment not specified elsewhere which results in final compounds or mixtures which are discarded by means of any of the operations (e.g. evaporation, drying, calcination)
- Incineration on land
- Incineration at sea
- [Emitting to the air]
- Permanent storage (e.g. emplacement of containers in a mine)
- Blending or mixture prior to the application any of the operations
- Repackaging prior to the application any of the operations
- Storage pending any of the operations (excluding temporary storage, pending collection, on the site where the waste is produced)

It is important the waste disposal occurs with no damage to humans, animals, plants, air, water and land. An example of such provisions is found in the German Circular Economy Act (2012)¹⁸⁹ shown below.

Waste shall be disposed of in such a manner that the public interest is not impaired. An impairment shall be deemed to have occurred in particular if:

- human health is impaired;
- animals and plants are endangered;
- water bodies and soil are harmfully influenced;
- harmful influences on the environment are caused by air pollution or noise;
- the aims, principles and other requirements of regional planning, and the interests of nature conservation, landscape management and urban development, are not considered, or
- public safety and public order are otherwise threatened or disturbed.

Furthermore, waste disposal should not be allowed outside permitted areas. While this may seem obvious, specifying this in law makes enforcement easier. An example stipulating this is found in the Netherlands Environmental Management Act (2004)¹⁹⁰ shown below.

Discarding waste substances – packaged or otherwise – by landfilling them or otherwise placing them on or under the ground or incinerating them outside an establishment shall be prohibited.

Another way of stating this is found in the UK Environmental Protection Act (1990)¹⁹¹ shown below. In the UK legislation the process is controlled through licensing facilities to allow for

¹⁸⁹ http://www.bmub.bund.de/fileadmin/Daten_BMU/Download_PDF/Abfallwirtschaft/kreislaufwirtschaftsgesetz_en_bf.pdf s.15

¹⁹⁰ <http://www.asser.nl/upload/eel-webroot/www/documents/national/netherlands/EMA052004.pdf> s.10.2.1

disposal. A notable exception in the legislation is that household waste is exempted, but only for households; businesses that only produce household waste are not exempted. For householders, it enables them, for example, to bury kitchen scraps in their garden to produce compost, without having to obtain a licence to authorise it. However, if the whole situation becomes a health hazard, then provisions in appropriate health legislation would come into effect.

A person shall not:

- deposit waste, or knowingly cause or knowingly permit waste to be deposited in or on any land unless a waste management licence authorising the deposit is in force and the deposit is in accordance with the licence;
- treat, keep or dispose of waste, or knowingly cause or knowingly permit waste to be treated, kept or disposed of:
 - in or on any land, or
 - by means of any mobile plant,
- except under and in accordance with a waste management licence;
- treat, keep or dispose of waste in a manner likely to cause pollution of the environment or harm to human health.

The above does not:

- apply in relation to household waste from a domestic property which is treated, kept or disposed of within the curtilage of the dwelling.
- extend to the treatment, keeping or disposal of household waste by an establishment or undertaking.

Mines as Disposal Sites

One of the options for land disposal is to use land that has already been impacted by mining and could be remediated to some extent by filling in the holes with waste. The quality of the substrate to effectively contain, for example, leachate would need investigation before authority was given to allow landfilling. At the end of the operation the land could potentially be remediated to look like it was before the mine started. A provision allowing for usage of mines for waste disposal is found in the German Circular Economy Act (2012)¹⁹² shown below.

A party holding mining rights for, or the entrepreneur of, a mineral mining operation, as well as the titleholder or owner of land used for mineral mining, or party otherwise authorised to dispose of such land, can be obliged by the competent authority to tolerate disposal of waste in exposed tunnels in his installation, or on his land, to permit access during normal business hours and, to the extent that this is indispensable, to make available existing facility equipment or installations, or portions thereof.

¹⁹¹ http://www.legislation.gov.uk/ukpga/1990/43/pdfs/ukpga_19900043_en.pdf s.33

¹⁹² http://www.bmub.bund.de/fileadmin/Daten_BMU/Download_PDF/Abfallwirtschaft/kreislaufwirtschaftsgesetz_en_bf.pdf s. 29

Air Emissions

Disposal to the air can cause widespread effects. The following list from the NZ Resource Management (National Environmental Standards for Air Quality) Regulations (2004)¹⁹³ shown below, puts conditions on substances that are likely to generate hazardous substances (e.g. carcinogens and particulates) when burnt.

A discharge of a contaminant to air from an activity specified below is prohibited, except to the extent that the regulation provides otherwise:

- The lighting of fires and the burning of waste at a landfill unless it is to control gas formed at the landfill;
- The burning of tyres unless the tyres are burnt at industrial and trade premises that have a resource consent for the discharge produced and emission control equipment that is designed and operated to minimise emissions of dioxins and other toxics from the process;
- The burning of bitumen;
- The burning of wire coated with any material unless the tyres are burnt at industrial and trade premises that have a resource consent for the discharge produced and emission control equipment that is designed and operated to minimise emissions of dioxins and other toxics from the process;
- The burning of oil in the open air unless:
 - the burning is for creating special smoke and fire effects for the purposes of producing films; or
 - for training firefighters; or
 - The burning is done by means of a flare for undertaking health and safety procedures in the petroleum exploration and production industry or the petrochemical industry;
 - The operation of an incinerator at a school or a healthcare institution
- The operation of a high-temperature hazardous waste incinerator unless it is a crematorium

Dumping at Sea

Disposing of waste by dumping it at sea is a separate issue. That sort of disposal is controlled for parties to the London Convention¹⁹⁴. Managing waste by dumping at sea is not an integrated waste management option for any country other than in the exceptional circumstances provided by the Convention. Legislation covering this should note that the importation of waste into a country for disposal at sea is prohibited. Disposal (or incineration) at sea needs to be permitted and these permits are normally issued by a cabinet minister as the action needs to follow the convention. Exceptions can be made where danger exists to humans or structures and disposal is the only alternative to avoid danger with the proviso that the damage caused by disposal would be less than that caused by not disposing. An example of these provisions is found in the Canadian Environmental Protection Act (1999)¹⁹⁵ shown below.

¹⁹³ <http://www.legislation.govt.nz/regulation/public/2004/0309/latest/DLM286835.html> s.4-12

¹⁹⁴ <http://www.imo.org/en/OurWork/Environment/LCLP/Documents/LC1972.pdf>

¹⁹⁵ <http://laws-lois.justice.gc.ca/PDF/C-15.31.pdf> s.123-30

- No person or ship shall import a substance for disposal in an area of the sea;
- No person shall load a substance onto any ship, aircraft, platform or other structure for the purpose of disposal in an area of the sea unless
 - the substance is waste or other matter; and
 - the loading is done in accordance with a permit.
- No ship shall incinerate a substance on board the ship in an area of the sea unless
 - the substance is waste generated on board the ship during normal operations; or
 - the incineration is done in accordance with a permit
- A permit shall contain any conditions that [national government] considers necessary for the protection of marine life, any legitimate uses of the sea or human life, including conditions relating to the following:
 - the nature and quantity of the substance for loading, disposal or incineration;
 - the method and frequency of the disposal or incineration authorized including, if necessary, the date or dates on which disposal or incineration is authorized;
 - the manner of loading and stowing the substance authorized for disposal or incineration;
 - the site at which disposal or incineration may take place;
 - the route to be followed by the ship or aircraft transporting the substance to the disposal or incineration site;
 - any special precautions to be taken respecting the loading, transporting, disposal or incineration of the substance; and
 - the monitoring of the disposal, the incineration and the disposal site to determine the effects of the disposal on the environment and human life.
- A person may dispose of a substance if:
 - it is necessary to avert a danger to human life or to a ship, an aircraft, a platform or another structure at sea in situations caused by stress of weather or in any other case that constitutes a danger to human life or a threat to a ship, an aircraft, a platform or another structure at sea;
 - the disposal appears to be the only way of averting the danger or threat; and
 - it is probable that the damage caused by the disposal would be less than would otherwise occur.
- Any disposal shall be carried out in a manner that minimizes, as far as possible, danger to human life and damage to the marine environment.
- This does not apply if the danger was caused or contributed to by the person's negligent act or omission.
- If disposal takes place, the master of the ship, the pilot in command of the aircraft or the person in charge of the platform or other structure shall report the disposal without delay to an enforcement officer at the location and in the manner that may be prescribed, and the report shall contain any information that may be prescribed.

Disposal Ban

Regulations to ban goods from landfills (or sewage treatment (e.g. under sink waste disposal units)) may lead to dumping of goods on roadsides or other public areas. Before a material ban is put in place an alternative system that is easy for consumers to engage with, must be

available. People are willing to do environmental good provided it is not too onerous. An example of this is found in the NZ Waste Minimisation Act (2008)¹⁹⁶ shown below.

- Regulations may be made controlling or prohibiting the disposal of products or waste;
- [National government] must not recommend the making of regulations unless satisfied there is adequate infrastructure and facilities in place to provide a reasonably practicable alternative to disposal or a reasonable time is provided before the regulations come into force for adequate infrastructure and facilities to be put in place.

Relevant Definitions: Controlled Waste, Disposal, Dumping, Landfill, Treatment, Waste

Separation

Source separation is fundamental to integrated waste management. Source separation allows the waste stream to be managed so that valuable materials are extracted, hazardous and dangerous materials do not make their way into the waste stream, cross-contamination does not diminish the value of separated materials (e.g. glass shards in waste paper), downstream processing is more efficient and the risks to the environment and public health are reduced or eliminated.

Once mixing occurs it is generally more costly to separate out components. Outside product stewardship and extended producer responsibility schemes, a major focus of keeping wastes separate is for hazardous wastes. One of the most common ways of reducing the hazardous nature of substances is to dilute them in uncontaminated soil, with water or into the atmosphere. The difficulty with each of these is that repeatedly diluting causes hazardous build up in other parts of the ecosystem or world.

Mixing to reduce the hazardous nature of substances is good if the result does not have an adverse effect on human health or the environment. Achievement of these conditions means that industry needs to use the best available technology which raises industry standards. An example of legislation providing for this is found in the German Circular Economy Act (2012)¹⁹⁷ shown below.

- The mixing, including the dilution, of hazardous waste with other categories of hazardous waste or with other waste, substances or materials shall not be permissible. Mixing shall be permissible by way of exception if:
 - it takes place in a installation authorised for this purpose in accordance with [a named] Act;
 - the requirements as to proper and safe recovery are complied with and the adverse impact of waste management on human health and the environment is not exacerbated by means of mixing, and
 - the mixing operation complies with best available techniques.
- Insofar as hazardous waste has been mixed in an unauthorised manner, it shall be separated where this is necessary in order to ensure proper and safe recovery and separation is technically possible and economically reasonable.

¹⁹⁶ <http://www.legislation.govt.nz/act/public/2008/0089/latest/DLM999802.html> s.23.1 & 2

¹⁹⁷ http://www.bmub.bund.de/fileadmin/Daten_BMU/Download_PDF/Abfallwirtschaft/kreislaufwirtschaftsgesetz_en_bf.pdf s.9

Relevant Definitions: Best Available Techniques, Effect on the Environment, Environment, Hazardous Waste, Installation, Recovery, Waste, Waste Management

Relevant International Agreements:

- European Agreement Concerning the International Carriage of Dangerous Goods by Inland Waterways (AND), Geneva, 2000. Including the Annex Regulation (2011)
- International Convention for the Prevention of Pollution from Ships (MARPOL 1973) and 1978 Protocol
- The Global Programme of Action for the Protection of the Marine Environment from Land Based Activities 1995

Waste Collection

People's reaction to waste can be driven by cultural factors with different cultures having differing aversions to waste handling which may influence who handles waste, the frequency of collection and how it is made available for collection. Waste collections can be conducted by an informal workforce or specialised collectors. Informal collectors are often involved in the separation of waste for saleable materials.

The return of unwanted materials is fundamental to the circular economy. Methods of collection or drop off need consideration to retain the integrity of the materials for reduced costs to return them into the economy. One contributor to efficiency is the provision of standardised collection systems that enable one or more types of materials to be collected together. An example enabling this provision is found in the German Circular Economy Act (2012)¹⁹⁸ shown below.

[National] Government shall be empowered, after consulting the parties concerned to mandate requirements pertaining to waste provision, handover, gathering and collection by collection and drop-off systems, in each case also in a standard recycling bin or by means of standard recyclable material collection in comparable quality together with related products or with products that are to be recovered in the same manner, which are in each case subject to a return obligation.

Charging for waste collection must be adapted to the particular context in each country. When a new waste charging system is introduced there is often an initial increase in fly tipping – people taking the waste and dumping it where they cannot be observed. However, this normally drops off quite quickly as the effort to avoid the charge exceeds the convenience of proper collection. When introducing a charge it is important that it covers all the costs – transport and disposal or separation for economic sustainability reasons, which underpins waste minimisation.

People who are in possession of waste have a responsibility to prevent waste getting into the wider environment and to permit collection of waste by those who are responsible or official operators. At best the escape of waste is a litter problem, at worst waterways and the air can become severely polluted. Having official waste collectors ensures that there is some degree of control on where the waste goes. It also enables local government to collect waste data within

¹⁹⁸ http://www.bmub.bund.de/fileadmin/Daten_BMU/Download_PDF/Abfallwirtschaft/kreislaufwirtschaftsgesetz_en_bf.pdf s.10

their jurisdiction to assist in informing waste planning processes. An evidence trail showing how the waste is transferred is a useful mechanism to assist waste to go to the right facilities and potentially be processed to get the highest rate of waste minimisation. An example considering waste possession and collection is found in the UK Environmental Protection Act (1990)¹⁹⁹ shown below.

People in possession of waste have a duty of care to:

- Prevent the escape of waste from their control;
- Transfer the waste (except householders producing domestic waste) so that:
 - the transfer is only to an authorised person;
 - provide a written description of the waste to subsequent possessors.

Relevant Definitions: Air, Air Pollution, Best Available Techniques, Contaminant, Controlled Waste, Discarding, Discharge, Disposal, Dumping, Effect on the Environment, Emissions, Environment, Environmental Pollution, Harm, Hazardous Waste, Household Waste, Incineration, Installation, Landfill, Marine Pollution, Multimedia, Nutrient, Release, Remediation, Storage, Treatment, Waste, Waste Management, Waste Minimisation, Water Pollution

Relevant International Agreements:

- Basel Convention on the Transboundary Movement of Hazardous Wastes 1989
- Convention for the Protection and Development of the Marine Environment in the Wider Caribbean Region (Cartagena Convention, 1983)
- Convention for the Protection of the Natural Resources and Environment of the South Pacific Region 1986
- Convention on the Transboundary Effects of Industrial Accidents, Helsinki 1992
- Convention to Combat Desertification (UNCCD) 1996
- European Agreement Concerning the International Carriage of Dangerous Goods by Inland Waterways (AND), Geneva, 2000. Including the Annex Regulation (2011)
- FAO International Code of Conduct on the distribution and use of Pesticides, Rome, 1985. (Revised Version 2005, Rome)
- Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships, 2009
- International Convention for the Prevention of Pollution from Ships (MARPOL 1973) and 1978 Protocol
- Kyoto Protocol 1997
- London Convention 1972
- London Convention -Protocol on London Convention 1996
- Minamata Convention on Mercury 2013
- OECD Decision C(92)39/FINAL on the Control of Transfrontier Movements of Wastes Destined for Recovery Operations
- Rotterdam Convention 1998

¹⁹⁹ http://www.legislation.gov.uk/ukpga/1990/43/pdfs/ukpga_19900043_en.pdf s.34

- Strategic Approach to International Chemicals Management 2006
- The Convention for Protection of the Mediterranean Sea against Pollution (Barcelona Convention) 1976
- The Global Programme of Action for the Protection of the Marine Environment from Land Based Activities 1995
- United Nations Convention on the Law of the Sea (UNCLOS) 1982
- Vienna Convention for the Protection of the Ozone Layer, 1985
- Wagani Convention 1995

Household Waste

From an integrated waste management perspective household waste primarily consists of solid waste and sewage. The waste can cause a risk to public health by attracting flies, mosquitos and rats, providing good conditions for them to breed²⁰⁰. Local government is best placed to manage household waste in their jurisdiction and it has a responsibility to assist householders to minimise their exposure to such vermin and thus reduce health bills. Sewage is considered in other parts of these guidelines, and this section will deal primarily with solid waste.

Regular collection of solid waste is essential to provide the health benefits achieved through breaking the vermin cycle. Where the general household waste contains organic matter it is advisable to collect it weekly as this minimises the build-up of odours from decomposing organics. An example of providing for this is found in the Netherlands Environmental Management Act (2004)²⁰¹ shown below.

Every [local government] shall ensure, in cooperation with other [local governments] or otherwise, that household waste – excluding bulky household waste – is collected at least once a week from all the premises situated within its territory where such waste substances may regularly be generated.

Collection

The most basic collection process is for householders to put all their waste into one receptacle and put it out for collection. A more sophisticated process (and one that householders quickly buy into once the environmental benefits are explained and other measures like differential pricing and ease of complying are added) is for some source separation for some materials that have market value after recycling. An example providing for this is found in the Netherlands Environmental Management Act (2004)²⁰² shown below.

[Local government] may decide to collect other components of household waste separately.

Organic Waste

Separation of organics to make into compost or anaerobically digest to provide energy (and a soil conditioner) is a measure that can significantly reduce the volume and weight of waste. An

²⁰⁰ http://www.who.int/water_sanitation_health/hygiene/emergencies/fs3_12.pdf

²⁰¹ <http://www.asser.nl/upload/eel-webroot/www/documents/national/netherlands/EMA052004.pdf>

s.10.21.1

²⁰² <http://www.asser.nl/upload/eel-webroot/www/documents/national/netherlands/EMA052004.pdf>

s.10.21.3

example providing for this is found in the Netherlands Environmental Management Act (2004)²⁰³ shown below. Note that it is possible to use the same measures with meat and meat products, however care should be given in the collection phase so that domestic and wild animals do not have access to the waste. If all organic matter is removed from household waste there is no need to collect the remainder on a weekly basis, which can free up the collection process for greater separation of other materials.

Vegetable, fruit and garden waste shall in any event be collected separately.

Bulky Waste

Householders accumulate bulky materials that they do not need. Provisions can be made for local government to organise waste collection or drop off centres for these materials. Collections can be done on an area basis or an individual booking system. An area basis has the convenience of concentrating effort in a small area. The downside to this is that when householders put out bulky materials for collection, informal collectors sift through it, spreading the waste further and sometime destroying reusable or recyclable goods to extract valuable materials, leaving the rest for cleaning up by the official collectors.

An individual booking system takes a more targeted approach, but requires more management. The advantage is that ugly piles of bulky materials do not appear on roadsides and reusable or recyclable goods are kept intact.

Collection centres provide the opportunity for neighbourhood exchanges. Unwanted bulky goods can be dropped off at the centres. Sorting the goods into resalable, recyclable and waste for disposal provides extra employment and assists the move toward a circular economy. An example providing for this is found in the Netherlands Environmental Management Act (2004)²⁰⁴ shown below.

Every [local government] shall ensure that:

- bulky household waste is collected from all the premises situated within its territory where such waste is generated, and
- sufficient opportunity is provided to leave such waste at least one designated place within the [local government area] or within the [local government areas] with which [local government] is cooperating.

Ordinances / Bylaws

Local government needs the ability to issue ordinances (bylaws) to enable them to carry out their waste functions efficiently. Useful ordinances consider rules on collecting waste, giving waste to another person, leaving waste at designated places, litter and the visibility of waste. Waste collection is important to consider when ownership transfers and who is the owner at any point, and therefore responsible.

²⁰³ <http://www.asser.nl/upload/eel-webroot/www/documents/national/netherlands/EMA052004.pdf>
s.10.21.2

²⁰⁴ <http://www.asser.nl/upload/eel-webroot/www/documents/national/netherlands/EMA052004.pdf>
s.10.22.1

Designating places for drop-off to provide uniformity assists with time efficient collection and reduces dumping. Drop-off can occur inside a property, on the kerbside of a road, in a nationalised place for each stretch of road or at collection centres. Designating these places reduces the ability of fly tippers providing a defence that they were dropping off and not dumping or littering.

Development of the ordinances is best conducted in a consultative way with the householders. When householders are asked to make a change in procedures they commonly come up with reasons why they personally cannot make the change (e.g. taking material to the kerbside up a hill is not possible because they are too frail to do it) and also gives local government to discover problems with proposed systems and solutions (e.g. for the above, get a neighbour to help you – strengthens neighbourhoods). An example containing these provision is found in the Netherlands Environmental Management Act (2004)²⁰⁵ shown below.

- [Local government] shall issue a waste ordinance [/bylaw].
- The waste ordinance [/bylaw] shall at a minimum include rules on:
 - transferring household waste or offering it for collection to a collection service designated by or pursuant to the ordinance [/bylaw];
 - transferring waste substances of this kind to another person;
 - leaving waste substances of this kind at a designated place.
- The waste ordinance [/bylaw] may also lay down rules on the collection of household waste.
- The waste ordinance [/bylaw] may in any event lay down rules on:
 - preventing waste substances ending up in the environment as litter or ensuring that this occurs as little as possible;
 - clearing up waste substances that have ended up in the environment as litter;
 - having waste substances in a place that is visible to the public.
- [Local government], in the interests of the efficient management of household waste, may provide in the waste ordinance [/bylaw] that:
 - household waste shall be collected near each premises;
 - household waste shall be collected with a frequency indicated in the ordinance [/bylaw];
 - no household waste shall be collected in part of the territory of the [local government].
- [Local government] shall involve residents and interested natural and legal persons in the [local government area] in the preparation of a decision of this kind.
- [Local government] shall ensure that sufficient opportunity is provided to leave household waste at least one designated place within the [local government area] or within the [local government area] with which the [local government] is cooperating.
- Rules may be laid down by [national government] relating to the inclusion in the ordinance [/bylaw] of an obligation to bring components of household waste to a designated place.

Relevant Definitions: Circular Economy, Disposal, Dumping, Environment, Household Waste, Recycling, Reuse, Waste, Waste Management, Waste Minimisation

²⁰⁵ <http://www.asser.nl/upload/eel-webroot/www/documents/national/netherlands/EMA052004.pdf> s.10.23

Relevant International Agreements:

- OECD Decision C(92)39/FINAL on the Control of Transfrontier Movements of Wastes Destined for Recovery Operations

Biowaste

Biowaste represents between 50 and 60% of the waste stream of developing countries. The environmental effects of biowaste include global warming and leachate production. In a circular economy, it is easier to remove biowaste from waste before it becomes mixed with other materials. The difficulty with biowaste is that in decomposition it can produce bad odours. Hence, if biowaste is separated from the general collection for separate collection, mechanisms for odour neutralisation or collection before the material becomes malodorous need to be put in place.

Sewage sludge can be treated in the same way as biowaste, but care needs to be taken to ensure that contaminants in sludge (e.g. heavy metals) do not contaminate the product.

In a circular economy biowaste and sewage sludge are kept separated from other wastes, but not every biowaste or sludge source can be used to produce compost due to contaminants. An example of legislation providing for this is found in the German Circular Economy Act (2012)²⁰⁶ shown below.

- Bio-waste that must be transferred to a public waste management organisation shall be collected separately.
- [National government] shall be empowered, after consulting the parties concerned to determine in particular:
 - what waste is deemed bio-waste or sewage sludge;
 - what requirements are to be made of the separate collection of bio-waste;
 - whether, and if so in what manner, bio-waste and sewage sludge are to be treated, what operations are to be applied in doing so and what other measures are to be taken thereby;
 - what requirements are to be made of the type and nature of the untreated bio-waste and sewage sludge, bio-waste and sewage sludge to be treated, and treated bio-waste and sewage sludge; and
 - that certain types of bio-waste and sewage sludge may not be put into circulation or recovered, or may only be put into circulation or recovered in certain quantities, only in a certain nature or only for certain purposes, depending on their starting substance, type, nature, origin, quantity, the type or time when the soil was treated by them, the nature of the soil, the situation at the location and kind of use.
- Requirements for the joint recovery of bio-waste and sewage sludge with other waste, substances or material may also be determined by means of a statutory ordinance [bylaw].

²⁰⁶ http://www.bmub.bund.de/fileadmin/Daten_BMU/Download_PDF/Abfallwirtschaft/kreislaufwirtschaftsgesetz_en_bf.pdf s.11

Processes should be put in place to ensure that the effectiveness of any programme is up to the expectations of the participants. For biowaste this means not only testing the materials but also the receiving environment. An example of legislation providing for this is found in the German Circular Economy Act (2012)²⁰⁷ shown below.

- Procedures may also be determined to review the requirements made of the recovery of bio-waste and sewage sludge, in particular:
 - obligations to examine the effectiveness of the treatment, the nature of the untreated and treated bio-waste and sewage sludge, the operations to be applied or the other activities;
 - examination methods which are necessary to review the activities; and
 - examinations of the soil.

Relevant Definitions: Biowaste, Circular Economy, Contaminant, Effect on the Environment, Recovery, Treatment, Waste, Waste Management

Sewage

International guidance on sewage disposal is available through the Global Plan of Action for the Protection of the Marine Environment from Land-based Activities²⁰⁸. An integrated waste management approach that leads to a circular economy needs to consider sewage. Sewage tends to be treated differently to solid waste as it is often piped to a treatment facility before discharge, with the sludge potentially recoverable to mix with biowaste. Most of the work for sewage treatment may be done at local government level with the process often run by a local government entity.

Developing a sewage plan is fundamental to establishing the current position and needs for the future, allowing for infrastructure, operational changes and environmental effects. An example providing for this is found in the Netherlands Environmental Management Act (2004)²⁰⁹ shown below.

- [Local government] shall draw up a municipal sewerage plan.
- The plan shall contain at least the following:
 - an overview of the facilities in the municipality for the collection and transport of wastewater and an indication of the time at which such facilities are estimated to be due for replacement;
 - an overview of the facilities as referred to above to be constructed or replaced during the duration of the plan;
 - an overview of the way in which the facilities are or will be operated;
 - the effects on the environment of existing facilities and of the activities announced in the plan;
 - a review of the financial consequences of the activities announced in the plan.

²⁰⁷ http://www.bmub.bund.de/fileadmin/Daten_BMU/Download_PDF/Abfallwirtschaft/kreislaufwirtschaftsge setz_en_bf.pdf s.11

²⁰⁸ <http://unep.org/gpa/gwi/gwi.asp>

²⁰⁹ <http://www.asser.nl/upload/eel-webroot/www/documents/national/netherlands/EMA052004.pdf> s.4.22.1 & 2

To improve the water quality of rivers, lakes and the marine environment wastewater must be treated before discharge, which may be a function of local government, as shown below in the example from the Netherlands Environmental Management Act (2004)²¹⁰.

Every municipality shall ensure the efficient collection and transport of wastewater discharged from the premises situated within its territory.

However, to achieve a national consistency, national government should provide the parameters for the life cycles of wastewater facilities. This has added importance when a country borders onto another country, or groups of countries around a body of water, to ensure that international treaties are adhered to collectively. This minimises the environmental and health impacts for the region. An example of this is found in the Netherlands Environmental Management Act (2004)²¹¹ shown below.

[National government] shall lay down rules for the design, construction, modification and maintenance of facilities for the collection and transport of wastewater in order to implement treaties or decisions of international organisations which are binding on the [country].

Reporting on progress is an essential feedback loop and this should be done regularly. The reports need to chronicle the situation for wastewater managed by local government and show the progress made since the previous report. The reports can then form the basis for decision-making to concentrate action to those areas that lag behind. An example of requiring reporting is found in the Netherlands Environmental Management Act (2004)²¹² shown below. The example requires reporting every two years, but where infrastructure is being set up in a country for the first time, it might be appropriate to have a closer monitoring period, like annually, so that a closer track can be kept on progress.

Every two years [national government] shall draw up a report describing the state of affairs concerning the collection and transport of wastewater and the disposal of sludge which comes mainly or entirely from the sewage treatment plants managed by [local government].

Another form of reporting giving more detail on the content of the report is found in the US Resource Conservation and Recovery Act (1976)²¹³ shown below. This report requires monitoring of who has access to the treatment plants for their wastewater and details on any lagoons commonly used as oxidation ponds.

- [National government] shall submit a report on mixtures of domestic sewage and other wastes that pass through a sewer system to a publicly owned treatment works. Such report shall include the types, size and number of generators which dispose of such substances in this manner, the types and quantities disposed of in this manner, and the identification of significant generators, wastes, and waste constituents not regulated.

²¹⁰ <http://www.asser.nl/upload/eel-webroot/www/documents/national/netherlands/EMA052004.pdf>

s.10.33.1

²¹¹ <http://www.asser.nl/upload/eel-webroot/www/documents/national/netherlands/EMA052004.pdf> s.10.34

²¹² <http://www.asser.nl/upload/eel-webroot/www/documents/national/netherlands/EMA052004.pdf>

s.10.35.1

²¹³ <https://www.law.cornell.edu/uscode/text/42/chapter-82> s.3018

- [National government] shall submit a report on wastewater lagoons at publicly owned treatment works and their effect on groundwater quality. Such report shall include:
 - the number and size of such lagoons;
 - the types and quantities of waste contained in such lagoons;
 - the extent to which such waste has been or may be released from such lagoons and contaminate ground water; and
 - available alternatives for preventing or controlling such releases.

Relevant Definitions: Biowaste, Circular Economy, Discharge, Disposal, Effect on the Environment, Land-based Sources, Lifecycle, Release, Treatment, Waste, Waste Management, Water Pollution

Relevant International Agreements:

- Bamako Convention on the ban on the Import into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes within Africa 1998
- Gothenburg Protocol on the reduction of acidification, eutrophication and ground-level, 1999
- International Convention for the Prevention of Pollution from Ships (MARPOL 1973) and 1978 Protocol
- Kyoto Protocol 1997
- London Convention 1972
- London Convention - Protocol on London Convention 1996
- OECD Decision C(92)39/FINAL on the Control of Transfrontier Movements of Wastes Destined for Recovery Operations
- The Global Programme of Action for the Protection of the Marine Environment from Land Based Activities 1995
- Wagani Convention 1995

Hazardous Waste

Hazardous wastes are generally ones that pose a hazard to humans or the environment and exhibit at least one of physical, chemical and biological hazards. Hazardous waste comes in a variety of forms, from healthcare to electronic to agricultural and household chemicals. Nuclear waste is generally considered under specific legislation and hence is not normally not part of general or hazardous waste legislation.

Hazardous waste should be considered in the context of its life cycle from manufacture of a hazardous substance or product to the disposal of any waste.

Transboundary Movements

Hazardous waste movement around the world is a significant issue managed internationally by the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal which is incumbent on the 183 governments²¹⁴ that have become a party to it. National governments then have to implement legislation that gives effect to the provisions in the Convention. An example is found in the Canadian Environmental Protection Act (1999)²¹⁵ shown below, which incorporates permitting as a control.

No person shall import, export or convey in transit a hazardous waste or hazardous recyclable material, or prescribed non-hazardous waste for final disposal, except:

- after notifying [national government] and paying the prescribed fee;
- after receiving from [national government] whichever one of the following permits is applicable:
 - an import permit or export permit that, except in the case of a permit states that the authorities of the country of destination and, if applicable, of the country of transit have authorized the movement, and that the authorities of the jurisdiction of destination have authorized the final disposal or recycling of the waste or material, or
 - a transit permit that states that [national government] has authorised the movement; and
- in accordance with the prescribed conditions.

Intra-Country Management

The management of hazardous waste within a country is also very important. Local government often has to manage hazardous waste, particularly household hazardous wastes, and hazardous wastes require different approaches to management and minimisation due to their more hazardous nature. This responsibility can be assisted by national government providing guidelines for local government in establishing hazardous waste programmes. An example is found in the US Resource Conservation and Recovery Act (1976)²¹⁶ shown below.

[National government] shall promulgate guidelines to assist [local government] in the development of [local government] hazardous waste programmes.

²¹⁴ <http://www.basel.int/Countries/StatusofRatifications/PartiesSignatories/tabid/4499/Default.aspx>

²¹⁵ <http://laws-lois.justice.gc.ca/PDF/C-15.31.pdf> s.185

²¹⁶ <https://www.law.cornell.edu/uscode/text/42/chapter-82> s.3006.a

Persistent Organic Pollutants

The disposal of persistent organic pollutants can cause widespread and long lasting damage. One way to manage this is found in the NZ Hazardous Substances and New Organisms Act (1996)²¹⁷ shown below.

[National government] may give directions as to the disposal of persistent organic pollutants.

Licensing

Elements of a successful hazardous waste management programme include a licensing system, a tracking system and training of licensees so that, not only is hazardous waste handled properly, but in the event of an accident appropriate action is taken to minimise health and environmental impacts.

An example of legislation restricting hazardous waste transfers is found in the Netherlands Environmental Management Act (2004)²¹⁸ shown below.

- Discarding hazardous waste by transferring it to another person shall be prohibited.
- This prohibition shall not apply if hazardous waste is transferred to a person who is authorised to recover or dispose of the waste substances in question.

Information

Tracking the movement of hazardous waste is essential to a sound hazardous waste management system. Without an adequate tracking system, the identity, origins, disposal sites and true management costs are lost. While the loss of hazardous waste may happen accidentally, deliberate mismanagement of the waste is attractive in that it reduces a company's costs by dumping it, while the company can charge a premium because of the waste's hazardous nature. The resultant dumping site is contaminated and the costs of cleaning it up are often borne by society when liability cannot be attributed to specific entities or the entities no longer exist.

The benefits of a hazardous waste tracking system are fourfold²¹⁹: it responds to the challenge of reducing the environmental impact of hazardous waste; the true cost of managing hazardous waste is revealed; trends in the characteristics of wastes generated, quantities and management methods can be tracked; and it promotes effective management of the wastes.

The development of a hazardous waste management system needs consultation with industry and ideally, could be set up and run by industry with government oversight. A tracking system has to be compulsory for all industry participants to create a level playing field and help to reveal unscrupulous operators.

An example of legislation setting up a tracking system is found in the Netherlands Environmental Management Act (2004)²²⁰ shown below.

²¹⁷ <http://www.legislation.govt.nz/act/public/1996/0030/latest/DLM381222.html> s.66

²¹⁸ <http://www.asser.nl/upload/eel-webroot/www/documents/national/netherlands/EMA052004.pdf> s.10.37

²¹⁹ Enander, RT. (1995). *Hazardous waste tracking and cost accounting practice*. CRC Press, Florida, USA. pp.240

²²⁰ <http://www.asser.nl/upload/eel-webroot/www/documents/national/netherlands/EMA052004.pdf> s.10.38.1

Any person who discards hazardous waste by transferring it to a person shall record the following information:

- the date of transfer;
- the name and address of the person to whom the waste substances are transferred;
- the usual nomenclature and the quantity of the waste substances concerned;
- the place to which and the manner in which the waste substances are transferred;
- the proposed manner in which the waste substances are to be managed;
- if the transfer takes place through the agency of another person who is commissioned to transport the waste substances to the person for whom they are intended: the latter's name and address and the name and address of the person for whom the waste substances are to be transported.

Long term retention of information is desirable for hazardous waste. A decision needs to be made on whether the retention is by the company(ies) transferring the waste, local government, or a nationalised database held at national government level. As the internet becomes more accessible, the ability to have a national cost-effective database increases as does the ability to retain records long-term. If a paper-based tracking system is introduced data needs to be retained for a period of years. An example of this is found in the Netherlands Environmental Management Act (2004)²²¹ shown below. In this example the retention period is five years, but equally seven or ten years could be an appropriate period. One possible way of determining how long to make the retention period is to equate it to the length of time that tax records need to be retained within a country.

The information recorded shall be kept for at least five years during which period it shall be available to those persons entrusted with the task of monitoring compliance with the Act.

To make a tracking system work individuals and companies need to record waste they receive and notify an appropriate agency. The data collected is the same as the person transferring the waste. An example of this is found in the Netherlands Environmental Management Act (2004)²²² shown below.

- A person to whom hazardous waste is transferred shall, for each transfer made to him, notify an agency designated by [national government] of the following:
 - the date of transfer;
 - the name and address of the person from whom the waste substances were received;
 - the usual nomenclature and the quantity of the waste substances;
 - the place to which and the manner in which the waste substances are transferred;
 - how the waste substances are to be recovered or disposed of;
 - if the transfer takes place through the agency of another person who was commissioned to transport the waste substances to him: the latter's name and

²²¹ <http://www.asser.nl/upload/eel-webroot/www/documents/national/netherlands/EMA052004.pdf>

s.10.38.2

²²² <http://www.asser.nl/upload/eel-webroot/www/documents/national/netherlands/EMA052004.pdf> s.10.40

address and the name and address of the person for whom the waste substances are to be transported.

- A person shall be prohibited from receiving hazardous waste without a specification and an accompanying note being provided.
- The information referred to above shall be sent to the competent province or municipality at its request.

To ensure safety and compliance, the notes of transfer need to be carried by the transporter. This condition allows monitoring of vehicles to ensure compliance, but also in the event that an accidental spillage occurs, authorities are able to manage the situation quickly and appropriately when they have the necessary information to do so. An example of this is found in the Netherlands Environmental Management Act (2004)²²³ shown below.

Any person who transports industrial or hazardous waste shall be obliged to carry with him an accompanying note for as long as the waste substances remain in his possession.

Accompanying regulations to the legislation normally detail the requirements on how the notification system works. An example of this is found in the Netherlands Environmental Management Act (2004)²²⁴ shown below.

- [Regulations] shall be laid down on the collection of [hazardous] waste.
- They shall include [regulations]:
 - on how a collector shall notify the agency designated and the information that he must submit in so doing;
 - imposing an obligation to give notice of any change to the information submitted upon notification of the agency;
 - on making the information submitted upon notification of the agency, and any change, available for inspection by any person;
 - obliging the collector to carry documents to be indicated therein during collection showing that he is on the list of collectors.
- It may be provided by [regulations] that a licence from [national government] shall be required for the collection of categories of designated waste.
- The conditions attached to the licence may:
 - provide that designated waste substances shall not be collected without special permission from the Minister;
 - impose an obligation to accept designated waste substances if offered to the collector;
 - impose an obligation to collect separately designated waste substances that have been transferred separately;
 - impose an obligation to fetch designated waste substances if offered to the collector;
 - impose an obligation to transfer waste substances to designated persons.

²²³ <http://www.asser.nl/upload/eel-webroot/www/documents/national/netherlands/EMA052004.pdf>

s.10.44.1

²²⁴ <http://www.asser.nl/upload/eel-webroot/www/documents/national/netherlands/EMA052004.pdf> s.10.46

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Container Standards

Regulations are needed to establish the standards hazardous waste handlers are expected to comply with. One notable regulation is for the container that the hazardous waste is stored in. If the hazardous waste is stored in an inappropriate container it could leak during normal transport or storage conditions, or in an accident. An example of establishing container standards is found in the US Resource Conservation and Recovery Act (1976)²²⁵ shown below.

[National government] shall promulgate regulations establishing standards, applicable to generators and transporters of hazardous waste as may be necessary to protect human health and the environment. Such standards shall establish requirements respecting the use of appropriate containers for hazardous waste.

Contaminants

It may be appropriate to stipulate the maximum levels of contaminants that can be disposed onto land. While this may deal with traditional and well-known hazardous wastes, emerging wastes (e.g. endocrine disruptors and nanoparticles) may not be covered unless the list is kept up to date. An example of such a list is found in the US Resource Conservation and Recovery Act (1976)²²⁶ shown below.

The land disposal of the following hazardous wastes is prohibited:

- Liquid hazardous wastes, including free liquids associated with any solid or sludge, containing free cyanides at concentrations greater than or equal to 1,000 mg/L.
- Liquid hazardous wastes, including free liquids associated with any solid or sludge, containing the following:
 - arsenic and/or compounds (as As) 500 mg/l;
 - cadmium and/or compounds (as Cd) 100 mg/l;
 - chromium (VI and/or compounds (as Cr VI)) 500 mg/l;
 - lead and/or compounds (as Pb) 500 mg/l;
 - mercury and/or compounds (as Hg) 20 mg/l;
 - nickel and/or compounds (as Ni) 134 mg/l;
 - selenium and/or compounds (as Se) 100 mg/l; and
 - thallium and/or compounds (as Th) 130 mg/l.
- Liquid hazardous waste having a pH less than or equal to 2.0
- Liquid hazardous wastes containing polychlorinated biphenyls at concentrations greater than or equal to 50 ppm.
- Hazardous wastes containing halogenated organic compounds in total concentration greater than or equal to 1,000 mg/kg.
- Dioxin-containing hazardous wastes numbered F020, F021, F022, and F023
- Those hazardous wastes numbered F001, F002, F003, F004, and F005.

²²⁵ <https://www.law.cornell.edu/uscode/text/42/chapter-82> s.3002.A

²²⁶ <https://www.law.cornell.edu/uscode/text/42/chapter-82> s.3004.d.2

Relevant Definitions: Contaminant, Controlled Waste, Discarding, Disposal, Dumping, Environment, Hazardous Waste, Hazardous Waste Management, Recycling, Storage, Waste, Waste Management, Waste Minimisation

Relevant International Agreements:

- Bamako Convention on the ban on the Import into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes within Africa 1998
- Basel Convention on the Transboundary Movement of Hazardous Wastes 1989
- Convention on Civil Liability for Damage Caused during Carriage of Dangerous Goods by Road, Rail and Inland Navigation Vessels (CRTD), Geneva 1989
- FAO International Code of Conduct on the distribution and use of Pesticides, Rome, 1985. (Revised Version 2005, Rome)
- Gothenburg Protocol on the reduction of acidification, eutrophication and ground-level, 1999
- Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships, 2009
- International Convention for the Prevention of Pollution from Ships (MARPOL 1973) and 1978 Protocol
- Minamata Convention on Mercury 2013
- Montreal Protocol on Substances that Deplete the Ozone Layer 1989
- OECD Decision C(92)39/FINAL on the Control of Transfrontier Movements of Wastes Destined for Recovery Operations
- Rotterdam Convention 1998
- Strategic Approach to International Chemicals Management 2006
- The Global Programme of Action for the Protection of the Marine Environment from Land Based Activities 1995
- Vienna Convention for the Protection of the Ozone Layer, 1985
- Wagani Convention 1995
- Working Environment (Air Pollution, Noise and Vibration) Convention, 1977

Burning

Burning in the sense defined here is different to incineration for disposal. The burning considered here is in relation to crop burning, and particularly stubble left after harvesting. The effects of burning stubble are particularly significant in developing countries relying on agricultural crops. The whole issue for regulating burning is not a simple one as there are a number of factors to consider when making decisions on regulating it.

There are a number of advantages and disadvantages to stubble burning²²⁷:

- Advantages
 - Cheap;
 - Quick and easy;

²²⁷ <http://agriculture.vic.gov.au/agriculture/grains-and-other-crops/crop-production/stubble-burning>

- Can assist weed, insect and disease control;
- Dealing with herbicide resistant weeds; and
- Reduced nitrogen tie-up.
- Disadvantages
 - Loss of nutrients
 - Loss of carbon
 - Impact on soil microbes and fauna
 - Reduction in soil structure (soil aggregate stability)
 - Increase in erosion (wind and water)
 - Can increase acidity over time

The best way to manage this situation is for each country to consider the merits of a blanket allowance, or prohibition, or exemptions. An example providing for regulations is found in the UK Environmental Protection Act (1990)²²⁸ shown below.

The appropriate Minister may regulate to prohibit or restrict the burning of crop residues on agricultural land by persons engaged in agriculture and may provide exemptions from any prohibition or restriction so imposed.

Relevant Definitions: Disposal, Incineration, Nutrient

Relevant International Agreements:

- FAO International Code of Conduct on the distribution and use of Pesticides, Rome, 1985. (Revised Version 2005, Rome)
- Kyoto Protocol 1997
- The Global Programme of Action for the Protection of the Marine Environment from Land Based Activities 1995

Smoke

Discharge of contaminants into the air can produce significant health and environmental effects. Smoke pollution causes a large number of health related problems²²⁹. Particulate matter, which produces dark smoke, is particularly hazardous producing health and environmental effects. These effects are²³⁰:

- Health:
 - Premature death in people with heart or lung disease;
 - Nonfatal heart attacks;
 - Irregular heartbeat;
 - Aggravated asthma;
 - Decreased lung function; and

²²⁸ http://www.legislation.gov.uk/ukpga/1990/43/pdfs/ukpga_19900043_en.pdf s.152.1

²²⁹ See <http://www.mass.gov/eea/docs/dep/air/aq/health-and-env-effects-air-pollutions.pdf>

²³⁰ <http://www3.epa.gov/pm/health.html>

- Increased respiratory symptoms, such as irritation of the airways, coughing or difficulty breathing.
- Environmental:
 - Visibility impairment;
 - Acidification of waterways;
 - Changing nutrient balance in coastal waterways;
 - Nutrient depletion in soil;
 - Damaging forest and farm crops; and
 - Damage stone and materials.

Elimination of dark smoke is desirable. A blanket prohibition with offences attached is a clear signal. A clause for prohibition may require a lead-in period before it takes effect to allow time for businesses to adjust. The amount of time needed could be by negotiation between industry and the local or national government. Requirements to change often significant pieces of equipment can get a very negative response from industry – right up to threatening to close the business and move to another locality with a consequent loss of employment. An example of prohibition is found in the UK Clean Air Act (1993)²³¹ shown below.

Dark smoke shall not be emitted from a chimney which serves the furnace of any fixed boiler or industrial plant, and if, on any day, dark smoke is so emitted, the person having possession of the boiler or plant shall be guilty of an offence.

Approval to install new furnaces should be obtained from local government and any discharges subject to approval (or otherwise). This could be achieved through a consenting process that involves an environmental impact assessment. An example of seeking permission is found in the UK Clean Air Act (1993)²³² shown below.

- No furnace shall be installed in a building or in any fixed boiler or industrial plant unless notice of the proposal to install it has been given to [local government].
- No furnace shall be installed in a building or in any fixed boiler or industrial plant unless the furnace is so far as practicable capable of being operated continuously without emitting smoke when burning fuel of a type for which the furnace was designed.

To avoid businesses playing off local governments against each other, it is advisable to have national standards for rates of emissions for particulates. Perverse outcomes can arise from adopting area allowable immissions, or single business emissions. In the former, the perverse outcome is that if an area has low levels of emissions it could entice higher-emission businesses to come to that area to provide employment, but also reduce the air quality. In the latter situation, formerly clean businesses can use cheaper fuels (that generally produce higher levels of particulates) as a cost saving measure. An example stipulating single business emissions is found in the UK Clean Air Act (1993)²³³ shown below.

²³¹ http://www.legislation.gov.uk/ukpga/1993/11/pdfs/ukpga_19930011_en.pdf s.2.1

²³² http://www.legislation.gov.uk/ukpga/1993/11/pdfs/ukpga_19930011_en.pdf s.4.1 & 2

²³³ http://www.legislation.gov.uk/ukpga/1993/11/pdfs/ukpga_19930011_en.pdf s.5.2

[National government] shall regulate limits on the rates of emission of [particulates] from the chimneys of furnaces.

An example of specifications for non-domestic furnaces to limit discharge of particulates is found in the UK Clean Air Act (1993)²³⁴ shown below.

A non-domestic furnace may not be used to burn pulverised fuel, solid fuel at greater than 45.4 kg per hour, or liquid or gaseous matter at more than 366.4 kW unless the furnace is provided with plant for arresting [particulates] which and has been installed in accordance with plans and specifications approved by [local government], and that plant is properly maintained and used.

To ensure that the maintenance provisions are carried out it is useful to require measurements of the emissions to be reported to local government. An example of this is found in the UK Clean Air Act (1993)²³⁵ shown below. It is usual to have set time periods for these recordings to be taken to ensure a more robust process.

An occupier of a building shall record measurements from time to time of the [particulates] and fumes emitted from the furnace and inform [local government] of the results.

Where whole areas have significant smoke issues, or local government wants to ensure that smoke-producing businesses are nationalised in one area, they can designate a particular area as a 'smoke control area' as shown in the example below from the UK Clean Air Act (1993)²³⁶.

- [Local government] may by order declare the whole or any part smoke control of the district of the authority to be a smoke control area;
- A smoke control order may:
 - make different provision for different parts of the smoke control area;
 - limit the operation to specified classes of building in the area; and
 - exempt specified buildings or classes of building or specified fireplaces or classes of fireplace in the area.

Community support for these waste issues is important because, all too often, people adopt a stance of 'out of sight, out of mind'. The effects of particulate emissions build up over time and people adjust to the situation. It is only when new people come into the area that anyone notices that something is wrong.

Local government can build support for smoke (or other air pollution) control provisions by conducting research, publicising information, holding meetings and discussion forums and exhibitions where appropriate. An example of this is found in the UK Clean Air Act (1993)²³⁷ shown below.

[Local government] may:

²³⁴ http://www.legislation.gov.uk/ukpga/1993/11/pdfs/ukpga_19930011_en.pdf s.6.1

²³⁵ http://www.legislation.gov.uk/ukpga/1993/11/pdfs/ukpga_19930011_en.pdf s.10.4

²³⁶ http://www.legislation.gov.uk/ukpga/1993/11/pdfs/ukpga_19930011_en.pdf s.18.1 & 2

²³⁷ http://www.legislation.gov.uk/ukpga/1993/11/pdfs/ukpga_19930011_en.pdf s.34.1

- undertake, or contribute towards the cost of, investigation and research relevant to the problem of air pollution;
- arrange for the publication of information on that problem;
- arrange for the delivery of lectures and addresses, and the holding of discussions, on that problem;
- arrange for the display of pictures, movies or models, or holding exhibitions, relating to that problem; and
- prepare, or join in or contribute to the cost of the preparation of the above.

Relevant Definitions: Air, Air Pollution, Contaminant, Dark Smoke, Discharge, Effect on the Environment, Emissions, Environmental Pollution, Immissions, Nutrient

Relevant International Agreements:

- Gothenburg Protocol on the reduction of acidification, eutrophication and ground-level, 1999
- United Nations Convention on the Law of the Sea (UNCLOS) 1982

Litter

There is a distinct difference between littering and dumping or disposing of waste. Litter tends to be individual items dropped by people particularly when they are away from home. As well as being unsightly and giving the feeling of a society that does not value its surroundings it also degrades the environment. Left unchecked, land-based litter travels downhill and eventually ends up in the waterways and is carried into the oceans producing a variety of effects²³⁸:

- Entanglement of marine animals and sea birds in litter;
- Ingestion by marine organisms and sea birds;
- Smothering the seabed which upsets the fragile ecosystem;
- Accumulation and dispersion of toxic substances which can lead to a protracted death;
- Environmental changes due to invasive species from alien species migrating to new territory due to the changed ecosystem; and
- Disturbances to ecosystems from mechanical cleaning due to wave action or human clean up.

Litter laws are often in place but enforcement is not a high priority for agencies. Where there is enforcement, local government officers are often responsible for clean up as well as enforcement. However, enforcement officers can include a range of officials, not just from local government. Examples of other officials include police, conservation officers, harbourmasters, fisheries inspectors, and potentially anyone else who has official duties in an outdoor environment.

²³⁸ <http://www.unep.org/regionalseas/marinelitter/about/effects/default.asp>

Litter penalties are normally a monetary fine with a back-up of court proceedings for non-payment. An example of litter clauses is found in the UK Environmental Protection Act (1990)²³⁹ shown below.

- A person is guilty of an offence if he throws down, drops or otherwise deposits any litter in any place and leaves it.
- Where an authorised officer of a litter authority finds a person who has littered, he may give that person a notice offering him the opportunity of discharging any liability to conviction for that offence by payment of a fixed penalty.

Relevant Definitions: Dumping, Effect on the Environment, Land-based Sources, Marine Pollution

Relevant International Agreements:

- The Global Programme of Action for the Protection of the Marine Environment from Land Based Activities 1995

Mining / Mineral Waste

In some countries mining is a significant generator of waste, some of which can be quite toxic. Mining waste tends to be high volume waste and includes not only solid waste but also drilling fluids and waste waters causing leachate and runoff. Mining waste can be managed like any other waste for potential recovery and/or disposal by landfilling or long-term storage. Sometimes mineral processing waste can be pumped out to sea through pipelines as slurry.

The process for managing mining wastes is to do an environmental impact assessment and then refer to recovery, disposal and landfill clauses of legislation for final management. An example of the matters to be covered for an environmental impact assessment for mining wastes is found in the US Resource Conservation and Recovery Act (1976)²⁴⁰ shown below.

- **Mining Waste:** Report on the adverse effects of solid wastes from active and abandoned surface and underground mines on the environment, including, but not limited to, the effects of such wastes on humans, water, air, health, welfare, and natural resources, and on the adequacy of means and measures currently employed by the mining industry, Government agencies, and others to dispose of and utilise such solid wastes and to prevent or substantially mitigate such adverse effects. Such study shall include an analysis of:
 - the sources and volume of discarded material generated per year from mining;
 - present disposal practices;
 - potential dangers to human health and the environment from surface runoff to leachate and air pollution by dust;
 - alternatives to current disposal methods;

²³⁹ http://www.legislation.gov.uk/ukpga/1990/43/pdfs/ukpga_19900043_en.pdf s.87

²⁴⁰ <https://www.law.cornell.edu/uscode/text/42/chapter-82> s.8002.f, m & p

- the cost of those alternatives in terms of the impact on mine product costs; and
- potential for use of discarded material as a secondary source of the mine product.
- **Drilling Fluids, Produced Waters, and other Wastes Associated with the Exploration, Development, or Production of Crude Oil or Natural Gas or Geothermal Energy:** Report on adverse effects, if any, of the above on human health and the environment, including, the effects of such wastes on humans, water, air, health, welfare, and natural resources and on the adequacy of means and measures currently employed by the oil and gas and geothermal drilling and production industry, Government agencies, and others to dispose of and utilise such wastes and to prevent or substantially mitigate such adverse effects. Such study shall include an analysis of:
 - the sources and volume of discarded material generated per year from such wastes;
 - present disposal practices;
 - potential danger to human health and the environment from the surface runoff or leachate;
 - alternatives to current disposal methods;
 - the cost of such alternatives; and
 - the impact of those alternatives on the exploration for, and development and production of, crude oil and natural gas or geothermal energy.
- **Materials Generated from the Extraction, Beneficiation, and Processing of Ores and Minerals, including Phosphate Rock and Overburden from Uranium Mining:** Report on adverse effects, if any, of the above on human health and the environment, including, the effects on human health and the environment, if any, of the disposal and utilisation of solid waste from the extraction, beneficiation, and processing of ores and minerals, including phosphate rock and overburden from uranium mining.

Construction and Demolition

A lot of material is generated in the construction and demolition sector. Typical data shows that construction and demolition waste can form up to 40% of the waste stream²⁴¹. Much of the waste is mineral waste which is inert (e.g. soil and rock) and can be reused or recycled so storage and disposal of this material has a low environmental impact. It is therefore desirable to minimise this source of waste. A legislative aid is found in the German Circular Economy Act (2012)²⁴² shown below.

[National] Government shall be empowered, after consulting the parties concerned to mandate to determine requirements of the recovery of mineral waste in technical structures.

²⁴¹ <http://siteresources.worldbank.org/INTURBANDEVELOPMENT/Resources/336387-1334852610766/Chap5.pdf>

²⁴² http://www.bmub.bund.de/fileadmin/Daten_BMU/Download_PDF/Abfallwirtschaft/kreislaufwirtschaftsgesetz_en_bf.pdf s.10

Relevant Definitions: Air, Air Pollution, Disposal, Effect on the Environment, Environment, Environmental Pollution, Landfill, Marine Pollution, Recovery, Storage, Waste

Relevant International Agreements:

- ASEAN Agreement on the Conservation of Nature and Natural Resources 1985
- Basel Convention on the Transboundary Movement of Hazardous Wastes 1989
- Convention for the Protection of the Natural Resources and Environment of the South Pacific Region 1986
- Convention to Combat Desertification (UNCCD) 1996
- European Agreement Concerning the International Carriage of Dangerous Goods by Inland Waterways (AND), Geneva, 2000. Including the Annex Regulation (2011)
- Gothenburg Protocol on the reduction of acidification, eutrophication and ground-level, 1999
- International Convention for civil liability for oil pollution Damage 1992
- International Convention for the Prevention of Pollution from Ships (MARPOL 1973) and 1978 Protocol
- International Convention on Civil Liability for Bunker Oil Pollution Damage, 2001
- Kyoto Protocol 1997
- London Convention 1972
- London Convention - Protocol on London Convention 1996
- OECD Decision C(92)39/FINAL on the Control of Transfrontier Movements of Wastes Destined for Recovery Operations
- United Nations Convention on the Law of the Sea (UNCLOS) 1982
- Wagani Convention 1995

Tyres

End-of-life tyres present a problem in many countries. When disposed of into a landfill tyres rise up through the landfill over time and protrude through the surface. Waste tyres present a range of health and environmental risks that make them not only difficult, but necessary to manage properly²⁴³.

One of the first steps in managing the end-of-life problem for tyres is to provide an analysis of the scale of the problem. An example of this is found in the US Resource Conservation and Recovery Act (1976)²⁴⁴ shown below.

Tyres: Report on discarded motor vehicle tyres including an analysis of the problems involved in the collection, recovery of resources including energy, and use of such tyres.

One of the ways to mitigate some of the problems is to reduce the volume that tyres occupy through shredding. Shredding is a very low technology solution to significantly alleviate the volume problem which can then lead to further processing. An example of providing assistance

²⁴³ See <http://www.basel.int/Implementation/Publications/TechnicalGuidelines/tabid/2362/Default.aspx>
²⁴⁴ <https://www.law.cornell.edu/uscode/text/42/chapter-82> s.8002.h

for companies that wish to purchase shredders is found in the US Resource Conservation and Recovery Act (1976)²⁴⁵ shown below.

[National government] shall make available grants equal to 5 percent of the purchase price of tyre shredders (including portable shredders attached to tyre collection trucks).

The issue of end-of-life tyres is one that is well-suited to management through an extended producer responsibility scheme or a product stewardship scheme. The UNEP produced Technical Guidelines for the environmentally sound management of used and waste pneumatic tyres²⁴⁶ provide good guidance on the management of tyres.

Relevant Definitions: Landfill, Recovery

Relevant International Agreements:

- Basel Convention on the Transboundary Movement of Hazardous Wastes 1989
- OECD Decision C(92)39/FINAL on the Control of Transfrontier Movements of Wastes Destined for Recovery Operations

Landfills

Disposal to landfills is covered under disposal (above) and the conditions that need to be considered when deciding to locate a landfill are covered under environmental impact assessment (above). Landfills in developing countries usually contain a high proportion of organic compounds (60 – 70%) of the municipal solid waste which translates to a high moisture content, low calorific value and significant methane emissions contributing to global warming²⁴⁷.

Gas collections systems can provide significant energy sources and combusting the methane to produce energy for use within the facility and to feed into a national or local grid. This not only reduces the need for other energy generation, but also reduces a country's carbon footprint since methane is 25 times more harmful to the atmosphere than carbon dioxide, one of the products from burning methane. An example of legislation requiring methane capture is found in the NZ Resource Management (National Environmental Standards for Air Quality) Regulations (2004)²⁴⁸ shown below. Restricting the size of the landfill to the largest ones means that electricity can be generated economically and over a long period of time. The stipulation of biodegradable waste ensures that large monofills (e.g. mining waste) which do not have organic matter do not have to put in a gas collection system.

The following apply if a landfill has a total capacity of over 1 million tonnes and contains at least 200,000 tonnes of waste, is likely to be accepting waste and the waste is likely to consist of 5% or more (by weight) of matter that is putrescible or biodegradable:

²⁴⁵ <https://www.law.cornell.edu/uscode/text/42/chapter-82> s.8004.a

²⁴⁶ <http://www.basel.int/Implementation/Publications/TechnicalGuidelines/tabid/2362/Default.aspx>

²⁴⁷ <http://www.unep.org/ietc/Portals/136/Publications/Waste%20Management/UNEP%20NWMS%20English.pdf> p18

²⁴⁸ <http://www.legislation.govt.nz/regulation/public/2004/0309/latest/DLM286835.html> s.25.1

- No discharge of gas to air from a landfill unless there is a gas collection system that is designed and operated to ensure that any discharge of gas from the surface of the landfill does not exceed 5 000 parts of methane per million parts of air; and
- the gas is flared or used as a fuel or for generating electricity.

Closed Landfills

The closure of a landfill is not the end of the life for a landfill. Under the ground materials within the landfill are still decomposing and changing composition. Ideally the site should be returned to the way it was (or better) before the landfill was constructed. The end-of-life and after life measures need funding, either through accumulated funds during the life of the landfill or some other mechanism that will enable no environmental impact for the following decades until the landfill reaches an inert state. An example of legislation that provides the framework for this is found in the Netherlands Environmental Management Act (2004)²⁴⁹ shown below.

- Measures shall be taken to guarantee that closed landfill sites do not cause any adverse environmental effects or, in so far as this cannot reasonably be required, the greatest possible protection is offered against such effects.
- The measures shall at least include:
 - measures to preserve, maintain, restore, improve or replace facilities designed to protect the soil;
 - regular inspection of facilities designed to protect the soil; and
 - regular testing of the soil under the landfill site.
- The person running a landfill site shall draw up an after-care plan for the implementation of the measures. The after-care plan shall require the approval of the provincial executive of the province in which the landfill site is entirely or mainly situated.

It is often difficult to determine how long closed landfills will need to be cared for. Determining the funding needed is a risk management process in which, if wrong decisions are made, local government, or even national government, may be called on to make up any shortfalls in funding. While the operational aspects of the landfill can be covered by the fees collected by the landfill operator, there are several mechanisms for building a pool of money to maintain closed landfills.

Levies for Aftercare

A special levy for aftercare could be charged on every tonne or disposal at the landfill during its lifetime. This levy could be held by the operator and used over the years after the landfill is closed. This scheme could be problematic in counties and with companies where trust is an issue. An alternative is for the money to be paid into a trust fund, administered privately or by local or national government. This has the benefit that money is actually available when needed to carry out maintenance. Another alternative is that when maintenance or remediation is needed, national or local government can draw on their funds to pay for it. This removes the problem of levying and administering the levy, but there is a high risk that at the time that the funds are needed the government will not have them to pay for this purpose and rather divert them to projects that have more 'visible' effects. An example of setting up a levy for funding

²⁴⁹ <http://www.asser.nl/upload/eel-webroot/www/documents/national/netherlands/EMA052004.pdf> s.8.49

closed landfill sites is found in the Netherlands Environmental Management Act (2004)²⁵⁰ shown below. Some of the issues are dealt with by some of the levy being used to fund liability insurance.

- [Local government] shall institute a levy to defray the costs associated with:
 - the care of landfill sites situated in the province concerned;
 - an obligation for the province concerned to contribute to a fund to cover major financial risks associated with the care of closed landfill sites;
 - the province's inventory of sites where waste has been landfilled and where landfilling ceased prior to 1 September 1996, and the investigation and systematic monitoring of the presence, nature and scale of any pollution at those sites.
- The levy may also relate to the costs associated with liability insurance.

Relevant Definitions: Air, Discharge, Disposal, Effect on the Environment, Emissions, Environmental Pollution, Harm, Inert Waste, Landfill, Remediation, Waste

Relevant International Agreements:

- Bamako Convention on the ban on the Import into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes within Africa 1998
- Basel Convention on the Transboundary Movement of Hazardous Wastes 1989
- OECD Decision C(92)39/FINAL on the Control of Transfrontier Movements of Wastes Destined for Recovery Operations
- Strategic Approach to International Chemicals Management 2006
- The Global Programme of Action for the Protection of the Marine Environment from Land Based Activities 1995
- Wagani Convention 1995

²⁵⁰ <http://www.asser.nl/upload/eel-webroot/www/documents/national/netherlands/EMA052004.pdf> s.15.44

CIRCULAR ECONOMY

A circular economy is one in which material flows are designed to circulate at high quality without entering the biosphere. Those materials that do enter the biosphere should have minimal environmental impact. The Circular Economy works on notion of optimising systems and not the components. From a waste management perspective, the transition to a circular economy is guided by application of the waste management hierarchy, for example, as found in the UNEP Guidelines²⁵¹.

This section covers the provisions related most closely to moving towards a circular economy. It covers the following provisions:

- Circular Economy Requirements and Obligations;
- Best Available Technology; and
- Procurement.

Circular Economy Requirements and Obligations

A major driver for transitioning to a circular economy is national government. The role of national government in the circular economy is to facilitate processes so that other stakeholders in the economy are enabled to maximise their performance.

Initiation

A decision to embark on developing a circular economy can be made through a national strategy statement or using a legislative approach. If it is done through a legislative approach it is good to start by setting up a plan that will provide the mechanisms to get actions going. An example of this is found in the Japanese Basic Act for the Establishment of a Sound Material-Cycle Society (2000)²⁵² shown below.

The Government shall establish a Fundamental Plan for establishing a [circular economy] for the purpose of comprehensive and systematic promotion of the policies and measures for establishing a [circular economy].

Circular Economy Plan Development

The elements of the plan should cover a typical plan outline. It sets out the basic propositions and the criteria that are needed as well as the actions that government needs to take in a systematic way. An example of this is found in the Japanese Basic Act for the Establishment of a Sound Material-Cycle Society (2000)²⁵³ shown below.

The Fundamental Plan for [a circular economy] shall provide the following matters:

- Basic principles on policies and measures for establishing a [circular economy];

²⁵¹ <http://www.unep.org/ietc/Portals/136/Publications/Waste%20Management/UNEP%20NWMS%20English.pdf> p18

²⁵² <https://www.env.go.jp/en/laws/recycle/12.pdf> Art.15

²⁵³ <https://www.env.go.jp/en/laws/recycle/12.pdf> Art.15

- The policies and measures the Government should make comprehensively and systematically for establishing a [circular economy]; and
- In addition to the matters stated in the foregoing two items, other necessary matters to promote the policies and measures for establishing a [circular economy] comprehensively and systematically.

A suitable sequence for the development of the plan is for officials (or an advisory body) to develop guidelines for developing the plan and to get ministerial acceptance. Input from across government is important to gain cabinet approval. Since this is a systemic change in thinking the plan should be reviewed on a regular basis. An example of this is found in the Japanese Basic Act for the Establishment of a Sound Material-Cycle Society (2000)²⁵⁴ shown below. Note that the National Environment Council is an advisory body. It is often very useful to have external input as this broadens the range of experience and produces a more robust output. In addition, the review period in Japan is set at 5 years.

- The National Environment Council shall, by [date], share its views with the Minister of the Environment regarding concrete guidelines for establishing the Fundamental Plan for [a circular economy].
- The Minister of the Environment shall, in accordance with the concrete guidelines under the preceding paragraph, hear the views of the National Environment Council, prepare a draft Fundamental Plan for [a circular economy], and seek a Cabinet decision on it by [date].
- The Minister of the Environment shall, in preparing the draft Fundamental Plan for [a circular economy], consult with the Ministers in charge of the matters on securing effective use of resources.
- After the Cabinet decision is obtained the Minister of the Environment shall, without delay, report the Fundamental Plan for [a circular economy] to [parliament] and make it available to the public.
- The Fundamental Plan for [a circular economy] shall be reviewed every five years or so.

National and Local Government Roles

A circular economy requires a sharing of roles between national and local government, businesses and the community. Each has a part to play and so the costs need to be shared in some way as well. An example of this is found in the Japanese Basic Act for the Establishment of a Sound Material-Cycle Society (2000)²⁵⁵ shown below.

The establishment of a [circular economy] must be undertaken by having necessary measures carried out under the proper sharing of roles among [national government], local governments, business operators, and citizens, and with the costs of such measures shared appropriately and fairly among them.

A circular economy does not just happen. Part of the implementation process is communication and education to business and the community. National government is best resourced to manage this on a nationwide basis, but results are most noticeable when it is followed up on a local basis to get communities of businesses and residents involved. An example of this is found

²⁵⁴ <https://www.env.go.jp/en/laws/recycle/12.pdf> Art.15

²⁵⁵ <https://www.env.go.jp/en/laws/recycle/12.pdf> Art.4

in the Japanese Basic Act for the Establishment of a Sound Material-Cycle Society (2000)²⁵⁶ shown below.

[National government] shall take necessary measures for the improvement of publicity and the promotion of education and learning on the establishment of a [circular economy], in view of the fact that it is indispensable to gain the understanding and cooperation of business operators and citizens in order to facilitate the transformation into a [circular economy].

Waste Minimisation

Implementation of a circular economy invokes certain obligations on waste generators and possessors. Minimisation of the waste is key in these obligations. Waste minimisation needs to be done in a way that ensures that the environmental and health benefits outweigh those of disposal. Waste generators will take measures to minimise waste when they can see business advantages to doing so. These advantages can take a variety of forms including financial gain from minimising, customer demands for environmental performance and local or national government demands. Government demands tend to be the weakest drivers. However, information and education campaigns showing the economic, social and environmental benefits of waste minimisation, coupled with an easy process to engage in waste minimisation can have significant benefits. These campaigns are most efficiently carried out by government or industry associations, or both working together.

An example of requiring waste minimisation is found in the German Circular Economy Act (2012)²⁵⁷ shown below.

- Waste producers or holders shall be obliged to [minimise] their waste. The [minimisation] of waste shall have priority compared to its disposal. The priority shall cease to apply if the disposal of the waste best ensures the protection of human health and the environment.
- The [minimisation] of waste, especially binding of waste within products, must take place properly and safely. [Minimisation] shall be deemed to take place properly if it is effected in compliance with the provisions of this Act and with other provisions of public law. It shall be deemed to take place safely when, given the nature of the waste, the level of contaminants that the waste contains and the type of [minimisation] in question, no impairment of the public interest is expected, and in particular when no accumulation of harmful substances occurs within the substance cycle.

A couple of the limitations on waste minimisation are the technical and economic feasibilities of doing it. Both of these limitations will vary depending on the level of development in the country under consideration. Drivers in one part of the world are often quite different to those in another part of the world and so methods of achieving change will vary accordingly. The use of best

²⁵⁶ <https://www.env.go.jp/en/laws/recycle/12.pdf> Art.27

²⁵⁷ http://www.bmub.bund.de/fileadmin/Daten_BMU/Download_PDF/Abfallwirtschaft/kreislaufwirtschaftsgesetz_en_bf.pdf s.7

available technology that is economically feasible and socially applicable presents the best option. An example of this is found in the German Circular Economy Act (2012)²⁵⁸ shown below.

The obligation to [minimise] waste shall be met, to the extent that this is technically possible and economically reasonable, especially when a market exists, or can be created, for an extracted substance or for extracted energy. Waste [minimisation] shall be deemed to be technically possible even when it requires pre-processing. Waste [minimisation] shall be deemed to be economically reasonable if the costs which [minimisation] entails are not disproportionate to the costs that waste disposal would entail.

Protection of human health and the environment are crucial aspects for a circular economy. National and/or local government can provide a lead in furnishing advice to business, ideally giving several options to solve a problem. An example of this is found in the German Circular Economy Act (2012)²⁵⁹ shown below.

Priority shall be given in meeting the [minimisation] obligation which best guarantees the protection of human health and the environment by the type and nature of the waste. Waste producers or holders shall have an option between several [minimisation] operations that are of equal ranking. When designing the [minimisation] operation, high-quality [minimisation] shall be encouraged which best guarantees the protection of human health and the environment.

Relevant Definitions: Circular Economy, Contaminant, Disposal, Environment, Harm, Inert Waste, Preparing for Reuse, Recovery, Recycling, Reuse, Storage, Waste, Waste Minimisation

Best Available Technology

Countries need to adopt technologies that are best suited to their situation. Often the most successful technologies applied in developing countries are low cost and low maintenance (e.g. handcarts for waste collection rather than large dedicated waste collection vehicles that spend long periods out of service due to lack of maintenance). Consultations with the affected parties along with appropriate research and development to adopt new solutions or adapt existing ones are essential parts of the process.

Assessment for the best available technologies considers a number of criteria. The technology should reduce the waste quantities and not just transfer them from one medium (e.g. solid) to another (e.g. air emissions). The technologies should also reduce the hazards level of the waste so that there is less potential impact on human health and the environment. The human health issue is especially important as ordinarily statistics for health treatment of workers normally come out of the health budget, not the environment budget.

²⁵⁸ http://www.bmub.bund.de/fileadmin/Daten_BMU/Download_PDF/Abfallwirtschaft/kreislaufwirtschaftsgesetz_en_bf.pdf s.7

²⁵⁹ http://www.bmub.bund.de/fileadmin/Daten_BMU/Download_PDF/Abfallwirtschaft/kreislaufwirtschaftsgesetz_en_bf.pdf s.8

The technology should also result in materials that can be used in operations higher up the waste management hierarchy. Ideally, the technology should also be something that is similar to what is already used in the business to make it as easy as possible for the workers to adapt to the new technology. Other factors such as technology that reduces the inputs of raw materials, the time taken to bring online the new technology and examining literature on best available technologies are useful criteria.

An example of criteria to determine the best available technology is found in the German Circular Economy Act (2012)²⁶⁰ shown below.

In determination of the best available technology, the following criteria are especially to be considered, taking into account the proportionality between the expense and benefits of potential measures, and the principle of precaution and prevention, and in each case with regard to installations of a specific type:

- use of technology that produces little waste;
- use of less-hazardous substances;
- promotion of [minimisation] of the substances – and where appropriate of the waste – generated and used in the individual operations;
- comparable operations, equipment and operational methods that have been successfully tested in the company;
- progress in technology and in scientific findings;
- the nature, impacts and quantities of relevant emissions;
- the times at which new or existing installations are/were commissioned;
- the time required to introduce better available technology;
- consumption of raw materials and the type of raw materials used in the individual processes (including water) and energy efficiency;
- the need to prevent or reduce total impacts of emissions, and hazards for human health and the environment, to the greatest possible extent;
- the need to prevent accidents and to reduce their consequences for human health and the environment;
- information published by international organisations; and
- information included in Best Available Technique Reference Documents.

Relevant Definitions: Emissions, Environment, Installation, Prevention, Waste, Waste Minimisation

Relevant International Agreement:

- Convention on Long-Range Trans-Boundary Air Pollution (LRTAP), Geneva 1979

²⁶⁰ http://www.bmub.bund.de/fileadmin/Daten_BMU/Download_PDF/Abfallwirtschaft/kreislaufwirtschaftsgesetz_en_bf.pdf Annex 3

Procurement

Government (both national and local) is a significant procurer of goods and services. They can either procure under formal contract or otherwise, works, supplies and services by public bodies. Another form of procurement is that for public-private partnerships where, typically, the government and private industry share the skills and assets of each sector in delivering a service or facility for the use of the general public. In either situation government is able to exert significant influence on the characteristics and quality of the goods and services through supply chain management. In a circular economy these characteristics include the environmental benefits of the goods and services. Examples include:

- government may decide that one of the significant criteria in paper purchase is that it must be recycled paper;
- photocopying services must be environmentally sound; or
- a public-private partnership to construct a new road includes criteria for environmentally sound practices like minimising the waste generated.

Public-private partnerships require that the government develops technical and managerial capacity to develop, negotiate, manage and supervise these sorts of contracts. Important aspects include using performance based contracting, including proportionate penalties for non-performance, are crucial for a successful purchasing programme

In proposals for supply of goods or services it is very useful to require suppliers to specify portions of minimised materials being utilised to get them to focus on a circular economy approach.

As with any government instrument, the potential for perverse outcomes should be considered. For example, a decision that all paper must be recycled could flood the market, causing the price of recycled paper to plummet, making it uneconomic to sell recycled paper, resulting in the processors going out of business.

It may not always make good sense to maximise the environmental aspects when considering procurement. Other factors come into consideration as well, like the availability of the goods and whether the waiting time justifies the inconvenience, or the goods cannot meet the performance standards set by the agency, or the price is excessive. In such cases it is appropriate to favour the solution that is most economically viable, socially acceptable and environmentally responsible.

An example of the above provisions is found in the US Resource Conservation and Recovery Act (1976)²⁶¹ shown below.

- Each procuring agency which procures any items shall procure such items composed of the highest percentage of recovered materials practicable (and in the case of paper, the highest percentage of the postconsumer [minimised] materials) consistent with maintaining a satisfactory level of competition.

²⁶¹ <https://www.law.cornell.edu/uscode/text/42/chapter-82> s.6002.c

- The decision not to procure such items shall be based on a determination that such procurement items:
 - are not reasonably available within a reasonable period of time;
 - fail to meet the performance standards set forth in the applicable specifications or fail to meet the reasonable performance standards of the procuring agencies; or
 - are only available at an unreasonable price.
- Contracting offices shall require that vendors:
 - certify that the percentage of [minimised] materials to be used in the performance of the contract will be at least the amount required by applicable specifications or other contractual requirements; and
 - estimate the percentage of the total material utilised for the performance of the contract which is recovered materials.

Relevant Definitions: Circular Economy, Waste Minimisation

Relevant International Agreements:

- FAO International Code of Conduct on the distribution and use of Pesticides, Rome, 1985. (Revised Version 2005, Rome)
- Strategic Approach to International Chemicals Management 2006
- United Nations Convention on the Law of the Sea (UNCLOS) 1982

EXTENDED PRODUCER RESPONSIBILITY / PRODUCT STEWARDSHIP

This section covers the provisions related to extended producer responsibility or product stewardship. It covers the following provisions:

- Extended Producer Responsibility;
- Product Stewardship;
- Drop-off Systems;
- Deposit Scheme;
- Material Ban; and
- Separation.

Extended Producer Responsibility

Extended producer responsibility and its alternative form, producer stewardship, recognise that someone or group has responsibility for waste and its management. This can be a particularly good method for managing specific wastes like e-waste. In extended producer responsibility it is the manufacturer or importer taking responsibility. With product stewardship (see the next section) all members of the supply chain have a shared responsibility and it is up to the parties to negotiate who takes what responsibility. Both approaches are based on the polluter pays principle that says that those who cause or generate pollution should pay for it²⁶². Both sections should be read as they highlight different ways of achieving the same outcomes. Further detail is provided in the UNEP Guidelines²⁶³.

Extended producer responsibility can occur through either voluntary schemes or mandated by national government. Local government may have a role in helping to administer schemes, but it is unlikely that local government would be able to institute a scheme since the sorts of products considered important enough for this sort of scheme are normally sold nationally or even internationally.

The first step is to permit national government to mandate a scheme. An example of this is found in the Netherlands Environmental Management Act (2004)²⁶⁴ shown below.

Rules may be laid down by [national government] relating to the taking in, recovery or disposal of categories of substances, preparations or other products.

The idea of making the rules is to ensure that waste for disposal is minimised. The onus is put on the importer or manufacturer to set up a waste minimisation system. An example is found in the Netherlands Environmental Management Act (2004)²⁶⁵ shown below.

²⁶² Rio Declaration on Environment and Development. Principle 16.

²⁶³ <http://www.unep.org/Documents.Multilingual/Default.asp?documentid=78&articleid=1163>

²⁶⁴ <http://www.unep.org/ietc/Portals/136/Publications/Waste%20Management/UNEP%20NWMS%20English.pdf> p.51

²⁶⁵ <http://www.asser.nl/upload/eel-webroot/www/documents/national/netherlands/EMA052004.pdf> s.10.17.1

These rules may include obliging persons who market substances, preparations or other products:

- to take in these products after use;
- to ensure that measures are taken aimed at recovering or disposing of these products in a manner indicated in the order in council after they have been taken in;
- to ensure that these products are transferred, after having been taken in, to a person belonging to a category designated in the order in council.

Drop Off

Successful schemes require easy participation by consumers. Examples include drop off zones close to consumers and recycling collections organised either privately or through local government with the expectation that the products will go through waste minimisation and not sent for disposal under a different route. An example is found in the Netherlands Environmental Management Act (2004)²⁶⁶ shown below.

- An order in council may be issued obliging persons belonging to a designated category to receive categories of waste substances or other designated products, and subsequently to use them in a manner indicated in the order in council.
- It may be provided by order in council that municipalities must ensure that sufficient opportunity is provided at at least one designated place within the municipality or within the municipalities with which the municipality is cooperating to leave substances, preparations or other designated products.

Free Riders

Effective results for product extended producer responsibility programmes require the majority of goods in the category to participate in a scheme. Questions always arise about how to provide for free-riders who do not have to bear the costs of participation but can sell the goods anyway. Capturing the vast majority of products in a category means that only some fringe marketers may not be included in the scheme. However, they will need to be monitored so that if their market share increases substantially, there is a strong case to force them into the scheme. An example is found in the Netherlands Environmental Management Act (2004)²⁶⁷ shown below.

- If it proves necessary in the interests of efficient waste disposal, the Minister may, in response to a reasoned request declare a waste management contribution agreement binding on all those who import into or market in the [country] a particular substance, preparation or other product.
- The request may be submitted only by individuals or organisations whose joint turnover of the substances, preparations or other products in question, in the opinion of the Minister, means that they constitute a significant majority of those who import into or market in the Netherlands those substances, preparations or other products.

²⁶⁵ <http://www.asser.nl/upload/eel-webroot/www/documents/national/netherlands/EMA052004.pdf>

s.10.17.2

²⁶⁶ <http://www.asser.nl/upload/eel-webroot/www/documents/national/netherlands/EMA052004.pdf> s.10.18

& 19

²⁶⁷ <http://www.asser.nl/upload/eel-webroot/www/documents/national/netherlands/EMA052004.pdf> s.

15.36.1 & 15.37.1

Individual Schemes

As well as a compulsory scheme, some product manufacturers may prefer to run their own scheme for a variety of reasons including efficiency of their own scheme. It is important in these situations that any scheme that is outside the general one at least matches the outcomes of the participants in the industry-wide scheme. An example allowing separate schemes is found in the Netherlands Environmental Management Act (2004)²⁶⁸ shown below.

[National government] may, upon request, and after consultation grant exemption from a waste management contribution agreement which has been declared universally binding if the applicant ensures that the waste substance in question is managed in such a way that, in the opinion of [national government], it is at least as effective as the management method stipulated in the universally binding waste management contribution agreement in question.

Voluntary Schemes

Voluntary producer responsibility schemes are also possible. One type of scheme which is particularly useful is taking responsibility for hazardous waste. Collection of hazardous waste also involves storage of this waste. To reduce the potential danger to the environment and community health local government should be empowered to obtain information on the location, types and quantities involved in these schemes. An example of this is found in the German Circular Economy Act (2012)²⁶⁹ shown below.

Manufacturers and distributors who voluntarily accept returned products, as well as waste remaining from products following product use, must notify the competent authority thereof prior to the commencement of such acceptance where the returned products include hazardous waste.

Relevant Definitions: Circular Economy, Disposal, Hazardous Waste, Lifecycle, Recovery, Recycling, Reduction, Release, Reuse, Storage, Treatment, Waste, Waste Management, Waste Minimisation

Product Inclusion

A much wider view of extended producer responsibility is found in the German Circular Economy Act (2012)²⁷⁰ shown below. Instead of targeting individual products, all products are included. Some provisions not specified in the Netherlands legislation include product development to minimise waste at all stages in the life cycle, labelling environmental pollutants, information on consumer waste minimisation for products and deposit payment provisions.

- Parties who develop, manufacture, process, treat or sell products shall bear product responsibility with regard to the achievement of the objectives of circular economy. Products must be so designed, if at all possible, that waste generation within their

²⁶⁸ <http://www.asser.nl/upload/eel-webroot/www/documents/national/netherlands/EMA052004.pdf> s. 15.38.1

²⁶⁹ http://www.bmub.bund.de/fileadmin/Daten_BMU/Download_PDF/Abfallwirtschaft/kreislaufwirtschaftsgesetz_en_bf.pdf s.24

²⁷⁰ http://www.bmub.bund.de/fileadmin/Daten_BMU/Download_PDF/Abfallwirtschaft/kreislaufwirtschaftsgesetz_en_bf.pdf s.23

production and use is reduced, and that environmentally compatible recovery and disposal of the waste resulting from their use is ensured.

- In particular, product responsibility shall comprise:
 - the development, production and marketing of products that can be re-used, that are technically durable and that are suitable, after use, for proper, safe and high-quality recovery and environmentally compatible disposal;
 - priority for use of recoverable waste or secondary raw materials in the production of products;
 - labelling of products containing pollutants in order to ensure environmentally compatible recovery or disposal of the waste remaining after their use;
 - provision of information concerning possibilities or obligations for return, re-use and recovery, and concerning deposit payment arrangements, through product labelling; and
 - acceptance of returned goods and of the waste remaining after their use, as well as the subsequent environmentally compatible recovery or disposal of such products and waste.

Regulated Products

As well as the general criteria above that apply to all products, certain products can be also regulated. The focus for these products is on packaging, avoiding the release of noxious substances, promoting waste reduction and recycling and container deposit schemes as found in the German Circular Economy Act (2012)²⁷¹ shown below. Note the provisions for consultation are important so that the proposed scheme is workable and the participants have sufficient lead in time to adapt their production.

[National government] is shall be empowered, after consulting the parties concerned, to mandate by statutory ordinance [/bylaw] that:

- certain products, especially packaging and containers with only certain characteristics or for certain uses, for which environmentally compatible recovery or disposal of produced waste is ensured, may be put into circulation;
- certain products may not be put into circulation if, during their treatment as waste, the release of noxious substances cannot be prevented, or can be prevented only at a disproportionately high cost, or if environmentally compatible waste treatment cannot be ensured by other means;
- certain products shall be put into circulation only in a specific form that clearly facilitates waste management, especially in a form that permits re-use or that facilitates [waste minimisation];
- certain products shall be marked in a specified manner to promote the acceptance of returned goods;
- certain products, due to the content of a noxious substance in the waste expected to remain after their intended use, shall be put into circulation only if they are provided with marking which points out, in particular, the necessity of return to the manufacturer, distributor or specified third parties;

²⁷¹ http://www.bmub.bund.de/fileadmin/Daten_BMU/Download_PDF/Abfallwirtschaft/kreislaufwirtschaftsgesetz_en_bf.pdf s.24

- for certain products, attention must be called at the point of sale or of putting into circulation to the possibility of reusing the goods or to the proper waste treatment chain, or the products must be appropriately marked;
- for certain products for which obligations to accept returned goods, or to return goods, have been mandated, attention must be called at the point of sale or of putting into circulation to the possibility of returning the goods, or the products must be appropriately marked;
- certain products for which levying of a deposit has been must be appropriately marked; if necessary such markings must include mention of the amount of the deposit.

Collection and Records

The obligations on manufacturers and distributors for extended producer responsibility can include additional provisions to require products to be returned to the point of sale for waste minimisation and keep records of types and quantities. The success of the programme requires adequate recording to ensure that data is available to show progress. An example is found in the German Circular Economy Act (2012)²⁷² shown below.

[National] Government shall be empowered, after consulting the parties concerned, mandate by statutory ordinance [/bylaw] that manufacturers or distributors:

- must accept certain products at the point of sale or where they occur;
- shall keep records concerning the products put into circulation and their characteristics, on the return of waste, on participation in systems for accepting returned goods and on the type, quantity, recovery and disposal of the waste accepted for return, and
- to provide documentation, as well as to retain it, store it, present it on request, as well as to deposit it with an authority, a public body responsible for waste management, a chamber of commerce and industry or, with its consent, association of chambers of commerce and industry.

Product Stewardship

Producer stewardship and its alternative form, extended producer responsibility, recognise that someone or group has responsibility for waste and its management. In product stewardship all members of the supply chain have a shared responsibility and it is up to the parties to negotiate who takes what responsibility. With extended producer responsibility (see the previous section) it is the manufacturer or importer taking responsibility. Both approaches are based on the polluter pays principle that says that those who cause or generate pollution should pay for it²⁷³. Both sections should be read as they highlight different ways of achieving the same outcomes.

An example of the purpose of product stewardship is found in the NZ Waste Minimisation Act (2008)²⁷⁴ shown below.

²⁷² http://www.bmub.bund.de/fileadmin/Daten_BMU/Download_PDF/Abfallwirtschaft/kreislaufwirtschaftsge setz_en_bf.pdf s.24

²⁷³ Rio Declaration on Environment and Development. Principle 16.

<http://www.unep.org/Documents.Multilingual/Default.asp?documentid=78&articleid=1163>

²⁷⁴ <http://www.legislation.govt.nz/act/public/2008/0089/latest/DLM999802.html> s.8

This is to encourage (and, in certain circumstances, require) the people and organisations involved in the life of a product to share responsibility for ensuring there is effective reduction, recycling, or recovery of the product and managing any environmental harm arising from the product when it becomes waste.

Another example is provided in the Brazilian National Solid Waste Policy (2010)²⁷⁵ shown below.

Shared responsibility is hereby established by the product life-cycle, to be implemented individually and chained, including manufacturers, importers, distributors and traders, consumers and holders of public offices of urban cleaning and solid waste management.

Mandatory Schemes

For product to have a mandatory product stewardship scheme certain criteria have to be met. Basic criteria include that the product produces significant environmental harm when it becomes a waste, that large benefits will accrue from waste minimisation and that this is appropriately managed under a product stewardship scheme. The last one is particularly important as some wastes that meet the first two criteria but fail the third (e.g. organic waste). An example of the providing for this is found in the NZ Waste Minimisation Act (2008)²⁷⁶ shown below. Note that in the legislation declaring a product to be a priority product instigates a mandatory product stewardship scheme.

[National government] may declare a product to be a priority product provided:

- the product will or may cause significant environmental harm when it becomes waste; or
- there are significant benefits from reduction, reuse, recycling, recovery, or treatment of the product; and
- the product can be effectively managed under a product stewardship scheme.

Public Opinion

One of the criteria for declaration of a priority product is public opinion. The importance of this is that if the public do not consider a product to have high environmental harm when it becomes as waste, the likelihood of public supporting the scheme lessens. However, it is clear that public opinion alone cannot be a driver for declaring priority products. A principal reason for this is that what the public perceives as doing great environmental harm may be more about what they see on a daily basis than what is the reality when a product is compared with other products (e.g. plastic bags compared to agricultural chemicals). An example of the providing for public opinion is found in the NZ Waste Minimisation Act (2008)²⁷⁷ shown below.

To declare a priority product the Minister must consider public concerns about environmental harm associated with the product when it becomes waste, provide the public with an opportunity to comment and must consider the effectiveness of any relevant voluntary product stewardship scheme.

²⁷⁵ <http://wiego.org/sites/wiego.org/files/resources/files/Pereira-Brazilian-Waste-Policy.pdf> s.30

²⁷⁶ <http://www.legislation.govt.nz/act/public/2008/0089/latest/DLM999802.html> s.9.2

²⁷⁷ <http://www.legislation.govt.nz/act/public/2008/0089/latest/DLM999802.html> s.9.3

Non-Priority Products

It is desirable that product stewardship schemes for non-priority products are also accredited to drive improvements in environmental behaviour. It is important that all product stewardship schemes are judged equally and so go through the same accreditation process. Provisions for allowing non-priority products are shown below from the NZ Waste Minimisation Act (2008)²⁷⁸

A product stewardship scheme that has been developed for a non-priority product may be accredited.

Accreditation

Certain elements need inclusion in the accreditation of product stewardship schemes, whether they are mandatory or voluntary. These elements include who is running the scheme, what products and brands are within the proposed scheme, the targets it is trying to achieve, an overview of the people and organisations involved in the life cycle of products in the scheme. In addition, administrative processes should be specified including responsibility for the scheme's objectives, decision-making processes, conformity, enforcement (between participants) and reporting needs.

The schemes need to run for a finite term before a decision is made on closure or extension. For example, the maximum time that a scheme can run in New Zealand is seven years²⁷⁹, which gives 1 – 2 years to set up and embed the scheme, 1 year to finish off at the end or prepare for the review and 4 – 5 years to run and fine tune before review or closure.

The criteria adopted for the scheme need to reflect any targets reducing environmental or health impacts in a national waste strategy and show what the scheme hopes to achieve towards the strategy. The intended waste minimisation, or other, objectives need to be included. Scheme operators are often tempting to state large figures for waste minimisation, but realistic figures that are beyond business as usual and require have more likelihood of being achieved.

The feedback loop of reporting is essential in any scheme. The reporting process need to be public and credible since any over or understating that is discovered will affect public support negatively across all schemes.

Adequate scheme funding needs addressing. Consideration along the whole supply chain provides an opportunity for collective decision-making. Some product stewardship schemes have a variety of funders from manufacturers to retailers, consumer proxies and recyclers. An example of a consumer proxy is local government which often helps (through local taxes or rates) to fund container recycling schemes which are generally well-supported by constituents.

An example of legislation defining what needs inclusion in a scheme is found in the NZ Waste Minimisation Act (2008)²⁸⁰ shown below.

To qualify for accreditation, a product stewardship scheme must:

²⁷⁸ <http://www.legislation.govt.nz/act/public/2008/0089/latest/DLM999802.html> s.11

²⁷⁹ http://www.mfe.govt.nz/sites/default/files/media/Waste/ps-accreditation-application-form-support-guide_1.pdf

²⁸⁰ <http://www.legislation.govt.nz/act/public/2008/0089/latest/DLM999802.html> s.14

- identify the scheme manager;
- provide a description of the scope of the scheme, including the product or brand of product to which it applies;
- set measurable waste minimisation, treatment, or disposal objectives for the product; and time frames for meeting the objectives
- list the classes of person involved in the design, manufacture, sale, use, servicing, collection, recovery, recycling, treatment, and disposal of the product;
- list the participants and assign responsibility to them for meeting the scheme's objectives;
- specify the arrangements for making decisions under the scheme, control and overall operation and keeping records and making reports
- specify the scheme's expiry date:
- identify the processes for compliance and enforcement of any agreements between participants
- provide for assessing the scheme's performance and for reporting on its performance;
- set out a strategy for publication of the scheme;
- set out how information will be provided to purchasers, users, and handlers of the product;
- outline how the scheme is to be funded.

Regulations

It may be necessary for regulatory assistance to achieve some schemes objectives. It is not necessary for all regulations to apply in every situation, but it is useful to have a toolbox of regulations that can apply in specified situations. These may include prohibitions on selling or disposing of products, prohibitions on materials in products, require takeback services, product management fees, deposits, labelling and waste management standards.

Prohibiting sale can be an anti-competitive measure that business organisations are generally opposed to such measures. However, there are some instances when prohibiting sale can be a sensible move; for example, products that are harmful to health like asbestos or materials that contain asbestos. Another use of sale prohibition is when a major manufacturer or importer of a priority product decides not to participate in a product stewardship scheme because, for example, it may increase the price of their product(s) and they can gain commercial advantage by not participating. In such cases the threat of market exclusion may be sufficient for them to decide to participate.

Where large quantities of goods flow across borders, it may not be possible for customs officials to check every package coming across a border. One tactic that business can use to try to overcome being part of a scheme is to locate their operation in a country that does not have such a scheme, have an online presence in the country with a scheme and deal directly with customers in that country. Policing of the scheme is dependent on the ability of customs officials to pick up the individual items.

Controlling disposal of a product needs an alternative that is easy for consumers to engage and accept the need for the control, otherwise widespread abuse will result.

Take back services (also known as drop-off systems – see the next section) are widely used internationally but are often opposed by business for several reasons. For a takeback service to succeed the reverse supply chain must be adequately resourced right back to the manufacturer (or importer) being able to send the product on the pathway back into the economy. Retailers have limited resources to take back and store products. In addition, the situations about the equitability of retailers having to take back products purchased from different stores and how the costs are borne need resolution.

Product labelling is often ‘greenwashing’ (e.g. a container with the label ‘dispose of this carefully’ or ‘be a tidy citizen’). However, some labels can provide useful information such as global warming potential, energy or water efficiency. Many labels for use of hazardous substances also provide useful information on directions for use and what to do in the case of an emergency. These sorts of provisions are useful to provide real health or environmental gains.

An example of legislation providing for such regulations is found in the NZ Waste Minimisation Act (2008)²⁸¹ shown below.

Regulations may be made:

- prohibiting the sale of a priority product, except in accordance with an accredited scheme;
- controlling or prohibiting the disposal of products or waste;
- controlling or prohibiting the manufacture or sale of products that contain specified materials;
- requiring specified classes of person to provide a takeback service for products, and prescribing requirements for the take-back service, the reuse, recycling, recovery, treatment, or disposal of products taken back;
- setting fees payable for the management of a product, the stages in the life of the product where the fee must be paid and how the fee must be applied
- requiring specified classes of person to charge a deposit on the sale of a product and the refund of the deposit;
- prescribing requirements for the labelling of a product;
- prescribing standards to be met when reusing, recycling, or recovering the product or material.

Invoking regulations needs careful consideration that any regulations will actually work. The effect of regulation within the country needs consideration. Lead time for implementation is also needed so that any necessary infrastructure is in place before people are expected to comply. People are put off very easily if a system does not work. If it does not work the first time they try many people will not spend the time to try again, thus losing community support for better practices. An example of legislation providing for this is found in the NZ Waste Minimisation Act (2008)²⁸² shown below.

²⁸¹ <http://www.legislation.govt.nz/act/public/2008/0089/latest/DLM999802.html> s.23.1

²⁸² <http://www.legislation.govt.nz/act/public/2008/0089/latest/DLM999802.html> s.23.2

[National government] must not recommend the making of regulations unless satisfied there is adequate infrastructure and facilities in place to provide a reasonably practicable alternative to disposal or a reasonable time is provided before the regulations come into force for adequate infrastructure and facilities to be put in place.

Relevant Definitions: Controlled Waste, Disposal, Environmental Emergency, Environmental Pollution, Harm, Lifecycle, Preparing for Reuse, Recovery, Recycling, Reduction, Reuse, Storage, Treatment, Waste, Waste Management, Waste Minimisation

Drop-off Systems

Drop-off systems allow consumers to return their unwanted goods to either nationalised drop-off centres or retailers where they bought the goods from. For a drop-off service to succeed the reverse supply chain must be adequately resourced right back to the manufacturer (or importer) being able to send the product on the pathway back into the economy. Retailers have limited resources to take back and store products. In addition, the situations about the equitability of retailers having to take back products purchased from different stores and how the costs are borne need resolution.

Some of the keys to success for drop-off systems are that they are implemented in collaboration with industry and that industry, when presented with the challenge of minimising the waste of their goods, do not have a better alternative (for them) to achieve the same, or superior results.

An example of legislating for drop-off systems is found in the German Circular Economy Act (2012)²⁸³ shown below.

- [National government] is shall be empowered, after consulting the parties concerned, to mandate by statutory ordinance [/bylaw] that:
 - certain products shall be marked in a specified manner to promote the acceptance of returned goods;
 - for certain products for which obligations to accept returned goods, or to return goods, have been mandated, attention must be called at the point of sale or of putting into circulation to the possibility of returning the goods, or the products must be appropriately marked.
- [National] Government shall be empowered, after consulting the parties concerned, mandate by statutory ordinance [/bylaw] that manufacturers or distributors:
 - may sell or put into circulation certain products only after providing a possibility for return;
 - shall accept certain products when returned and shall provide for return by suitable measures, especially by means of establishing or participating in systems for accepting returned goods, or by levying a deposit;
 - must accept certain products at the point of sale or where they occur;

²⁸³ http://www.bmub.bund.de/fileadmin/Daten_BMU/Download_PDF/Abfallwirtschaft/kreislaufwirtschaftsgesetz_en_bf.pdf s.24

- shall keep records concerning the products put into circulation and their characteristics, on the return of waste, on participation in systems for accepting returned goods and on the type, quantity, recovery and disposal of the waste accepted for return, and
- to provide documentation, as well as to retain it, store it, present it on request, as well as to deposit it with an authority, a public body responsible for waste management, a chamber of commerce and industry or, with its consent, association of chambers of commerce and industry.

Relevant Definitions: Disposal, Recovery, Storage, Waste, Waste Management, Waste Minimisation

Deposit Scheme

A deposit on a product at the time of sale can generate funds to be used for waste minimisation. This is particularly useful for products presenting a waste problem which can be managed through a deposit and refund scheme. Examples of such products are tyres, drinking containers, packaging and e-waste.

The same issues for drop-off systems (see above) apply to deposit schemes with the addition that businesses need to handle additional financial transactions and money needs to be retained (somehow) until it is needed for refunding. There also need to be provisions for what to do with money that builds up due to non-return of goods over time. Items like drink containers present a potential health hazard in that drink residues may remain in the containers which attract vermin.

An example of legislation that manages the financial side of deposit schemes is found in the Canadian Environmental Protection Act (1999)²⁸⁴ shown below.

[National government] can make regulations respecting systems relating to deposits and refunds, including, but not limited to, regulations providing for, or imposing requirements respecting:

- deposits, including the amount of any deposit and the substance, product containing a substance or activity in relation to which a deposit is required, the conditions for the use of a deposit and the conditions for and manner of paying a deposit;
- the period during which a deposit may be held;
- refunds, including the amount of any refund and the substance, product containing a substance or activity in relation to which a refund may be granted and the conditions for and manner of paying a refund;
- the establishment of a fund for deposits, and the operation, management and administration of the fund;
- the designation of a person to administer the fund for deposits and the conditions for the designation;

²⁸⁴ <http://laws-lois.justice.gc.ca/PDF/C-15.31.pdf> s.325

- reports and forms related to deposits, refunds and the fund for deposits;
- the maintenance of books and records for the administration of any regulation made under this section; and
- the forfeiture of deposits, including unclaimed deposits and the conditions under which and the circumstances in which deposits may be forfeited.

Where a deposit is charged it may be useful to have some indication on the product that the product is part of a deposit scheme which is an encouragement to people to return the product after use to a place where they can retrieve the deposit. Such a scheme may also help informal (or formal) recycling operators to minimise the waste resulting from use of the product. These sorts of schemes contribute to reducing litter problems by providing an incentive for people to remove the litter from the environment. An example of providing labelling is found in the German Circular Economy Act (2012)²⁸⁵ shown below.

[National government] shall be empowered, after consulting the parties concerned, to mandate by statutory ordinance [/bylaw] that certain products for which levying of a deposit has been must be appropriately marked; if necessary such markings must include mention of the amount of the deposit.

To ensure that an equal burden is carried by all parties marketing a class of goods that has a deposit scheme, regulations can be formulated requiring them to participate. An example of legislation enabling such regulations is found in the German Circular Economy Act (2012)²⁸⁶ shown below.

[National] Government shall be empowered, after consulting the parties concerned, mandate by statutory ordinance [/bylaw] that manufacturers or distributors shall accept certain products when returned and shall provide for return by suitable measures, especially by means of establishing or participating in systems for accepting returned goods, or by levying a deposit.

Relevant Definitions: Recycling, Waste Minimisation

²⁸⁵ http://www.bmub.bund.de/fileadmin/Daten_BMU/Download_PDF/Abfallwirtschaft/kreislaufwirtschaftsgesetz_en_bf.pdf s.24

²⁸⁶ http://www.bmub.bund.de/fileadmin/Daten_BMU/Download_PDF/Abfallwirtschaft/kreislaufwirtschaftsgesetz_en_bf.pdf s.24

USE OF ECONOMIC MEASURES

Economic measures provide a toolbox to promote the polluter pays principle. When considering economic measures it is important to identify the decision-makers so that the right people have the information they need to make decisions. This section covers the provisions related to economic instruments. It covers the following provisions:

- Levies; and
- Funding Mechanisms.

Levies

Economic instruments like levies are used in waste management to make the system more efficient and to internalise the costs of waste management so that they are borne by those who create waste. Economic instruments discourage waste generation and provide an incentive for source separation of waste to boost the opportunity for waste minimisation. In addition, finding funds out of the public budget is difficult because it competes with so many other priorities that have a more immediate impact (e.g. health and schooling). So, a self-funding mechanism is attractive to governments especially when it is seen as good for the environment. It is important that levies are not put into the government's consolidated fund, but instead ring-fenced for waste management as other priorities can become prominent resulting diversion of waste-generated money.

Disposal Charges

Some policy elements need consistency across a country if they are to be effective. An example in this category is levies charged for waste disposal. Disposal charges may vary across a country which can be due to market forces or life cycle costs associated with the disposal facility. An example of charging property owners on a per property basis by local government jurisdiction is found in the Netherlands Environmental Management Act (2004)²⁸⁷ shown below.

To cover the costs it incurs in connection with the management of household waste, each [local government] may institute a levy which may be imposed on persons who, whether by virtue of a personal or property right or otherwise, actually use premises in respect of which an obligation to collect household waste applies.

Programme Funding

Levies are often imposed by national or local government to provide funding for waste minimisation programmes or to deter disposal. An example of legislation providing for this is found in the NZ Waste Minimisation Act (2008)²⁸⁸ shown below.

The purpose is to enable a levy to be imposed on waste disposed of to raise revenue for promoting and achieving waste minimisation and increase the cost of waste disposal to recognise that disposal imposes costs on the environment, society, and the economy.

²⁸⁷ <http://www.asser.nl/upload/eel-webroot/www/documents/national/netherlands/EMA052004.pdf>

s.15.33.1

²⁸⁸ <http://www.legislation.govt.nz/act/public/2008/0089/latest/DLM999802.html> s.25

A standard levy across a country provides a level playing field for all participants. A local levy can be subject to pressures from local, national and international companies who can threaten to move operations to another jurisdiction where the conditions are more favourable. The pressure on local government to provide employment opportunities can be so great that they bow to business demands and lower or remove a levy. This can be repeated across a country and create a downward spiral. An example providing for a standard levy is found in the NZ Waste Minimisation Act (2008)²⁸⁹ shown below. Initially the size of the levy can be small and selectively applied to some classes of landfill across a country, especially where administering the levy functions are a new operations for the agency responsible for managing the levy. It is also easier to get cross-government approval for a small increase in charges that do not affect business too much. With time it is easier to raise the level on the basis that there is a need to further develop infrastructure or provide more of an incentive to use alternatives to disposal.

- A levy is imposed on waste disposed of at a disposal facility.
- Disposal does not include the deposit of waste onto land if, within 6 months the waste is reused, recycled, recovered or treated and removed for deposit elsewhere or removed from the land for any other reason.
- The levy is payable on the amount of waste disposed of at a disposal facility at the prescribed rate or if the rate is not prescribed, \$10 per tonne, or \$10 per unit of volume that is considered equivalent to a tonne.
- The operator of a disposal facility must pay the levy on waste disposed of at the facility.

Exemptions

Allowing exemptions from a waste levy has the potential to create room for levy avoidance behaviour, to undermine the levy base and add significant administrative costs to a levy system. Generally, there should be no exemptions from the levy for waste disposal. Exceptional circumstances can occur where it would be unjust to charge a levy (e.g. a large earthquake produces abnormal amounts of waste that must be disposed of immediately like food) and a mechanism should be in place for these circumstances. An example found in the NZ Waste Minimisation Act (2008)²⁹⁰ shown below. Initially some companies will try to establish the bounds of exceptional circumstances by trying for an exemption (e.g. moving waste from a poorly constructed historical dumpsite to a lined landfill and contaminated soil from a stream under remediation²⁹¹).

The levy may be waived if [national government] is satisfied that exceptional circumstances justify the waiver.

To get a good uptake of the levy requires all disposal facilities to participate. In circumstances where operators do not cooperate an instrument is needed to provide a mechanism for levying. An example of this is found in the NZ Waste Minimisation Act (2008)²⁹² shown below.

²⁸⁹ <http://www.legislation.govt.nz/act/public/2008/0089/latest/DLM999802.html> s.26 – 28

²⁹⁰ <http://www.legislation.govt.nz/act/public/2008/0089/latest/DLM999802.html> s.29

²⁹¹ <https://www.mfe.govt.nz/sites/default/files/media/Waste/waste-disposal-levy-review-2014-pdf.pdf>

²⁹² <http://www.legislation.govt.nz/act/public/2008/0089/latest/DLM999802.html> s.31.1

If an operator did not provide records or information as required or the levy collector considers, on reasonable grounds, to be incomplete or incorrect the levy collector may estimate the amount payable make a written demand for the amount.

Levy Review

A mechanism is needed to review any levy for effectiveness. Doing this periodically ensures the matter is considered. An example of this is found in the NZ Waste Minimisation Act (2008)²⁹³, shown below, where the prime criteria are quantities disposed or minimised. The period below is once in an election cycle (but outside election year).

[National government] must review the effectiveness of the levy at least triennially taking into account:

- the advice of the [advisory committee];
- whether the amount of waste disposed of in [the country] has decreased since the last review; and
- whether the amount of waste [minimised] in [the country] has increased since the last review.

Another approach to reviewing the performance of a levy is found in the Japanese Basic Act for the Establishment of a Sound Material-Cycle Society (2000)²⁹⁴ shown below. In this Act, the review considers the effect of the levy before a change is implemented on a wide range of parameters including 'any possible effects' and 'influences on the economy' and surveying citizens to get their understanding and cooperation.

With regard to policies to urge business operators and citizens, by imposing appropriate and fair economic burdens, to take actions contributing to the prevention or reduction of the generation of wastes from products and containers or the appropriate and smooth cyclical use or disposal of products and containers when they have become circulative resources, [national government] shall conduct proper surveys and studies on any possible effects, influences on the economy, if any measures under such policies are taken, and shall make efforts to gain understanding and cooperation from citizens towards establishing a [circular economy] by making use of such policies and measures if it is necessary to introduce them.

Levy Collection

It may be convenient to contract someone outside national government, or in another government department to collect the levy especially if the administering department does not have experience in such matters. An example allowing for this is found in the NZ Waste Minimisation Act (2008)²⁹⁵ shown below.

[National government] may appoint a levy collector.

²⁹³ <http://www.legislation.govt.nz/act/public/2008/0089/latest/DLM999802.html> s.31.1

²⁹⁴ <https://www.env.go.jp/en/laws/recycle/12.pdf> Art.23

²⁹⁵ <http://www.legislation.govt.nz/act/public/2008/0089/latest/DLM999802.html> s.40.1

Changes to the scope of the levy, its rate, collection or spending are best done by regulation as they tend to have shorter times for enactment. An example allowing for this is found in the NZ Waste Minimisation Act (2008)²⁹⁶ shown below.

Regulations can be made for:

- Imposing or exempting a levy on any class, facility, type or volume of waste;
- Determining the rate(s) of the levy;
- Calculation and method of payment of the levy;
- Distribution and spending of the levy.

While levies are often considered as part of the solid waste management process, an integrated waste management approach considers all media. An example of a pre-disposal levy is charging for water use as found in the Netherlands Environmental Management Act (2004)²⁹⁷ shown below.

- [Local government] may impose a levy on the abstraction of groundwater to cover the said costs.
- The levy shall be imposed on persons owning establishments for the abstraction of groundwater, not including establishments which serve solely to regulate the water table or the hydraulic head.
- The levy shall be based on the amount of water abstracted.

Relevant Definitions: Circular Economy, Circulative Resources, Cyclical Use, Disposal, Disposal Facility, Dumping, Environment, Household Waste, Landfill, Lifecycle, Multimedia, Preparing for Reuse, Prevention, Reduction, Reuse, Treatment, Waste, Waste Management, Waste Minimisation

Funding Mechanisms

Cities in developing countries often struggle to access investment funding necessary to improve waste management. Grants to encourage the development of waste minimisation facilities and programmes are essential to enable the society to develop beyond collect and dispose to progress towards a circular economy. Levies provide a good (and politically easily defensible) source of funds to assist business and the community to encourage waste minimisation. Grants can encourage establishment of industries that would otherwise not have the capital to move into new areas (e.g. developing alternative low waste products). Careful management is needed so as not to create long term dependence by the supported industry. Consideration should also be given on the chance of the grants distorting competition with unsubsidised businesses. It should be noted that inducements, once applied, can be politically difficult to reduce or withdraw, regardless of whether the need has diminished or higher priorities compete for the resources.

²⁹⁶ <http://www.legislation.govt.nz/act/public/2008/0089/latest/DLM999802.html> s.41.1

²⁹⁷ <http://www.asser.nl/upload/eel-webroot/www/documents/national/netherlands/EMA052004.pdf> s.15.34

An example of targeting resources to where they are needed is found in the Japanese Basic Act for the Establishment of a Sound Material-Cycle Society (2000)²⁹⁸ shown below.

In order to help business operators engaged in the manufacturing or processing of products or the cyclical use, disposal, collection or transport of circulative resources improve their facilities for efficient use of raw materials, expand their facilities for manufacturing recycled articles, or take other suitable measures to prevent or reduce raw materials from becoming wastes or to conduct proper cyclical use and disposal of circulative resources, the State shall make efforts to take necessary measures to give them necessary and appropriate economic assistance, taking their economic situations, into consideration.

Where a levy is collected by national government it is appropriate that it is distributed through several channels. Since waste management is a partnership between national and local government, one convenient mechanism is for local government to decide on how to spend half of it within their areas and for national government to decide on the other half based on specific needs and not conflicting with programmes local government are providing. Distribution according to population is a better mechanism than quantities of waste collected in the area or the amount taken to a landfill (or sewage treatment plant if considering liquid waste) in the area. Distribution according to waste generation has the perverse outcomes of disadvantaging area that have taken significant steps to minimise waste. Distribution according to waste quantities going to a landfill (or sewage plant) in a local government area has the perverse outcome of encouraging more small landfills and sewage treatment plants.

Administration costs can come out of the collected levy. A rule of thumb is that those costs should not be more than 5 – 10% of the amount collected; 5% shows a lean operation and 10% is a generous allocation. An example of this is found in the NZ Waste Minimisation Act (2008)²⁹⁹ shown below.

[National government] must distribute and spend all levy money received by:

- paying any refunds to operators in accordance with regulations;
- paying one half of the remainder, according to the district's population as a percentage of the total population, to [local government] provided:
 - the [local government] has a waste management plan;
 - [local government] reviewed the waste management plan as required.
- spending the remainder on 1 or more of the following:
 - collecting and administering the levy;
 - funding projects that [national government] has approved for funding;
 - administration costs relating to projects that [national government] has considered or approved for funding (for example, the costs of approving or declining funding or of auditing the projects)

[Local government] may spend the levy money it receives on matters to promote or achieve waste minimisation in accordance with its waste management and minimisation plan.

²⁹⁸ <https://www.env.go.jp/en/laws/recycle/12.pdf> Art.23

²⁹⁹ <http://www.legislation.govt.nz/act/public/2008/0089/latest/DLM999802.html> s.30 and 32.1

When developing this sort of legislation the waste industry can make a strong point that they fear that local government can use their newly found funds to set up in opposition to the current industry, subsidise and undercut existing services and become a monopoly in the area. Thus, when local government is making decisions on how to spend its portion of the funds it must consider what is already in place and seek to fill gaps, not compete with existing services. An example of this is found in the NZ Waste Minimisation Act (2008)³⁰⁰ shown below.

[Local government] must consider the effects that the decision may have on any existing waste minimisation services, facilities, and activities.

An alternative process is for a list of acceptable types of projects which local government can apply for to national government. An example of this is found in the US Pollution Prevention Act (1990)³⁰¹ as shown below. In this situation local government has to find 50% of the funding, something which may prove difficult in developing countries.

Provide matching grants (up to 50%) to [local government] for:

- technical assistance to businesses seeking information about source reduction opportunities;
- funding experts to provide onsite technical advice to businesses seeking assistance;
- assisting in the development of source reduction plans;
- targeting assistance to businesses where lack of information is an impediment to source reduction; and
- providing training in source reduction techniques.

Tax Incentives

Environmental taxes encourage business to operate in a more environmentally responsible way. Examples of environmental market-based instruments include indirect taxation, targeted subsidies and tradeable emission rights. Taxes and charges can be levied on goods directly or indirectly linked to polluting activities (e.g. carbon emissions). Subsidies can be applied directly or indirectly to encourage consumers and producers to choose inputs and goods that have favourable environmental properties.

Pollution taxes induce polluters to reduce their pollution up to the point that the cost of pollution abatement equals the size of the tax. Imposing taxes and charges universally has the advantage of lower administration charges, but it is a very blunt instrument. An example of flexibility in instruments is found in the Brazilian National Solid Waste Policy (2010)³⁰² shown below.

[National and local government] within the framework of their jurisdictions, may establish standards with the aim of granting tax, financial or credit incentives to:

- industries and entities engaged in a reuse, treatment and recycling of solid waste produced in the national territory;

³⁰⁰ <http://www.legislation.govt.nz/act/public/2008/0089/latest/DLM999802.html> s.32.2

³⁰¹ <http://www.epw.senate.gov/PPA90.pdf> s.6605.b

³⁰² <http://wiego.org/sites/wiego.org/files/resources/files/Pereira-Brazilian-Waste-Policy.pdf> s.32.1.1 & 2

- projects related to responsibility for product life cycle, primarily in partnership with cooperatives or other forms of association of catadores (*garbage pickers*) of reusable and recyclable materials formed by low-income individuals;
- companies dedicated to urban cleaning and related activities.

Accountability

Accountability for spending is important, particularly for local government. Firstly local government needs to develop a waste management plan that is agreed to by the residents, then it needs to allocate funding according to the plan, and finally it needs to demonstrate to national government that it has complied with its plan. A lever for national government to ensure that local government complies is to withhold further funding, an event that would be publicised in the media and is certain to stir up the residents. The mere threat of having the power to do this is often sufficient to get local government to comply. An example of this is found in the NZ Waste Minimisation Act (2008)³⁰³ shown below.

[National government] may retain levy payments to a territorial authority if satisfied that the territorial authority has not spent the money in accordance with their waste management and minimisation plan or met a [national government] standard or not provided prescribed records or information.

Grants

Grants from a contestable (or otherwise) fund can form a part of funding mechanisms. Grants can come from general taxation or ring-fenced funding like levies. Grant allow for businesses, community groups, non-government organisations and individuals to engage in projects that would otherwise not happen. These actions enable a much wider range of organisations to improve an integrated waste management system. A legislative tool can be very open ended as for example in the NZ Waste Minimisation Act (2008)³⁰⁴ shown below. The criteria here are quite broad which, on one hand, allows flexibility to match the needs to the situation, but on the other hand, can be the subject of abuse of the intention of the funding mechanism.

[National government] may approve funding to any project to promote or achieve waste minimisation on any terms or conditions [national government] thinks fit.

An example of a more constricted funding mechanism is found in the US Resource Conservation and Recovery Act (1976)³⁰⁵ shown below. Note that in the specification the waste referred to is solid. For integrated waste management legislation 'solid' can be omitted thus allowing for waste in any media. Note also that a lot of the topics are working at the lower end of the waste management hierarchy in the recovery space; this could be expanded to cover the higher levels of the hierarchy to provide a greater thrust towards a circular economy.

[National government] shall conduct, and encourage, cooperate with, and render financial and other assistance to appropriate [local government] authorities, agencies, and institutions, private agencies and institutions, and individuals in the conduct of, and promote the coordination of,

³⁰³ <http://www.legislation.govt.nz/act/public/2008/0089/latest/DLM999802.html> s.37

³⁰⁴ <http://www.legislation.govt.nz/act/public/2008/0089/latest/DLM999802.html> s.38.1

³⁰⁵ <https://www.law.cornell.edu/uscode/text/42/chapter-82> s. 8001.a

research, investigations, experiments, training, demonstrations, surveys, public education programmes, and studies relating to:

- any adverse health and welfare effects of the release into the environment of material present in solid waste, and methods to eliminate such effects;
- the operation and financing of solid waste management programs;
- the planning, implementation, and operation of resource recovery and resource conservation systems and hazardous waste management systems, including the marketing of recovered resources;
- the production of usable forms of recovered resources, including fuel, from solid waste;
- the reduction of the amount of such waste and unsalvageable waste materials;
- the development and application of new and improved methods of collecting and disposing of solid waste and processing and recovering materials and energy from solid wastes;
- the identification of solid waste components and potential materials and energy recoverable from such waste components;
- small scale and low technology solid waste management systems, including but not limited to, resource recovery source separation systems;
- methods to improve the performance characteristics of resources recovered from solid waste and the relationship of such performance characteristics to available and potentially available markets for such resources;
- improvements in land disposal practices for solid waste (including sludge) which may reduce the adverse environmental effects of such disposal and other aspects of solid waste disposal on land, including means for reducing the harmful environmental effects of earlier and existing landfills, means for restoring areas damaged by such earlier or existing landfills, means for rendering landfills safe for purposes of construction and other uses, and techniques of recovering materials and energy from landfills;
- methods for the sound disposal of, or recovery of resources, including energy from sludge (including sludge from pollution control and treatment facilities, coal slurry pipelines, and other sources);
- methods of hazardous waste management, including methods of rendering such waste environmentally safe; and
- any adverse effects on air quality (particularly with regard to the emission of heavy metals) which result from solid waste which is burned (either alone or in conjunction with other substances) for purposes of treatment, disposal or energy recovery.

Training and Education

Training and education are important factors for successful implementation of a programme and this is covered extensively in the UNEP Guidelines³⁰⁶. While a lot of programmes will include it as part of knowledge transfer, it is useful to highlight that aspect in legislation. An example of this is found in the US Resource Conservation and Recovery Act (1976)³⁰⁷ shown below. While the example focuses on equipment and facilities this could be expanded to cover a much wider range of training and education opportunities.

³⁰⁶ <http://www.unep.org/ietc/Portals/136/Publications/Waste%20Management/UNEP%20NWMS%20English.pdf> p.62

³⁰⁷ <https://www.law.cornell.edu/uscode/text/42/chapter-82> s.7008.b.A

[National government] is authorised to make grants to, and contracts with any eligible organisation to:

- develop, expand, or carry out a programme (which may combine training, education, and employment) for training persons for occupations involving the management, supervision, design, operation, or maintenance of solid waste management and resource recovery equipment and facilities; or
- train instructors and supervisory personnel to train or supervise persons in occupations involving the design, operation, and maintenance of solid waste management and resource recovery equipment and facilities.

Relevant Definitions: Air, Circular Economy, Circulative Resources, Cyclical Use, Demonstration, Disposal, Effect on the Environment, Environment, Environmental Pollution, Harm, Hazardous Waste, Hazardous Waste Management, Landfill, Multimedia, Recovery, Reduction, Release, Resource Conservation, Treatment, Waste, Waste Management, Waste Minimisation

Relevant International Agreements:

- Framework Convention on Climate Change (UNFCCC), New York, 1992
- The Global Programme of Action for the Protection of the Marine Environment from Land Based Activities 1995

ENVIRONMENTAL ASPECTS OF WASTE

This section covers the provisions related the environmental aspects of waste. The environmental aspects of legislation are often found in different pieces of legislation, possibly handled by different agencies than that managing waste. In these cases it is important that government institutions talk to one another. Environmental aspects cover the following provisions:

- Environmental Impact Assessment;
- Adverse Effects;
- Air Quality;
- Contaminated Land;
- Discharge of Contaminants;
- Environmental Emergencies and Disasters; and
- Import/Export/Transboundary Waste.

Environmental Impact Assessment

An environmental impact assessment can be particularly useful in the mitigation of the effects of discharges to the environment due to waste disposal activities (e.g. landfilling, incineration and water discharge).

Environmental impact assessment (also known as an assessment of environmental effects in some jurisdictions³⁰⁸) is a fundamental process to enable decision-makers in local or national government to assess the potential effects of any proposed activity that may affect the environment. The process becomes even more useful when the results are open to public scrutiny as it gives the community a say in their development. However, it also opens the door for competing interests to delay or stop developments.

An environmental impact assessment needs to contain enough information so that decision-makers are able to make decisions from a knowledgeable standpoint. An environmental impact assessment should provide information on a number of aspects. If the proposed activity will have significant adverse environmental effects the assessment should include consideration of alternative locations or methods that may have less impact on the environment. There should be an assessment of the actual or potential risks and effects, giving as much scientific data as is reasonably practical. Any proposed discharges should be assessed in terms of the effects on the surrounding environment and alternatives to lessen the effects on the environment. Mitigation of any effects needs inclusion as these form part of the positive balance for an application.

If it is possible for an applicant to consult with potentially affected people then this avenue should be explored. From an implementation perspective, pre-consultation with potentially affected parties can reduce conflict and the consequent administrative needs.

³⁰⁸ NZ Resource Management Act (1991)

Where an activity is likely to have ongoing effects, the environmental impact assessment should contain a description of the ongoing monitoring and by whom which increases the veracity of the monitoring results.

An example providing for these provisions is found in the NZ Resource Management Act (1991)³⁰⁹ shown below.

An assessment of an activity's effects on the environment must include the following information:

- if it is likely that the activity will result in any significant adverse effect on the environment, a description of any possible alternative locations or methods for undertaking the activity;
- an assessment of the actual or potential effect on the environment of the activity;
- if the activity includes the use of hazardous substances and installations, an assessment of any risks to the environment that are likely to arise from such use;
- if the activity includes the discharge of any contaminant, a description of:
 - the nature of the discharge and the sensitivity of the receiving environment to adverse effects; and
 - any possible alternative methods of discharge, including discharge into any other receiving environment;
- a description of the mitigation measures (including safeguards and contingency plans where relevant) to be undertaken to help prevent or reduce the actual or potential effect;
- identification of the persons affected by the activity, any consultation undertaken, and any response to the views of any person consulted;
- if the scale and significance of the activity's effects are such that monitoring is required, a description of how and by whom the effects will be monitored if the activity is approved.

Matters of Concern

The environmental impact assessment must show how matters of concern will be managed. These matters of concern can include: effects on neighbours; effects on the locality; effects on surrounding ecosystems; effects on resources providing aesthetic values for present or future generations; discharge of contaminants to the environment; and the effects of hazards both natural and anthropogenic. An example of these provisions is found in the NZ Resource Management Act (1991)³¹⁰ shown below.

An assessment of the activity's effects on the environment must address the following matters:

- any effect on those in the neighbourhood and, where relevant, the wider community, including any social, economic, or cultural effects;
- any physical effect on the locality, including any landscape and visual effects;
- any effect on ecosystems, including effects on plants or animals and any physical disturbance of habitats in the vicinity;

³⁰⁹ <http://www.legislation.govt.nz/act/public/1991/0069/latest/DLM230265.html> Schedule 4 s.6.1

³¹⁰ <http://www.legislation.govt.nz/act/public/1991/0069/latest/DLM230265.html> Schedule 4 s.6.1

- any effect on natural and physical resources having aesthetic, recreational, scientific, historical, spiritual, or cultural value, or other special value, for present or future generations;
- any discharge of contaminants into the environment, including any unreasonable emission of noise, and options for the treatment and disposal of contaminants;
- any risk to the neighbourhood, the wider community, or the environment through natural hazards or the use of hazardous substances or hazardous installations.

It is also useful to have a summary of those factors that have been assessed without full information to give an indication of what is known and what is uncertain. An example providing for this is found in the Netherlands Environmental Management Act (2004)³¹¹ shown below.

An environmental impact statement shall contain an overview of the omissions in the descriptions due to lack of the necessary information.

In keeping with the allowing for public consultation and the involvement of the public, the assessment should also contain statements that can be understood by the public. An example providing for this is found in the Netherlands Environmental Management Act (2004)³¹² shown below.

An environmental impact statement shall contain a summary providing sufficient information for the general public to be able to assess the environmental impact statement and the environmental effects of the proposed activity and of the alternatives described therein.

Advisory Body

A useful addition to the environmental impact assessment process is the formation of an advisory body to provide information to the national government to make recommendations on guidelines for the contents of environmental impact statements where this expertise is insufficient within government. The committee should consist of experts covering descriptions of activities and localities, environmental protection and pollution. Limiting appointment times is a way of allowing for refreshment of a committee. An example setting this up is found in the Netherlands Environmental Management Act (2004)³¹³ shown below.

- The duties of the [Environmental Impact Assessment] Committee shall be to make recommendations to the competent authority on the issuing of guidelines regarding the content of an environmental impact statement.
- The Committee shall consist of experts on such matters as the description, protection, pollution and impairment of the environment and on activities which may have serious adverse effects on the environment.
- The members shall be appointed for a period of five years. They shall be eligible for immediate reappointment.

³¹¹ <http://www.asser.nl/upload/eel-webroot/www/documents/national/netherlands/EMA052004.pdf>

s.7.10.1

³¹² <http://www.asser.nl/upload/eel-webroot/www/documents/national/netherlands/EMA052004.pdf>

s.7.10.1

³¹³ <http://www.asser.nl/upload/eel-webroot/www/documents/national/netherlands/EMA052004.pdf> s.2.17

Relevant Definitions: Contaminant, Discharge, Disposal, Effect on the Environment, Environment, Environmental Pollution, Incineration, Installation, Landfill, Treatment, Water Pollution

Relevant International Agreements:

- European Agreement Concerning the International Carriage of Dangerous Goods by Inland Waterways (AND), Geneva, 2000. Including the Annex Regulation (2011)
- Rio Declaration on Environment and Development (1992)

Adverse Effects

Adverse effects on the environment can be anything from insignificant to catastrophic. Most activities do have an effect on the environment, but from a legislative perspective the requirements to counteract the effects must be reasonable. For example, the measures taken to reduce the noise from an air-conditioning unit would be less than those at an airport to reduce engine noise.

The usual methods to manage adverse environmental effects are to avoid them if possible, remedy the situation or mitigate the effects, in that order. It is also useful to make a natural person responsible to manage any adverse environmental effects as this focuses the attention of that person. This reinforces the polluter pays principle. An example of this is found in the NZ Resource Management Act (1991)³¹⁴ shown below, where the person responsible is the one who is either doing the activity or has commissioned the activity.

Every person has a duty to avoid, remedy, or mitigate any adverse effect on the environment arising from an activity carried on by or on behalf of the person.

Where the adverse effects are caused by, for example, business operations it is appropriate to expect the business to remedy the situation, in a similar way to that for environmental emergencies. Some businesses are not in a position to pay for remediation, either through their available capital or that they are not in business when the adverse effect is discovered. In such cases a fund administered by national government can be an appropriate mechanism to manage the situation. Establishment of the fund can be through direct contributions from business, through annual allocations from national government budgets, or through business insurance. Each system has advantages and disadvantages.

Direct contributions from business mean that the sector that causes the damage pays for it, but it also means that good practitioners pay for the delinquent ones. Policing of delinquent business operators should be considered.

Allocation from national government budgets means that the responsibility for some delinquent business operators falls on the whole of society, most of whom are innocent. However, the fund

³¹⁴ <http://www.legislation.govt.nz/act/public/1991/0069/latest/DLM230265.html> s.17.1

can build up to a stage whereby remediation can happen quite quickly, limiting environmental damage as much as possible.

Business insurance through the private sector provides the ability for insurance companies to adjust the premiums according to the track record of the business or operator. However, the public administration to ensure that businesses are insured can be quite large.

An example of legislating for business responsibility is found in the Japanese Basic Act for the Establishment of a Sound Material-Cycle Society (2000)³¹⁵ shown below.

In the case where the cyclical use and disposal of circulative resources are recognized to cause obstacles to environmental conservation, [national government] shall take necessary measures to require the business operators that used, disposed of or discharged the circulative resources causing obstacles to environmental conservation to bear the expenses necessary for the appropriate treatment of the circulative resources, remove the obstacles to environmental conservation, and restore the affected environment to its original state. In this case, [national government] shall take necessary measures, including the creation of a fund to which business operators contribute, so that the costs may be covered even when the business operators concerned cannot bear such expenses owing to lack of financial resources or inability to determine liability.

Relevant Definitions: Circulative Resources, Cyclical Use, Discharge, Disposal, Effect on the Environment, Environment, Remediation, Treatment

Relevant International Agreements:

- ASEAN Agreement on the Conservation of Nature and Natural Resources 1985
- Bamako Convention on the ban on the Import into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes within Africa 1998
- Basel Convention on the Transboundary Movement of Hazardous Wastes 1989
- Convention for the Protection of the Natural Resources and Environment of the South Pacific Region 1986, Convention on Biological Diversity (CBD) 1992
- Convention on Long-Range Trans-Boundary Air Pollution (LRTAP), Geneva 1979
- Convention on the Transboundary Effects of Industrial Accidents, Helsinki, 1992
- FAO International Code of Conduct on the distribution and use of Pesticides, Rome, 1985. (Revised Version 2005, Rome)
- Framework Convention on Climate Change (UNFCCC), New York, 1992
- Gothenburg Protocol on the reduction of acidification, eutrophication and ground-level, 1999
- Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships, 2009
- Kyoto Protocol 1997
- Montreal Protocol on Substances that Deplete the Ozone Layer 1989

³¹⁵ <https://www.env.go.jp/en/laws/recycle/12.pdf> Art.22

- Rotterdam Convention 1998
- Strategic Approach to International Chemicals Management 2006
- The Convention for Protection of the Mediterranean Sea against Pollution (Barcelona Convention) 1976
- The Global Programme of Action for the Protection of the Marine Environment from Land Based Activities 1995
- United Nations Convention on the Law of the Sea (UNCLOS) 1982
- Vienna Convention for the Protection of the Ozone Layer, 1985
- Wagani Convention 1995

Air Quality

Air pollution affects air quality. Air pollution can originate from anthropogenic or natural sources. Legislation only deals with anthropogenic sources since natural sources are often very difficult for humans to control. Air pollution is the introduction of particulates, biological molecules, or other harmful materials into Earth's atmosphere, causing disease, death to humans, damage to other living organisms such as food crops, or the natural or built environment. The primary anthropogenic pollutants include: sulfur oxides (SO_x); nitrogen oxides (NO_x); carbon monoxide (CO); volatile organic compounds (VOCs); particulates (PM₁₀ and PM_{2.5}); and ground level ozone (O₃).

The start to moving towards better air quality is air monitoring. Targeting a set number of gases is a useful place to start as well as setting levels that need to be adhered to. Initially, there may be breaches. One way to encourage better air quality is to define the number of acceptable breaches per year (if any) as there can be local conditions that can arise intermittently that cause exceedances. An example of this is found in the NZ Resource Management (National Environmental Standards for Air Quality) Regulations (2004)³¹⁶ shown below.

Ambient air quality standards are specified for carbon monoxide, nitrogen dioxide, ozone, PM₁₀ and sulphur dioxide along with the number of breaches allowed over a 12 month period (if any).

Local government or industry can carry out air quality monitoring (either self-monitoring or an external accredited monitor). Falsification of results can be a possibility, which can happen at all levels. If the self or external monitoring route is taken it is also good to have independent auditing by either local government or an accredited agency.

It is important to monitor frequently; once a year at a pre-determined time and day will not produce a robust result. Frequent testing early on and even continuous monitoring can show the extent of a problem, whether there are fugitive emissions at different times of the day, month or year. Emissions from non-point sources (e.g. private households) can also produce significant

³¹⁶ <http://www.legislation.govt.nz/regulation/public/2004/0309/latest/DLM286835.html> s.13

air pollution. An example of setting up testing regimes is found in the German Federal Immission Control Act (2002)³¹⁷ shown below.

- In order to monitor air quality, [local government] shall conduct tests at regular intervals.
- [Local government] are authorised to establish by ordinance [/bylaw] test areas where the nature and extent of air pollution which is not covered by the above and which may cause harmful effects on the environment must be determined either over a specified period or continuously and where the circumstances that are conducive to the development and dispersion of the air pollution must be investigated.

Air emissions should be part of integrated waste management, which ensures that the transfer of pollutants from one medium to another cannot be a claim for good practice. For example, incineration as a method to reduce waste to landfill is not an environmental solution to landfill disposal.

The concept of immissions (compared to emissions) considers the receiving environment and is not so concerned about where the emissions are coming from. From a local government monitoring perspective it makes sense to measure the system and then act on the individual components. It also makes sense to consider neighbouring jurisdictions since airflow can affect a much wider area than, for example, landfills. An example of legislation to set up a controlled system is found in the German Federal Immission Control Act (2002)³¹⁸ shown below.

- [Local government] shall take the necessary measures to ensure compliance with the immission values laid down in an ordinance [/bylaw].
- The measures pursuant to the above:
 - shall be in line with an integrated approach for the protection of air, water and soil;
 - shall not contravene any provisions for the protection of health and safety in the workplace; and
 - shall not cause significant impairment to the environment in other [jurisdictions].

Action Plans

Further measures, such as an action plan that applies in the short term where local government anticipates there is a risk that exceedances may occur. An example is found in the German Federal Immission Control Act (2002)³¹⁹ shown below.

If there is a risk that the immission limits or alert thresholds defined in an ordinance [/bylaw] are exceeded, [local government] shall draw up an action plan defining the measures to be taken in the short term. The measures defined in the action plan shall be such as to ensure that the risk of these values being exceeded is reduced or that the period during which these values are exceeded is shortened.

³¹⁷ http://www.bmub.bund.de/fileadmin/bmu-import/files/english/pdf/application/pdf/bimschg_en_bf.pdf
s.44

³¹⁸ http://www.bmub.bund.de/fileadmin/bmu-import/files/english/pdf/application/pdf/bimschg_en_bf.pdf
s.45

³¹⁹ http://www.bmub.bund.de/fileadmin/bmu-import/files/english/pdf/application/pdf/bimschg_en_bf.pdf
s.47

Emissions often come from multiple sources in an area. Some may be stationary (e.g. factories and homes) but others mobile (e.g. cars and trucks). With an integrated waste management concept of polluter pays, multiple sources mean that there should be a shared responsibility based on the proportions of emissions that various polluters contribute. It is important to engage the public in the process. An example of this is found in the German Federal Immission Control Act (2002)³²⁰ shown below.

[Local government] shall ensure participation of the public in drawing up or changing clean air plans.

Relevant Definitions: Air, Air Pollution, Disposal, Effect on the Environment, Emissions, Environment, Environmental Pollution, Harm, Immissions, Incineration, Installation, Landfill, Reduction, Sustainable Management, Waste Management, Water Pollution

Relevant International Agreements:

- ASEAN Agreement on the Conservation of Nature and Natural Resources 1985, Convention on Long-Range Trans-Boundary Air Pollution (LRTAP), Geneva 1979
- Gothenburg Protocol on the reduction of acidification, eutrophication and ground-level, 1999

Transport Sector

Air pollution from traffic congestion is a waste issue in many countries with big cities. With 14 of the top 20 cities in the world by population³²¹ found in developing nations, the increase in waste air emissions from traffic is an urban waste issue that is not going to abate by itself. Over 90% of air pollution in cities in these countries comes from vehicle emissions from older vehicles coupled with poor vehicle maintenance, inadequate infrastructure and low fuel quality³²².

Legislation to manage the problem can focus on clean air policies to ban or reduce traffic in defined areas. For the least disruption to traffic and commerce, roading authorities need to work with air emission authorities and urban planners for the common good. Business interests tend to oppose any changes in traffic, but can provide useful insights into situations that may cause problems which enables local government to be proactive. An example of traffic legislation is found in the German Federal Immission Control Act (2002)³²³ shown below.

- The road traffic authority shall restrict or ban motor vehicle traffic in accordance with relevant road traffic regulations, if such is provided for by a clean air plan or action plan. The road traffic authority may, in agreement with the authority responsible for immission

³²⁰ http://www.bmub.bund.de/fileadmin/bmu-import/files/english/pdf/application/pdf/bimschg_en_bf.pdf
s.47

³²¹ <http://www.citymayors.com/statistics/largest-cities-population-125.html>

³²² http://www.unep.org/urban_environment/Issues/urban_air.asp

³²³ http://www.bmub.bund.de/fileadmin/bmu-import/files/english/pdf/application/pdf/bimschg_en_bf.pdf
s.40

control, grant exemptions from any bans or restrictions on motor vehicle traffic, if so required by unpostponable and overriding reasons related to the common good.

- The road traffic authority may restrict or ban motor vehicle traffic on certain roads or in certain areas in accordance with relevant road traffic regulations, where such motor vehicle traffic contributes to pollution levels exceeding the immission values laid down in ordinances [bylaws] and where the authority responsible for immission control deems this necessary in view of local conditions, in order to reduce any harmful effects on the environment caused by air pollution or prevent the formation thereof. Traffic-related and urban planning aspects shall be duly taken into account.

Relevant Definitions: Air, Air Pollution, Controlled Waste, Effect on the Environment, Emissions, Environment, Environmental Pollution, Harm.

Relevant International Agreements:

- Bamako Convention on the ban on the Import into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes within Africa 1998
- Basel Convention on the Transboundary Movement of Hazardous Wastes 1989
- Convention on the Transboundary Effects of Industrial Accidents, Helsinki 1992
- Environmental Protection: Aircraft Engine Emissions, Annex 16, vol. 2 to the Chicago Convention on International Civil Aviation, Montreal, 1981
- European Agreement Concerning the International Carriage of Dangerous Goods by Inland Waterways (AND), Geneva, 2000. Including the Annex Regulation (2011)
- Gothenburg Protocol on the reduction of acidification, eutrophication and ground-level, 1999
- International Convention for the Prevention of Pollution from Ships (MARPOL 1973) and 1978 Protocol
- Rotterdam Convention 1998
- Strategic Approach to International Chemicals Management 2006
- The Global Programme of Action for the Protection of the Marine Environment from Land Based Activities 1995
- United Nations Convention on the Law of the Sea (UNCLOS) 1982
- Wagani Convention 1995
- Working Environment (Air Pollution, Noise and Vibration) Convention, 1977

Fuels

The composition of fuels is closely associated with pollution from traffic. The control of fuel components and mixtures provides a significant step to controlling harmful air emissions. An appropriate approach is to regulate fuels and fuel additives before allowing them onto the local market so that they meet performance requirements to protect the environment. An example of

legislation providing for controls of fuels is found in the German Federal Immission Control Act (2002)³²⁴ shown below.

[National government] is authorised, after hearing the parties concerned that fuels, lubricants or any additives shall not be produced, placed on the market or imported, be it commercially or within the framework of business undertakings, unless they meet certain requirements for the protection against any harmful effects on the environment caused by air pollution. It may in particular be provided that:

- any natural constituents of fuels or lubricants or any additives when used for the intended purpose, are deemed to give rise to air pollution or obstruct measures aimed at combating air pollution shall not be added or shall not exceed a certain maximum content;
- additives to fuels or lubricants shall not contain any of a list of substances which are deemed to give rise to air pollution or obstruct measures aimed at combating air pollution, or shall only contain special compositions of these substances;
- fuels or lubricants shall contain certain additives which help limit the formation of air pollution;
- fuels, lubricants or any additives shall undergo special treatment which helps limit the formation of air pollution;
- anyone who produces or imports liquid fuels, lubricants or any additives or in any other way moves them into the jurisdiction of this Act, be it commercially or within the framework of business undertakings, shall notify the competent supreme Federal authority of:
 - any additives to such liquid fuels or lubricants that are composed of chemical elements other than carbon, hydrogen and oxygen; and
 - any details still to be particularised of the type and quantity used and the potentially harmful effects of these additives or any combustion products thereof on the environment.

The ability of national government to regulate the importation and distribution of fuel is an important one for integrated waste management as it can reduce the environmental impact of the product. Along with the components of the fuel, regulations can cover other important aspects such as: handling and transfer; recordkeeping; auditing; measuring and monitoring; testing procedures; and reporting. The combined effect can be a well-controlled market from quality and environmental perspectives. An example of this is found in the Canadian Environmental Protection Act (1999)³²⁵ shown below.

[National government] may make regulations respecting:

- the concentrations or quantities of an element, component or additive in a fuel;
- the physical or chemical properties of a fuel;
- the characteristics of a fuel, based on a formula related to the fuel's properties or conditions of use;
- the blending of fuels;

³²⁴ http://www.bmub.bund.de/fileadmin/bmu-import/files/english/pdf/application/pdf/bimschg_en_bf.pdf

s.34

³²⁵ <http://laws-lois.justice.gc.ca/PDF/C-15.31.pdf> s.140

- the transfer and handling of a fuel;
- the keeping of books and records by persons who produce, sell or import fuel or blend fuels;
- the auditing of the books and records and the submission of audit reports and copies of the books and records;
- the submission by persons who produce, sell or import fuel or blend fuels of information regarding:
 - the fuel and any element, component or additive contained in the fuel,
 - any physical or chemical property of the fuel or any substance intended for use as an additive to the fuel,
 - the adverse effects from the use of the fuel, or any additive contained in the fuel, on the environment, on human life or health, on combustion technology and on emission control equipment, and
 - the techniques that may be used to detect and measure elements, components, additives and physical and chemical properties;
- the conduct of sampling, analyses, tests, measurements or monitoring of fuels and additives and the submission of the results;
- the submission of samples of fuels and additives;
- the conditions, test procedures and laboratory practices to be followed for conducting sampling, analyses, tests, measurements or monitoring; and
- the submission of reports on the quantity of fuel produced, imported or sold for export.

Relevant Definitions: Air, Air Pollution, Effect on the Environment, Emissions, Environment, Environmental Pollution, Harm, Protecting the Environment, Treatment, Waste Management

Relevant International Agreements:

- European Agreement Concerning the International Carriage of Dangerous Goods by Inland Waterways (AND), Geneva, 2000. Including the Annex Regulation (2011)
- Framework Convention on Climate Change (UNFCCC), New York, 1992
- Gothenburg Protocol on the reduction of acidification, eutrophication and ground-level, 1999
- Kyoto Protocol 1997
- The Global Programme of Action for the Protection of the Marine Environment from Land Based Activities 1995

Contaminated Land

Assessment and/or remediation of contaminated land are not normally a waste management responsibility, however some jurisdictions include contaminated land in integrated waste management legislation (e.g. South Africa³²⁶). The waste generated through a contaminated site remediation is part of a waste management process and it is likely that treatment and disposal (to a landfill if the remaining material does not meet the criteria for being inert) will be required.

³²⁶ http://iwmp.environment.gov.za/waste_act/chapter4/part8

Two processes that seem to regularly occur for contaminated land are that it is a local government responsibility to identify the land, decide whether it needs remediation and a timeframe to undertake the activity. An example is found in the UK Environmental Protection Act (1990)³²⁷ as shown below.

- Every [local government] shall periodically inspect land to:
 - Identify contaminated land; and
 - Decide whether any land is required to be designated as a special site.
- If the authority decides that the land is contaminated, it shall give notice of that decision to relevant persons specifying what remediation is needed and when it must be remediated by.

Relevant Definitions: Contaminated Land, Disposal, Inert Waste, Landfill, Remediation, Treatment, Waste Management

Discharge of Contaminants

The discharge of contaminants causes environmental impacts, regardless of whether the discharge occurs onto land, water or air. Regulating discharges is a significant step to reducing environmental impacts and it is a measure that is best carried out by local government. The responses from business tend to fall into four categories: imposing limits will make their operations uneconomic and they will close; calling for exemptions for years (if not decades) so that they have enough time to adapt their operation in an economically sustainable way to the new limitations; accept that the change is needed to protect the environment; or do nothing and wait till the authorities catch up with them and then embark on a delaying process. Responses to each of these scenarios need consideration before legislation is enacted.

In a similar way to maintaining air quality, any permitting needs to take into account the receiving environment and its carrying capacity for the proposed contaminant as well as measures to avoid, reduce or mitigate the environmental impacts. An example for setting up a procedure to empower local government to regulate the discharge of contaminants into the environment is found in the NZ Resource Management Act (1991)³²⁸ shown below.

Discharge of contaminants into the following media can only be done where allowed by a national environmental standard or a [local government] plan or a [permit] (issued by [local government]):

- Water;
- Onto or into land (which may result in contaminants entering the water);
- Into the air or onto the land from any industrial or trade premises.

The discharge of contaminants into coastal marine areas (within 12 nautical miles of the coast) can cause significant environmental damage. Such discharges can be controlled in several

³²⁷ http://www.legislation.gov.uk/ukpga/1990/43/pdfs/ukpga_19900043_en.pdf s.78.C & E

³²⁸ <http://www.legislation.govt.nz/act/public/1991/0069/latest/DLM230265.html> s.15.1

ways: regulations that allow for the discharge; allowances in local government plans; local government permits; or the contaminant is sufficiently diluted that it cannot be seen in the receiving environment, there are odours or marine life is not affected. An example of this is found in the NZ Resource Management Act (1991)³²⁹

Discharge of a harmful substance or contaminant into a coastal marine area from a ship or offshore installation into water, onto or into land, or into air, unless permitted by regulations, a rule in a coastal plan or resource consent or after reasonable mixing, the harmful substance or contaminant is not likely to give rise to any of the following effects in the receiving waters:

- the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;
- any conspicuous change of colour or visual clarity;
- any emission of objectionable odour;
- any significant adverse effects on aquatic life; or
- the harmful substance or contaminant, when discharged into air, is not likely to be noxious, dangerous, offensive, or objectionable to such an extent that it has or is likely to have a significant adverse effect on the environment.

No person may, in a coastal marine area:

- dump from any ship, aircraft, or offshore installation any radioactive waste or other radioactive matter; or
- store any radioactive waste or other radioactive matter or toxic or hazardous waste on or in any land or water.

Discharges to air can affect a large number of people, from those who are discharging to people quite far away. Many of the significant discharges produce hazardous substances including carcinogens (e.g. PVC from electrical wire coatings), particulate matter (e.g. tyres) or acidic gases that affect soft tissue in humans (e.g. hydrogen chloride from burning PVC that attacks eye and lung tissue). Generally industrial discharges are controlled by local government permitting processes, 'backyard operators' burn small to medium scale amounts of materials that have human health effects. An example of legislation restricting these practices is found in the NZ Resource Management (National Environmental Standards for Air Quality) Regulations (2004)³³⁰ shown below.

A discharge of a contaminant to air from an activity specified below is prohibited, except to the extent that the regulation provides otherwise:

- The lighting of fires and the burning of waste at a landfill unless it is to control gas formed at the landfill;
- The burning of tyres unless the tyres are burnt at industrial and trade premises that have a resource consent for the discharge produced and emission control equipment that is

³²⁹ <http://www.legislation.govt.nz/act/public/1991/0069/latest/DLM230265.html> s.15.b.1.b & 15.c.1

³³⁰ <http://www.legislation.govt.nz/regulation/public/2004/0309/latest/DLM286835.html> s.4-12

designed and operated to minimise emissions of dioxins and other toxics from the process;

- The burning of bitumen;
- The burning of wire coated with any material unless the tyres are burnt at industrial and trade premises that have a resource consent for the discharge produced and emission control equipment that is designed and operated to minimise emissions of dioxins and other toxics from the process;
- The burning of oil in the open air unless:
 - the burning is for creating special smoke and fire effects for the purposes of producing films; or
 - for training firefighters; or
 - The burning is done by means of a flare for undertaking health and safety procedures in the petroleum exploration and production industry or the petrochemical industry;
 - The operation of an incinerator at a school or a healthcare institution
- The operation of a high-temperature hazardous waste incinerator unless it is a crematorium.

Relevant Definitions: Air, Contaminant, Discharge, Dumping, Effect on the Environment, Emissions, Environment, Harm, Hazardous Waste, Installation, Landfill, Multimedia, Protecting the Environment, Storage, Waste, Waste Minimisation, Water Pollution

Environmental Emergencies and Disasters

Environmental Emergencies

Environmental emergencies can result from small scale events (e.g. human error releasing a tank of a hazardous substance) to natural disasters that can affect whole countries, or larger. These large events can create enormous waste management challenges. In either case forethought and planning needs to be undertaken during 'peace time' so that when the need arises national and local government are able to concentrate on fixing the problem and not getting the mandate to act. Often careful previous planning that enables quick action in an emergency can forestall creating a much bigger problem.

Disasters

Small emergencies tend to involve small quantities of homogeneous wastes with a localised spread, while disasters cover a much larger area and have a wide variety of waste needs. For a disaster situation the United Nations Office for the Coordination of Humanitarian Affairs has provided a series of actions to be considered in disaster management³³¹:

- Waste needs assessment
- Identification and ranking of hazards
- Waste handling plan

³³¹ <https://www.msb.se/RibData/Filer/pdf/26599.pdf>

- Disposal site guidelines
- Fundraising
- Dumpsite closure guidelines
- Exit strategies
- Contingency or preplanning

While the last bullet point is not strictly part of a disaster response, it bridges the gap between response, recovery and the longer term development. Contingency planning can be conducted either in the long-term phase of disaster management or as a preparedness measure before a disaster³³².

Guidelines and Codes of Practice

National government is best situated to produce guidance documents and codes of practice to enable local government and industry to prevent, prepare and respond to environmental emergencies. A key part of the documentation is consultation with stakeholders. An example of legislation enabling these provisions is found in the Canadian Environmental Protection Act (1999)³³³ shown below.

- [National government] may issue guidelines and codes of practice respecting the prevention of, preparedness for and response to an environmental emergency and for restoring any part of the environment damaged by or during an emergency.
- [National government] shall offer to consult with the [local] government a government department or agency, representatives of industry and labour and with persons interested in the quality of the environment or environmental emergencies.

National government may act proactively to require specified people or organisations to prepare for emergencies involving hazardous substances. As well as dealing with small scale environmental emergencies it is useful to consider actions to minimise environmental and health impacts of these substances during the response and recovery phases of disasters (small quantities of pesticides stored by householders). An example of legislation enabling these provisions is found in the Canadian Environmental Protection Act (1999)³³⁴ shown below.

[National government] may at any time publish a notice requiring any person or class of persons described in the notice to prepare and implement an environmental emergency plan respecting the prevention of, preparedness for, response to or recovery from an environmental emergency in respect of:

- a substance or group of substances on the List of Toxic Substances; or
- a substance or group of substances in relation to which there has been published:
 - a statement of [national government] indicating that the measure that they propose to take, as confirmed or amended, is a recommendation that the substance be added to the List of Toxic Substances

³³² <https://www.msb.se/RibData/Filer/pdf/26599.pdf>

³³³ <http://laws-lois.justice.gc.ca/PDF/C-15.31.pdf> s.196 & 197

³³⁴ <http://laws-lois.justice.gc.ca/PDF/C-15.31.pdf> s.199

- a copy of an order proposed to be made.

Another approach is taken in the NZ Hazardous Substances and New Organisms Act (1996)³³⁵ shown below. In this approach when a hazardous substance first comes up for approval to put in on the market (import or manufacture), one of the criteria is to document how this substance should be managed in the event of an emergency.

When approving the use of a hazardous substance [national government] must impose controls that, in the event of an emergency, it is dealt with in accordance with a specified plan which includes requirements for the disposal of the hazardous substance, agricultural compound or medicine and any waste products.

Hazardous Substance Emergency Management

The management of hazardous substances entering the environment in the event of an emergency is critical to minimise the impact. The management process includes: identification of the substances; the effect on the environment; the minimum quantities needed to trigger the need for an emergency plan (this generally negates the need for every household and small user to develop an emergency plan); locations of the substances (for ease of identification); and notification and reporting emergencies and actions taken. An example of this is found in the Canadian Environmental Protection Act (1999)³³⁶ shown below.

Make regulations

- establishing a list of substances that, if they enter the environment as a result of an environmental emergency:
 - have or may have an immediate or long-term harmful effect on the environment or its biological diversity;
 - constitute or may constitute a danger to the environment on which human life depends; or
 - constitute or may constitute a danger to human life or health;
- prescribing, in respect of a substance on the list established, a minimum quantity;
- respecting the identification of the places where a substance referred to in any quantity or in the quantity prescribed for that substance, is located and requiring notification to the Minister of those places;
- respecting the prevention of, preparedness for, response to and recovery from an environmental emergency in respect of a substance;
- respecting the notification and reporting of an environmental emergency;
- respecting the notification and reporting of the measures taken:
 - to prevent the environmental emergency, or
 - to repair, reduce or mitigate any negative effects on the environment or human life or health that result from the environmental emergency or that may reasonably be expected to result from it;

³³⁵ <http://www.legislation.govt.nz/act/public/1996/0030/latest/DLM381222.html> s.49

³³⁶ <http://laws-lois.justice.gc.ca/PDF/C-15.31.pdf> s.200

- respecting the implementation of international agreements in relation to environmental emergencies; and
- respecting any other matter necessary.

Damage Minimisation

An environmental emergency requires action to minimise the environmental damage. The first steps in this process are to notify officials as soon as possible while taking effective actions to minimise the effects of the emergency. In addition, the public should be protected. An example of this is found in the Canadian Environmental Protection Act (1999)³³⁷ shown below.

If there occurs an environmental emergency in respect of a substance on a list established under the regulations or interim orders, as soon as possible in the circumstances:

- notify an enforcement officer or any other person designated by regulation or interim order and provide a written report on the environmental emergency to the enforcement officer or other person;
- take all reasonable emergency measures consistent with the protection of the environment and public safety:
 - to prevent the environmental emergency, or
 - to repair, reduce or mitigate any negative effects on the environment or human life or health that result from the environmental emergency or that may reasonably be expected to result from it; and
 - make a reasonable effort to notify any member of the public who may be adversely affected by the environmental emergency.

Integrated waste management requires that, in the event of an environmental emergency, any wastes produced are managed to maximise waste minimisation. Maximisation involves separating various waste components and treating them, preferably on site to minimise the environmental burden. An example of this is found in the Netherlands Environmental Management Act (2004)³³⁸ shown below.

If an exceptional incident so requires, one or more of the following obligations or the following prohibition may be imposed in the interests of environmental protection on the person on whose premises waste substances designated in the relevant decision are generated or are present:

- an obligation to separate the waste substances and keep them separate, including from waste and other substances;
- an obligation to transfer the waste substances in a separated state if they discard them;
- an obligation to [minimise] or dispose of the waste substances at the place where they are generated, in a manner indicated in the decision;
- a prohibition on keeping the waste substances longer than the period indicated in the decision;

³³⁷ <http://laws-lois.justice.gc.ca/PDF/C-15.31.pdf> s.201

³³⁸ <http://www.asser.nl/upload/eel-webroot/www/documents/national/netherlands/EMA052004.pdf>
s.17.4.1

- an obligation to transfer the waste substances to a person belonging to a category designated in the decision, or to take them to a designated place.

Responsibility

Determining the allocation of responsibility is another important aspect of managing emergencies. While liability for disasters cannot be attributable to any person or organisation, small scale environmental emergencies often are the results of someone or some people making an error. As well as examination for liability issues, the same investigation can provide guidance to improve practice.

Normally the person responsible for the emergency is expected to remediate the environment and pay costs for those involved in the remediation as well as any penalties. It should be noted that the cost of clean-up can substantially outweigh the penalties imposed by courts. An example of this is found in the Canadian Environmental Protection Act (1999)³³⁹ shown below.

The person who owns or has the charge, management or control of a substance immediately before an environmental emergency is liable:

- for restoring any part of the environment damaged by or during the emergency;
- for costs and expenses incurred by a [government] department within the meaning of the Criminal Code or other public authority in respect of measures taken to prevent, repair, remedy or minimize the damage to the environment resulting from the emergency, including measures taken in anticipation of the environmental emergency, to the extent that the measures taken and the costs and expenses are reasonable, and for any loss or damage caused by such measures; and
- for costs and expenses incurred by [national government] in respect of measures taken to prevent, repair, remedy or minimize the environmental emergency to the extent that the measures taken and the costs and expenses are reasonable, and for any loss or damage caused by such measures.

There are situations where an environmental emergency may not be attributable to a facility owner. These situations (e.g. war, natural disaster, third party sabotage, government responsibility) provide a defence against accepting liability. An example of this is found in the Canadian Environmental Protection Act (1999)³⁴⁰ shown below.

The owner is not liable under that subsection if the owner establishes that the environmental emergency:

- resulted from an act of war, hostilities or insurrection or from a natural phenomenon of an exceptional, inevitable and irresistible character;
- was wholly caused by an act or omission of a third party with intent to cause damage; or
- was wholly caused by the negligence or other wrongful act of government, public department or public authority.

³³⁹ <http://laws-lois.justice.gc.ca/PDF/C-15.31.pdf> s.205

³⁴⁰ <http://laws-lois.justice.gc.ca/PDF/C-15.31.pdf> s.205

Relevant Definitions: Controlled Waste, Disposal, Effect on the Environment, Environment, Environmental Emergency, Harm, Hazardous Waste, Landfill, Remediation, Reuse, Storage, Treatment, Waste, Waste Management, Waste Minimisation

Relevant International Agreements:

- Convention for the Protection of the Natural Resources and Environment of the South Pacific Region 1986
- London Convention 1972
- London Convention -Protocol on London Convention 1996
- The Convention for Protection of the Mediterranean Sea against Pollution (Barcelona Convention) 1976
- The Global Programme of Action for the Protection of the Marine Environment from Land Based Activities 1995
- Wagani Convention 1995

Import/Export/Transboundary Waste

Waste, and particularly hazardous waste, may not be able to be managed within a country's borders, for a variety of reasons including the quantities produced and hazardous nature. Rather than allow substandard practices within generating countries and dumping into accepting countries, it is better to manage the transboundary movements. The notification of transboundary movement of hazardous waste under the Basel Convention is an excellent tool to help ensure the environmentally sound management of transboundary movements of hazardous waste.

Conforming to international agreements is an essential part of each country taking their responsibility for wastes they create or manage. The short term costs of managing waste according to the Basel Convention far outweigh the long term environmental and economic costs of managing dumping. The process of managing the administrative aspects of the transboundary movement of wastes helps to ensure environmental protection. An example of the acceptance criteria is found in the US Pollution Prevention Act (1990)³⁴¹ shown below. Note that while the US legislation speaks to the export of hazardous waste the same criteria can be applied to importation.

No person shall export any hazardous waste unless:

- such person has provided the notification required
- the government of the receiving country has consented to accept such hazardous waste
- a copy of the receiving country's written consent is attached to the manifest accompanying each waste shipment; and
- the shipment conforms with the terms of the consent of the government of the receiving country.

³⁴¹ <http://www.epw.senate.gov/PPA90.pdf> s. 3017.a

A more general statement is found in the UK Environmental Protection Act (1990)³⁴², shown below, where the cabinet minister is charged with making regulations for hazardous waste movement.

The Secretary of State may, for the purpose of preventing any risk of environmental pollution or of harm to human health arising from waste being imported or exported, make regulations prohibiting or restricting:

- the importation into and the landing and unloading;
- the exportation of waste of any description.

The Netherlands Environmental Management Act (2004)³⁴³, shown below, requires management of transboundary movements through environmental impact statements, with publication in both countries.

If an activity, in preparation for which an environmental impact statement must be drawn up, may have serious adverse effects on the environment in another country, the information shall be supplied to the government or to an authority to be designated by that government in that country at the same time as they are made public in the Netherlands.

Many countries border with others and a lot of waste issues are common across borders. Transboundary issues include the wastes derived from forests and rivers. In some instances particular wastes from one country may not generate sufficient quantities to warrant a minimisation process, but if two or more countries cooperate, a regional processing plant may prove to be economic. While transboundary movements of waste may pose issues, most of these can be worked through where value addition is the objective when moving waste from one country to another (rather than disposal). An example of empowering regional cooperation is found in the UK Environmental Protection Act (1990)³⁴⁴ shown below.

Ensuring that the network enables:

- the [Regional] Community to become self-sufficient in waste disposal, and the Member States individually to move towards that aim, taking into account geographical circumstances or the need for specialised installations for certain types of waste; and
- waste to be disposed of in one of the nearest appropriate installations, by means of the most appropriate methods and technologies in order to ensure a high level of protection for the environment and public health.

Relevant Definitions: Dumping, Effect on the Environment, Environment, Environmental Pollution, Harm, Hazardous Waste, Waste

Relevant International Agreements:

³⁴² http://www.legislation.gov.uk/ukpga/1990/43/pdfs/ukpga_19900043_en.pdf s.141.1

³⁴³ <http://www.asser.nl/upload/eel-webroot/www/documents/national/netherlands/EMA052004.pdf> s.7.38.1a

³⁴⁴ http://www.legislation.gov.uk/ukpga/1990/43/pdfs/ukpga_19900043_en.pdf schedule.2A

- Bamako Convention on the ban on the Import into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes within Africa 1998
- Basel Convention on the Transboundary Movement of Hazardous Wastes 1989
- Convention on Long-Range Trans-Boundary Air Pollution (LRTAP), Geneva 1979
- Convention on the Transboundary Effects of Industrial Accidents, Helsinki, 1992
- European Agreement Concerning the International Carriage of Dangerous Goods by Inland Waterways (AND), Geneva, 2000. Including the Annex Regulation (2011)
- FAO International Code of Conduct on the distribution and use of Pesticides, Rome, 1985. (Revised Version 2005, Rome)
- Framework Convention on Climate Change (UNFCCC), New York, 1992
- Gothenburg Protocol on the reduction of acidification, eutrophication and ground-level, 1999
- International Convention for the Prevention of Pollution from Ships (MARPOL 1973) and 1978 Protocol
- International Convention on Civil Liability for Bunker Oil Pollution Damage, 2001
- Kyoto Protocol 1997
- London Convention 1972
- London Convention - Protocol on London Convention 1996
- OECD Decision C(92)39/FINAL on the Control of Transfrontier Movements of Wastes Destined for Recovery Operations
- Rio Declaration on Environment and Development (1992)
- Rotterdam Convention 1998
- Strategic Approach to International Chemicals Management 2006
- The Global Programme of Action for the Protection of the Marine Environment from Land Based Activities 1995
- United Nations Convention on the Law of the Sea (UNCLOS) 1982
- Vienna Convention for the Protection of the Ozone Layer, 1985
- Wagani Convention 1995
- Working Environment (Air Pollution, Noise and Vibration) Convention, 1977

RESPONSIBILITIES IN WASTE MANAGEMENT

Improved governance is essential to mobilise abilities to address challenges, recognise opportunities and reap the benefits of sound waste management. Government institutions in this area are often weak and under-resourced, often due to the low priority politicians put on waste management. Critical to improving waste management capacity is cooperation between national and local government and recognition that the private sector is a key player. It is critical to identify the key stakeholders in any waste management activity.

This section covers the provisions related to the duties and responsibilities of the various stakeholders. It covers the following provisions:

- National government;
- Advisory Committee;
- Local Government;
- Non-Government Organisations;
- Citizens; and
- Private Sector.

National Government

National government has the role of ensuring that resources are utilised to reflect national interests and priorities. A national approach provides a level playing field for the private sector and the ability to plan for large scale implementation programmes (that are often economically better). In a similar way, adjoining local government jurisdictions will focus their efforts to the same priorities with some local variations. It is critical that national level decisions do not have the effect of cancelling out local initiatives and innovations. The relationship between what is done at the national and local levels must be kept productive and mutually reinforcing. An example of clearly describing the role of national government is found in the Japanese Basic Act for the Establishment of a Sound Material-Cycle Society (2000)³⁴⁵ shown below.

[National government] is responsible for formulating and implementing fundamental and comprehensive policies and measures towards the establishment of a [circular economy].

Integrated waste management cannot successfully exist in a silo within a national government ministry. It must link to other areas that are affected and can contribute to an integrated approach such as environment, industry policy, infrastructure and planning, education and health in an organic way. An example of legislating for this is found in the Japanese Basic Act for the Establishment of a Sound Material-Cycle Society (2000)³⁴⁶ shown below.

In formulating policies and measures for establishing a [circular economy], necessary consideration shall be given towards fostering mutual organic linkages with policies and measures for ensuring proper circulation of substances in nature and other policies and measures for environmental conservation.

³⁴⁵ <https://www.env.go.jp/en/laws/recycle/12.pdf> Art.9

³⁴⁶ <https://www.env.go.jp/en/laws/recycle/12.pdf> Art.8

Ombudsman

An ombudsman is usually an independent office appointed by the government or parliament. The office is charged with representing the interests of the public by investigating and addressing complaints of maladministration or a violation of rights. They typically investigate complaints and attempt to resolve them, usually through recommendations (binding or not) or mediation. The role of the ombudsman is to make the public service more transparent. They can make binding or non-binding decisions, depending on the parameters set by national government. In non-binding situations ombudsmen can achieve significant traction simply by publicising their decisions, even to parliament. They are regarded as non-partisan. An ombudsman is a useful role when setting up a nationwide integrated waste management system as they can provide clarity and transparency to the public and public service. An example of doing this for waste is found in the US Resource Conservation and Recovery Act (1976)³⁴⁷ shown below. In the US situation, the ombudsman's role was for four years during the major changes in waste system.

- [National government] shall establish an Office of Ombudsman, to be directed by an Ombudsman. It shall be the function of the Office of Ombudsman to receive individual complaints, grievances, and requests for information submitted by any person with respect to any program or requirement under this Act.
- The Ombudsman shall make appropriate recommendations to the Administrator.

Progress

To facilitate the progression of integrated waste management short and medium term activities drive a programme. An annual planning cycle provides an opportunity to review progress, set or amend short term goals and determine budgets. An example is found in the Netherlands Environmental Management Act (2004)³⁴⁸ shown below where a several ministries are involved in the programme.

- [National Government] shall draw up a national [integrated waste management] programme annually.
- The programme shall contain at least:
 - a programme of activities for the protection of the environment to be carried out by the government in the next four years;
 - a programme for the determination or review of environmental quality requirements giving an indication of the results the programme seeks to achieve;
 - a review of the items included in the various chapters of the budget relating to [integrated waste] management, and an indication of the financial consequences for the State in the following years of the activities;
 - a report on the progress made in implementing the current national [integrated waste management] plan.

³⁴⁷ <https://www.law.cornell.edu/uscode/text/42/chapter-82> s.2008

³⁴⁸ <http://www.asser.nl/upload/eel-webroot/www/documents/national/netherlands/EMA052004.pdf> s.4.7.1

- In drawing up the programme, the Ministers shall take into account the current [integrated waste management] plan.

Assigning a cabinet minister to report to parliament on progress for each local government constituency stimulates discussion and a desire for local government to improve their position on the league table which results in better integrated waste management practices. An example requiring this is found in the UK Environmental Protection Act (1990)³⁴⁹ shown below.

[National government] must report to Parliament on the performance of each [local government] in meeting its recycling and composting standards (if any) and meeting the requirement to provide household waste collection.

Waste Flight

Where specific issues are identified that apply in some places, but have the potential to spread, the minister can make regulations that are binding on all. The advantage of a national approach is that it reduces waste 'flight' where polluters move from a regulated to a non-regulated (or lower levels of regulation) area. Waste flight results in greater pollution. An example using air emissions is found in the UK Clean Air Act (1993)³⁵⁰ shown below. Note that the legislation provides for a defence of suing the best practical means to reduce emissions.

- [National government] regulates limits on the rates of emission of [particulates] and dust from the chimneys of furnaces;
 - A defence would be to prove that the best practicable means had been used for minimising the alleged emission.

Import Restrictions

A further measure that can be taken at national government level is to restrict import and distribution of materials that cannot meet standards set by the State. An example using fuel is found in the UK Clean Air Act (1993)³⁵¹ shown below.

- For the purpose of limiting or reducing air pollution, [national government] may by regulations:
 - impose requirements on the composition and contents of any fuel of a kind used in motor vehicles; and
 - prevent or restrict the production, treatment, distribution, import, sale or use of any fuel which in any respect fails to comply with the requirements.

Relevant Definitions: Air, Air Pollution, Circular Economy, Emissions, Environment, Environmental Pollution, Household Waste, Recycling, Treatment, Waste, Waste Management, Waste Minimisation

Advisory Committee

³⁴⁹ http://www.legislation.gov.uk/ukpga/1990/43/pdfs/ukpga_19900043_en.pdf s.47A.1

³⁵⁰ http://www.legislation.gov.uk/ukpga/1993/11/pdfs/ukpga_19930011_en.pdf s.5.2

³⁵¹ http://www.legislation.gov.uk/ukpga/1993/11/pdfs/ukpga_19930011_en.pdf s.30.1

Advisory committees can serve a very useful role in providing independent technical advice from a range of perspectives to the cabinet minister. If set up and used properly advisory committees can bring a wealth of knowledge on issues and likely outcomes of proposed actions. An example of setting the scope for an advisory committee is found in the Canadian Environmental Protection Act (1999)³⁵² shown below.

For the purpose of enabling national action to be carried out and taking cooperative action in matters affecting the environment and for the purpose of avoiding duplication in regulatory activity among governments, [national government] shall establish a National Advisory Committee to advise [national government] on:

- proposed regulations
- a cooperative, coordinated intergovernmental approach for the management of [waste]; and
- other environmental matters that are of mutual interest to [national government] and other governments and to which this Act relates.

A more specific mandate on the functions of an advisory committee is found in the NZ Waste Minimisation Act (2008)³⁵³ shown below. This committee was set up to advise on extended producer responsibility (product stewardship), the effectiveness of the waste levy and reporting mechanisms. In addition the skills background for the committee is listed. Half the board retires every three years (or less) so that there is some continuity of thinking.

- The function of the Board is to advise [national government] on:
 - Declaring priority products under product stewardship schemes;
 - Guidelines and contents on product stewardship schemes;
 - Accrediting a product stewardship scheme that is not consistent with any guidelines;
 - Recommending the making of regulations prohibiting the sale of a priority product except in accordance with an accredited scheme;
 - Recommending the making of regulations in relation to products, materials and waste;
 - Setting or varying criteria for approving funding of a project;
 - Reviewing the effectiveness of the levy;
 - Recommending the making of regulations on imposition of the waste disposal levy or the rate of the levy;
 - Recommending the making of regulations for records, information, and reports.
- [National government] must appoint between 4 and 8 members to the Board for a renewable 3 year term (or less).
- The Board must have knowledge, skill and experience relating to:
 - The Waste Minimisation Act;
 - Matters likely to come before the Board;
 - Community projects for Waste Minimisation;

³⁵² <http://laws-lois.justice.gc.ca/PDF/C-15.31.pdf> s.6

³⁵³ <http://www.legislation.govt.nz/act/public/2008/0089/latest/DLM999802.html> s.90 – 93

- Industry including the commercial waste industry;
- Local government;
- Behaviour for interacting with [indigenous people].

A further type of advisory committee is one that consists of cabinet ministers from a variety of portfolios that affect integrated waste management. The US Resource Conservation and Recovery Act (1976)³⁵⁴, shown below, charges the committee with analysis of incentives and disincentives to foster the circular economy, examining public policies for their effect on the circular economy, the effects of financial instruments on the circular economy, and the need for research, development and demonstration to advance the circular economy.

- The [Minister] of Commerce, the [Minister] of Labour, the Chairman of the Council on Environmental Quality, the [Minister] of the Treasury, the [Minister] of the Interior, the [Minister] of Energy, the Chairman of the Council of Economic Advisors, and a representative of the Office of Management and Budget shall investigate:
 - the appropriateness of recommended incentives and disincentives to foster resource conservation;
 - the effect of existing public policies (including subsidies and economic incentives and disincentives, percentage depletion allowances, capital gains treatment and other tax incentives and disincentives) upon resource conservation, and the likely effect of the modification or elimination of such incentives and disincentives upon resource conservation;
 - the appropriateness and feasibility of restricting the manufacture or use of categories of consumer products as a resource conservation strategy;
 - the appropriateness and feasibility of employing as a resource conservation strategy the imposition of solid waste management charges on consumer products, which charges would reflect the costs of solid waste management services, litter pickup, the value of recoverable components of such product, final disposal, and any social value associated with the non-recycling or uncontrolled disposal of such product; and
 - the need for further research, development, and demonstration in the area of resource conservation.

Relevant Definitions: Circular Economy, Commercial Waste, Demonstration, Disposal, Environment, Recycling, Resource Conservation, Waste, Waste Management, Waste Minimisation

Local Government

Local government has a role to ensure that resources are applied locally to reflect national interests and priorities. Local government is the main specialist provider of integrated waste management services in most countries. The services can be delivered by the public and/or

³⁵⁴ <https://www.law.cornell.edu/uscode/text/42/chapter-82> s.8002.j

private sector. The private sector can be a combination of operating locally or internationally, local community-based organisations and/or informal or micro-enterprises.

A significant part of local government activity concerns planning. Reference should be made to the sections on planning and waste management plan for aspects relevant to local government.

The role of national government in the work that local government does to empower local government is highlighted by the Japanese Basic Act for the Establishment of a Sound Material-Cycle Society (2000)³⁵⁵ shown below.

The State shall take necessary measures to ensure that policies for establishing a [circular economy], including those on the cyclical use and disposal of circulative resources, will be appropriately made and implemented by local governments.

Local government has the responsibility but often does not have the resources to manage the situation. It is therefore up to national government to either provide the resources or enable local government to get the needed resources. An example providing for this is found in the Japanese Basic Act for the Establishment of a Sound Material-Cycle Society (2000)³⁵⁶ shown below.

[National government] shall make efforts to take necessary financial and other measures regarding the costs for local governments to make and implement policies for establishing a [circular economy].

Collection Systems

Local government management of waste is achieved using several tools. The first requirement is for a collection system which may be separated into materials that can re-enter the circular economy and those destined for disposal. An example stipulating a collection system is found in the German Circular Economy Act (2012)³⁵⁷ shown below.

The public bodies responsible for waste management shall recover or dispose of, waste from private households in their area that has occurred and has been made available to them, as well as waste for disposal from other areas of origin.

Household Waste

From an integrated waste management perspective household waste primarily consists of solid waste and sewage. The waste can cause a risk to public health by attracting flies, mosquitos and rats, providing good conditions for them to breed³⁵⁸. Local government is best placed to manage household waste in their jurisdiction and it has a responsibility to assist householders to minimise their exposure to such vermin and thus reduce health bills. Sewage is considered in other parts of these guidelines, and this section will deal primarily with solid waste.

³⁵⁵ <https://www.env.go.jp/en/laws/recycle/12.pdf> Art.25

³⁵⁶ <https://www.env.go.jp/en/laws/recycle/12.pdf> Art.26

³⁵⁷ http://www.bmub.bund.de/fileadmin/Daten_BMU/Download_PDF/Abfallwirtschaft/kreislaufwirtschaftsgesetz_en_bf.pdf s.20

³⁵⁸ http://www.who.int/water_sanitation_health/hygiene/emergencies/fs3_12.pdf

Regular collection of solid waste is essential to provide the health benefits achieved through breaking the vermin cycle. Where the general household waste contains organic matter it is advisable to collect it weekly as this minimises the build-up of odours from decomposing organics. An example of providing for this is found in the Netherlands Environmental Management Act (2004)³⁵⁹ shown below.

Every [local government] shall ensure, in cooperation with other [local governments] or otherwise, that household waste – excluding bulky household waste – is collected at least once a week from all the premises situated within its territory where such waste substances may regularly be generated.

Householders tend to be treated differently to commercial and industry waste producers. This is because householders are small producers of waste and are a dispersed group. Their solid and liquid waste collections are better handled through nationalised processes rather than individual negotiations. This allows for economy of scale as well as consistency. This works well in an urban situation, but due to distances between houses, this may not work well in rural areas. In rural areas it is often left up to the individual householders to manage their waste by taking it to nationalised waste transfer stations. An example of legislation covering the role of local government in waste collection is found in the UK Environmental Protection Act (1990)³⁶⁰ shown below. Note that in this example there is a provision for local government to provide services to businesses for a fee. This may work well in areas where private waste enterprises do not operate, but in other situations may make private enterprise uneconomic which could reduce competition and lead to higher prices for waste collection. Without proper control excess income from waste activities can be diverted by local government into non-waste priorities, reducing the chance to improve waste management.

Each [local government] shall:

- Arrange for the collection of household waste in its area except waste situated at an isolated or inaccessible place making the cost of collecting it unreasonably high;
- For a fee, collect any commercial waste from the premises, or arrange for the collection of the waste if requested by the occupier at cost.

Collection

The most basic collection process is for householders to put all their waste into one receptacle and put it out for collection. A more sophisticated process (and one that householders quickly buy into once the environmental benefits are explained and other measures like differential pricing and ease of complying are added) is for some source separation for some materials that

³⁵⁹ <http://www.asser.nl/upload/eel-webroot/www/documents/national/netherlands/EMA052004.pdf>

s.10.21.1

³⁶⁰ http://www.legislation.gov.uk/ukpga/1990/43/pdfs/ukpga_19900043_en.pdf s.36

have market value after recycling. An example providing for this is found in the Netherlands Environmental Management Act (2004)³⁶¹ shown below.

[Local government] may decide to collect other components of household waste separately.

Organic Waste

Separation of organics to make into compost or anaerobically digest to provide energy (and a soil conditioner) is a measure that can significantly reduce the volume and weight of waste. An example providing for this is found in the Netherlands Environmental Management Act (2004)³⁶² shown below. Note that it is possible to use the same measures with meat and meat products, however care should be given in the collection phase so that domestic and wild animals do not have access to the waste. If all organic matter is removed from household waste there is no need to collect the remainder on a weekly basis, which can free up the collection process for greater separation of other materials.

Vegetable, fruit and garden waste shall in any event be collected separately.

Bulky Waste

Householders accumulate bulky materials that they do not need. Provisions can be made for local government to organise waste collection or drop off centres for these materials. Collections can be done on an area basis or an individual booking system. An area basis has the convenience of concentrating effort in a small area. The downside to this is that when householders put out bulky materials for collection, informal collectors sift through it, spreading the waste further and sometime destroying reusable or recyclable goods to extract valuable materials, leaving the rest for cleaning up by the official collectors.

An individual booking system takes a more targeted approach, but requires more management. The advantage is that ugly piles of bulky materials do not appear on roadsides and reusable or recyclable goods are kept intact.

Collection centres provide the opportunity for neighbourhood exchanges. Unwanted bulky goods can be dropped off at the centres. Sorting the goods into resalable, recyclable and waste for disposal provides extra employment and assists the move toward a circular economy. An example providing for this is found in the Netherlands Environmental Management Act (2004)³⁶³ shown below.

Every [local government] shall ensure that:

- bulky household waste is collected from all the premises situated within its territory where such waste is generated, and

³⁶¹ <http://www.asser.nl/upload/eel-webroot/www/documents/national/netherlands/EMA052004.pdf>

s.10.21.3

³⁶² <http://www.asser.nl/upload/eel-webroot/www/documents/national/netherlands/EMA052004.pdf>

s.10.21.2

³⁶³ <http://www.asser.nl/upload/eel-webroot/www/documents/national/netherlands/EMA052004.pdf>

s.10.22.1

- sufficient opportunity is provided to leave such waste at least one designated place within the [local government area] or within the [local government areas] with which [local government] is cooperating.

Ordinances / Bylaws

Local government needs the ability to issue ordinances (bylaws) to enable them to carry out their waste functions efficiently. Useful ordinances consider rules on collecting waste, giving waste to another person, leaving waste at designated places, litter and the visibility of waste. Waste collection is important to consider when ownership transfers and who is the owner at any point, and therefore responsible.

Designating places for drop-off to provide uniformity assists with time efficient collection and reduces dumping. Drop-off can occur inside a property, on the kerbside of a road, in a nationalised place for each stretch of road or at collection centres. Designating these places reduces the ability of fly tippers providing a defence that they were dropping off and not dumping or littering.

Development of the ordinances is best conducted in a consultative way with the householders. When householders are asked to make a change in procedures they commonly come up with reasons why they personally cannot make the change (e.g. taking material to the kerbside up a hill is not possible because they are too frail to do it) and also gives local government to discover problems with proposed systems and solutions (e.g. for the above, get a neighbour to help you – strengthens neighbourhoods). An example containing these provision is found in the Netherlands Environmental Management Act (2004)³⁶⁴ shown below.

- [Local government] shall issue a waste ordinance [/bylaw].
- The waste ordinance [/bylaw] shall at a minimum include rules on:
 - transferring household waste or offering it for collection to a collection service designated by or pursuant to the ordinance [/bylaw];
 - transferring waste substances of this kind to another person;
 - leaving waste substances of this kind at a designated place.
- The waste ordinance [/bylaw] may also lay down rules on the collection of household waste.
- The waste ordinance [/bylaw] may in any event lay down rules on:
 - preventing waste substances ending up in the environment as litter or ensuring that this occurs as little as possible;
 - clearing up waste substances that have ended up in the environment as litter;
 - having waste substances in a place that is visible to the public.
- [Local government], in the interests of the efficient management of household waste, may provide in the waste ordinance [/bylaw] that:
 - household waste shall be collected near each premises;
 - household waste shall be collected with a frequency indicated in the ordinance [/bylaw];
 - no household waste shall be collected in part of the territory of the [local government].

³⁶⁴ <http://www.asser.nl/upload/eel-webroot/www/documents/national/netherlands/EMA052004.pdf> s.10.23

- [Local government] shall involve residents and interested natural and legal persons in the [local government area] in the preparation of a decision of this kind.
- [Local government] shall ensure that sufficient opportunity is provided to leave household waste at least one designated place within the [local government area] or within the [local government area] with which the [local government] is cooperating.
- Rules may be laid down by [national government] relating to the inclusion in the ordinance [/bylaw] of an obligation to bring components of household waste to a designated place.

Relevant Definitions: Circular Economy, Disposal, Dumping, Environment, Household Waste, Recycling, Reuse, Waste, Waste Management, Waste Minimisation

Relevant International Agreements:

- OECD Decision C(92)39/FINAL on the Control of Transfrontier Movements of Wastes Destined for Recovery Operations

Information

Local government needs to have knowledge of the waste situation in their territory. An overall plan as well as reports on progress is an essential tool. Where local government has given responsibility to private enterprise to manage waste it may be more difficult to gather information from these companies as they fear that too much sharing of their knowledge can work against them in future contracting rounds. Local government officials should be aware of this in setting up contracts for waste management. An example for embedding this in legislation is found in the German Circular Economy Act (2012)³⁶⁵ shown below.

[Local government] shall prepare waste management concepts and waste balance sheets concerning the recovery, in particular the preparation for re-use and recycling and disposal of waste that is produced in their area and that must be made available to them.

Planning

Local government planning processes can reflect those processes carried out at national government level. An example is found in the Netherlands Environmental Management Act (2004)³⁶⁶ shown below. The additional elements to the national government plan (see national government section) are tabulating occurrences of serious pollution and noise abatement measures.

- At least once every four years [local government] shall draw up an [integrated waste management] plan to guide the decisions to be taken by the government and by administrative authorities to which [local government] powers have been delegated;
- The plan shall contain the main elements of the [local government]’s [integrated waste management] policy – which mirror the national [integrated waste management] plan.

³⁶⁵ http://www.bmub.bund.de/fileadmin/Daten_BMU/Download_PDF/Abfallwirtschaft/kreislaufwirtschaftsgesetz_en_bf.pdf s.20

³⁶⁶ <http://www.asser.nl/upload/eel-webroot/www/documents/national/netherlands/EMA052004.pdf> s. 4.9 &

- The [local government] executive shall draw up an annual [integrated waste management] programme.
- The programme shall at least include a programme of activities for the protection of the environment to be carried out in the next four years, including:
 - a list of cases investigated and instances of serious pollution and an indication of when the investigation or cleanup of those cases of pollution shall or should commence;
 - a list of measures needed to combat noise annoyance over the next four years;
 - a summary of the financial consequences of the activities referred to including the grants to be requested from [national government];
 - a report of the progress made with the implementation of the current [integrated waste management] plan.

An alternative formatting of the plan is found in the UK Environmental Protection Act (1990)³⁶⁷ shown below. In this approach the plan must contain elements that the Minister has stipulated and details that the local government has to set performance targets, the measures it will take to achieve them and how it cooperates with surrounding jurisdictions.

- Local [government] must prepare and integrated waste management plan which:
 - sets out, by reference to policies contained in the national waste management plan, how the local [government] intends to carry out its functions;
 - contains statements on such matters relating to the carrying out of those functions as [national government] may specify in directions;
 - include statements on:
 - performance targets which the local [government] shall endeavour to meet;
 - steps the local [government] proposes to take to meet performance targets;
 - arrangements for cooperating with other local [governments] to carry out respective waste management functions.

National Government Oversight

Following development of the plan, the Minister provides national government oversight by approving, modifying or refusal and requiring local government to resubmit as found in the UK Environmental Protection Act (1990)³⁶⁸ shown below.

- [National government] shall:
 - Approve the plan without modifications; or
 - Approve the plan with such modifications as they consider appropriate; or
 - refuse to approve the plan and require the local authority to prepare and submit, a further integrated waste management plan.

Licensing

³⁶⁷ http://www.legislation.gov.uk/ukpga/1990/43/pdfs/ukpga_19900043_en.pdf s.44ZA

³⁶⁸ http://www.legislation.gov.uk/ukpga/1990/43/pdfs/ukpga_19900043_en.pdf s.44ZB

Local government can also issues licenses as a way to control waste management activities in their area. These licensing procedures can be very effective in improving the standard of waste management in the area. An example is found in the UK Environmental Protection Act (1990)³⁶⁹ shown below.

- [Local government] must keep a public register of:
 - Licences granted by [local government];
 - Applications to [local government] for licences or modifications to licences;
 - Notices issued effecting the modification of licences;
 - Notices effecting the revocation or suspension of licences or imposing requirements on the holders of licences;
 - appeals relating to decisions of [local government];
- certificates of completion issued by [local government].

Relevant Definitions: Circular Economy, Circulative Resources, Controlled Waste, Cyclical Use, Disposal, Environment, Environmental Pollution, Recovery, Recycling, Waste, Waste Management

Relevant Definitions: Waste Management,

Non-Government Organisations

Non-government organisations are important sources for gaining support, raising awareness, providing information and advice. They may also work to provide services that, for example, reduce waste production. Non-government organisations can be key stakeholders in deciding the political acceptability of waste management policies. National government can play a role in mobilising the non-government organisations to either aid implementation of policies or oppose them. Non-government organisations in the waste sector tend to support environmental good projects. The people involved in the waste area are generally activists who promote best practice or even leading-edge practice without the constraints of economics. These sorts of non-government organisations can be a useful balance to (some) business groups who advocate no change unless it helps the businesses economically. The results tend to be that national government has to play a moderating role so as not to alienate too many people. An example of legislation that recognises that many sectors have responsibility for reducing waste is found in the Japanese Basic Act for the Establishment of a Sound Material-Cycle Society (2000)³⁷⁰ shown below.

[National government] shall take necessary measures to encourage voluntary activities for establishing a [circular economy] by business operators, citizens, or non-government organizations organized by them, including such activities as collecting circulative resources, holding gatherings for the transfer or exchange of circulative resources, and indicating

³⁶⁹ http://www.legislation.gov.uk/ukpga/1990/43/pdfs/ukpga_19900043_en.pdf s.64

³⁷⁰ <https://www.env.go.jp/en/laws/recycle/12.pdf> Art.28

contributions to the cyclical use and disposal of products and containers when they have become circulative resources.

One of the most powerful tools available is information. In the absence of information misinformation appears. Hence, transparency through the provision of accurate information is important for groups to take actions that support government initiatives to minimise waste.

An example of legislation that recognises the importance of information is found in the Japanese Basic Act for the Establishment of a Sound Material-Cycle Society (2000)³⁷¹ shown below.

[National government] shall make efforts to properly provide necessary information on the establishment of a [circular economy], including information on the occurrence of circulative resources and the state of their cyclical use and disposal, to help promote voluntary activities by non-government organisations, etc. towards the establishment of a [circular economy].

Relevant Definitions: Circular Economy, Circulative Resources, Cyclical Use, Disposal, Waste Management, Waste Minimisation

Citizens

Members of the community are involved in many aspects of waste as consumers of goods, waste generators and users of waste minimisation initiatives. Their participation (or lack of it) determines the success (or otherwise) of waste initiatives. The community culture plays a significant role in determining the responses of citizens to government imitated actions. Often the first reactions of citizens are to oppose change that involves them taking more effort. Then comes acceptance when the citizens realise that they can engage in doing environmental good with very little effort and finally they become champions expressing dismay that others are not prepared to engage to the same extent. An example of this was the introduction of recycling bins in Auckland City (New Zealand), with a population at the time of 400,000 people. A call centre was getting 800 phonecalls per day in the month preceding the changeover objecting to the change. Within two weeks of the changeover, the calls had dropped to zero as the people realised that their fears were unfounded.

An example of what can be achieved is found in Uji City, Japan with population of 190,000 people. Citizens are expected to separate their waste into 17 categories to assist the circular economy. Some of this acceptance is due to the ordered society that Japan operates in.

An example of legislation that lays out the duties of citizens to use durable products and promote a circular economy through separation for recycling, returning goods to suppliers where applicable and contributing as individuals to a circular economy is found in the Japanese Basic Act for the Establishment of a Sound Material-Cycle Society (2000)³⁷² shown below.

- Citizens are responsible for making efforts to prevent or reduce the generation of wastes from products and to promote appropriate cyclical use of the products that have become

³⁷¹ <https://www.env.go.jp/en/laws/recycle/12.pdf> Art.28

³⁷² <https://www.env.go.jp/en/laws/recycle/12.pdf> Art.12

circulative resources, as well as for cooperating with [national] and local governments regarding policies and measures on the proper disposal of such products by using products as long as possible, using recycled articles, and cooperating in the separation and collection of circulative resources.

- In addition to the provisions in the preceding paragraph, citizens are responsible for cooperating in measures implemented by relevant business operators, by delivering the products, containers that have become circulative resources properly to the business operators stipulated in that paragraph and by other appropriate practices.
- In addition to the provisions in the foregoing two paragraphs, citizens are, responsible for making their own efforts towards the formation of a [circular economy] and for cooperating in the policies and measures implemented by [national] or local governments for establishing a [circular economy].

The public can play a very useful role as an informal monitor and voice for compliance or change. The 'name and shame' approach can be a very effective tool for change. This requires a robust and transparent system. It needs to be robust to stand up to polluter (and public) scrutiny and transparent so that the affected parties from air pollution (the public) are aware of what is happening in their neighbourhood. Along with transparency comes timeliness. These days there are many avenues for real time (or close to real time) monitoring (e.g. public display screens or websites). For example, the world air quality index³⁷³ displays near real time data on particulate matter for sites around the world. An example of legislation requiring public reporting is found in the German Federal Immission Control Act (2002)³⁷⁴ shown below.

The public shall be provided with relevant information on air quality as required by any ordinances [/bylaws]. [Local government] shall without undue delay announce to the public any non-compliance with alert thresholds determined as immission values in ordinances [/bylaws] through radio, television, the press or in other ways.

Further actions, other than just public announcements, are needed where acceptable immission limits are exceeded. The development of a clean air plan can provide an opportunity for the polluters and local government to develop a sustainable course of action that is acceptable to both and has the support of the public through a transparent process. An example of legislation setting up the process is found in the German Federal Immission Control Act (2002)³⁷⁵ shown below and when used in collaboration with the previous clause above, provides a strong approach. Note that the plan may need to consider the effects on neighbouring local government areas.

If the immission limits specified in an ordinance [/bylaw], including any margins of tolerance defined therein, are exceeded, [local government] shall draw up a clean air plan that defines the necessary measures for achieving a durable reduction of air pollution and conforms to the requirements of the ordinance [/bylaw].

³⁷³ <http://waqi.info/>

³⁷⁴ http://www.bmub.bund.de/fileadmin/bmu-import/files/english/pdf/application/pdf/bimschg_en_bf.pdf
s.46a

³⁷⁵ http://www.bmub.bund.de/fileadmin/bmu-import/files/english/pdf/application/pdf/bimschg_en_bf.pdf
s.47

Relevant Definitions: Circular Economy, Circulative Resources, Cyclical Use, Disposal, Recycling, Waste, Waste Minimisation

Relevant International Agreements:

- Convention on Biological Diversity (CBD) 1992
- Convention on the Transboundary Effects of Industrial Accidents, Helsinki, 1992
- Framework Convention on Climate Change (UNFCCC), New York, 1992
- Strategic Approach to International Chemicals Management 2006
- The Global Programme of Action for the Protection of the Marine Environment from Land Based Activities 1995

Private sector

The private sector is a major actor in determining waste generation. Business decisions from the design or importing of a product through to the end-of-life processes determine the magnitude of the environmental impact. Many business waste generators will engage the private sector to manage their waste.

The move towards a circular economy requires businesses to take a life cycle approach when thinking about their products. Businesses on a journey to a circular economy show a progression of responses. A common starting point is for business to sell anything that the consumer will buy. The next step is that when the business sees a need to tap into an environmental market, they sell the same goods but track their business performance focusing on how much energy they can save and how much of their waste can be recycled. When they see the gains achieved through such simple changes, they either become complacent or see how they can make further changes to improve the environmental credentials of their products, including through procurement decisions. It is at this point that large environmental gains can accrue.

Durability

Prevention of waste can be challenging to manage. Consumer-based societies rely on obsolescence of products to fuel the economy. Making durable goods intuitively means that the market becomes saturated and reduces future demand. However, evidence shows that durable products can displace shorter-life products and shift the market. For example, the rise of Japanese cars in the United States through better quality had the flow on effect of American manufacturers improving their quality, with the result that the consumer benefitted through better, longer-life cars³⁷⁶. Overall, the market has grown over the years faster than the population increase³⁷⁷.

³⁷⁶ Garvin, DA. (1984). Product quality: An important strategic weapon. *Business Horizons*, Vol. 27, No.3, May-June, pp.40 – 43

³⁷⁷ Wu, T, Zhao, H and Ou, X. (2014). Vehicle Ownership Analysis Based on GDP per Capita in China: 1963–2050. *Sustainability*, vol. 6, pp. 4877-4899; doi:10.3390/su6084877

Businesses tend to raise the argument that as they are providing a social good (e.g. employment and improving the economy of the area) they should be exempt or pay a reduced portion. Another argument that business brings up is that if they are subjected to more costs it would make their operation uneconomic and they would have to close or move to another area, thus affecting employment and commerce. Local government would need to judge the authenticity of the statements and how they will react. Some options are to give an extended (defined) period for compliance, provide loans or grants to provide technology to eliminate or mitigate the emissions and to provide assistance (e.g. consultants) to improve their processes. An example of implementing a proportional scheme is found in the German Federal Immission Control Act (2002)³⁷⁸ shown below.

The measures shall, on the basis of the respective contribution to the total emissions and in accordance with the principle of proportionality, be applied to all those emitters who are partly responsible for immission values being exceeded or for any other harmful effects on the environment caused in an area subject to investigation.

Further powers that can be given to local government are that if there is a risk of exceedances then ordinances may specify for particular areas that it is illegal to operate specified mobile equipment, to construct specified equipment and operation restrictions (time or meeting more demanding constraints), or fuel restrictions. These restrictions can drive better behaviour, but note that businesses may raise similar arguments as in the previous paragraph. An example of this is found in the German Federal Immission Control Act (2002)³⁷⁹ shown below.

If there is a risk that any immission limits specified in an ordinance [/bylaw] are exceeded, the designated authorities are authorised to require by ordinance [/bylaw] that in certain areas to be specified, it shall not be permissible:

- to operate certain non-stationary installations;
- to construct certain stationary installations;
- to operate certain non-stationary or stationary installations unless they are operated at fixed times only or meet more stringent technical requirements; or
- to use certain fuels in such installations or to use them on a larger scale,

where installations or fuels are likely to contribute to exceeding the immission values.

The responsibilities for business in a circular economy are to manage goods to have the least impact on the economy. An example of legislation that encapsulates these principles is found in the Japanese Basic Act for the Establishment of a Sound Material-Cycle Society (2000)³⁸⁰ shown below. There is an accent on extended producer responsibility in the Japanese approach.

³⁷⁸ http://www.bmub.bund.de/fileadmin/bmu-import/files/english/pdf/application/pdf/bimschg_en_bf.pdf
s.47

³⁷⁹ http://www.bmub.bund.de/fileadmin/bmu-import/files/english/pdf/application/pdf/bimschg_en_bf.pdf
s.47

³⁸⁰ <https://www.env.go.jp/en/laws/recycle/12.pdf> Art. 11

- In conducting business activities business operators are responsible for taking necessary measures to prevent or reduce the incidence of raw materials, etc. becoming wastes, etc. in the course of business activities. When raw materials, etc. have become circulative resources in the course of business activities, business operators are responsible for undertaking proper cyclical use of such resources through self-initiated actions, or for taking necessary measures to enable proper cyclical use to take place. In cases in which raw materials, etc. cannot undergo cyclical use, business operators are responsible for undertaking proper disposal, on their own responsibility.
- Business operators engaged in the manufacturing, sale, etc. of products, containers, etc. are, in the course of business activities, responsible for taking necessary measures to prevent or reduce the incidence of such products, containers, etc. from becoming wastes, including by increasing the durability of the products, containers, etc. concerned, and by strengthening systems for conducting repairs to these goods. At the same time, these business operators are responsible for taking necessary measures to facilitate the proper cyclical use of, and to minimize the difficulties involved in the proper disposal of, such products, containers, etc. that are circulative resources, by improving the design of these products, containers, etc., indicating their materials or components, and other means.
- In addition to the provisions in the preceding paragraph, it is necessary for [national government], local governments, business operators, and citizens to properly divide their respective roles in order to undertake in a proper and smooth manner the cyclical use of products, containers, etc. which have become circulative resources. In cases in which the roles of any particular business operators are deemed important in establishing a [circular economy] from the viewpoint of such considerations as the design and selection of raw materials for products, containers, etc. and the collection, etc. of products, containers, etc. that have become circulative resources, the business operators undertaking the manufacture, sale, etc. of these products, containers, etc. are themselves responsible for collecting or delivering, or undertaking the proper cyclical use of, these products, containers, etc. which have become circulative resources, as their responsibility within the division of roles.
- In cases in which the cyclical use of circulative resources is both technically and economically possible and in which the promotion of cyclical use is deemed important for the establishment of a [circular economy], business operators able to undertake the cyclical use of these circulative resources, are responsible for undertaking the proper cyclical use of these circulative resources in the course of business activities.
- In addition to the provisions in the foregoing paragraphs, business operators are responsible for making their own efforts towards the establishment of a [circular economy] by using recycled articles, etc. in the course of business activities, and for cooperating with policies and measures implemented [national government] or local governments towards the establishment of a [circular economy].

Relevant Definitions: Circular Economy, Circulative Resources, Cyclical Use, Disposal, Lifecycle, Prevention, Waste

Relevant International Agreements:

- Basel Convention on the Transboundary Movement of Hazardous Wastes 1989
- International Convention for civil liability for oil pollution Damage 1992
- International Convention on Civil Liability for Bunker Oil Pollution Damage, 2001
- OECD Decision C(92)39/FINAL on the Control of Transfrontier Movements of Wastes Destined for Recovery Operations
- Vienna Convention for the Protection of the Ozone Layer, 1985

Liquid Waste

Liquid waste, particularly sewage, is best managed by local government to get economies of scale and the ability to pipe it economically to treatment plants to clean up rivers and lakes. An example providing for this is found in the UK Environmental Protection Act (1990)³⁸¹ shown below.

[Local government] may construct, lay and maintain, within or outside its area, pipes and associated works for the purpose of collecting waste.

Material Collection

As well as the collection of waste, local government can make provisions to collect materials that can be reintroduced into the economy after processing or separation. It is often useful to start with a few categories and expand these as confidence and experience in managing the system increases. An example is found in the UK Environmental Protection Act (1990)³⁸² shown below.

[Local government] must make provision to collect at least two types of recyclable waste (capable of being recycled or composted) together or individually separated from the rest of the household waste where reasonably financial practical.

- [Local government] can require the occupier to place the waste for collection in receptacles of a kind and number specified

As mentioned above, local government can engage in collections from commercial premises. From a time efficiency perspective it is normal to specify what receptacles are acceptable and how the waste is to be collected. An example from the UK Environmental Protection Act (1990)³⁸³ is shown below.

[Local government] may, upon request, supply waste receptacles for commercial or industrial waste and arrange to collect for a reasonable charge;

- the authority may make provision with respect to:
 - the size, construction and maintenance of the receptacles;
 - the placing of the receptacles for the purpose of facilitating the emptying of them, and access to the receptacles for that purpose;
 - the placing of the receptacles for that purpose on roads;

³⁸¹ http://www.legislation.gov.uk/ukpga/1990/43/pdfs/ukpga_19900043_en.pdf s.45

³⁸² http://www.legislation.gov.uk/ukpga/1990/43/pdfs/ukpga_19900043_en.pdf s.45A.2

³⁸³ http://www.legislation.gov.uk/ukpga/1990/43/pdfs/ukpga_19900043_en.pdf s.47

- the substances or articles which may or may not be put into the receptacles and the precautions to be taken where particular substances or articles are put into them; and
- the steps to be taken by occupiers of premises to facilitate the collection of waste from the receptacles.

One of the issues that arise with waste collection is with unlicensed operators sorting through material put out for collection to separate materials that could be on sold. This has two effects: the official waste collector loses potential income if they decide to later separate waste; and the unlicensed operator can leave a mess while searching through the waste which has to then be cleaned up by someone. An example of legislation prohibiting this is found in the UK Environmental Protection Act (1990)³⁸⁴ shown below.

No one can sort over or disturb anything deposited at a place for the deposit of waste provided by a waste collection authority including roadside containers without consent.

Relevant Definitions: Air, Commercial Waste, Controlled Waste, Disposal, Dumping, Household Waste, Industrial Waste, Treatment, Waste, Waste Management, Waste Minimisation

Relevant International Agreements:

- The Global Programme of Action for the Protection of the Marine Environment from Land Based Activities 1995

³⁸⁴ http://www.legislation.gov.uk/ukpga/1990/43/pdfs/ukpga_19900043_en.pdf s.60.1

AUDITING AND REPORTING

This section covers general provisions for auditing and reporting. These provisions should be read in conjunction with legislation on environmental audits. The section covers the following provisions:

- Auditing;
- Data/Information;
- Monitoring; and
- Reporting.

Audit

Auditing is necessary function to evaluate the effectiveness of controls. An effective system of controls is vital to achieve the business objectives, obtain reliable financial reporting on the operations and prevent fraud and misappropriation of assets. Ensuring that the requirements of legislation are followed and no falsified information is submitted safeguards the integrity of the provisions of legislation. In the waste sense three critical areas for auditing are a waste levy collection system, grants allocations and hazardous substances.

A waste levy collection system requires measurement of quantities, reporting, payment of the levy and refunds where appropriate. The connection between the measurement of quantities and translating it into financial terms is the key step. Solid waste is recorded with either a weighbridge (or equivalent) or volume equivalent; liquid and air emissions can be measured by metering. In each case calibration of the measuring device is needed; specifications for carrying this out are usually legislated for in 'weights and measures' type legislation.

The use of grants is another area that is open to abuse. When public money is being used for projects, the public need to have confidence that the money is being used appropriately. Lack of accountability leads to a breakdown in public trust and aids corruption.

Auditing the tracking process for hazardous waste is especially important since small quantities of hazardous waste inappropriately disposed of can have a significant environmental impact over a wide area.

An example of legislation requiring auditing of waste disposal and grant allocations is found in the NZ Waste Minimisation Act (2008)³⁸⁵ shown below.

An auditor may audit:

- A disposal facility for payment of the levy and compliance with record keeping;
- Any person who is required to keep records;
- A levy collector with respect to levy collection;
- A territorial authority that receives levy money; or
- Any person who is paid levy money for projects or product stewardship schemes.

³⁸⁵ <http://www.legislation.govt.nz/act/public/2008/0089/latest/DLM999802.html> s.88

An example for hazardous waste auditing is found in the US Pollution Prevention Act (1990)³⁸⁶ shown below.

Operators of facilities emitting toxic chemicals need to report annually on techniques for source reduction opportunities including:

- external and internal audits; and
- material balance audits.

Relevant Definitions: Disposal, Disposal Facility, Emissions, Hazardous Waste, Reduction

Relevant International Agreements:

- ASEAN Agreement on the Conservation of Nature and Natural Resources 1985
- Convention on the Transboundary Effects of Industrial Accidents, Helsinki, 1992
- European Agreement Concerning the International Carriage of Dangerous Goods by Inland Waterways (AND), Geneva, 2000. Including the Annex Regulation (2011)
- Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships, 2009
- International Convention for the Prevention of Pollution from Ships (MARPOL 1973) and 1978 Protocol
- Kyoto Protocol 1997
- United Nations Convention on the Law of the Sea (UNCLOS) 1982

Data/ Information

One of the important goals of policy is to improve the quality of the information available to make decisions. Businesses in the waste sector inevitably have waste data they make their business decisions on. They are reluctant to share that data with local and national government as there are fears that those entities can use the data to against them, or for setting up competing operations or, if the data becomes publicly available, can provide strategic information to actual and potential competitors in the private sector.

Businesses will also argue that the collection of data is an expensive operation and some will suggest that a cost/benefit exercise should be a determinant in seeking new data disclosure. However, national (and to a lesser extent local) government need to get quality information on waste and minimisation to carry out its functions in driving the strategic direction of the country or local government area.

Regulations are generally a faster way of getting change than legislation. It is often convenient for legislation to set up framework powers to enable regulations to manage the detail over time. An example providing for this is found in the NZ Waste Minimisation Act (2008)³⁸⁷ shown below.

Regulations can be made for:

³⁸⁶ <http://www.epw.senate.gov/PPA90.pdf> s.6607.b

³⁸⁷ <http://www.legislation.govt.nz/act/public/2008/0089/latest/DLM999802.html> s.86

- Disposal facility operators to provide records and information to enable amounts of levy payable by the operator to be accurately calculated;
- Any class of person to provide records and information to assist in:
 - Measuring progress in waste management and minimisation;
 - Report on the state of the environment;
 - Assess performance in waste minimisation and decreasing waste disposal;
 - Identify improvements needed in infrastructure for waste minimisation.

Power to make a wider set of regulations from an integrated waste management perspective are found in the UK Pollution Prevention and Control Act (1999)³⁸⁸ shown below. This example also provides for getting information on the destination of waste.

The Secretary of State may by regulations make provision for enabling persons of any specified description (whether or not they are holders of permits) to be required:

- to compile information:
 - on emissions within the meaning of the regulations;
 - on energy consumption and on the efficiency with which energy is used;
 - on waste within the meaning of the regulations and on the destinations of such waste;
- to provide such information in such manner as is specified in the regulations.

In small countries with only one or two main providers of waste disposal services it may be difficult getting over the commercial sensitivity barrier. One solution is that the information is supplied to the government department that is authorised to collect it and they hold it securely and use it to inform policy, but do not make it publicly available. The issue of public accessibility to information is covered in the UK Pollution Prevention and Control Act (1999)³⁸⁹ shown below.

The Secretary of State may by regulations make provision for securing:

- that publicity is given to specified matters;
- that regulators maintain registers of specified matters (but excepting information which under the regulations is, or is determined to be, commercially confidential and subject to any other exceptions specified in the regulations) which are open to public inspection.

Another significant use of data is to inform the public on best practice. This is often done by setting up a database that is accessible to the public. If industry information forms part of the database, then sufficient information should be given to profile the industry initiative, but commercially sensitive parts should not be included. An example for setting up such a database is found in the US Pollution Prevention Act (1990)³⁹⁰ shown below.

- [National government] shall establish a Source Reduction Clearinghouse to compile information including a computer database which contains information on management, technical, and operational approaches to source reduction. [National government] shall use the clearinghouse to:

³⁸⁸ <http://www.legislation.gov.uk/ukpga/1990/43/data.pdf> s.11

³⁸⁹ <http://www.legislation.gov.uk/ukpga/1990/43/data.pdf> s.12

³⁹⁰ <http://www.epw.senate.gov/PPA90.pdf> s.6606.a & b

- serve as a centre for source reduction technology transfer;
- mount active outreach and education programs by [local government] to further the adoption of source reduction technologies; and
- collect and compile information reported by [local government] receiving grants on the operation and success of [local government] source reduction programs.
- [National government] shall make available to the public such information on source reduction as is gathered and such other pertinent information and analysis regarding source reduction as may be available to [national government]. The database shall permit entry and retrieval of information to any person.

Relevant Definitions: Disposal, Disposal Facility, Emissions, Environment, Reduction, Waste, Waste Management, Waste Minimisation

Relevant International Agreements:

- ASEAN Agreement on the Conservation of Nature and Natural Resources 1985
- Basel Convention on the Transboundary Movement of Hazardous Wastes 1989
- Benelux Convention on Nature Conservation and Landscape Protection 1982
- Convention concerning the Use of White Lead in Painting 1921, Convention for the Protection and Development of the Marine Environment in the Wider Caribbean Region (Cartagena Convention, 1983)
- Convention for the Protection of the Natural Resources and Environment of the South Pacific Region 1986, Convention on Biological Diversity (CBD) 1992
- Convention on Long-Range Trans-Boundary Air Pollution (LRTAP), Geneva 1979
- Convention on the Transboundary Effects of Industrial Accidents, Helsinki, 1992
- Convention to Combat Desertification (UNCCD) 1996
- European Agreement Concerning the International Carriage of Dangerous Goods by Inland Waterways (AND), Geneva, 2000. Including the Annex Regulation (2011)
- FAO International Code of Conduct on the distribution and use of Pesticides, Rome, 1985. (Revised Version 2005, Rome)
- Gothenburg Protocol on the reduction of acidification, eutrophication and ground-level, 1999
- Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships, 2009
- International Convention for the Prevention of Pollution from Ships (MARPOL 1973) and 1978 Protocol
- London Convention -Protocol on London Convention 1996
- Minamata Convention on Mercury 2013
- Montreal Protocol on Substances that Deplete the Ozone Layer 1989
- OECD Decision C(92)39/FINAL on the Control of Transfrontier Movements of Wastes Destined for Recovery Operations
- Rotterdam Convention 1998
- Strategic Approach to International Chemicals Management 2006

- The Convention for Protection of the Mediterranean Sea against Pollution (Barcelona Convention) 1976
- The Global Programme of Action for the Protection of the Marine Environment from Land Based Activities 1995
- United Nations Convention on the Law of the Sea (UNCLOS) 1982
- Vienna Convention for the Protection of the Ozone Layer, 1985
- Working Environment (Air Pollution, Noise and Vibration) Convention, 1977

Monitoring

A good information base allows monitoring of progress which can then be translated into reports that inform policymakers and others for decision-making processes. Monitoring can be conducted either internally or through external agencies. Self-monitoring and reporting require a degree of trust that should be checked through regular audits by external parties (either local or national government or third party providers).

The requirement for monitoring can be through surveying periodically, or for set periods or continuously. Continuous monitoring can be the most expensive solution and thought should be given to the environmental and/or health benefit versus the cost for continuous monitoring. An example for surveying is found in the Japanese Basic Act for the Establishment of a Sound Material-Cycle Society (2000)³⁹¹ shown below.

[National government] shall conduct necessary surveys to prepare and implement appropriately the policies and measures for establishing a [circular economy], including surveys of the occurrence, cyclical use and disposal of circulative resources, their future outlook, or the environmental impact of disposal of circulative resources.

An example of focused monitoring for facilities that can have serious human health and environmental impacts is found in the US Resource Conservation and Recovery Act (1976)³⁹² shown below. Note that this could be extended to solid and liquid waste emissions for an integrated waste management approach.

[National government] shall promulgate regulations for the monitoring and control of air emissions at hazardous waste treatment, storage, and disposal facilities, including but not limited to open tanks, surface impoundments, and landfills, as may be necessary to protect human health and the environment.

A comprehensive monitoring programme can include assurance that activities meet best practice in terms of emission control and testing regimes. Where self-monitoring is permitted self-reporting is also a requirement. Best practice ensures that the results of regular monitoring are reported to the authorities as well as all incidents where variances from permitted activities

³⁹¹ <https://www.env.go.jp/en/laws/recycle/12.pdf> Art.29

³⁹² <https://www.law.cornell.edu/uscode/text/42/chapter-82> s.3004.n

occur. An example of specifying a monitoring regime (in this case for landfills) is found in the German Circular Economy Act (2012)³⁹³ shown below.

The [National] Government shall be empowered, after consulting the parties concerned, to mandate, that the construction, characteristics, operation, condition following closure and operator monitoring of landfills must meet certain requirements; in particular, it may mandate:

- that sites must conform to certain requirements;
- that landfills must meet certain operational, organisational and technical requirements;
- that the waste stored in landfills must conform to certain requirements; in so doing, it may be provided in particular that waste with certain metal contents may not be stored and what waste is regarded as inert waste;
- that the emissions produced by landfills must not exceed certain maximum levels;
- that operators must carry out, or have carried out, certain measurement and supervisory activities during operation and in the after-care phase;
- that operators must have an expert carry out certain tests;
 - during construction or otherwise prior to the start-up of landfill operations,
 - following the start-up of landfill operations, or following a change;
 - at regular intervals; or
 - upon or following closure.
- that, in case of certain events, operators must inform the competent authority within a specified period of time, take the necessary measures to prevent and limit adverse effects on public well-being, or that the competent authority must oblige the operator to take such measures;
- that operators must report to the competent authority without delay during operations and in the after-care phase all results of monitoring that provide indications of significant adverse environmental impacts, as well as certain events that may have such impacts, and to provide the competent authority with regular reports on the results of the measurement and monitoring activities prescribed by the statutory ordinance.

Relevant Definitions: Air, Circular Economy, Circulative Resources, Controlled Waste, Cyclical Use, Disposal, Emissions, Environment, Hazardous Waste, Landfill, Storage, Treatment, Waste, Waste Management

Relevant International Agreements:

- Bamako Convention on the ban on the Import into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes within Africa 1998
- Basel Convention on the Transboundary Movement of Hazardous Wastes 1989
- Convention for the Protection and Development of the Marine Environment in the Wider Caribbean Region (Cartagena Convention, 1983)
- Convention for the Protection of the Natural Resources and Environment of the South Pacific Region 1986

³⁹³ http://www.bmub.bund.de/fileadmin/Daten_BMU/Download_PDF/Abfallwirtschaft/kreislaufwirtschaftsgesetz_en_bf.pdf s.43

- Convention on Biological Diversity (CBD) 1992
- Convention on the Transboundary Effects of Industrial Accidents, Helsinki, 1992
- European Agreement Concerning the International Carriage of Dangerous Goods by Inland Waterways (AND), Geneva, 2000. Including the Annex Regulation (2011)
- FAO International Code of Conduct on the distribution and use of Pesticides, Rome, 1985. (Revised Version 2005, Rome)
- Framework Convention on Climate Change (UNFCCC), New York, 1992
- Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships, 2009
- International Convention for the Prevention of Pollution from Ships (MARPOL 1973) and 1978 Protocol
- Rotterdam Convention 1998
- Strategic Approach to International Chemicals Management 2006
- The Global Programme of Action for the Protection of the Marine Environment from Land Based Activities 1995
- United Nations Convention on the Law of the Sea (UNCLOS) 1982
- Working Environment (Air Pollution, Noise and Vibration) Convention, 1977

Reporting

Reporting provides an opportunity to publicise progress, achievements and difficulties. At the highest level of government, ministries report to parliament for their scrutiny. An annual report on these factors is quite common. The report is one way to highlight to parliament areas of importance. This is one way to increase the profile of work done by an agency and encourage the minister to focus on these areas. An example on how the integrated waste management processes have progressed the move to a circular economy is found in the Japanese Basic Act for the Establishment of a Sound Material-Cycle Society (2000)³⁹⁴ shown below.

- [National government] shall submit annually to the [parliament] reports on the state of the generation, cyclical use and disposal of circulative resources, and on the policies and measures the government has implemented towards the establishment of a [circular economy].
- [National government] shall annually prepare and submit to the [parliament] documents clarifying the policies and measures it is going to implement in light of the state of the generation, cyclical use and disposal of circulative resources as reported under the preceding paragraph.

An example of more detailed requirements to be contained in the report to parliament is found in the US Pollution Prevention Act (1990)³⁹⁵ shown below. The legislation below focuses on the trends in source reduction in industry. The reporting looks at trends on an industry by industry basis looking for confirmation on the validity of the data and what is needed to make the

³⁹⁴ <https://www.env.go.jp/en/laws/recycle/12.pdf> Art.14

³⁹⁵ <http://www.epw.senate.gov/PPA90.pdf> s.6608.b

reporting more useful. The report also needs to consider changes that would remove barriers to improvement and provide incentives for source reduction.

[National government] reports to [parliament] on:

- Analysis of the data on an industry-by-industry basis including an evaluation of trends in source reduction by industry, firm size, production, or other useful means;
- An analysis of the usefulness and validity of the data for measuring trends in source reduction and the adoption of source reduction by business;
- Identification of regulatory and non-regulatory barriers to source reduction;
- Opportunities for using existing regulatory programmes, and incentives and disincentives to promote and assist source reduction;
- Recommendations for incentives needed to encourage investment and research and development in source reduction;
- Identification of opportunities and development of priorities for research and development in source reduction methods and techniques;
- evaluation of the cost and technical feasibility for source reduction opportunities and
- Current activities and identification of industries with significant barriers to source reduction; and
- Evaluation of methods of coordinating, streamlining, and improving public access to data.

Transparency

Transparency in operations enhances good practice. Local government may demand transparency from its waste operators. One way of achieving this is to licence operators and require them to report on types of waste, nature of it and the quantities. Licencing provides an opportunity to ensure that the person or organisation being licenced is reliable and that there is sufficient knowledge and expertise to do the job. An example of this is found in the German Circular Economy Act (2012)³⁹⁶ shown below.

A statutory ordinance [/bylaw] in accordance may prescribe that parties putting into circulation or disposing of certain waste with regard to the treatment, collection, gathering, transport, storage and deposit of which special requirements are to be made due to their type, nature or quantity:

- must report such;
- shall require a licence to do so;
- must meet certain requirements with regard to their reliability; or
- must prove their necessary expertise or knowledge in a procedure to be stipulated in detail.

Licensed Waste Establishments

Licensed waste establishments are another category from which it is useful to gain information. The reports that provide the most useful information are ones written in a way that can be

³⁹⁶ http://www.bmub.bund.de/fileadmin/Daten_BMU/Download_PDF/Abfallwirtschaft/kreislaufwirtschaftsgesetz_en_bf.pdf s.16

understood by the general public but contain enough technical information to give an accurate picture of what has happened in the establishment over the preceding year. An example of reporting criteria is found in the Netherlands Environmental Management Act (2004)³⁹⁷ shown below.

- The person who operates the [licensed] establishment shall each year draw up an environmental report which is formulated concisely and in a manner that is intelligible for the general public.
- The report shall contain an overall description for the reporting year of:
 - the nature of the establishment and the activities and processes in the establishment;
 - the adverse effects on the environment caused by the establishment, including a summary of the relevant quantitative data;
 - the technical, organisational and administrative measures taken and facilities installed in respect of the establishment in order to protect the environment.
- The report shall provide information on:
 - the main changes that have taken place in the reporting year in relation to the previous reporting year; and
 - the developments that may reasonably be expected in the next reporting year.

Streamlining

There can be a tendency for different parts of an organisation to require the same information, perhaps presented in slightly different formats. Businesses realise that reporting is a necessary function for the smooth operation of a licensing system and it is to their benefit to show that they are a responsible operator, willing to give honest information.

Streamlining of the reporting requirements will cut down on business costs (and their frustrations). In setting up a reporting scheme legislators should consider what is already required from the target audience and whether that can be used to provide the needed information. An example of this is found in the Netherlands Environmental Management Act (2004)³⁹⁸ shown below, where those businesses that are part of a product stewardship or extended producer responsibility scheme are not required to produce this additional report as they already report on progress through the scheme. In this way businesses that are involved in doing 'environmental good' are not penalised.

The requirement that an environmental report be drawn up for the public shall not apply if the person operating the establishment has registered as an organisation in relation to [product stewardship or extended producer responsibility scheme(s)] and is included as such in the list of registered organisations.

Commercial Aspects

Commercial confidentiality and secrecy are issues that need addressing within a reporting requirement. There is a need to maintaining privacy, but vital information that has a significant

³⁹⁷ <http://www.asser.nl/upload/eel-webroot/www/documents/national/netherlands/EMA052004.pdf> s.12.2

³⁹⁸ <http://www.asser.nl/upload/eel-webroot/www/documents/national/netherlands/EMA052004.pdf> s.12.3

bearing for assessing the situation in a business needs reporting. In most situations the position of the line would be determined on a case by case basis, however, countries should be guided by their current legislation on information access acts.

Commercial advantage is something that keeps many businesses alive and protecting that assists businesses to carry on functioning. If commercially sensitive data is needed as part of a reporting system, it should be kept secure within the agency requesting the report.

Another worldwide issue is that of terrorism, either electronic or physical, and measures need to be taken that reporting requirements do not compromise security. As for commercial sensitivity, if a report needs to contain data that could compromise security, it needs to be kept secure. An example providing for this is found in the Netherlands Environmental Management Act (2004)³⁹⁹ shown below.

It shall not be necessary for an environmental report that is made public to contain commercial secrets or security information with regard to which an irrevocable decision to maintain secrecy has been taken for an earlier reporting year.

Timeliness

Timely reporting is a necessary feature to enable any remedial action to be taken to minimise health and environmental impacts where necessary. Responsible businesses will take action during the year and report on the actions taken, rather than wait for a government agency to require them to do so. It is quite common to require end of year reporting to be available within 3 months of the close of the year. Publication of the reports normally happens after an agency has had time to consider, review, seek clarification and receive responses to their satisfaction. An example requiring this is found in the Netherlands Environmental Management Act (2004)⁴⁰⁰ shown below.

- The person who operates the establishment shall, as soon as possible after an environmental report for [local government], has been drawn up, but no more than three months after the end of the reporting year, submit [an] environmental report for the previous reporting year to [national government].
- At the earliest opportunity, but no later than six months after the end of the reporting year, the person who operates the establishment shall, upon request, permit any person to inspect free of charge, or shall provide in return for payment no greater than the cost, a copy of an environmental report.

Review

Robustness of the reporting is achieved through a review process. Not every annual report needs peer review, but it is advisable that any that are flagged for issues plus a selection of the others are reviewed. This ensures robustness of the system as well as the reports. An example

³⁹⁹ <http://www.asser.nl/upload/eel-webroot/www/documents/national/netherlands/EMA052004.pdf> s.12.6.4
⁴⁰⁰ <http://www.asser.nl/upload/eel-webroot/www/documents/national/netherlands/EMA052004.pdf> s.12.7

requiring this is found in the Netherlands Environmental Management Act (2004)⁴⁰¹ shown below.

The person who operates the establishment shall allow an independent expert to assess whether the report provides a true picture of the environmental pollution caused by the establishment and the environmental measures taken in operating the establishment in the reporting year.

Similar obligations should be put on local government to report to national government on their activities in relation to their responsibility.

Relevant Definitions: Circular Economy, Circulative Resources, Cyclical Use, Disposal, Effect on the Environment, Environment, Environmental Pollution, Protecting the Environment, Reduction, Waste Management

Relevant International Agreements:

- Basel Convention on the Transboundary Movement of Hazardous Wastes 1989
- European Agreement Concerning the International Carriage of Dangerous Goods by Inland Waterways (AND), Geneva, 2000. Including the Annex Regulation (2011)
- FAO International Code of Conduct on the distribution and use of Pesticides, Rome, 1985. (Revised Version 2005, Rome)
- Gothenburg Protocol on the reduction of acidification, eutrophication and ground-level, 1999
- Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships, 2009
- International Convention for the Prevention of Pollution from Ships (MARPOL 1973) and 1978 Protocol
- London Convention 1972
- London Convention - Protocol on London Convention 1996
- Minamata Convention on Mercury 2013
- Montreal Protocol on Substances that Deplete the Ozone Layer 1989
- OECD Decision C(92)39/FINAL on the Control of Transfrontier Movements of Wastes Destined for Recovery Operations
- Strategic Approach to International Chemicals Management 2006
- The Global Programme of Action for the Protection of the Marine Environment from Land Based Activities 1995
- United Nations Convention on the Law of the Sea (UNCLOS) 1982

⁴⁰¹ <http://www.asser.nl/upload/eel-webroot/www/documents/national/netherlands/EMA052004.pdf>
s.12.10.1

MEASURES FOR COMPLIANCE AND ENFORCEMENT

This section provides for a graduated response from authorities. The progression provides for compliance tools followed by administrative action. If this does not succeed civil and criminal actions can ensue. Environmental legislation often contains additional tools that can be utilised to assist waste compliance and enforcement. The section covers the following provisions:

- Licensing;
- Company Waste Management Officer;
- Immission Control Officer;
- Liability;
- Enforcement; and
- Offences and penalties.

Licensing

Licensing of premises that recover, treat or dispose of waste is common, as is licensing of waste collection and disposal operations (see earlier for comment on the last two categories). These types of industries have the potential to cause significant negative environmental impacts, as well as significant environmental benefits. The purpose of licensing in such situations is to minimise the former and maximise the latter. The licensing of premises needs adequate reporting mechanisms to determine environmental impacts.

Licensing should not be open-ended. A review after a set period provides an opportunity to assess the effectiveness of the licensee in reducing the environmental impact of their operation. In the example below from the Netherlands Environmental Management Act (2004)⁴⁰², the review period is five years. This is a convenient period as this means the business is able to get on with its day to day operations, but has a periodic check in place to ensure it is keeping up with best practice.

If a licence relates to an establishment where waste substances are recovered or disposed of, the licence shall at least contain the obligations to record and keep the data for at least five years:

- waste substances designated therein that are recovered or disposed of in the establishment: by quantity, nature and origin;
- substances used or consumed in the recovery or disposal of the waste substances: by nature and quantity;
- substances, preparations and other products, including waste substances, generated during recovery or disposal: by nature and quantity;
- the manner in which the waste substances are recovered or disposed of;
- substances, preparations and other products that leave the establishment, in so far as they are generated during recovery or disposal: by nature and quantity.

⁴⁰² <http://www.asser.nl/upload/eel-webroot/www/documents/national/netherlands/EMA052004.pdf> s.8.35.1

Waste facilities are not the only businesses that can produce emissions with significant environmental impacts. This is recognised in the German Federal Immission Control Act (2002)⁴⁰³, shown below, which includes those commercial premises that are likely to cause harmful effects on the environment and must be licensed.

- The construction and operation of installations which, on account of their nature or operation, are particularly likely to cause harmful effects on the environment or otherwise endanger or cause significant disadvantages or significant nuisances to the general public or the neighbourhood, and the construction and operation of stationary waste disposal plants designed to store or treat wastes shall be subject to licensing. With the exception of waste disposal plants, installations which do not serve commercial purposes and are not used within the framework of business undertakings shall not be subject to licensing unless they are particularly likely to cause harmful effects on the environment caused by air pollution or noise.
- Installations subject to licensing shall be constructed and operated in such a way that, in order to ensure a high level of protection for the environment as a whole:
 - harmful effects on the environment or any other hazards, significant disadvantages and significant nuisances to the general public and the neighbourhood are avoided;
 - precautions are taken to prevent any harmful effects on the environment or any other hazards, significant disadvantages or significant nuisances, in particular by such measures as are appropriate according to the best available techniques;
 - wastes are avoided, unavoidable wastes are recovered, and non-recoverable wastes are disposed of without impairing the public welfare; wastes shall be deemed to be unavoidable if avoidance is not technically feasible or not reasonable; avoidance shall be deemed to be inadmissible if it leads to more adverse effects on the environment than would be the case with the option of recovery;
 - economical and efficient energy use is ensured. (GF s. 5)

Monitoring of the emissions is a crucial aspect to determine environmental impacts and progress on reducing impacts that businesses are making. In some cases periodic monitoring is sufficient, but for others continuous monitoring either for specified durations or continually may be needed. An example providing for this is found in the German Federal Immission Control Act (2002)⁴⁰⁴ shown below.

- [Local government] may order that the operator of an installation have the nature and type of the emissions released from such installation and the immissions occurring within the sphere of influence of such installation determined by one of the agencies designated by [local government] if there is reason to fear that harmful effects on the environment may be caused by the installation. [Local government] is authorised to specify details regarding the type and extent of the measurements to be made and regarding the presentation of the results thereof.

⁴⁰³ http://www.bmub.bund.de/fileadmin/bmu-import/files/english/pdf/application/pdf/bimschg_en_bf.pdf
s.4 & 5

⁴⁰⁴ http://www.bmub.bund.de/fileadmin/bmu-import/files/english/pdf/application/pdf/bimschg_en_bf.pdf
s.26, 27 & 29

- The operator of an installation subject to licensing shall provide the [local government] with information on the type and volume and the spatial and temporal distribution of the air pollutants emitted from the installation including the conditions governing such emission (emission declaration).
- In the case of installations subject to licensing, the [local government] may order specific emissions or immissions to be determined continuously by means of measurement loggers in lieu of individual measurements.

Licensing waste collectors and processors provides a greater degree of accountability than having an open market. It is an effective mechanism to reduce waste dumping and poor processing. Both the collectors and the processing facilities need to be licenced. More will be said about licensing later in the document, but an example of provisions calling for licensing are found in the UK Environmental Protection Act (1990)⁴⁰⁵ shown below.

- Operators require a licence:
 - Site licences can be granted by a waste regulation authority
 - Mobile licenses are granted by a waste regulation authority where the operator has its principal place of business
- Public consultation needs to occur when the licence holder proposes to carry out anything that he might not be entitled to do (including variations to already issued licenses).
- Licences can be revoked, suspended, surrendered or transferred.
- Licence applicants or holders can appeal decisions (to [national government]) for unfavourable decisions

Relevant Definitions: Air, Air Pollution, Best Available Techniques, Disposal, Effect on the Environment, Emissions, Environment, Environmental Pollution, Harm, Immissions, Installation, Recovery, Release, Statutory Nuisances, Storage, Treatment, Waste

Company Waste Management Officer

A Company Waste Management Officer is a responsibility in installations that regularly produce hazardous waste, licensed waste producers, and in which waste treatment and disposal operations take place. Their role is to be the designated resource person on waste minimisation and compliance with any integrated waste minimisation legislation. They will usually be the contact person to liaise with local authority monitors.

Some businesses will argue that this is just a cost to business, but these roles can be bundled with health and safety officers (and immission control officers) and just form another part of their job. An example of provisions for company waste management waste officers is found in the German Circular Economy Act (2012)⁴⁰⁶ shown below.

⁴⁰⁵ http://www.legislation.gov.uk/ukpga/1990/43/pdfs/ukpga_19900043_en.pdf s.36

⁴⁰⁶ http://www.bmub.bund.de/fileadmin/Daten_BMU/Download_PDF/Abfallwirtschaft/kreislaufwirtschaftsgesetz_en_bf.pdf s.59 & 60

- Operators of installations subject to licensing, operators of installations in which hazardous waste is regularly produced, operators of stationary sorting, recovery or waste disposal installations, and holders, shall promptly appoint one or more Company Waste Management Officer(s) (Waste Management Officers) to the extent that this is necessary with regard to the type or size of the relevant installations because of the:
 - waste accumulated, recovered or disposed of in the installation;
 - technical problems of prevention, recovery or disposal; or
 - capability of products or goods to cause problems, during or following their use as intended, with regard to proper and safe recovery or environmentally compatible disposal.
- The Waste Management Officer shall advise the operator and the company's personnel on matters that could be of significance with regard to waste prevention and waste management. He/she shall be authorised and obliged:
 - to supervise the stages of waste treatment from its occurrence or delivery to its recovery or disposal;
 - to supervise compliance with the provisions of this Act and of the statutory ordinances [/bylaws] issued on the basis of this Act, as well as fulfilment of existing conditions and restrictions, especially by controlling, at regular intervals, the company installations and the type and nature of the waste which occurs in the installations or which is recovered or disposed of therein, to provide information regarding defects detected and to make proposals for measures for eliminating these defects;
 - to inform company personnel:
 - concerning impairment of the public interest that could result from the waste which occurs, or is recovered or disposed of in the installations;
 - concerning facilities and measures for preventing such impairment of the public interest, taking into account the laws and statutory ordinances [/bylaws] applying to the prevention, recovery and disposal of waste;
 - in case of installations subject to licensing or installations in which hazardous waste regularly occurs to encourage the development and introduction:
 - of environmentally compatible, low-waste processes, including processes for the prevention, proper and safe recovery or environmentally compatible disposal of waste,
 - of environmentally compatible, low-waste-producing products, including processes for re-use, recovery and environmentally compatible disposal upon cessation of their use; and
 - to co-operate in the development and introduction of the processes mentioned, especially by studying the processes and products using criteria of waste management;
 - to also encourage improvements in the process in installations in which waste is recovered or disposed of.

Relevant Definitions: Disposal, Hazardous Waste, Installation, Prevention, Recovery, Treatment, Waste, Waste Management, Waste Minimisation

Immission Control Officer

The Immission Control Officer, like the company waste management officer, has responsibility in installations subject to licensing due to the type and amount of emissions, technical problems with emissions or the potential environmental harmful effects from air pollution, noise or vibrations. Their role is to be the resource person and local authority contact on immission control related to any integrated waste management legislation. An example of provisions for immissions control officers is found in the German Federal Immission Control Act (2002)⁴⁰⁷ shown below.

- Operators of installations subject to licensing shall appoint one or several officers responsible for immission control (immission control officers) if this is deemed necessary in view of the type and size of the installations on account of:
 - the emissions released by the installations;
 - technical problems concerning emission control; or
 - the susceptibility of the products, if used for the intended purpose, to causing any harmful effects on the environment due to air pollution, noise or vibrations.
- The immission control officer shall advise the operator and the staff members on all matters that may be of relevance for immission control. He is authorised and required:
 - to work towards the development and introduction of:
 - environmentally compatible processes, including processes for the prevention or proper and safe recovery of wastes resulting from operation or their disposal as waste, and for the utilisation of any waste heat produced;
 - environmentally compatible products, including processes for recovery and re-use.
 - to cooperate in developing and introducing environmentally compatible processes and products, especially by appraising the environmental compatibility of such processes and products;
 - to measure emissions and immissions, notifying any defects observed and submitting proposals on measures to remedy such defects;
 - to instruct the staff members on the harmful environmental effects caused by their installation and on suitable equipment and measures to prevent such effects, taking into account the obligations ensuing from this Act or any ordinance [bylaw] issued hereunder.

Relevant Definitions: Air, Air Pollution, Disposal, Effect on the Environment, Emissions, Environment, Environmental Pollution, Harm, Immissions, Installation, Prevention, Recovery, Release, Waste, Waste Management

Liability

For ease of administration it is useful to have a strict liability clause whereby it is not necessary to prove intention to commit an offence. This provision removes the defence of ignorance.

⁴⁰⁷ http://www.bmub.bund.de/fileadmin/bmu-import/files/english/pdf/application/pdf/bimschg_en_bf.pdf
s.53 & 54

Different jurisdictions apply strict liability clauses in different ways. Some have no strict liability since it is not consistent with a no punishment without guilt philosophy (e.g. Germany) while others (e.g. USA) only apply it to the most minor offences (e.g. parking infringements). Other jurisdictions (e.g. India) impose strict liability on activities that are hazardous or inherently dangerous resulting in harm due to an accident.

Countries will need to tailor liability clauses that are consistent with other legislation. An example in a waste context is found in the NZ Waste Minimisation Act (2008)⁴⁰⁸ shown below.

In any prosecution for an offence specified, it is not necessary to prove that the defendant intended to commit the offence.

Relevant Definitions: Effect on the Environment, Environment, Harm, Remediation, Waste Minimisation

Relevant International Agreements:

- International Convention for civil liability for oil pollution Damage 1992

Liability Defence

There are some instances when individuals and companies take actions that constitute breaches of legislation when not taking those actions would result in greater damage to human health or the environment. Actions that fall into this category are, for example, saving lives, protecting property or the environment from serious damage. To be defensible, the actions need to be judged reasonable, caused by circumstances beyond the control of the person taking the actions, could not have been reasonably foreseen or prevented and the effects were minimised. An example of legislation providing for this is found in the NZ Waste Minimisation Act (2008)⁴⁰⁹ shown below.

Defences to committing offences are that:

- to save or protect life or health or prevent injury;
- to prevent serious damage to property;
- It was necessary to avoid actual or likely significant harm to the environment;
- The defendant's conduct was reasonable in the circumstances;
- The effects were adequately remediated or mitigated afterwards;
- It was due to an action or event beyond the control of the defendant;
- The action or event could not reasonably have been foreseen or prevented.

Relevant Definitions: Effect on the Environment, Environment, Harm, Remediation, Waste Minimisation

Relevant International Agreements:

- International Convention for civil liability for oil pollution Damage 1992

⁴⁰⁸ <http://www.legislation.govt.nz/act/public/2008/0089/latest/DLM999802.html> s.68

⁴⁰⁹ <http://www.legislation.govt.nz/act/public/2008/0089/latest/DLM999802.html> s.69

Enforcement

It is often believed that if the right enforcement regime is put in place waste management legislation will be enforceable. Unfortunately, this does not happen. Each country has legislation which is enforced vigorously, though the wording from country to country differs. Examples of legislation that is enforced in many countries include tax, health and citizen safety. For waste management legislation to be enforced, waste management programmes need to align with government priorities and be seen to contribute positively to government outcomes. It is only then that enforcement provisions in legislation will be effective.

Enforcement functions are often split between national and local government. A term that is sometimes used in this context is administrative enforcement. At the discretion of the respondent, administrative orders or complaints can trigger a process that can move to the judicial system for resolution⁴¹⁰.

To put it simply, national government enforces the measures that need coordination across the nation or are transnational and local government enforces other matters. National government enforcement extends to monitoring local government to ensure compliance and parity across jurisdictions.

Effective enforcement needs cross-boundary cooperation. Adjacent local government areas need to have similar, and preferably the same, trigger levels for enforcement and procedures for managing enforcement issues. Setting these procedures in place actually *reduces* enforcement issues since one set of rules diminishes the chances for confusion.

An example of the division of responsibilities between national and local government is found in the Netherlands Environmental Management Act (2004)⁴¹¹ shown below.

- [National government] shall be responsible for ensuring that the administrative enforcement of the obligations in so far as they relate to:
 - prevention and recovery;
 - transfer of waste;
 - the collection of industrial waste or hazardous waste;
 - trading, mediation or transportation.
- Officials designated by [national government] shall be charged with monitoring compliance with the provisions laid down by or pursuant to the Act concerned.
- [Local government] shall be responsible for:
 - the enforcement under administrative law of the provisions applied to the operator of the establishment on the basis of the Acts concerned;
 - collecting and recording information about the establishment;
 - dealing with complaints with respect to compliance with the provisions relating to the establishment laid down by or pursuant to the Acts concerned.
- [Local government] shall be responsible for the administrative enforcement of the obligations laid down by or pursuant to:

⁴¹⁰ <http://www.inece.org/conf/proceedings2/33-Admin.%20forcemen.pdf>

⁴¹¹ <http://www.asser.nl/upload/eel-webroot/www/documents/national/netherlands/EMA052004.pdf> s.18.2

- the waste ordinance [/bylaw];
- efficient management of household waste;
- the discarding of wastewater;
- the discarding of industrial waste or hazardous waste;
- the management of industrial waste.

Steps

Enforcement can be undertaken through a series of steps, each with more consequences than earlier ones. The first step is to engage in checking that controlled activities meet the restrictions placed on them. This may include physical sampling or receiving information from the managers of the controlled activity. If breaches of the imposed controls are found, the non-complier responsible has to take preventative or remedial action. Failure to do so can result in an escalation, whereby a notice requiring action is issued. If no action happens, the regulator can get a court order to enforce the notices, followed by cease work notices. If provided for, the Court can require the non-complier to undertake remedial action at their expense. This is a standard set of enforcement escalation clauses with costs and penalties increasing at each step. An example of this is found in the UK Pollution Prevention and Control Act (1999)⁴¹² shown below.

- Regulators, when monitoring or inspecting permitted activities, can take samples or make copies of information and arrange for preventive or remedial action at the cost of the permit holders;
- Regulators can serve notices to:
 - take remedial action for actual or potential contraventions;
 - provide financial security pending the taking of remedial action in respect of any contraventions; or
 - require permit holders to take steps to remove imminent risks of serious environmental pollution.
- Regulators can apply to the Court to enforce notices;
- Regulators can suspend permits to stop the carrying on of activities to which they relate;
- A Court can order a person convicted of an offence to take remedial action (either instead of, or in addition to, any punishment) at the person's expense.

Statute of Limitations

In the context of legal interpretation, it is useful to have time limits on administrative enforcement since the longer the period between the offence and filing charges, the harder it is to produce reliable witnesses or evidence. An example of this is found in the NZ Waste Minimisation Act (2008)⁴¹³ shown below.

- The limitation period in respect of an offence against this Act ends on the date that is 12 months after the date on which the matter giving rise to the charge first became known, or should have become known, to the person who commences the proceedings; and
- The limitation period in respect of an offence against a bylaw ends on the date that is 6 months after the date on which the matter giving rise to the charge first became known,

⁴¹² <http://www.legislation.gov.uk/ukpga/1990/43/data.pdf> s.14-18

⁴¹³ <http://www.legislation.govt.nz/act/public/2008/0089/latest/DLM999802.html> s.71

or should have become known, to the territorial authority that commences the proceedings.

Other matters that should be addressed under enforcement are:

- Entitlement to infringement fees; and
- Rights to enter households (as opposed to businesses).

Procedures in individual countries tend to differ, but for waste-related enforcement issues, it is suggested that the provisions are similar to the severity for other related statutes in operation.

Relevant Definitions: Controlled Waste, Discarding, Environmental Pollution, Hazardous Waste, Household Waste, Industrial Waste, Prevention, Recovery, Waste, Waste Management

Relevant International Agreements:

- ASEAN Agreement on the Conservation of Nature and Natural Resources 1985
- Bamako Convention on the ban on the Import into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes within Africa 1998
- Basel Convention on the Transboundary Movement of Hazardous Wastes 1989
- Convention for the Protection and Development of the Marine Environment in the Wider Caribbean Region (Cartagena Convention, 1983)
- FAO International Code of Conduct on the distribution and use of Pesticides, Rome, 1985. (Revised Version 2005, Rome)
- Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships, 2009
- International Convention for the Prevention of Pollution from Ships (MARPOL 1973) and 1978 Protocol
- International Convention on Civil Liability for Bunker Oil Pollution Damage, 2001
- London Convention - Protocol on London Convention 1996
- OECD Decision C(92)39/FINAL on the Control of Transfrontier Movements of Wastes Destined for Recovery Operations
- Strategic Approach to International Chemicals Management 2006
- The Global Programme of Action for the Protection of the Marine Environment from Land Based Activities 1995
- United Nations Convention on the Law of the Sea (UNCLOS) 1982

Offences and Penalties

Offences can come under administrative, civil and criminal codes. Conviction of an offence can result in a range of penalties dependent on the circumstances. Penalties can be a variety of actions including revocation of permits or licences, restoration of affected areas, fines and imprisonment.

Transgressions of the law inevitably incur costs or imprisonment. Imprisonment is not normal for disposal offences and fines tend to be in relation to other similar offences in the country. A good

way of discouraging offending is through the imposition of cost recovery to rectify the situation. An example of imposing costs for illegal disposal is found in the UK Environmental Protection Act (1990)⁴¹⁴ shown below.

- Where an offence occurs the Court may require the offender to pay for:
 - the costs arising from investigations of the enforcement authority
 - the seizure of a vehicle involved in the offence and may include the cost of disposing of the contents of the vehicle
 - costs of removing the waste from land;
 - costs to eliminate or reduce the consequences of the disposal or deposit of waste on land.
- Vehicles used in commissioning the offence may be forfeited to the Court taking notice of:
 - The value of the vehicle;
 - The financial and other effects on the offender of the forfeiture;
 - The offender's need to use the vehicle for lawful purposes.

The penalties for offences should be commensurate with other similar offences in each country. As such, it is not appropriate to suggest values in these guidelines that should apply universally. To give some idea of the scale that each of the examples below use, the word 'value' will be used as the highest fine or term in that particular country's legislation and other penalties will be shown as a proportion of that value (e.g. value/2 would mean half of the largest amount and value/4 would be one quarter).

Some of the more serious offences are for those actions that can lead to significant environmental damage. The actions need to be committed knowingly or carelessly in contravention of regulations. These actions include falsely using a seal to fraudulently legitimise an operation, unauthorised waste disposal or treatment (including hazardous waste), abuse of licences and violating local government bylaws or ordinances. These incur the highest fines as shown in the example below from the German Circular Economy Act (2012)⁴¹⁵.

A regulatory offence (punishable by a fine up to [value]) shall be deemed to have been committed by anyone who wilfully or negligently:

- uses a designated seal;
- treats, stores or landfills waste for disposal in contravention of the Act;
- constructs or significantly modifies a landfill without a plan approval decision;
- violates an enforceable restriction tied to a licence;
- violates an enforceable prohibition;
- collects or transports hazardous waste, trades in it or acts as a broker for it without permission; or
- violates a statutory ordinance [/bylaw].

⁴¹⁴ http://www.legislation.gov.uk/ukpga/1990/43/pdfs/ukpga_19900043_en.pdf s.33.A&C

⁴¹⁵ http://www.bmub.bund.de/fileadmin/Daten_BMU/Download_PDF/Abfallwirtschaft/kreislaufwirtschaftsgesetz_en_bf.pdf s.69

A lesser scale of offence occurs when someone, once again knowingly or carelessly, does not provide required documentation, obstructs entry to premises or does not appoint a company waste management officer. An example of this is found in the German Circular Economy Act (2012)⁴¹⁶ shown below.

A regulatory offence (punishable by a fine up to [*value/10*]) shall be deemed to have been committed by anyone who wilfully or negligently:

- fails to provide notification, correct notification, complete notification or notification on time;
- fails to tolerate entry to premises;
- fails to submit an emissions declaration, a correct emissions declaration or a complete emissions declaration, or fails to submit an emissions declaration on time, or fails to supplement an emissions declaration, a correct emissions declaration or a complete emissions declaration, or fails to supplement an emissions declaration on time;
- fails to provide information correctly, completely, or on time;
- fails to permit entry on to land or residential, business or operational premises, inspection of a document or technical inspections or testing;
- fails to make a designated installation accessible or to provide workers, tools or documents;
- violates an enforceable order;
- fails to keep a register, a correct register or a complete register;
- fails to record information, to record correct information, to record complete information, or to record information on time;
- fails to submit a register, a correct register or a complete register, or fails to submit a register on time, or fails to provide notification, correct notification or complete notification, or fails to provide notification on time;
- fails to retain information or documentation or fails to do so for the prescribed period;
- fails to affix warning panels to a vehicle, or fails to affix them correctly, completely or on time;
- fails to appoint a Waste Management Officer, or does not do so on time.

Offences under extended producer responsibility or product stewardships schemes are also significant. Note that this applies to both voluntary and mandatory schemes. An example is found in the NZ Waste Minimisation Act (2008)⁴¹⁷ shown below.

A fine not exceeding [*value*] for a producer or person who contravenes regulations in relation to priority products, accredited schemes and wastes.

A lower level of fine is provided for where local government does not follow national government directives or where people violate waste bylaws. The effect on local government finances would be minimal, but the publicity surrounding the case would be a far more effective

⁴¹⁶ http://www.bmub.bund.de/fileadmin/Daten_BMU/Download_PDF/Abfallwirtschaft/kreislaufwirtschaftsgesetz_en_bf.pdf s.69

⁴¹⁷ <http://www.legislation.govt.nz/act/public/2008/0089/latest/DLM999802.html> s.65

deterrent bringing shame to politicians and officials. An example is found in the NZ Waste Minimisation Act (2008)⁴¹⁸ shown below.

A fine not exceeding [*value/5*] for:

- territorial authorities who do not comply with ministerial requirements; or
- people who breach bylaws.

A very useful provision is to award costs to remedy an offence. The cost for remediation can greatly exceed fines imposed depending on the severity of the breach. An example of this, modified for integrated waste management, is found in the UK Environmental Protection Act (1990)⁴¹⁹ shown below.

- Where an offence occurs the Court may require the offender to pay for:
 - the costs arising from investigations of the [local government];
 - the seizure of a vehicle involved in the offence and may include the cost of disposing of the contents of the vehicle;
 - costs of removing the waste;
 - costs to eliminate or reduce the consequences of the disposal or deposit of waste.
- Vehicles used in commissioning the offence may be forfeited to the Court taking notice of:
 - the value of the vehicle;
 - the financial and other effects on the offender of the forfeiture;
 - the offender's need to use the vehicle for lawful purposes.

Relevant Definitions: Disposal, Emissions, Hazardous Waste, Installation, Landfill, Remediation, Storage, Treatment, Waste, Waste Management

⁴¹⁸ <http://www.legislation.govt.nz/act/public/2008/0089/latest/DLM999802.html> s.65

⁴¹⁹ http://www.legislation.gov.uk/ukpga/1990/43/pdfs/ukpga_19900043_en.pdf s.33A & C

APPENDIX 1: UN SUSTAINABLE DEVELOPMENT GOALS AND INTEGRATED WASTE MANAGEMENT LEGISLATION

UN Sustainable Development Goal	Integrated Waste Management Legislation
1 – End poverty	<ul style="list-style-type: none"> Waste Strategy Waste Management Hierarchy Circular Economy Requirements and Obligations Best Available Technology Extended Producer Responsibility / Product Stewardship Levies Grants Discharge of Contaminants Private Sector
2 – End hunger; Food security	<ul style="list-style-type: none"> Waste Strategy Waste Management Hierarchy Circular Economy Requirements and Obligations Best Available Technology Extended Producer Responsibility / Product Stewardship
3 – Health for all	<ul style="list-style-type: none"> Waste Strategy Waste Management Hierarchy Infrastructure Planning Air Emissions Waste Collection Hazardous Waste Burning Smoke Mining / Mineral Waste Circular Economy Requirements and Obligations Extended Producer Responsibility / Product Stewardship Levies Grants Training and Education Environmental Impact Assessment Adverse Effects Air Quality Contaminated land Discharge of Contaminants Environmental Emergencies and Disasters Licensing Liability Enforcement Offences and Penalties
4 – Education	<ul style="list-style-type: none"> Consultation Grants Training and Education

	Reporting
6 – Clean water and sanitation	Waste Strategy Waste Management Hierarchy Infrastructure Planning Waste collection Landfills Biowaste Sewage Hazardous Waste Mining / Mineral Waste Circular Economy Requirements and Obligations Extended Producer Responsibility / Product Stewardship Levies Funding Mechanisms Environmental Impact Assessment Adverse Effects Contaminated Land Discharge of Contaminants Environmental Emergencies and Disasters Import / Export / Transboundary Waste Liability Licensing Enforcement Offences and Penalties
7 – Access to energy	Waste Strategy Waste Management Plan Waste Management Hierarchy Hazardous Waste Circular Economy Requirements and Obligations Best Available Technology Extended Producer Responsibility / Product Stewardship Grants Training and Education Environmental Impact Assessment Adverse Effects
8 – Growth and employment	Waste Strategy Waste Management Plan Waste Management Hierarchy Hazardous Waste Circular Economy Requirements and Obligations Best Available Technology Extended Producer Responsibility / Product Stewardship Grants Training and Education
9 – Sustainable industry	Infrastructure Planning Waste Management Hierarchy Circular Economy Requirements and Obligations Best Available Technology Extended Producer Responsibility / Product Stewardship Grants

	Training and Education Licensing Enforcement Offences and Penalties
11 – Safe Cities	Waste Strategy Waste Management Plan Waste Management Hierarchy Hazardous Waste Circular Economy Requirements and Obligations Best Available Technology Extended Producer Responsibility / Product Stewardship Grants Training and Education
12 – Sustainable consumption and production	Waste Strategy Waste Management Plan Waste Management Hierarchy Hazardous Waste Circular Economy Requirements And Obligations Best Available Technology Extended Producer Responsibility / Product Stewardship Levies Grants Training and Education Auditing Data / Information Monitoring Collections and Records Reporting Licensing Enforcement
13 – Climate change	Waste Strategy Waste Management Plan Waste Management Hierarchy Air Emissions Circular Economy Requirements and Obligations Best Available Technology Extended Producer Responsibility / Product Stewardship Grants Training and Education Transport Sector Fuels Monitoring Reporting
14 – Marine resources	Waste Strategy Waste Management Plan Waste Management Hierarchy Hazardous Waste Landfills Contaminants Discharge of Contaminants

	Dumping at Sea Circular Economy Requirements and Obligations Best Available Technology Extended Producer Responsibility / Product Stewardship Grants Training and Education
15 – Terrestrial ecosystems	Waste Strategy Waste Management Plan Waste Management Hierarchy Hazardous Waste Circular Economy Requirements and Obligations Best Available Technology Extended Producer Responsibility / Product Stewardship Grants Training and Education Contaminated Land Discharge of Contaminants
16 – Inclusive societies	Data / Information Reporting Licensing Enforcement Offences and Penalties
17 – Implementation	Waste Strategy Waste Management Hierarchy Transboundary Waste Best Available Technologies Extended Producer Responsibility / Product Stewardship Levies Grants Reporting

APPENDIX 2: CONVENTIONS, PROTOCOLS AND AGREEMENTS

Convention	Scope
ASEAN Agreement on the Conservation of Nature and Natural Resources 1985 http://cil.nus.edu.sg/rp/pdf/1985%20Agreement%20on%20the%20Conservation%20of%20Nature%20and%20Natural%20Resources-pdf.pdf	Regional
Bamako Convention on the ban on the Import into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes within Africa 1998 http://www.au.int/en/sites/default/files/Convention En Bamako Ban Import into Africa and Transboundary Movement hazardouswastes Bamako 30January1991.pdf	Regional
Basel Convention on the Transboundary Movement of Hazardous Wastes 1989 http://www.basel.int/portals/4/basel%20convention/docs/text/baselconventiontext-e.pdf	Global
Benelux Convention on Nature Conservation and Landscape Protection 1982 http://www3.unisi.it/did/dip-direcon/benelux.pdf	Global
Convention concerning the Use of White Lead in Painting 1921 https://www.ilo.org/dyn/normlex/en/f?p=NORMLEXPUB:51:0::NO:51:P51_CONTENT_REPOSITORY_ID:2542964:NO	Global
Convention for the Protection and Development of the Marine Environment in the Wider Caribbean Region (Cartagena Convention, 1983) http://www.car-spaw-rac.org/IMG/pdf/cartagena-convention.pdf	Regional
Convention on Biological Diversity (CBD) 1992 https://www.cbd.int/doc/legal/cbd-en.pdf	Global
Convention on Civil Liability for Damage Caused during Carriage of Dangerous Goods by Road, Rail and Inland Navigation Vessels (CRTD), Geneva 1989 http://www.transportrecht.org/dokumente/CRTDengl.pdf	Global
Convention on Long-Range Trans-Boundary Air Pollution (LRTAP), Geneva 1979 http://www.unece.org/fileadmin/DAM/env/lrtap/full%20text/1979.CLRTAP.e.pdf	Global
Convention on the Transboundary Effects of Industrial Accidents, Helsinki, 1992 http://www.unece.org/fileadmin/DAM/env/documents/2006/teia/Convention%20E%20no%20annex%20I.pdf	Global
Convention to Combat Desertification (UNCCD) 1996 http://www.unccd.int/Lists/SiteDocumentLibrary/Parliament/2003/PDUNCCD(eng).pdf	Global
Environmental Protection: Aircraft Engine Emissions, Annex 16, vol. 2 to the	Global

Chicago Convention on International Civil Aviation, Montreal, 1981.	
file:///C:/Documents%20and%20Settings/ietc/My%20Documents/Downloads/AN16_V1_cons.pdf	
European Agreement Concerning the International Carriage of Dangerous Goods by Inland Waterways (AND), Geneva, 2000. Including the Annex Regulation (2011)	Regional
http://www.unece.org/fileadmin/DAM/trans/danger/publi/adn/adn2011/English/ADN_2011_VOL_I_E_protected.pdf	
European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR), Geneva, 1957.	Regional
http://www.unece.org/fileadmin/DAM/trans/danger/publi/adr/ADRagree_e.pdf	
FAO International Code of Conduct on the distribution and use of Pesticides, Rome, 1985. (Revised Version 2005, Rome)	Global
http://www.fao.org/docrep/018/a0220e/a0220e00.pdf	
Framework Convention on Climate Change (UNFCCC), New York, 1992	Global
https://unfccc.int/resource/docs/convkp/conveng.pdf	
Gothenburg Protocol on the reduction of acidification, eutrophication and ground-level, 1999	Global
http://www.unece.org/fileadmin/DAM/env/lrtap/full%20text/1999%20Multi.E.Amended.2005.pdf	
Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships, 2009	Global
http://www.basel.int/Portals/4/Basel%20Convention/docs/ships/HongKongConvention.pdf	
International Convention for civil liability for oil pollution Damage 1992	Global
http://www.transportrecht.org/dokumente/HaftungsUe_engl.pdf	
International Convention for the Prevention of Pollution from Ships (MARPOL 1973) and 1978 Protocol	Global
http://www.placng.org/new/laws/l28.pdf	
International Convention on Civil Liability for Bunker Oil Pollution Damage, 2001	Global
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/273257/6693.pdf	
Kyoto Protocol 1997	Global
http://unfccc.int/resource/docs/convkp/kpeng.pdf	
London Convention 1972	Global
http://www.imo.org/en/OurWork/Environment/LCLP/Documents/LC1972.pdf	
London Convention - Protocol on London Convention 1996	Global
http://www.gc.noaa.gov/documents/qcil_lp.pdf	
Minamata Convention on Mercury 2013	Global
http://www.unep.org/hazardoussubstances/Portals/9/Mercury/Documents/dipcon/CONF_3_Minamata%20Convention%20on%20Mercury_final%2026%2008_e.pdf	

Montreal Protocol on Substances that Deplete the Ozone Layer 1989	Global
https://treaties.un.org/doc/Publication/UNTS/Volume%201522/volume-1522-I-26369-English.pdf	
OECD Decision C(92)39/FINAL on the Control of Transfrontier Movements of Wastes Destined for Recovery Operations	Global
http://www.oecd.org/env/waste/42262259.pdf	
Rotterdam Convention 1998	Global
https://www.unido.org/fileadmin/user_media/Services/Environmental_Management/GUDDIS/Legal_Frameworks/rotterdam_convention.pdf	
Strategic Approach to International Chemicals Management 2006	Global
https://sustainabledevelopment.un.org/content/documents/SAICM_publication_ENG.pdf	
The Convention for Protection of the Mediterranean Sea against Pollution (Barcelona Convention) 1976	Regional
http://www.ypeka.gr/LinkClick.aspx?fileticket=30r%2B7BeaSOo%3D&tabid=406&language=el-GR	
The Global Programme of Action for the Protection of the Marine Environment from Land Based Activities 1995	Global
http://coralreef.noaa.gov/threats/pollution/resources/unep_lbsp_prgrm.pdf	
United Nations Convention on the Law of the Sea (UNCLOS) 1982	Global
http://www.un.org/depts/los/convention_agreements/texts/unclos/unclos_e.pdf	
Vienna Convention for the Protection of the Ozone Layer, 1985	Global
http://www.unep.ch/ozone/pdfs/viennaconvention2002.pdf	
Wagani Convention 1995	Regional
http://www2.unitar.org/cwm/publications/cbl/synergy/pdf/cat3/UNEP_regional_seas/convention_waigani/convention_waigani.pdf	
Working Environment (Air Pollution, Noise and Vibration) Convention, 1977	Global
http://www2.unitar.org/cwm/publications/cbl/synergy/pdf/cat3/ilo_agreements/convention148/R156_work_env_en.pdf	