UNEP

Waste Management Planning
An Environmentally Sound Approach for Sustainable Urban Waste Management

An Introductory Guide for Decision-makers

United Nations Environment Programme
Division of Technology, Industry and Economics

INTERNATIONAL ENVIRONMENTAL TECHNOLOGY CENTRE

Integrative Management Series No.6

Environmentally Sound Technologies (ESTs) encompass technologies that have the potential for significantly improved environmental performance relative to other technologies. Broadly speaking, ESTs protect the environment, are less polluting, use resources in a sustainable manner, recycle more of their wastes and products, and handle all residual wastes in a more environmentally acceptable way than the technologies for which they are substitutes. The adoption and use of ESTs implies careful consideration of both human resource development and local capacity building.

Information on ESTs is not always available in a form that can be easily understood by decision-makers and those without technical expertise. To encourage greater understanding of ESTs and their benefits, this booklet has been prepared using a minimum of technical jargon. We sincerely hope that you find the information in the booklet both interesting and useful.

First edition 2004

UNITED NATIONS PUBLICATION

ISBN 92-807-2490-8

This publication is printed on recycled paper.

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Foreword

This booklet provides a short introduction to the importance of waste management planning, specific waste management problems in developing countries, and a short guide on what to be aware of when drafting a waste management plan.

The European Topic Centre on Waste and Material Flows[1] has developed a methodological guidance note on preparing a Waste Management Plan, commissioned by the EU Commission[2].

In preparing the booklet ISWA[3] and UNEP have found that many subjects covered in the above mentioned document also apply to countries outside Europe as well as developing countries. Therefore, large parts of an early draft of this methodological guidance note have been reproduced in the booklet.

The overall aim of the booklet is to help countries around the world implement the waste targets set in Agenda 21[4] and through those reach a sustainable future.

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1 The European Topic Centre on Waste and Material Flows (ETC/WMF) is a consortium built around the Danish Environmental Protection Agency/Environmental Protection Agency, City of Copenhagen as lead organisation. The partners in the consortium are:
Agenzia Nazionale per la Protezione dell'Ambiente(A), Italy
Environmental Protection Agency, Ireland
Estonian Environment Information Centre
Federal Environment Agency, Austria
National Technical University of Athens, Greece
Slovak Environmental Agency
Wuppertal Institute, Germany.

2 The Waste Guide can be downloaded from the homepage of the EU Commission :
http://europa.eu.int/comm/environment/waste/plans/index.htm

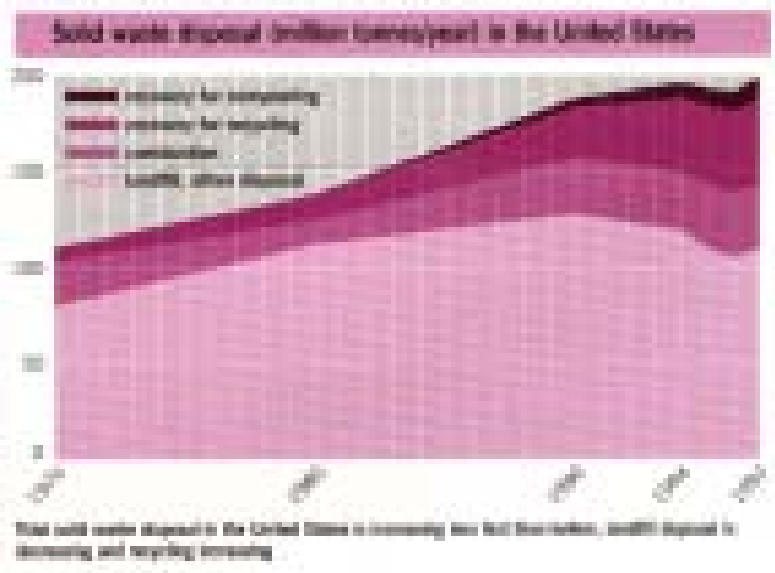
3 ISWA is a world-wide association of organisations, enterprises and individuals within the field of waste managemeent. Presently ISWA has members in nearly 76 countries as well as National Members in 34 countries. The members of ISWA are waste collectors, waste hauliers, waste processors and waste disposers, managers, practitioners, scientists, international organisations and authorities, as well as consultants and producers of equipment and services in industry, all connected in a network, to exchange experiences on professional waste management world-wide. As a non-profit and non-governmental association ISWA's main objective is to contribute to sustainable development. ISWA is founded on the idea that dialogue and international relationships create the fundamental conditions for a successful development strategy.

4 To see a summary of the Agenda 21 targets and other international agreements and definitions (see Annex 1 "Waste management after Rio")

1. The Waste Challenge

Waste problems exist wherever there is a human population. The characteristics of these problems vary from one place to another, and with time as societies develop. Although they may first appear to be local issues, the scope and magnitude of these problems are increasing as population density and standards of living rise. The time is past when waste management could be considered in isolation. Environmental, technological and financial factors all have some bearing, and the need to conserve resources also demands attention.

Resource management extends far beyond waste management. It begins with strengthening awareness of the natural limits of resources, both materials and energy. This awareness, omnipresent in ancient times, has gradually been lost in the development of an affluent society. As long as individuals, and the economy can easily afford raw materials and energy, it remains unlikely that this situation will change. What are needed are alternative, successful incentives to ensure that people take better care of global resources. Today's waste management practices do not adequately fulfil this objective and hence need to be developed further to enhance the effective management of resources. Products and manufacturing processes should be designed taking into account resource conservation goals, even if this seems to conflict with economic benefits.



Source: Global Environmental Outlook 3, 2002, p. 261

The concept of Integrated Waste Management (IWM) has evolved over the last ten years and is now becoming more broadly accepted. In such a system, the technical solution to waste disposal is not the only focal point. Instead, IWM relies on a number of different approaches to manage waste, focusing on a more holistic approach to all aspects of waste management, from generation to disposal and all stages in between. All stakeholders participating in and affected by the waste management system are considered covering cultural, social, economic and environmental factors.

Most countries have adopted a waste policy. Clear, concise and consistent policy is necessary to establish and set up waste management systems and make necessary investments. The content and quality of existing waste policies vary widely. A waste policy must, apart from environmental

and health aspects, take into consideration socio-economic, political, institutional and cultural factors.

A limitation to successful waste policy is the lack of a tradition and understanding of the need to integrate all of these factors. Some factors may change rapidly and will have effects on the policy while others are contradictory. Nevertheless, a well-established and supported waste policy is of crucial importance for the state of waste management in any country. Another limiting factor is the financial resources required to ensure realisation.

The "Waste Hierarchy" was introduced in Agenda21 (see Annex 1). Since then, countries have developed slightly differing hierarchies while recognising the main grouping of options. The issues for discussion are the flexibility with which the hierarchy is to be applied and the components of the various levels of the hierarchy. The hierarchy must be seen as providing general guidelines and as a good basis for development of a waste policy. It should be applied in a flexible manner and take account of the fact that, for many developing countries, the first priorities are ensuring that a collection service is available to as large a part of the population as possible, and raising the quality of landfills.

2. Waste Management in Developing Countries

In developing countries and countries with economies in transition, waste management often emerges as a problem that endangers human health and the environment. To make matters worse, waste management usually has a low priority on the political agenda of such countries, as they are struggling with other important issues such as hunger, health problems, water shortages, unemployment and even civil war. In such situations, it is easy to understand why waste problems have a tendency to grow steadily.

In the developing world, millions of people are living without a waste management system. A first step to improving this situation is to work out a phased technical and legal framework for waste management and then start the collection and disposal process, with the objective of continuously improving the system.

In developing countries, uncontrolled landfills are still a huge danger for the surrounding environment and are a health risk to the population, causing contamination of the drinking water and soil. Thus, solid waste management has become an issue of concern for public health and environmental protection agencies in many developing countries. There are also large differences in the waste management standards of developed countries and the gap is even greater between developed and developing countries. The waste produced by human settlements and the resulting problems are mainly the same – but there are differences between regions and locations due to variables such as climatic, cultural, industrial, geological, legal and environmental factors. The waste management systems in different developing countries vary substantially and in some cases are virtually non-existent.

Much can be achieved by small-scale improvements to existing systems. Furthermore, it should be emphasised that there is a need to build cooperative "South-to-South" relations amongst developing countries to encourage the exchange of information. Much can also be achieved by optimising the already existing collection systems and by introducing cost recovery systems, based on the "polluter pays" concept.

Although developing countries have very limited economic resources it is very important for them to consider the short-term cost versus the long-term cost. In the USA, for example, experience has shown that the resources spent on cleaning up past pollution from hazardous wastes are far in excess of those needed for management of wastes currently being generated. It is therefore important to take early action to develop a hazardous waste system which, in the long run, will save money by preventing the problems of inadequate waste management from arising.

Development of legislation and the establishment of treatment and disposal facilities typically takes 10 - 15 years. Therefore it is important in the short term to develop interim or transitional facilities to allow efficient phase out of uncontrolled dumping. There is no time to wait for detailed waste data and waste management infrastructure to be put in place before action is taken. The capital costs for these transitional technologies may be relatively modest, while the long-term costs for sophisticated, high technology facilities are often beyond the resources of the public sector in developing countries. One way forward is to foster effective co-operation, information sharing and knowledge transfer between the public and private sectors. There is a need to develop facilities, support services and enforcement capabilities simultaneously with the necessary legislation and regulations. In most cases a "carrot and stick" approach will be needed.

Although the waste hierarchy is accepted it must be emphasised that, as the most common form of disposal is uncontrolled landfills, the building of controlled landfills is a high priority in these countries.

2.1 Uncontrolled Dumps

Currently, the most common method of waste disposal in developing countries is some form of landfilling. There are many variants of this method, including uncontrolled dumping to undefined areas, collection and disposal to unmanaged open dumps, and collection/disposal to controlled landfills. An important focus is therefore the proper closure of unmanaged open dumps, coupled with the construction and proper operation of controlled landfills.

With over 200,000 open dump areas in the world that will require environmental protection and clean-up in the future, ***UNEP and ISWA believe that the methodical closure of such dumps is a first priority***. While it is necessary to eliminate the environmental threats caused by these sites, it is also necessary to change and improve the fundamental waste management practices which lead to uncontrolled dumping and open dumps. For those countries and population centres that have employed the use of sanitary landfills and managed operations, the advantages of environmental protection can be demonstrated.

It is important to get the waste out of the cities and to find a safe location away from water and populated areas. The use of engineered systems, including liners, leachate collection, landfill gas collection, and cover, should increase, and old open dumps should be replaced with new sanitary landfill cells. These systems will demonstrate improved environmental protection, particularly for localized ground and surface water resources and air quality.

2.2 Waste Scavengers

In many rapidly developing cities, considerable numbers of the urban poor depend on the recycling of waste materials for their livelihood. This was the case in large cities in nineteenth century Europe and North America, and is still the case in most cities in developing countries today. In the developed world, these informal sector waste 'scavengers' or 'pickers' largely disappeared as living standards rose—with the side effect that recycling rates fell, often to near zero. A major focus of Western waste policy over the past decade has been to build new recycling systems in their place.

The cleanest and most efficient forms of scavenging involve source segregation of recyclable materials and either door-to-door collection or 'bring' systems. Itinerant waste buyers go from door-to-door, buying sorted, dry recyclable materials which they then transport to a recycling shop. Alternatively, householders can take their materials direct to the recycling shop (such systems operated in many communist countries up to the 1980s). Two more dirtier forms of scavenging are where people sort through the waste in communal bins before the authorized collection vehicle arrives, or where the 'official' waste collectors conduct a certain amount of segregation during loading of waste into collection vehicles. The last, and certainly most onerous, type of scavenging takes place at the disposal site. Disposal sites in medium and large metropolitan areas attract hundreds—and in the megacities thousands—of individuals who recover materials for sale. Some of the scavengers (who often include young children) live on or near the disposal site, which is not only detrimental to their health, but can also be dangerous due to 'landslips' and fires.

Waste scavengers pose a major policy dilemma for city governments. The presence of large communities of people making a living from waste, often in appalling sanitary conditions, can be an embarrassment to politicians in a rapidly commercialising city. Scavengers can also reduce the efficiency of the waste management system as those who work at the collection point often spread refuse around, increasing the time required for waste collection, and those at disposal sites hinder the work of collection vehicles, tractors and/or compaction equipment. On the other hand, scavenging provides a livelihood, often for many thousands of the urban poor. With the focus of the Millennium Development Goals on poverty reduction, simply removing such a means of making a living is not an option. Moreover, one aim of improving waste management is to increase recycling so as to move 'up the waste hierarchy', it therefore makes little sense to undermine an existing recycling system.

A major challenge of waste management in developing countries is how best to work with the existing informal recycling sector to improve livelihoods, working conditions and recycling efficiency. Significant experience is accumulating from around the world, with many examples of projects involving both international donors and local NGOs. Successful strategies often combine a number of elements, including helping scavenger communities to move up the recycling 'chain' so that they become more like entrepreneurs or SMEs. This can be achieved by, for example, moving from bin sorting to itinerant buying or adding value to the materials they collect before selling them on to a 'middleman'; providing education so that it is no longer necessary for young children to work; separating scavengers from vehicle movements on transfer stations and landfill sites; and improving health and safety conditions.

2.3 Importing Wastes Containing Hazardous Materials

Most developing countries have local industries that are highly dependent upon the availability of secondary raw materials for re-processing. These materials include various paper products, plastics and metals. Unfortunately, the methods used to recover secondary raw materials are often inefficient

and disregard the basic principles of occupational health. In some instances this can lead to significant environmental problems, especially where the standards of treatment are low and emissions are uncontrolled. An example of this is the dismantling of electronic equipment containing hazardous substances that may pose a risk to the environment and to the health of workers. An important goal, therefore, is to prevent the export of inappropriate wastes to developing countries for recycling.

2.4 Health Care Wastes

Health care waste is a small but very significant waste stream with high potential risk for populations in developing countries. Health care wastes carry a higher potential for injury, infection and pollution of the environment than any other type of waste. The waste stream contains a wide range of hazardous and infectious materials (i.e. chemicals, pharmaceuticals, cytotoxics, radioactive substances). Consequently, even though this waste stream should be given high priority in the manner in which it is managed, safe reliable infrastructure for the management of health care waste is not in place in many countries.

It is very important to classify health care wastes into categories and to separate the non-risk waste so that it can be disposed of with the municipal waste stream. The methods of storage chosen for this waste stream are particularly important. It is vital to treat the infectious waste and eliminate the pathogens it contains by disinfection. UNEP and ISWA have been co-operating with the World Health Organisation for some years in assisting in the development of health care waste management programmes for low and middle-income countries, but there is still much to achieve.

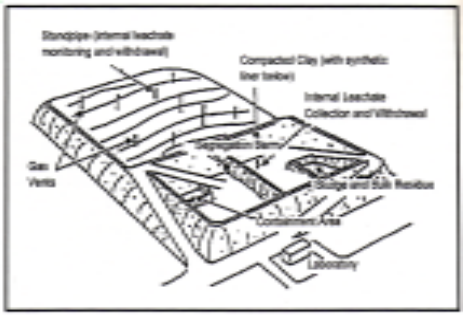
2.5 Waste from Natural and Industrial Disasters

Natural disasters and other emergency situations tend to generate large quantities of debris that is difficult to handle under converntional waste management arrangement. As well, it is also important to continue to manage regular municipal waste under emergency conditions. To avoid the chaos that has often been observed in the past, waste strategies and planning need to consider how to deal with disaster wastes at a local level. A link with local level emergency plans is essential to make this work. Such planning is especially important since normal infrastructure and waste personnel are often not avaiable during a crisis as all available resources are dedicated to addressing humanitarian issues. Annex II gives further information and references to gude local authorities.

3. Taking Action

Waste planning in developing countries is facing some other realities where the most restrictive factor is probably to achieve the most with the limited funds available to the waste service. But

Typical layout of a secure landfill



Source: Solid Waste Management for Economically Developing Countries, 1996, p. 288

improvements are not necessarily dependent on massive investments. Developing countries can probably increase their performance by using what they already have in a more efficient way. Good organisational structure and the quality of management are two other important factors for efficient waste management. The work on waste planning of necessity evokes these factors and may help to stress their importance.

3.1 The Importance of Waste Management Planning

Efficient waste planning is necessary to ensure a well functioning waste management system. First of all, it is important to have a national waste management plan that gives the total overview of the waste situation in the country as well as formulating targets and strategies. A national waste management plan should of course be complemented with local waste management plans. Local factors should be taken into consideration when developing a waste management plan. Experience and information can be transferred and collected from other regions and localities but each plan is specific to the local circumstances.

Apart from the adoption of a waste policy, a legal framework is required that enables setting of objectives and targets. A well-elaborated legal framework can assist in effective implementation. The legal framework should also include an effective enforcement system. In most countries, environmental legislation has emerged in response to emerging environmental problems. There is often a lack of coordination between different pieces of legislation protecting different environmental interests. Legislation is often also incoherent since it has been issued at different times, is derived from different problems, protects different interests and encompasses different objectives.

The national and/or regional waste policy together with the legal framework provides the foundation for the waste plan. The local waste plan is of more tangible character and will encompass waste quantities, waste composition and treatment capacity. Typically, it will also contain measures on waste minimisation and prevention, recycling and reduction of waste going to landfill. A well-prepared waste plan at local level can be a very useful tool for local waste managers to improve local waste management. Furthermore, the long-term planning assists in making previsions and enables the possibility to be pro-active regarding deficiencies (lack of disposal capacity, major investments, etc).

A waste management plan should first of all give a comprehensive picture of the existing situation, including what kind of waste exists and where it is going. In addition, a plan should explicitly consider what wastes might be generated by possible natural disasters (earthquakes, typhoon, floods, tsunamis..) as well as by urban or industrial disasters (fires, factory explosions, oil spills, and so on).

The first objective of a waste management plan is therefore to give the parties involved in waste management planning an overview of the existing waste management system. In some cases the work of drawing this picture can be quite extensive, regardless of whether it is a revision of existing data or establishing status and collecting data for the first time. The status should also give answers to the following questions:

- Does the present waste management system meet the political objectives for waste prevention/minimisation, recycling/energy recovery and safe disposal facilities?
- Does the present waste management system address the environmental, health and safety issues?
- Does the present waste management system represent an adequate administrative and organisational framework in terms of efficiency?

- What are the initial areas of concern in relation to:
  - political objectives,
  - improving the environmental and health and safety performance of the present system, the capacity and the physical performance (collection equipment, trucks, access to treatment and disposal facilities) of the waste system as a whole, and in terms of proximity and self-sufficiency, and any sites designated for emergency events.
  - improving the efficiency and the organisational framework of the system?

The second objective of the plan is to plan for the future. In many cases it makes sense to have a short- and a long-term plan. It is recommended that the future plan consider issues such as:

- The future waste management infrastructure, for example:
  - which collection systems are in place?
  - which types of waste management installations are in place?
  - how are responsibilities divided between local authorities (or other competent authority) and industry?
- Does the present waste management system have sufficient capacity for current and future requirements (based on known waste prognoses)?
- Are the strategic objectives in line with legislation?
- Have targets been set for all relevant waste streams and/or treatment methods, and are they measurable?
- Have indicators been identified in order to monitor the development?
- Have instruments been identified and are they sufficient to reach the set targets/objectives?
- Are they cost-efficient?
- What are the economic consequences of the plan?

Finally the plan should also deal with softer issues such as public education, community participation, financial aspects, health and safety, and regulations.

The present booklet gives a short description on how to make a waste management plan. If a more detailed tool is needed ISWA and UNEP recommend the 'Strategic Planning Guide for Municipal Solid Waste Management" by David Wilson, Andrew Whiteman and Angela Tormin. This publication gives guidance and tools both on the process of waste management planning, and on the issues that need to be considered in action plans. An important aspect is the recommendation for an "inclusive" planning process that involves relevant community stakeholders in addition to the waste management professionals. The Guide is available on the World Bank website on http://www.worldbank.org/urban/solid_wm/erm/start_up.pdf . The inclusive process has been tested in several large cities ref www.wastekeysheets.net . The training manual for North Africa based on this material is now also available for wider use. www.metap-solidwaste.org

3.2 Defining the Current Situation

Defining the current situation requires collecting the necessary data to provide general knowledge of waste sources, quantities, waste composition, and the structure of the present waste management system. This work is carried out to measure levels of achievement compared to stated objectives and strategies. Furthermore, it provides an overview of the current waste management system to identify the need for further development and to define strategic objectives.

This work is usually carried out mainly by the administrative authorities, in co-operation with the different parties within the existing waste management system, so that there is a solid platform for political decision making on future systems.

The outline of the current situation will differ from national, to regional, to local levels, since the need for information will differ. At national level aggregated data will be of importance, while the need for data at local level (a local authority) will be of a more detailed nature, due to the local waste management structure.

■ *Gathering the Necessary Information*

In order to be able to set objectives and decide on future initiatives, the competent authority will have to have an overview of the existing situation as regards waste quantities, treatment capacity, financial aspects and environmental impacts.

The first step is to collect and evaluate information. The second step is to describe and analyse the existing system. Analysis then allows for the identification of problems in the existing system.

Collection of information is the process of completing a qualitative description by collecting and collating relevant data on the number of units (e.g. households and companies), quantities of waste, treatment capacities, etc.

The availability of data on waste is clearly an essential factor in preparing a comprehensive analysis on the existing situation. Availability of reliable data is also necessary to monitor attaining of objectives. It is therefore advisable to develop a data collection system as soon as possible in the planning process.

Collection of information includes detailed descriptions of collection materials, collection frequency, transportation systems, and waste treatment facilities, including recycling. The various parts of the waste management system must be described in terms of technology, economy, and organisational structures. At the start of the process it may be difficult to get reliable figures, in which case estimations should be made.

Basically the information should be structured according to:

- Different waste-producing activities in the relevant area: the “sources of waste”.
- Materials of which the waste is composed: the “fractions of waste”.
- The processes the waste goes through: generation, collection, transport, sorting, treatment and disposal.

Example of waste generators

- Households
- Municipal services
- Industries
- Institutions, trade/commerce and offices
- Construction and demolition sites
- Power plants
- Sewage treatment plants
- Incineration plants

By identifying the "sources of waste" it will be possible to direct awareness campaigns and waste prevention programmes towards those sources with the highest volumes of waste or those producing the most hazardous waste. At the same time it will create the platform for any specific regulation directed towards specific waste streams and waste producers. Finally, the effectiveness of inspection and enforcement will be improved.

Rough list of waste streams

- Municipal waste
  - Paper
  - Cardboard
  - Glass
  - Iron
  - Other metals
  - Plastics
  - Waste food and organic waste
  - Organic residues (garden waste)
- Packaging Wastes
- End-of-life vehicles
- Tyres
- Waste electric and electronic equipment
- Construction and demolition waste
- Hazardous waste
- Health care waste
- Waste oil
- Sewage sludge
- Agricultural waste
- Inert residues Textilesl
- Bulky waste

By addressing the "fractions of waste" it is possible to obtain information about the quantity and composition of the different fractions. The authorities will then have a background for setting strategic objectives for each waste stream as well as the future treatment methods and installations needed to attain the objectives.

The status of the existing waste management system and its description allow identification of needs in terms of design, capacity, and new initiatives.

Local and/ regional waste management system

If the waste management plan is to be prepared at local or regional level, it may be relevant to include a detailed description of the waste management system in place. The description could include the following examples, as a minimum:

- Collected materials
- Number and types of collection vehicles
- Transfer stations/sorting facilities
- Treatment plants (e.g. landfills, incineration plants)
- Recycling activities (informal as well as formal)
- Payment schemes
- Regulation (national as well as local)

Finally, it may be relevant to present the amounts of waste that go through the different processes (generation, collection, transport, sorting, treatment and disposal). This is in order to be able to assess whether current capacity of waste management installations is sufficient.

❖ *Data Collection Methods*

One way to collect data is to construct key-figures through sorting tests and other kinds of test programmes. Key figures could have the form of waste production per capita, per industrial sector, quantities of hazardous waste, typical fractions in household waste, etc. It is necessary to know the waste composition in order to estimate the efficiency of the existing separate collection systems, and to estimate the need and possibilities of new separate collection initiatives.

Another way is to measure the waste stream directly. Such measurements can have varying degrees of sophistication. When it is possible to weigh the waste this is, of course, the most accurate form of registration. Without such data, calculations can be made based on data from equipment currently in use (number of bins emptied, number of trucks arriving at the plant, etc.).

Authorised local authorities, private waste management companies, waste-producing or waste-recycling companies could provide some of the necessary data. These parties will often have important information on quantities of waste collected, recycled or treated, as well as on its composition.

In many cases data can be collected by request from sources such as producers, transport firms or treatment plants. This can be done in various ways, typically by surveying producers or waste managers.
Statistical information to be collected can include:

- Population size
- Geographical size of the area from which waste is collected, categorised as residential, industrial, or commercial areas
- A detailed picture of the size and number of principal industries, commercial undertakings including agriculture, and tourism
- Annual amounts of waste and its composition, analysed with seasonal fluctuations.

■ *Description and Analysis of the Existing System*

It is important for the plan to include a description of the existing waste collection system and waste management installations. The present waste collection system should be described in physical, financial, and organisational terms. This description should also be given for each waste source and for special waste streams.

As for the collection system, waste management installations should also be described in physical, financial, and organisational terms. The waste management installations will often consist of many different treatment plants, such as incineration plants, composting plants, landfills and various types of recycling facilities.

Current throughput, as well as the maximum capacity of each plant, should be described. The information can be obtained through questionnaires or visits to the plants, but information can also be gathered from permits and other official sources, etc.

On the basis of the information and analyses of the existing situation it should be possible to evaluate the performance of the existing system. Therefore political decision-makers and their administrators will have a benchmark by which to identify the problems that need special attention in the future, and which objectives are realistic and achievable within the timeframe of the waste management plan.

3.3 Defining the Scope and Strategy for a Waste Management Plan

One of the most important tasks is to determine the sources, types and quantities of waste generated, the present collection, transport and treatment, and how these might change in the future. It is thus necessary to decide the geographical area, e.g. municipalities or regions, and the sectors (households, industry, agriculture etc.), to be included in the waste management plan. The types of waste being included in the plan, and those given priority must also be clearly defined. Another task is to decide the time period for which the waste management plan is to be developed.

■ *Planning for the Future*

On the basis of the analyses performed during establishment of the current situation and evaluation of the existing waste management system, it should be possible to propose:

- the future political objectives,
- the future needs for changes in order to improve the environmental, health and safety performance of the present system,
- the future needs for changes in relation to the capacity and the physical performance of the waste system,
- the future changes in order to improve the efficiency and the organisational framework of the system.

As prevention has the highest priority in the waste management hierarchy, efforts should be made to aim to reduce the quantity of waste generated. The appropriate qualified authorities should therefore focus on setting goals for:

- promotion of clean technologies and products,
- reduction of the hazardousness of wastes,
- establishment of technical standards and possibly world-wide rules to limit the presence of certain dangerous substances in products,
- promotion of reuse and recycling schemes,
- appropriate use of economic instruments,
- eco-balances,
- eco-audit schemes,
- life-cycle analysis,
- actions on consumer information and education, and development of the eco-label system.

In order to calculate the future needs for waste management services, it is necessary to estimate the future quantities of waste in the various streams. The nature, volume, and location of waste and residues requiring treatment and disposal in the future can be hard to predict accurately for various reasons:

- Population growth
- Changes in economic circumstances (growth/recession)
- Changes in demand for, and nature of, consumer goods
- Changes in manufacturing methods

- New waste treatment methods
- Effects of policy changes (prevention, minimisation, re-use, recycling)

Thus, a single prognosis of future waste is generally difficult to formulate. Nevertheless, the need for some sort of basis, especially for future investments, is obvious in order to secure the necessary capacity of the system for the future. When preparing plans, several scenarios covering changes in waste generation and market demands for recovered materials are needed. The planning process should therefore choose among alternative future scenarios.

After evaluation of the different scenarios, the plan will be based upon the scenario that is most advantageous technically, environmentally and economically, and which represents a flexible solution to future changes in waste generation, etc.

Waste management planning is a long-term infrastructure issue, with large investments and long term planning horizons. This poses specific challenges to waste planning in a fast growing and constantly changing society.

Planning procedures for locating a new landfill takes time. It is therefore realistic to expect that the planning process itself, including environmental impact assessments on the various alternatives, will take place in the short-term, while physical changes and the expected changes in the waste streams might occur later. In addition, some options will have to be investigated in more detail through the exchange of experience with other regions, cities, and countries. Often it is necessary to identify areas where further information and research are needed before action can be taken.

Measures such as increasing taxes on waste going to landfills will gradually change the behaviour of the waste generators, but the generators will also need alternative solutions. Higher prices on landfills might be the incentive to make recycling and energy recovery activities feasible, but they will not be in place from day one.

The time frame for the drawing up or revision of the plan depends on a number of factors. To reflect this, the plan can consist of two parts: Part 1, which would be for immediate action, and Part 2, which would be a long-term perspective.

The reason for the long-term perspective part of the plan is that considerable difficulties can be expected in identifying suitable sites for waste treatment facilities or landfills within, or close to, urban areas. Also, it will be necessary to put considerable effort into site selection, environmental impact assessment, and public consultation in order to obtain permission for new sites. Finally, waste treatment facilities represent large investments that need to be redeemed over a longer period.

Costs of collection are more short-term in nature and less capital intensive. The main items are more likely to be contracts with entrepreneurs that typically have a lifetime of no more than five years.

From a practical point of view, the time frame of the plan should also be long enough to make it possible to evaluate whether the targets in the plan are reached. Therefore it will not be practical to re-evaluate the plan until after more than three years. The time frame of the plan may also reflect other considerations on the political scene e.g. the period between local elections. Thus, a time frame of three to five years would be appropriate for revision of the action part of the waste plan.

■ *Links to Other Policy Areas*

Waste planning has to be an integrated part of the total national planning system, both as a wider approach to sustainable development and in order to achieve the overall goals set down in the waste management plans. A number of different policy areas relate directly to waste planning and they ought to be considered when the scope of the waste management plan is decided upon.

- Demography
- Economic growth
- Public health impacts
- Occupational health
- Energy resources
- Space (land use)
- Material resources
- Water quality
- Contamination of soil
- Greenhouse gases

In order to deal effectively with debris and ordinary wastes during times of natural disasters and other major accidents, it is important to have prior discussions with disaster response agencies so that this aspect becomes integrated in the approved community emergency plans.

Summary of Swiss Guidelines for Waste management

Scientific and technical guidelines:

- Waste disposal systems should generate materials that can be recycled or deposited in a final disposal site.
- Hazardous substances must be concentrated, not diluted.
- Organic substances are not compatible with final disposal sites.

Political guidelines:

- Waste management is guided by the objectives of the environmental protection laws.
- Waste disposal systems must be environmentally compatible.
- Waste should be disposed of within Switzerland.
- Regional responsibility for planning of landfill sites is applicable.
- Public authorities play a subsidiary role in waste management.

Economic guidelines:

Public authorities should bno subsidize waste disposal systems.
The *polluter pays* principle is to be adhered to.

Source: Municipal Solid Waste Management, 2003, p. 7

■ *Economic Consequences and Financing*

Although it can be argued that proper waste disposal is affordable, the initial investments for the infrastructure are nevertheless, considerable. In particular, the construction of MSW incineration plants and of well-equipped landfill sites is expensive. However, costs must be considered over a long period of time. From past experience, it can be observed that cleaning up old, polluting waste deposits may cost more than investment in proper facilities and adequate treatment of the waste. Therefore, it is not so much a question of affordability as of choosing to pay enough for waste disposal at the outset, rather than being faced with uncontrolled, inflated costs later.

Achieving the preferred mix of treatment methods for each waste stream in the future system is the real puzzle of waste management planning. The final result will consist of a number of measures and instruments (legal and economic) to be activated, awareness campaigns, new waste collection schemes and access to new treatment installations.

Besides estimating the effectiveness of initiatives in terms of volumes of waste (tonnes per year) to be directed and redirected in the overall waste stream, the future waste management system will typically represent significant investment and additional operating costs.

A major factor for the final decisions and approval of the new waste management system will be to decide on the economic consequences, both for initial investment and for the future level of user payments and fees. Again, each initiative will have to be evaluated in terms of economic

	Total cost of existing waste management system	**Total short-term cost (3 - 5 years)**	**Total long-term cost (8 - 12 years)**
General administrative initiatives			
General initiatives on waste prevention			
Initiatives on waste stream 1			
Initiatives on waste stream 2			
Initiatives on waste stream 3, etc.			
Total cost			
Total cost per tonne			

The aim is to estimate the total costs in terms of capital costs and operating costs. However, as collection equipment, landfills and other installations needed in the overall waste management system have various lifetimes and depreciation periods, calculation is needed in order to compare and aggregate the costs of numerous operations. One way is to calculate the total annual costs, i.e. operating cost plus the annual payback for capital investments.

Table 1 suggests differentiating in the total cost between general administrative initiatives (e.g. cost for waste planning, issuing permits, legislation, etc.), general initiatives on waste prevention and the various waste streams. This should make it possible to keep track of the economic costs of reaching the objectives. It should also make it possible to compare the costs of the existing waste management system with the future costs of the new waste management plan.

It is important as suggested, to calculate costs per tonne. This establishes the average cost and may also be used to compare the costs with other alternatives.

As mentioned, the plan may only cover 3 - 5 years, while it may be necessary to have a long-term perspective to establish the necessary capacity to manage the future quantities of waste. Thus,

some consideration of long-term capacity and costs is often useful. In Table 2 the long-term is defined as the period of 8 - 12 years from the start of the waste management plan, but this will always depend on national or regional conditions.

- ***Defining Performance Indicators***

One of the difficulties in setting up a new waste management plan is the transformation of qualitative political objectives into quantitative measurable targets and indicators. However, measurable targets and indicators are important in order to assess whether or not the political objective is met.

One approach is to define political objectives for each of the elements in the hierarchy of waste management options. For each objective at least one measurable target, measurable indicator, instrument and precondition should be defined. If the objective is of a rather broad nature several targets, indicators and instruments may be useful or necessary.

The matrix provided in Table 3 may be useful to organise the objectives and proposed initiatives.

	Political objective	**Measurable targets**	**Measurable indicators**	**Instruments**	**Preconditions**
Waste Prevention					
Recycling					
Recovery					
Landfilling					

Each of the political objectives may have several targets and instruments or measures. A possibility is to have an overall target for recycling and combine it with recycling targets for specific waste streams or specific sources such as households.
Reducing the landfilling of biodegradable municipal waste within Europe is provided as an example in Table 3.

	Political objective	**Measurable targets**	**Measurable indicators**	**Instruments**	**Preconditions**
Landfilling: Reduce the use of landfills	To save natural resources by increasing recycling of waste to avoid unproductive use of land and to reduce negative environmental impacts on natural resources	**Year 2006:** The amount of BMW going to landfill must be reduced to 75% of the total amount by weight of BMW produced in 1995.	**Year 2004:** Treatment facility for BMW to be established parallel to gradual development of separate collection schemes for paper, cardboard, garden waste, and food waste	**Year 2002:** **a)** Approve the legislative framework in order to secure the individual separation of biodegradable wastes. **b)** Increase the taxes on waste that goes to landfill by 20% each year.	**Year 2001 - 02:** Conduct a baseline study on relevant treatment methods
		Year 2009: must be reduced to 50%.			
		Year 2016: must be reduced to 35%.			

Note: Targets are from the Council Directive 99/31/EC on the landfill of waste. BMW is an abbreviation for biodegradable municipal waste.

4. Implementing the Plan

When all the analyses of the existing situation and the future developments in waste quantities are made and the objectives are set, it is time to decide how these objectives are to be met. In a way this is the core of the planning process.

As a minimum, three types of decisions will have to be made decisions regarding:
- the choice of collection system,
- the waste management installations

- the division of responsibilities between local authorities (or other competent authority) and industry.

Collection systems for all identified types of sources and waste streams should be decided on. What sorts of systems are necessary to reach the objectives? Will special regulation be needed, such as a legal obligation for regions or municipalities to establish collection systems in areas of more than a certain size? Also, does it have to be a kerbside collection, which is typically more expensive but also more effective, or will it be enough to have a bring system either as bring banks or as a recycling site? These are the sorts of questions that should be asked for each source and waste stream.

The strategy should also include decisions on type, capacity and location of existing as well as future waste management installations. At least for the development period of the waste management plan. This may be one of the most difficult issues to deal with in the planning, which is why the public should be involved in the decision, at least through a consultation process.

Facilities and disposal sites for disaster wastes should also be designated beforehand, and their location included in local emergency plans. Regular updating of the plans will be needed in communities where rapid urban development is ocurring. As much of the inert debris may be able to be recovered and recycled, temporary storage, sorting and recycling areas can also be usefully designated. Some thought should also be given to waste collection and transport needs during emergencies, with additional vehicles and equipment being designated in the emergency plan.

Before deciding on collection and treatment methods it may be useful to carry out one or more cost-benefit analyses (CBA) for different initiatives for waste streams or sources. The CBA is a tool to create an overview of the consequences/impacts of different options and, of course, to help decision-makers. The use of CBAs may also be an opportunity to examine the impact of the waste management system on other plans, such as health, spatial planning, etc.

The third decision concerns the division of responsibilities between public administration and industry. Often household waste and waste from trade and industry that is similar to household waste are being collected and treated under the responsibility of the municipalities. Alternatively, collection, recycling and treatment of industrial waste may be the responsibility of the industries themselves. Another division of responsibility is the concept of producer responsibility, where the producer has some kind of obligation to take back and treat a product when it becomes waste.

5. Public Participation and Individual Involvement

Public participation is crucial in order to implement the waste management plan.
ISWA and UNEP see public participation--resulting from public awareness raised through education--as being necessary for the plan to be implemented.

❖ *Communication and Social Issues*

ISWA and UNEP believe that there is a need for a stronger focus on communication and social issues in order to effect a structural change that will move society towards less waste of resources and less contaminating behaviour.

However, in order to change consumers' value systems it is important to focus on the different players, on their individual interests and how those interests change. It is important to be aware of the following:

- The inter-relations between different social groups, specific living conditions and backgrounds, all of which have a major influence on people's consumption and environmental behaviour.
- There can be conflicing representations of a single thing/idea/place. People live in different worlds, even though they share the same locality.
- Environmental awareness is not the same thing as environmental behaviour. People may well see the benefit for the environment of using reusable or recyclable products, but their social needs may take them stick to traditional patterns. Price and convenience are two essential factors here.

Part of the solution is that the communication should aim at turning inappropriate behaviour into awareness. People expect solutions, but they must become aware that they too are part of the problem and it is therefore a natural consequence that they should contribute to a solution.

Waste education will become one of the prime issues in years to come. An interesting option is to firmly embed environmental issues in the school syllabus starting at a very basic level.

n During the Planning Process

It is important to be in contact with all stakeholders throughout the entire planning process - this will lead to more successful implementation. In some cases it can be necessary for the government to help mobilise the "weaker" interests groups.

It is important that all stakeholders with rights responsibilities and interests play an active role in decision making.

Links to examples of Waste management plans can be found at the back of this booklet, in Annex 2.

Reference

Christian L., Stefanie H., and Samuel S. (2003) Municipal Solid Waste Management: Strategies and Technologies for Sustainable Solutions, p.7.
International Solid Waste Association (1996) Solid Waste Management for Economically Developing Countries. Edited by Luis F. D., George M. S., Linda L. E., and Clarence G. G. p. 288.
United Nations Environment Programme (2003) Global Environment Outlook 3, p.261.

ANNEX 1:
Waste Management after Rio

Ten years after Rio, and the adoption of Agenda 21, came the World Summit in Johannesburg. Assessments have been made at all levels of society of the progress made in achieving the objectives and goals set in Agenda21. ISWA and UNEP have participated in an assessment of the waste industry's progress towards sustainable development. The report of that assessment can be downloaded from (www.iswa.org). In this context, we give a short summary of the principles, objectives and goals established in Rio for waste management.

Agenda 21

In 1992, Agenda 21 stated that environmentally sound waste management should move towards more safe disposal or recovery of waste and that there was a need to change to more sustainable patterns of production and consumption by introducing integrated life cycle management concepts. Furthermore, it was stated that a preventive waste management approach which focused on changes in lifestyles and in production and consumption patterns offered the best chance for reversing current trends.

Furthermore, Agenda 21 also introduced the waste hierarchy. The waste hierarchy is a stepwise approach to waste management in order of environmental priority for different waste management options. The general principle of the waste hierarchy consists of the following steps:

- Minimising wastes.
- Maximizing environmentally sound waste reuse and recycling.
- Promoting environmentally sound waste disposal and treatment.
- Extending waste service coverage.

To reach these goals, Agenda 21 set the following objectives:

- ❑ To stabilise or reduce the production of wastes destined for final disposal.
- ❑ By the year 2000, ensure sufficient national, regional and international capacity to access, process and monitor waste trend information and implement waste minimisation policies.
- ❑ By the year 2000, have in place in all industrialised countries programmes to stabilise and reduce, if practicable, production of wastes destined for final disposal, including per capita wastes (where this concept applies), at the level prevailing at that date; developing countries as well should work towards that goal without jeopardizing their development prospects.

Agenda 21 also stressed that it is very important to extend waste service coverage, especially in the developing countries. A large number of people die each year from waste related diseases. It is therefore an overall objective to provide environmentally safe waste collection and disposal services to all people:

- ❑ By 2000, have the necessary technical, financial and human resource capacity to provide waste collection services commensurate with needs.
- ❑ By 2025, provide all urban populations with adequate waste services.
- ❑ By 2025, ensure that full urban waste service coverage is maintained and sanitation coverage achieved in all rural areas.

Agenda 21 also deals separately with objectives regarding hazardous waste. It sets objectives regarding prevention and minimisation of the generation of hazardous waste and it also deals with the ratification of the Basel Convention on the Control of Transboundary Movements of Hazardous

Waste. The need to introduce cleaner production and to promote the use of regulatory and market mechanisms were mentioned as solutions to the prevention and minimisation of hazardous wastes. Agenda 21 also stresses that one of the main priorities in ensuring environmentally sound management of hazardous wastes is to provide awareness, education and training programmes at all levels of society.

The Basel Convention is ratified by 135 member countries and the European Union (as of April 2000), to address the problems and challenges posed by hazardous waste. The Secretariat, in Geneva, Switzerland, facilitates implementation of the Convention and related agreements. It also provides assistance and guidelines on legal and technical issues, gathers statistical data, and conducts training on the proper management of hazardous waste. The Secretariat is administered by UNEP. The key objectives of the Convention are:

- to minimise the generation of hazardous wastes in terms of quantity and hazardousness;
- to dispose of them as close to the source of generation as possible;
- to reduce the movement of hazardous wastes.

http://www.basel.int

10 years after Rio

After Rio most countries have generally accepted the waste hierarchy as a strategy towards an environmentally sound waste management system. In the last ten years the concept of Integrated Waste Management has also evolved and is slowly becoming accepted by decision makers. In such a system, the technical solution of disposing of waste is not the only focal point. Instead, it relies on a number of different means to manage waste. It aims at a holistic approach to the chain of waste management from generation to disposal and all stages in between. All actors participating in and affected by the waste management system are considered as well as cultural, social and economic factors.

Most industrialised countries have adopted a waste policy. A long-term and well-prepared waste policies required throughout the world. Clear, concise and consistent policy is necessary to set up waste management systems and make the necessary investments.

The content and the quality of existing waste policies vary. Apart from environmental and health aspects waste policy must take into consideration socio-economic, political, institutional and cultural factors. A successful waste policy can be hindered by the lack of tradition and understanding in integrating all these factors. Some factors may change rapidly and will have effects on policy, others are contradictory. Nevertheless, a well-established and supported waste policy is of crucial importance for the state of waste management in any country. Another limiting factor is the financial resources required to ensure implementation.

Different countries have developed slighty differing waste hierarchies, while everyone recognises the main grouping of options. The issues for discussion are the flexibility with which the hierarchy is to be applied and the components of the various levels of the hierarchy. First, the hierarchy must be seen as providing general guidelines and as a good basis for development of a waste policy. The hierarchical 'ranking' is established with regard to environmental effects.

A waste hierarchy based on the above ranking must be applied in a manner that is flexible and that takes account of the fact that, for many developing countries, the first priorities are ensuring that a

collection service is available to as large a part of the population as possible, and raising the quality of landfills.

- The ISWA Working Group on Sanitary Landfill has published a manual on how to set up a sanitary landfill.
- The ISWA Working Group on Developing Country Issues has published Guidance for Landfilling in Economically Developing Countries

Both publications are for sale through the ISWA homepage: http://www.iswa.org.

Other important definitions, agreements and principles
When decision makers have to set up a waste management system it is very important to be aware of the following definitions, principles and agreements. ISWA is, at the moment, also working on an International Waste Convention.

OECD agreement
The OECD countries have agreed on the following definitions on waste prevention and waste minimisation:

Preventive Measures			**Waste Management Measures**			
Prevention	Reduction at source	Re-use of products	Quality improvements	Recycling	Energy recovery	Pre-treatment
Waste Minimisation						

The EU principles
Within the EU the following principles are in force:

- To secure the preservation of nature and resources, waste production must be minimised and avoided where possible **(prevention principle).**
- To secure a reduction of impacts from waste on human health and the environment, especially to reduce the hazardous substances in waste, through the **precautionary principle**.
- To make sure that those who produce waste or contaminate the environment pay the full costs of their actions, through the **polluter pays** and **producer responsibility** principles.
- To secure an adequate infrastructure by establishing an integrated and adequate network of disposal installations, based on the principle of **proximity** and **self-sufficiency.**

These principles mark the historical evolution of the waste management system, from giving the highest priority to aspects of infrastructure, then adding aspects of human health and the environment, and finally integrating concerns on preservation of nature and resources.

ANNEX 2:
Planning for Disaster Waste Management

Planning for Disaster Waste Management

For many waste planning authorities, already struggling to cope with rapidly increasing waste volumes linked to their expanding consumer-based social systems, the generation of additional wastes by a disaster can exceed their ability to cope.

Natural disasters, industrial accidents and other emergency situations generate large quantities of waste that are difficult to handle both during and after the crisis. The sheer volumes of waste and the unknown composition of some of it make handling and disposal a potential risk to human health and the environment.

It is probable that the infrastructure and personnel normally dealing with waste management will not be available during a crisis, as all available resources are usually dedicated to addressing humanitarian issues. Waste clearance and disposal is therefore often left to inexperienced personnel under ad-hoc conditions, presenting an immediate risk to operators and a threat of pollution and other problems sometime after the event.

It is highly desirable that waste management planning at local and national levels take into account the high-volume wastes from potential disaster events. However, ‘disaster event ’ is clearly a variable concept, and it is therefore essential that the emergency agencies be involved in defining the types of events that could occur in individual communities, allowing the waste agencies, in turn, to make adequate contingency provisions.

The following issues can be incorporated into the disaster waste management planning process:

1. Identification, with emergency agencies, of possible disaster events that could occur, and development of scenarios on the basis of risk assessments.

2. Estimation of likely volumes and composition of wastes from various disaster scenarios. Attention should be given to waste components with potential health and environmental impacts such as chemical contamination from commercial premises, wastes from health care institutions, asbestos and other substances commonly included in buildings, spilled fuels and oils, and agricultural chemicals from stores and farms. Residues generated by damage to waste disposal facilities themselves, such as floods sweeping away a garbage dump, should also be included.

3. Identification of possible storage or disposal areas for large volumes of inert solid debris close to where such waste might be generated, i.e. towns and industrial zones. It is unlikely that debris will be carried very far during a crisis.

4. Identification of additional removal, transport and handling equipment and of personnel that might be called upon (and not already employed in other aspects of humanitarian crisis relief). The emergency services should have a stand-by list of resources immediately appropriate to waste management functions, and should know the land areas available for storage/disposal.

5. Identification of the possibilities for separation and recovery of potentially valuable waste components. As well as providing secondary materials for reconstruction, such operations provide some employment relief for victims who have lost their livelihood. Ownership, resale or donation conditions of recovered waste should ideally be determined in the planning process, to avoid time-consuming disputes during a crisis.

6. Training of non-waste personnel to assume temporary waste management functions during a crisis.

7. Identification of wastes that might arise from a large-scale disaster relief operation, especially health-care wastes and any equipment that will eventually be discarded.

8. Explicit planning for circumstances in which major industrial accidents cause an especially difficult situation, as regular municipal authorities have little experience in handling the debris from chemical plants or transport accidents. While the industry's expertise can assist, questions of legal liability and lack of facilities that can accommodate such special waste remain.

9. Integration of the normal waste generated during the emergency period into the waste management plan, as well as additional waste such as medical waste that is produced during relief operations. This has to be managed at the same time as the debris.

In particular, the following need to be incorporated into disaster waste planning:

- maintaining close links with disaster management agencies, and ensuring that waste management is incorporated into emergency plans;
- nominating stand-by waste personnel and equipment and ensuring training and practice, as in normal emergency management;
- identifying temporary waste handling locations;
- resolving legal liability and ownership issues concerning emergency wastes;
- disaster mitigation measures in the design and operation of waste management facilities;
- elaborating special emergency waste systems for sensitive installations like hospitals;
- incorporating disaster wastes into waste planning at national and local level.

A coordinator/manager for disaster waste should be clearly identified by the authorities.

What is disaster* waste?

** Earthquakes, floods, tsunamis, landslides, forest fires, hurricanes factory explosions, transport accidents, pipeline ruptures, oil spills conflicts, civil disturbance,*

Natural and man-made disasters can generate enormous volumes of debris, including soil and sediments, building rubble (brick, concrete and timber), vegetation (leaves, branches and trees), personal effects, hazardous materials (oil drums, asbestos and batteries), mixed domestic and clinical wastes and, all too often, human and animal remains. This waste represents a risk to human health from biological sources (flies, rodents, rotting carcasses), chemical sources (asbestos, oils, solvents) and physical sources (cuts, abrasions, collapse). The waste also impedes pedestrian and vehicle access and blocks services (drains, sewers).

Disaster waste also comprises valuable resource materials including scrap metals (copper, steel, aluminium), timber (for reconstruction and heating/cooking), demolition waste from buildings/structures (for re-use, re-working as an aggregate or in-filling/protection material) and uncontaminated soil/sediment (for restoration or in-filling). Industrial accidents (including transport spills) involve a range of chemicals and fuels that present significant risks to communities, to handlers of the waste, and to the environment when soil and water are contaminated.

Taken together, disaster waste management places an additional burden on a community already struggling to cope during a crisis. Good planning helps to be prepared for events that will generate exceptional wastes.

Some further Information

1. WHO, *Safe Management of Wastes from Healthcare Activities*. Chapter 16 refers specifically to emergency situations.

2. State of California, Integrated Waste Management Disaster Plan, htttp://www.ciwmb.ca.gov/Disaster/DisasterPlan/

3. Waste Management in Emergencies network, http://www.redr.org/WMinE/index.htm

ANNEX 3:
Useful Websites and Publications

Further information

UNEP DTIE	*http://www.uneptie.org/pc/pc/waste/waste.htm*
ISWA General Secretariat	*http://www.iswa.org*
The European Commission, DG Environment, Nuclear Safety and Civil Protection	*http://europa.eu.int/comm/environment/index_en.htm*
The European Statistical Office	*http://www.europa.eu.int/eurostat.html*
The European Environment Agency	*http://www.eea.eu.int/*
European Topic Centre on Waste and Material Flows	*http://waste.eionet.eu.int/* Wastebase, an electronic database with information on waste, waste policies, planning, management and treatment in Europe: *http://wastebase.eionet.eu.int/*
The Secretariat of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal	*http://www.basel.int*
OECD Environment Directorate	*http://www.oecd.org/department/0,2688,en_2649_33713_1_1_1_1_1,00.html*
European Waste Club	*http://www.wasteclub.org*
ACRR (Association of Cities and Regions for Recycling)	*http://www.acrr.org/german/about-us/uber-uns.htm*
The Resource Recovery Forum	*http://www.residua.com/rrf/index.htm*

National waste management plans and strategies

Austria	Federal Waste Management Plan 2001, Austrian Federal Ministry of Agriculture, and forestry environment and water management: *http://gpool.lfrz.at/gpoolexport/media/file/federalwaste.pdf*
Denmark	Waste 21, Waste Management Plan 1998-2004, Danish Environmental Protection Agency: *http://www.mst.dk/homepage/*
England and Wales	Waste Strategy 2000 (Part 1 and 2), Department of the Environment, Transport and the Regions: Part 1: *http://www.defra.gov.uk/environment/waste/strategy/cm4693/pdf/wastvol1.pdf* Part 2: *http://www.defra.gov.uk/environment/waste/strategy/cm4693/pdf/wastv2_1.pdf*
Ireland	"A Policy statement waste management – changing our ways", The Department of the Environment and Local Government, September 1998: *http://www.environ.ie/environ/envindex.html*
Norway	The Government's Waste Policy, Ministry of the Environment: *http://odin.dep.no/md/engelsk/publ/rapporter/022051-220006/index-dok000-b-n-a.html*
South Africa	National Waste Management Strategies and Action Plans South Africa: *www.environment.gov.za*
Hong Kong	Waste Reduction Framework Plan of Hong Kong: *http://www.info.gov.hk/efb/link/wrfp/index.html*

Useful literature for waste management planning

Cointreau-Levine S., Coad, A., and Gopalan, P. 2000. *Guidance Pack: Private Sector Participation in Municipal Solid Waste Management,* Swiss Centre for Development Cooperation in Technology and Management, St.Gallen, Switzerland.

Hoornweg, D., and Thomas, L., 1999. *What a Waste: Solid Waste Management in Asia*. Urban and Local Government Working Paper Series #1, World Bank, Washington DC.

Hoornweg, D., Thomas, L. and Otten, L. 2000. *Composting and Its Applicability in Developing Countries.* Urban and Local Government Working Paper Series #8, World Bank, Washington, DC.

Johannessen, L. M., and Boyer, G., 1999. *Observations of Solid Waste Landfills in Developing Countries: Africa, Asia and Latin America*. Urban and Local Government Working Paper Series #3, World Bank.

Johannessen, L., Kijkman, M., Bartone, C., Hanrahan, D., Boyer, M., and Chandra, C., 2000. *Health Care Waste Management Guidance Note*. Health, Nutrition and Population, World Bank, Washington, DC, May 2000.

Pan American Center for Sanitary Engineering and Environmental Sciences (CEPIS). 2001. *COSEPRE - Costs of Urban Cleansing Services: Technical Documentation, Version 1 - Windows98.* World Bank Urban and Local Government Working Paper Series No. 9, CEPIS, Lima, 2001.

Pan American Health Organization (PAHO/WHO). 1997. *Methodological Guidelines for Sectoral Analysis in Solid Waste.* PIAS Technical Report Series No. 4, Pan American Health Organization, 1997 *(in Spanish).*

Rand T., Haukohl, J., and Marxen, U., 2000. *Municipal Solid Waste Incineration: Decision Maker's Guide*. World Bank, Washington.

Schubeler, P. 1996. *Conceptual Framework for Municipal Solid Waste Management in Low-Income Countries.* Urban Management Programme Working Paper No. 9, World Bank, August 1996.

Thurgood, M., 1998. *Decision-Maker's Guide to Solid Waste Landfills (summary).* The World Bank, World Health Organization, Swiss Agency for Development and Cooperation, and Swiss Center for Development Cooperation in Technology and Management, Washington DC, July 1998.

Wilson D.C., Whiteman A.D and Tormin A.C. 2001. *Strategic Planning Guide for Municipal Solid Waste Management*, published by the World Bank and DFID on behalf of the Collaborative Working Group on SWM in Middle- and Low-Income Countries *(available on CD-ROM from infoshop@worldbank.org).*

Useful UNEP and ISWA publications for developing Countries:

Training Resource Pack for Hazardous Waste Management in developing Economies- by UNEP, SBC and ISWA – orders can be placed on-line through http://www.earthprint.com

Hazardous Waste Policies and Strategies - a trainers manual - by UNEP/ISWA, 1991. available on http://www.uneptie.org/pc/hazardouswaste/ssmenuD2.htm

Landfill/Hazardous Industrial Waste- a trainers mannual - by UNEP/ISWA, 1993. available on http://www.uneptie.org/pc/hazardouswaste/ssmenuD3.htm

Guidance for Landfilling -Waste in Economically Developing Countries by George M. Savage, CalRecovery, Luis Diaz, CalRecovery, Clarence G. Golueke, CalRecovery Charles Martone, Roy F. Weston Inc., and Robert K. Ham, ISWA Working Group on Sanitary Landfilling.

Industry as a partner for Sustainable development – Waste Management – ISWA-UNEP publication prepared for the World Summit in Johannesburg 2002

Operations Guidelines by ISWA Working Group on Sanitary Landfill edited by Derek Greedy March 1999

Waste Management World –see link at ISWA homepage www.iswa.org

Waste Management: The Challenge for Asian Cities – Search for a Sustainable Future- edited by C.S. Poon P.C.K. Lei 2000

Appropriate Environmental and Solid Waste Management and Technologies for Developing Countries – proceedings from ISWA Annual Congress in Istanbul 2002

Management of Infectious Health Care Waste – ISWA publication 1995

Publications from the Basel Convention can be accessed from http://www.basel.int

ANNEX 4:
Profiles

Presentation of ISWA

ISWA The International Solid Waste Association (ISWA) was founded in 1970 as an independent, non-governmental, non-profit making association.

The objectives of ISWA are to promote sustainable waste management practices worldwide through scientific, economic and social instruments. ISWA works to protect human health and the environment and to ensure sustainable resource management. ISWA is the leading international association of reference for high quality professional information and advice regarding all aspects of waste management

ISWA is open to all countries in the world, and the activities are solely in the public interest. ISWA's members are kept abreast of new developments and trends in waste management around the world. ISWA members are kept informed on legislation and environmental policies on regional, national and international levels. Members are present in most international fora where decision makers meet. This means that ISWA is probably the biggest network within waste management in the world.

- ISWA's main activities are carried out in the 34 National Member countries. In addition there are members in some 42 other countries, thus ISWA activities cover 76 countries worldwide.
- ISWA is an association of members from all over the world, and is open to national associations, public or private companies, municipalities, public authorities, universities, research institutions, individuals, and other organisations or associations.
- There are member categories for National Members, Organisation Members, and Individual Members with a discounted fee for students and individuals from lower and lower-middle income countries.

Technical activities

ISWA's technical activities are based on the work carried out in ISWA's 12 Working Groups on different solid waste topics:

- biological treatment of waste
- collection & transportation technology
- communication & social issues
- developing country issues
- ecomomic analyses for sustainable development
- hazardous waste
- health care waste
- legal issues
- recycling & waste minimisation
- sanitary landfill
- sewage & water works sludge
- thermal treatment

ISWA publishes a scientific journal *Waste Management & Research* six times a year as well as books, a news magazine *Waste Management World* six times a year, a newsletter, and other specialist publications, Working Group Reports etc.

The publications are the product of active engagement by members and Working Group activities.

Membership Benefits
All members receive

- free subscriptions to *Waste Management World*, *Waste Management* and *ISWA News*.
- Access to join ISWA's Working Groups as Corresponding Members

Organisation Members (Gold and Silver) receive:

- access to an international network of professionals in waste management
- information from international organisations
- participation in all Working Group activities with one employee in each group
- link from ISWA' s home page (for gold members only)
- 25% discount on all ISWA publication
- discount on registration fees for ISWA' s Annual Congress, conferences, and seminars
- free listing of products and services in the Directory Issue of Waste Management World and ISWA's waste management service database
- listing in Waste Management World (Gold members only)

Individual Members

- access to an international network of professionals in waste management
- 25% discount on all ISWA publication
- discount on registration fees for ISWA' s Annual Congress, conferences, and seminars

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United Nations Environment Programme
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PROGRAMME DES NATIONS UNIES POUR L'ENVIRONNEMENT • PROGRAMA DE LAS NACIONES UNIDAS PARA EL MEDIO AMBIENTE
ПРОГРАММА ОРГАНИЗАЦИИ ОБЪЕДИНЕННЫХ НАЦИЙ ПО ОКРУЖАЮЩЕЙ СРЕДЕ
UNEP

About the UNEP Division of Technology, Industry and Economics

The mission of the UNEP Division of Technology, Industry and Economics is to help decision-makers in government, local authorities, and industry develop and adopt policies and practices that:

- are cleaner and safer;
- make efficient use of natural resources;
- ensure adequate management of chemicals;
- incorporate environmental costs;
- reduce pollution and risks for humans and the environment.

The UNEP Division of Technology, Industry and Economics (UNEP DTIE), with the Division Office in Paris, is **composed of one centre and four branches**:

The International Environmental Technology Centre (Osaka), which promotes the adoption and use of environmentally sound technologies with a focus on the environmental management of cities and freshwater basins, in developing countries and countries in transition.

Production and Consumption (Paris), which fosters the development of cleaner and safer production and consumption patterns that lead to increased efficiency in the use of natural resources and reductions in pollution.

Chemicals (Geneva), which promotes sustainable development by catalysing global actions and building national capacities for the sound management of chemicals and the improvement of chemical safety world-wide, with a priority on Persistent Organic Pollutants (POPs) and Prior Informed Consent (PIC, jointly with FAO).

Energy and OzonAction (Paris), which supports the phase-out of ozone depleting substances in developing countries and countries with economies in transition, and promotes good management practices and use of energy, with a focus on atmospheric impacts. The UNEP/RISØ Collaborating Centre on Energy and Environment supports the work of the Branch.

Economics and Trade (Geneva), which promotes the use and application of assessment and incentive tools for environmental policy and helps improve the understanding of linkages between trade and environment and the role of financial institutions in promoting sustainable development.

UNEP DTIE activities focus on raising awareness, improving the transfer of information, building capacity, fostering technology cooperation, partnerships and transfer, improving understanding of environmental impacts of trade issues, promoting integration of environmental considerations into economic policies, and catalysing global chemical safety.

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The UNEP - DTIE International Environmental Technology Centre

Established in April 1994, the International Environmental Technology Centre (IETC) is an integral part of the Division of Technology, Industry and Economics (DTIE) of the United Nations Environment Programme (UNEP). It has offices at two locations in Japan - Osaka and Shiga.

The Centre's main function is to promote the application of Environmentally Sound Technologies (ESTs) in developing countries and countries with economies in transition. IETC pays specific attention to urban problems, such as sewage, air pollution, solid waste, noise, and to the management of fresh water basins.

IETC is supported in its operations by two Japanese foundations: The Global Environment Centre Foundation (GEC), which is based in Osaka and handles urban environmental problems; and the International Lake Environment Committee Foundation (ILEC), which is located in Shiga Prefecture and contributes accumulated knowledge on sustainable management of fresh water resources.

IETC's mandate is based on Agenda 21, which came out of the UNCED process. Consequently IETC pursues a result-oriented work plan revolving around three issues, namely: (1) Improving access to information on ESTs; (2) Fostering technology cooperation, partnerships, adoption and use of ESTs; and (3) Building endogenous capacity.

IETC has secured specific results that have established it as a Centre of Excellence in its areas of speciality. Its products include: an overview on existing information sources for ESTs; a database of information on ESTs; a regular newsletter, a technical publication series and other media materials creating public awareness and disseminating information on ESTs; Local Agenda 21 documents developed for selected cities in collaboration with the UNCHS (Habitat)/UNEP Sustainable Cities Programme (SCP); advisory services; Action Plans for sustainable management of selected lake/reservoir basins; training needs assessment surveys in the field of decision-making on technology transfer and management of ESTs; design and implementation of pilot training programmes for adoption, application and operation of ESTs; training materials for technology management of large cities and fresh water basins; and others.

The Centre coordinates its activities with substantive organisations within the UN system. IETC also seeks partnerships with international and bilateral finance institutions, technical assistance organisations, the private, academic and non-governmental sectors, foundations and corporations.