ISWA’s 10 years perspective on waste management

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Foreword

Through its members ISWA has access to a unique combination of knowledge and experience of waste management. Following the request from the ISWA President 2000-2002, Christoph Scharff, each of the 12 ISWA Working Groups have developed a 10-year perspective on its specific area of interest. The contributions have made the basis for this report that aims to show a comprehensive picture of the future for waste management.

In the present era of rapid communication and quick changes in society a 10-year perspective may seem too long and could even risk of hampering the evolution of new solutions. On the other hand in order to implement a sustainable waste management strategy there is a need for a clear and well-established waste policy within a reasonable future horizon. This balance between long-term stability and quick and open decision channels is not unique to the waste industry. But ISWA sees it as one of its important tasks to use its collective knowledge to facilitate bridging the gap between those two conflicting perspectives.

The present document has been drafted with the aim of continuing the dialogue initiated within the different ISWA groups (especially the Working Groups and the Scientific and Technical Committee). It is a first attempt by ISWA to develop such a paper and it will be up-dated and changed following continuing dialogue both within ISWA and with ISWA’s external contacts. Any comments on the report will be highly appreciated.

There is no single solution to solve the waste “problem” that clearly stems from a large number of different sources. Nevertheless the main objectives of waste management within the broader perspective of resource management remain the same: –

- limit the amount of waste generated,
- increase the reuse and recycling and,
- for the remaining waste that will always be generated
- to limit the content of hazardous substances to aid
- treatment and stabilisation of these residues and thereby
to achieve the main goal of sustainable waste management.

Jeff Cooper
Chair ISWA Scientific and Technical Committee
Executive Summary

The President of ISWA for 2000-2002 Dr Christoph Scharff, asked in the Working Programme for ISWA’s Committees introduced at the ESPC-meeting 2 July 2000 in Paris ISWA’s Working Groups to deliver their view in the form of a report on a 10-year perspective for each of their specific fields of waste management. This report is the result of this request and it shows how ISWA’s different Working Groups look upon the future for waste management.

ISWA has since Rio worked for the objectives set out for waste management internationally. ISWA is the only international professional waste association that has the objective to disseminate information and knowledge throughout the world on all aspects of waste management without lobbying for special treatment-methods.

With Agenda 21 in 1992 it was stated that environmentally sound waste management should move towards more safe disposal or recovery of waste. There was also a need for changing to more sustainable patterns of production and consumption by introduction of integrated life cycle management concept. 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.

Today ten years after Rio we as waste managers must reflect on those international targets set 10 years ago and we must look closely at what has happened within the last ten years in reaching these objectives. 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.

Regional differences around the World

The Member States of the European Union have reached the most advanced state in waste management in the world. Individual Directives set concrete targets for reduction, recycling, recovery and detoxification of different waste streams. The gap between more and less advanced Member States is getting smaller and waste management policies in the EU are currently subject to remarkable changes.

In the Commission’s proposal for a 6th Environmental Action Program (6th EAP) the waste issue is being incorporated into the management of natural resources. This change demonstrates that a more integrated approach is taken that considers entire life cycles of products. Furthermore, the general objective of attaining Sustainable Development will be the guideline to widen the perspective from a mainly environmental focus to the inclusion of economic and social aspects.

Focussing on the final disposal of waste alone is certainly the wrong approach in many cases, material and substance flow analyses will be more widely applied. The goals of dematerialization and “detoxification” of all economic activities in a long-term perspective will become more important than goals in the field of waste management. Thus, new ways of policy-making are needed. As a result of this comprehensive approach, the goals of waste minimisation and decoupling economic growth and waste generation may finally be achieved.
Compared to the European Union, a more pragmatic approach is used in the USA. Economic considerations based on cost-benefit analyses play an important role in policy-making. The US Environmental Protection Agency – EPA - states that as economic growth results in more products and materials being generated, there will be an increased need to invest in source reduction activities.

Some high- and medium-income countries obviously follow the approach of the EU, some follow that of the USA. Limited availability of land normally leads to more “European” solutions (e.g. Hong Kong, Singapore, Japan). Countries where this limitation does not exist tend to follow the pragmatic course of the USA (e.g. Australia).

Japan, which also is a very highly industrialised country and which is quite densely populated in comparison with other countries of the world has sharply reduced the volume of waste and hygienic and biological hazards by the use of incineration. In Japan "Law for Promotion of Resource Recycling and Reuse" and "Waste Disposal and Public Cleansing Law" were enacted as basic statutory regulations regarding waste disposal and recycling in 1991. The law for Promotion of Resource Recycling and Reuse aims at promoting recycling at the production, distribution and consumption stages, having resources effectively used, suppressing generation of wastes and conserving environment. The new "Waste Disposal and Public Cleansing Law" includes newly added provisions concerning suppression of discharge of wastes, proper pre-sorting, storage, collection, transport, recycling and disposal.

All in all most developed countries have adopted waste management policies and implemented measures to achieve the objectives and the targets set in Rio ten years ago. The waste hierarchy and the waste problems are acknowledged and also institutionalised through legislation. However there are still regional and cultural differences in the different waste management systems. Regarding the objectives set up in Rio too much waste is still generated and too much of this waste is not utilised and going to landfill sites.

Developing Countries
The situation in the developing countries is very different from the situation in the industrialised countries. Many developing countries do not have the technical and financial resources to safely manage solid wastes including inadequate provisions for storage at the point of generation and inefficient and deficient collection. Final disposal in these countries usually is a matter of transporting the collected wastes to the nearest available open space and then dumping them. The situation for waste management leads to many problems, including pollution of surface and groundwater, migration of combustible gas from the site, litter, odours, and breeding of disease carriers.

Developing countries generally lack policies aimed at managing solid wastes. The management of municipal solid waste usually is the responsibility of local government. The budgetary process is not well defined and usually insufficient to cover the costs of the service. Due to the fact that they generally have relatively limited financial and human resources, developing countries select low-cost strategies like improving collection and switching from dump sites to sanitary landfills.

However economies in transition are facing the worst problems with increased quantities of waste due to industries such as oil refining, petrochemicals, pharmaceuticals manufacture and metal fabrication which are intensive producers of hazardous waste. At the same time as there is a lack of treatment facilities complying with the standards to avoid risks to human health and the environment.
Future challenges for waste management sector
ISWA has in its 10-year report identified four major challenges for the next ten years for the waste management sector:

1. To stabilise and to prevent waste from being generated – to decouple waste generation from economic growth
2. To reduce the hazardousness of the waste generated
3. To ensure sustainable waste treatment
4. To work for the introduction of sound waste management practices in the collection, treatment and disposal of waste in developing countries

In order to attain one of the major challenges – that is preventing waste - there is a need for a new approach. The focus must be upon the whole product chain and not only on the waste phase of products, substances and materials. Important decisions in relation to the amount of waste generated are taken both at the concept and design stage and further on during the production process. There is a need for dematerialisation of the economic process – that is to still consume the same amount of products but those products should be produced with less materials and produce less waste.

The environmental performance of the different waste treatment methods has improved substantially over the last decade. This progress must continue and this is especially relevant for facilities that have not yet been up-graded and for facilities in developing countries. Another important aspect to further improve the environmental performance of facilities is to control the quality of the input of waste. Optimised treatment processes together with relevant quality of incoming waste will ensure improved environmental performance.

The role of the waste industry is to provide information and knowledge upstream for those generating the waste. This feedback of the problems encountered in later stages will enable preventive measures to be taken to ensure sustainable waste management.

Another important goal is to render waste less hazardous. Current chemical policies and production and consumption patterns influence the quality of the waste and the environmental impact of waste management systems. But rendering waste less hazardous also depends on the existing collection systems for hazardous waste and on the level of information and education of both industry and households. The issue of rendering waste less hazardous is of great importance in developing countries, mainly for public health reasons.

Historically, health and safety have been the major concerns in waste management. Today's society demands more than this: apart from being safe, waste management must also be sustainable. At the simplest level, sustainable waste management must therefore be:

- efficient in terms of environmental protection
- socially acceptable
- efficient in terms of economic viability

The challenge today is how to reach a policy where all three aspects are taken into consideration. The most important question in this context is: How do we manage our resources with a maximum of environmental protection and social acceptability?
Major steps to be taken

Finally, set out below are the major steps that ISWA considers have to be taken in the next ten years by the waste industry in order to prevent and reduce both the quantities and the hazardous nature of waste:

The Prevention of Waste

- Integration of waste polices into other environmental policies
- Material needs to be conserved and reused and progress is also required to improve the markets for recyclable materials
- Better product design
- From cradle to cradle-to-cradle instead of from cradle to grave
- Develop a waste convention to give legal effect to those policies set out in AGENDA 21
- Coordinated strategy for public information and education to make the public aware of the waste problems but also to increase their confidence in the waste management sector.
- Accessible and transparent data is crucial if strategies are to be successful and sustainable waste management practices achieved. The industry needs to have access to clear, transparent and replicable data and information.
- Standards for the waste industry that include new and emerging technologies and also the management of specific waste types e.g. agricultural waste.
- Considerable investments should be made in emerging technologies and support should be given to research and development.
- Building of new partnerships needs so that all stakeholders can work together towards a common goal.
- The waste industry has to encourage and take part in multiple stakeholder involvement.
- The waste industry must set and achieve sustainability targets.

The Developing Countries

- Is to get from “no control” to a managed situation, and the first step towards that is through so-called “transitional” technologies.
- To train and disseminate information on sound and low-cost technology to the developing countries.
- Assist developing countries to put regulation in place. Help should also be given through education where ISWA can provide training courses and particularly financial help through ISWA’s contacts with International Aid Agencies.
- Make National waste policies more coherent; the legal framework, its implementation and enforcement need to be improved in all parts of the world. Waste management plans at national and local level are needed; these can serve as the basis for the improvement of and investment in waste management systems.
- The practical experience of practitioners and planners, regulators and operators, scientists and researchers in waste management must be made more available to developing countries and economies in transition. Immediate support and transfer of know-how are most valuable, as they facilitate the implementation of sound waste management strategies and practices. In many cases, a small amount invested in education and “training the trainers” can enable local staff and regional regulators to help them effectively.
- From a global point of view, the most urgent need is to close the gap between developed and developing countries. The first priority in this context is to make sure that there are collection services available to as large a part of the world’s population as possible and to raise the quality of landfill sites.
What can ISWA do?
ISWA collect information on the hidden flows. It can also help the developing countries by informing the rest of the world about the side effects of the consumption patterns in developed countries.

ISWA through its members can facilitate for the waste management industry to help manufacturers by pointing out which products, materials and substances are causing barriers to sustainable waste management.

Take the lead in the process for the waste management sector to rethink its role and to acknowledge its responsibility to make available their expertise to the waste generators and policy makers.

Participate in the development of improved communication strategies to build sustainable development. The overall goal is to develop o and communicate new paradigms and change human behaviour patterns.

ISWA will engage in the development of new decision making tools that will be of help to decision makers to choose the most sustainable policy option

ISWA will initiate an ISWA Development Fund (IDF) with the aim of supporting ISWA Training Courses etc. in developing countries.

The ISWA vision

- Progressing towards a waste-free world
- Consolidate evolution in developed countries
- Improve Waste Management in developing countries
  - Generate Less Waste
  - Utilise More waste
- Reduce health and environmental impacts
- Achieve an international waste treaty by 2010
1. Introduction

1.1 Background

ISWA is an independent, non-governmental, non-profit making association. ISWA’s objective is the maximum exchange of information and experience worldwide on all aspects of solid waste management. The major technical activities of ISWA are carried out by ISWA’s Working Groups. The Working Groups provide the technical expertise for ISWA meetings, projects, information and conference programmes. Members of the Working Groups represent the interests of all sectors of waste management - the private and public sectors, the academic world, service providers and manufacturers etc. ISWA therefore has a unique position to provide a strategy paper on waste management reflecting the views of a large spectrum of waste professionals dealing with all different aspects of waste management.

The President of ISWA, for 2000-2002 Dr Christoph Scharff, asked ISWA’s Working Groups to deliver their view in the form of a report on a 10-year perspective for each of their specific fields of waste management. The papers, resulting from that process are to be found in chapter 4 of this report. They show how ISWA’s different Working Groups look upon the future for waste management.

ISWA’s 10-year perspective paper is a strategic paper that aims to show a comprehensive picture of the future for waste management as well as providing policy makers around the world with guidelines for sustainable waste management policy innovation.

Sustainable development emerged as a concept in the report of the World Commission on Environment and Development (the Brundtland report) in 1987. Furthermore, it was put on the global agenda in 1992 by the United Nations Earth Summit in Rio de Janeiro followed by the Rio + 5 conference in 1997. It was decided to draw up a sustainable development strategy for the Rio + 10 World Summit on sustainable development in Johannesburg August 2002. This paper should be seen as a complementary contribution for the 2002 Johannesburg World Summit, to which ISWA has already been asked to make a submission in another context.

1.2 Content of paper

Chapter 2 of this report seeks to establish what are the current topics being discussed at an international level in relation to waste management. Presently ISWA has members in 90 countries as well as National Members in 32 countries. The large geographical area that is covered by ISWA indicates the worldwide status and impact that it has created. In chapter 3, ISWA outlines its vision on waste management in the next ten years.

The background material, from ISWA’s 12 Working Groups, can be found in chapter 4. This chapter therefore can be read by those who want to go in to more detail about the 10-year perspectives of specific aspects of waste management.
2. Ten years after Rio de Janeiro

2.1 Objectives set in Rio "Agenda 21"

ISWA has since Rio worked for the objectives set out for waste management internationally. ISWA is the only truly international professional waste association that has the capability to disseminate information and knowledge throughout the world on all aspects of waste management.

Now ten years after Rio and the adoption of the Agenda 21, it is time for a follow-up by the World Summit in Johannesburg. At all levels in society assessments are made of the achievements made in relation to the objectives and goals set up in Agenda 21. ISWA has participated together with UNEP – United Nations Environmental Programme – in an assessment of the waste industry towards sustainable development. This report can be downloaded from the website of ISWA (www.iswa.org).

In this context we will give a short resumé of the principles, objectives and goals in relation to waste management established in Rio.

With Agenda 21 in 1992 it was stated that environmentally sound waste management should move towards more safe disposal or recovery of waste and that there was a need for changing to more sustainable patterns of production and consumption by introduction of integrated life cycle management concept. 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, the Agenda 21 also introduced the so-called waste hierarchy, which 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 the Agenda 21 set some of 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 the waste service coverage, especially to the developing countries. A large number of persons die each year from waste related diseases and therefore it is an overall objective to provide environmentally safe waste collection and disposal services to all people:

• By year 2000, have the necessary technical, financial and human resources capacity to provide waste collection services commensurate with needs;
• By year 2025, provide all urban populations with adequate waste services;
• By the year 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 up 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. As solutions to the prevention and minimisation of hazardous waste it is mentioned that there is a need to introduce an integrated cleaner production approach and also to promote the use of regulatory and market mechanisms. 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 covering all levels of society.

2.2 Where are we today and what are the trends

Today ten years after Rio we as waste managers must reflect on those international targets set 10 years ago and we must look closely at what has happened within the last ten years in reaching these objectives.

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.

2.2.1 EU

The member states of the European Union have reached the most advanced state in waste management in the world. Extensive source separation and material and energy recovery from wastes have led to a constant decrease of landfilled material. The EU Landfill Directive will reduce the amounts landfilled to a minimum and at the same time reduce the content of organic carbon. An important part of waste legislation is based on the concept of priority waste streams. Individual Directives set concrete targets for reduction, recycling, recovery and detoxification. The gap between more and less advanced member states is getting smaller.

Waste management policies in the EU are currently subject to remarkable changes. In the Commission’s proposal for a 6th Environmental Action Program (6th EAP) the waste issue is being incorporated into the management of natural resources. In the communication for the 6th EAP, drafted by the Commission, the waste issue is part of a chapter called “The sustainable Use of Natural Resources and Management of Waste”. The Commission has also announced that it will launch a resource and recycling strategy during this year, which will be the framework for future waste regulation within the EU. Furthermore, it became clear that the integrated product policy (IPP) is the cornerstone of the 6th EAP, which will set the agenda for European environmental legislation.

The fact that the waste management unit in the European Commission’s Directorate General (Environment) no longer exists may be regarded as a visible sign for this reorientation. A new unit called “Sustainable Resources – Consumption and Waste” was established in its place. This change demonstrates that a more integrated approach is taken that considers entire life cycles of products. Furthermore, the general objective of attaining Sustainable Development will be the guideline to widen the perspective from a mainly environmental focus to the inclusion of economic and social aspects.
Maybe this change will also lead to a new way of applying the European waste management hierarchy (minimisation – material recycling – energy recovery – disposal) in a more comprehensive way to find the optimal combination of options. The concept of priority waste streams will probably remain, but this new approach (which is more life cycle oriented) could lead to the revision of existing regulations. The increasing consideration of economic aspects will probably lead to more cost-effective solutions for existing and new regulations.

It is obvious, however, that the tail (waste management) cannot wag the dog (the entire economy). Since focussing on the waste end alone is certainly the wrong approach in many cases, material and substance flow analyses will be more widely applied. The goals of dematerialization and “detoxification” of all economic activities in a long-term perspective will become more important than goals in the field of waste management.

Thus, new ways of policy-making are needed. These may result from a structured dialogue between a broad range of stakeholders. Waste management institutions will be challenged to contribute to that dialogue, the topics of which will be the whole picture and issues like supply of primary resources, production, trade, transport and consumption. As a result of this comprehensive approach, the goals of waste minimisation and decoupling economic growth and waste generation may finally be achieved.

Within the next ten years, several accession candidates will become Member States of the EU. They will have to fulfil the EU’s legal framework for waste (and resource) management, probably with specified extended deadlines.

2.2.2 United States
Compared to the European Union, a more pragmatic approach is used in the USA. Economic considerations based on cost-benefit analyses play an important role in policy-making. Due to this approach, landfill continues to be the most common solution in the USA. Two factors play an important role in this context: a relatively low population density, and incomplete cost accounting on waste management alternatives.

The US Environmental Protection Agency – EPA - states that as economic growth results in more products and materials being generated, there will be an increased need to invest in source reduction activities such as light weighting of products and packaging, reuse of products, grass recycling, backyard composting. Also important, will be to utilise existing recycling and composting facilities, further developing this infrastructure, and buying recycled products, to conserve resources and minimise the dependence on disposal through combustion and landfill.

2.2.3 Other high- and medium income Countries
Some high- and medium-income countries obviously follow the approach of the EU, some follow that of the USA. Limited availability of land normally leads to more “European” solutions (e.g. Hong Kong, Singapore, Japan). Countries where this limitation does not exist tend to follow the pragmatic course of the USA (e.g. Australia).

Japan, which also is a very highly industrialised country and which is quite densely populated in comparison with other countries of the world, with industries/population concentrated in cities, has sharply reduced the volume of waste and hygienic and biological hazards by the use of incineration. As expected, in large cities, waste generation density is high, but space resources are scarce. The difficulty in acquiring suitable land in such a city for a waste treatment or disposal site increases every year. Pronounced difficulty in such land acquisition is encountered in the case of final disposal sites, which
In Japan, extra efforts have been made to reduce generated waste by various intermediate treatments. In 1997, 78.1% of the total quantity was incinerated and 13.4% was separated and crushed, or put in a high-speed composting process or other treatment. Thus 91.5% of discharged waste was subject to some form of intermediate processing. Material recovery by local municipalities was 3.35 million tonnes and promotion of intermediate processing led to a decrease in the quantity of waste disposed of at landfill site, from 15.3 million tonnes in 1992 to 12.0 million tonnes in 1997. (Tanaka – The International Conference on Municipal Solid Waste Treatment and Recycling in Guangzhou, China, 2001: 14-20).

In Japan "Law for Promotion of Resource Recycling and Reuse" and "Waste Disposal and Public Cleansing Law" were enacted as basic statutory regulations regarding waste disposal and recycling in 1991. The law for Promotion of Resource Recycling and Reuse aims at promoting recycling at the production, distribution and consumption stages, having resources effectively used, suppressing generation of wastes and conserving environment. The new "Waste Disposal and Public Cleansing Law" includes newly added provisions concerning suppression of discharge of wastes, proper pre-sorting, storage, collection, transport, recycling and disposal. In June 1995, the Law for Promotion of Separate Collection and Recycling of Packaging Waste was enacted as the statutory regulations intended for waste containers and packages, which constitute a large proportion of urban waste, and this was a significant addition to the Japanese legislation on recycling.

2.2.4 Developing countries
All in all we can state that most developed countries have adopted waste management policies and implemented measures to achieve the objectives and the targets set in Rio ten years ago. The waste hierarchy and the waste problems are acknowledged and also institutionalised through legislation. However there is still regional and cultural differences in the different waste management systems and also in the way countries interpret the waste hierarchy as well as in the way the countries looks upon the different waste treatment methods. Regarding the objectives set up in Rio too much waste is still generated and too much of this waste is not utilised and going to landfill sites.

The situation in the developing countries is very different from the situation in the industrialised countries. Many developing countries do not have the technical and financial resources to safely manage solid wastes including inadequate provisions for storage at the point of generation and inefficient and deficient collection. Final disposal in these countries usually is a matter of transporting the collected wastes to the nearest available open space and then dumping them. The attention given to the dumped waste usually comes from scavengers, birds and animals in search for food and other useful items. In some cases the waste is set on fire in order to reduce the volume and to minimise the attraction of animals and vermin (ISWA Publication: Guidance for Landfilling Waste in Economically Developing Countries 1998:19). The situation for waste management leads to many problems, including pollution of surface and groundwater, migration of combustible gas from the site, litter, odours, and breeding of disease carriers.

Developing countries generally lack policies aimed at managing solid wastes. In addition, most countries do not have modern regulations and existing regulations are antiquated and rarely enforced. Maintenance programs are not existent and the equipment used is not enough and often out of service. The management of municipal solid waste usually is the responsibility of local government. The budgetary process is not well defined and usually insufficient to cover the costs of the service. Similarly, tariffs for the management of wastes are rarely put into place and if they are, the funds collected are not sufficient to cover the expenses. Due to the fact that they generally have relatively limited financial and human resources, developing countries select low-cost strategies like improving...
collection and switching from dump sites to sanitary landfills. Nevertheless, in many cases, because of a lack of knowledge combined with other factors, many of the more expensive solutions are considered.

However, economies in transition are facing the worst problems with increased quantities of waste due to industries such as oil refining, petrochemicals, pharmaceuticals manufacture and metal fabrication which are intensive producers of hazardous waste. At the same time as there is a lack of treatment facilities complying with the standards to avoid risks to human health and the environment. The problems that are encountered are the uncontrolled dumping of waste to land, inadequate or no control at all of emissions to water and air.

2.3 Conclusion

When looking at the global status for waste management today it must be acknowledged that different challenges are faced depending on which part of the world we are looking at. However, the most industrialised countries have implemented a political framework more or less based upon the same waste hierarchy. Also we can state that most industrialised countries today have extended waste service coverage and have implemented legislation for environmentally sound waste management in line with the goals set in Agenda 21. Although the industrialised countries have come a long way both on the political and technological aspects regarding waste management there is still a long way to go to reach the overall goal set in Rio for changing to more sustainable patterns of production and consumption. There is, as stated in Rio ten years ago, still a need for changing lifestyles towards lower waste generation.

However when looking at the developing countries not much has happened. ISWA therefore finds that the developing country issues will be at the top of the agenda for the next ten years. The rapid growth in the population and in the economy combined with the lack of training in modern waste management practices complicates the effort of improving waste management services. Of course improvements are planned, or have been made, in storage and collection of the wastes, but they still remain limited.

Some economically developing countries, mostly with support from international organisations, are in the process of developing their waste management systems. The key ingredients in these success stories include: political will, intelligent and appropriate technical systems and comprehensive measures to achieve high cost recovery.

In the future, some of the large metropolitan and urban areas in developing countries will be facing serious problems associated with the identification and establishment of disposal sites. Recognition of these events will lead to the implementation of modern concepts in the management of their wastes including waste reduction and recycling. In medium and small size communities, the improvements in waste management systems will be largely driven by concerned citizens and accomplished with the assistance of international organisations. These will in turn be driven by concerns about global contamination, but initially through improvements in the efficiency of existing systems.
3. Where shall we go to in the next 10 years?

The waste management sector has four major challenges for the next ten years:

- To stabilise and to prevent waste from being generated – to decouple waste generation from economic growth
- To reduce the hazardousness of the waste generated
- To ensure sustainable waste treatment
- To work for the introduction of sound waste management practices in the collection, treatment and disposal of waste in developing countries

3.1. Prevention

In order to attain one of the major challenges – that is preventing waste - there is a need for a new approach. The focus must be upon the whole product chain and not only on the waste phase of products, substances and materials. Important decisions in relation to the amount of waste generated are taken both at the concept and design stage and further on during the production process.

Figure 1: Product Chain

| Virgin Material Extraction | Production and consumption | Waste | Treatment and disposal |

3.1.1 Virgin Material Extraction

In order for the society to develop in a more sustainable way there is a need for dematerialisation of the economy, in other words to produce the same with less. The amount of virgin material used per produced unit, MIP material input must be minimised. The huge amount of waste generated when extracting natural resources has high environmental impact such as erosion, contamination etc. Extraction of virgin material is often located in the developing countries. The waste produced during extraction can also be referred to as hidden flows, which is waste that is connected to the product but it may never become visible in the country where the product is produced and consumed.

3.1.2 Production, consumption and waste generation

In the production and consumption phase we have different kinds of waste problems, many production processes produces a lot of waste and some of which also include hazardous waste. There is a need for redesigning products and thereby minimising the hazardous nature of the products (detoxification) and also to be creative in the production technology in order to minimise waste during the production phase. Both production and consumption will always generate waste, but waste generation must be minimised and detoxified.

The figure below of the dematerialisation of the economic process shows the way in which we should proceed. We can still consume the same amount of products but those products should be produced with less materials and produce less waste.
3.1.3 The waste phase of the waste chain
Although a lot can be done to prevent the generation of waste there will always be waste to be collected treated or disposed of. To be able to recycle or recover with energy generation it is very important that people fully understand and are prepared to participate in their waste management system. Of course it is important to have legislation, but in order to obtain waste that has been properly segregated at source by the public and therefore better quality waste streams we need to focus more on our communication and social issue skills. Education about the waste management system will therefore become one of the prime issues in the years to come. An interesting option is to firmly embed in the young generation issues concerning the environment at school as early as possible.

We have seen in the last couple of years that governments have focused a lot on household waste. ISWA would however like to stress that industrial waste needs to get a lot more attention, because of the high content of hazardous substances. Household waste is still important, but we should focus on hazardous waste. Waste is becoming increasingly hazardous and poses a big risk for the environment.

ISWA also finds that there is need to focus upon proper systems for the management of health care waste, which also is an increasing problem, especially in the developing countries and can have a damaging effect upon the health of the local community particularly where there is little or no control over the disposal methods and scavenging on dumps is a way of life. The waste phase of the chain also involves questions such as who has the responsibility for the waste. ISWA supports the principle of producer responsibility and stresses that this should be extended to more products. ISWA also sees the possibility of extending that responsibility to consumers. It is important for people to take a personal responsibility for the waste they produce.

3.1.4 The treatment and disposal phase of the waste
Once waste minimisation has been practised and prevented from being generated, we need to ensure that the products are designed so that they can be easily dismantled and recycled. At the moment there is a tendency towards producing more complex products, which are difficult to dismantle for recycling.
Although prevention and reuse is the overall target there will always be waste that has to be treated or disposed of. Within the waste hierarchy recycling is of the higher priority when it comes to treatment, followed by recovery of energy and finally disposal. ISWA supports the general philosophy of the waste hierarchy, but states that it has to be applied with flexibility after taking into consideration the local and socio-economic circumstances.

The environmental performance of the different waste treatment methods has improved substantially over the last decade. This progress must continue and this is especially relevant for facilities that have not yet been up-graded and for facilities in developing countries. Another important aspect to further improve the environmental performance of facilities is to control the quality of the input of waste. Optimised treatment processes together with relevant quality of incoming waste will ensure improved environmental performance.

Controlled landfills in the developing countries are a priority because the alternative in many cases is uncontrolled dumps although some simple low cost recycling/reuse methods can be of interest.

To reach higher recycling rates there is a need to acknowledge that this means higher complexity and that the authorities will need a wide range of highly developed managerial skills in order to overview the whole system. Furthermore it will require sufficient qualified staff for inspection, supervision, control and data and information processing. Future systems should be kept as simple as possible and be developed gradually.

3.1.5 Conclusion on prevention
To reach the goal on waste prevention a structural change of today's society is needed. Social progress has led to the overuse of natural resources in order to fuel our consumer societies, for example social progress has meant more waste generated as people eat more take-away foods and buy more easy-to-use throwaway goods, such as disposable diapers etc. Social progress has also meant more welfare and less dependency on family security networks. Therefore we see more and more single person households that are producing more waste than families living together on a per capita basis.

The overall challenge for all involved in managing waste, is to change the way all sectors of society think about and treat natural resources; to foster a new culture based on conserving rather than disposing of products made up of finite natural materials.

We need to re-use materials several times and we also need to redefine the way we design products in the first place. It is important to involve manufacturers that have to take action to reduce waste at every stage of the supply chain, from for example extracting raw materials to dismantling a computer. The overall goal is to extend the “from the cradle-to-the grave” approach to “from the cradle-to-the cradle”. It is important to encourage the use of recyclable materials and making products more resource efficient. Producers must be made aware of the waste phase in order to encourage, facilitate and implement innovatory eco-design.

The role of the waste industry is to provide information and knowledge upstream for those generating the waste. This feedback of the problems encountered in later stages will enable preventive measures to be taken to ensure sustainable waste management.
3.2 Reduction of the hazardousness of the waste generated

Another important goal is to render waste less hazardous. This is closely linked to areas outside waste management. Current chemical policies and production and consumption patterns influence the quality of the waste and the environmental impact of waste management systems. But rendering waste less hazardous also depends on the existing collection systems for hazardous waste and on the level of information and education of both industry and households. The setting up of collection systems for household hazardous waste will help to create public awareness of the risks that this type of waste poses to human health and to the environment. In the long term, this awareness will lead to changed consumption patterns and to an increasing demand for substitute products with less risk.

The issue of rendering waste less hazardous is of great importance in developing countries, mainly for public health reasons. Most developing countries do not separate waste; the waste collected consists of household waste, hazardous waste and health care waste. Improper storage, collection and treatment of this waste pose a high risk to public health. This is a priority area for seeking to make improvements.

Hazardous waste, regardless if it originates from households or industry, should not be included in the municipal waste fraction for several reasons. The most important one was mentioned above. Another reason why industry is interested in ensuring that hazardous wastes are properly collected and taken care of is of commercial nature. Attempts are being made in many countries to create markets for recyclables, compost and other end-products from biological treatment, it is vital therefore that hazardous waste is taken care of correctly in order to eliminate any risk of contamination of those tradable waste fractions.

3.3 Ensure sustainable waste treatment

Historically, health and safety have been the major concerns in waste management. These two still apply - waste must be managed in a way that minimises the risks to human health. However, today's society demands more than this: apart from being safe, waste management must also be sustainable. At the simplest level, sustainable waste management must therefore be:

- efficient in terms of environmental protection
- socially acceptable
- efficient in terms of economic viability

In the past, the simple capital and operational costs of a waste management system was the most important limiting factor in the decision making process. More recently, however, environmental considerations have played an increasingly important role in this process. The social aspects of waste management, although not a new concept in itself, have been included in the decision making process to a lesser extent as the research work into how to measure the impact of waste management systems on people's lives is only just beginning. The challenge today is how to reach a policy where all three aspects are taken into consideration. The most important question in this context is: How do we manage our resources with a maximum of environmental protection and social acceptability?

New tools have to be developed to be able to answer these kinds of question, tools that can help the policy makers in taking more sustainable decisions. It is not our goal to find one universally applicable tool but to use different tools in a combination. Using the cost benefit analyses programme devised to assess welfare arrangements is such a tool, which could help to clarify complex issues and to deliver a clear strategy for realising Sustainable Development. Furthermore material flow analyses should also be developed and adopted by policy-makers in order to evaluate the environmental benefit.
A structured dialogue among a broad range of stakeholders will be needed to find new ways of policy-making. Waste management institutions will be challenged to contribute to that dialogue which will deal with the whole picture including the supply of primary resources, production, trade, transport and consumption. This comprehensive approach will help to achieve the goals of waste minimisation and decoupling the link of economic growth with that of waste generation.

Waste management should not only be a matter of managing end-of-pipe problems. Instead, it should be an integrated part of the overall environmental policy towards sustainable development. Material and substance flow analysis should be applied more widely. Focussing on the waste end alone is the wrong approach in many cases. The goals of dematerialization and “detoxification” of all economic activities in a long-term perspective will have to become more important than the goals in the field of waste management alone.

The first objective for sustainable waste management is clearly to reduce the amount of waste generated. However, waste will still be produced. The second objective is therefore to manage waste in a sustainable way. This involves minimising the overall environmental burdens, minimising the overall economic costs, and maximising the social acceptability of the whole waste management system. The third objective is to shift the “waste” focus of the whole waste debate to a “resource” focus. Only when waste management systems evolve into optimised resource management systems will they be truly sustainable.

To put it in a nutshell, waste management has to become an integral part of sustainable integrated resource and waste management.

3.4. Developing countries issues

Millions of people are today living without a waste collection system. Therefore the first step to improve the 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 the developing countries uncontrolled landfills are still a huge danger for the surrounding environment and are a health risk to the population and causing contamination of the drinking water and soil.

However, 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. This 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 are in some cases virtually non-existent.

Much can be achieved by small-scale improvements of already existing systems. Furthermore, it should be emphasised that there is a need for building South-to-South relations to encourage the exchange of information. A lot can also be achieved by optimising the already existing collection systems and by introducing cost recovery systems, in other words let the polluter pay.
In the USA the resources spent on cleaning up past pollution from hazardous wastes has been shown to far exceed those needed for management of wastes currently being generated. Therefore it is important to take early action to develop a hazardous waste system, which in the long run will save money by preventing the problems of insufficient waste management from arising (There is an ISWA-UNEP forthcoming publication which will explain this in more detail).

Producer responsibility should be extended so that producers also have the responsibility when exporting commodity to the developing countries of the world. A suggestion could be to have a prepaid fee that goes into a fund, which then goes to the country where the commodity is disposed of.

Development of legislation and the establishment of treatment and disposal facilities will take 10-15 years. Therefore it is important in the short term to develop interim or transitional facilities to allow the phasing out of uncontrolled dumping to take place more quickly. We cannot wait until we have detailed waste data and an infrastructure in place before action is taken and transitional technologies offer that short-term action. The capital costs for these may be relatively modest, while the long-term costs for sophisticated, possibly high technology facilities will be beyond the resources of the public sector in most developing countries. Therefore an obvious way forward is seen as co-operation between the public and the private sector. In the developing countries there is a need for knowledge, but it should not be an excuse for not taking any action. There is a need to develop facilities, support services and enforcement capabilities simultaneously with the necessary legislation and regulations and in most cases a carrot and stick approach will be needed (ISWA-UNEP forthcoming publication).

Although ISWA supports the waste hierarchy ISWA also must emphasise that as the most common disposal is uncontrolled landfills the building of controlled landfills is of high priority in these countries.

ISWA stresses that health care waste represents a high risk for the population in these countries which usual have other social and economic problems that leave the population vulnerable to disease. This waste stream should consequently have a high priority in the manner in which is managed. It is very important to classify the waste into categories. Furthermore, it is important 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. Finally it is seen as vital to treat the infectious waste and by disinfection eliminate the pathogens it contains. ISWA has been co-operating with the World Health Organisation for some years in assisting in the development of healthcare waste management programmes for low and middle-income countries but there is still much to achieve.

Furthermore, it is a goal for the future to prevent the export of inappropriate waste going to the developing countries for recycling. The standards of treatment in these countries are not very high and often uncontrolled. An example is the dismantling of electronic equipment containing hazardous substances where it is an objective to prevent the use of children in the workforce. Not only is this a danger to their health and also for the environment it is also unethical and therefore introduces the social dimension of sustainable development.

Most developing countries have various processes aimed at the recovery of materials from the waste stream. Studies have shown that local industries are, in some cases, strongly dependent upon the availability of secondary raw materials for re-processing. Some of these materials include: cardboard, various paper products, different types of plastics and metals.
Unfortunately, the methods used to recover secondary raw materials are inefficient, disregard the basic principles of occupational health and in some instances cause significant environmental problems such as the recovery and reprocessing of automobile batteries at the “home level”. Resource recovery or scavenging, as it is commonly called, takes place in most urban areas in developing countries. The process is carried out at various stages of the waste management system and in different ways. Some of the most common methods are briefly described in the following sections.

In large urban areas with an active and well-defined commercial area or an area with a large number of apartment buildings occupied by people earning a high income, scavengers typically sort through the waste before the authorized collection vehicle arrives. The most common materials that are recovered include: various types of paper products (cardboard, newspaper, and office papers), some plastics and aluminium containers. In most cases, the scavengers use carts or similar units for the storage and transport of the recovered materials. In areas where there is a relatively high generation of recyclable materials, the scavengers store the materials in specific locations for their eventual collection by commercial trucks. There are isolated cases where scavengers travel from house to house buying secondary materials.

Another method of scavenging takes place during the collection process. In this particular method, the collectors themselves and/or helpers conduct a certain amount of segregation during the loading of the waste into the collection vehicles. The segregation process is facilitated in the situations where open trucks are used which allows for some of the collectors to be stationed inside the vehicle. The recyclable materials are stored either inside the truck or on the sides of the vehicle.

The last and the certainly the most onerous type of scavenging is the one that takes place at the disposal site. Disposal sites, particularly those located in medium and large metropolitan areas attract hundreds and in the megacities thousands of individuals for the recovery of a variety of materials for sale. Some of the scavengers live on or near the disposal site. Living on disposal sites is not only detrimental to the health of the scavengers but, as it has been shown in several instances, it can be dangerous due to slides and fires. The relative closeness of the disposal site to the scavengers’ dwellings and other factors make it easy for them to allow the participation of their children and other family members in segregation activities. The scavengers work at the landfills under some of the most precarious conditions and under different climatic situations (from extremely hot to very cold and wet conditions). In some of the very large disposal sites, the scavengers set up their rules and have been known to divide the site into areas where only specific groups are allowed to work.

ISWA is well aware of the fact that scavenging activities play a major role in the survival of many of the people that perform those activities. However, the methods used for the activities reduce the efficiency of the waste management system and most importantly are detrimental to the health of the scavengers.

Scavengers that perform their activities prior to the collection phase break open bags to have access to their contents or indiscriminately remove other materials from containers and leave them on the street increasing the time required to collect the materials by the formal collection sector. Resource recovery conducted during the collection process reduces the efficiency of the collection system. Scavengers that conduct their work at the disposal sites have a tremendous influence on the speed at which the collection vehicles discharge their contents as well as on the effectiveness and efficiency of the tractors and/or compaction equipment. Adequate modifications to the existing scavenging systems must be made so that resource recovery is limited to specific locations and those that conduct the process do so under safe and “clean” conditions. Most importantly, children and the elderly must be absolutely
prohibited from conducting any kind of scavenging activities.

3.5 What can ISWA do?

ISWA can through its national members from the developing countries collect information on how the hidden flows described in the preceding paragraphs are causing problems for these countries. It can also help the developing countries in other ways by informing the rest of the world about the side effects that the consumption patterns in developed countries can have on these countries.

Turning now to the innovation of eco-design, the waste management industry can help manufacturers by pointing out which products, materials and substances are causing barriers to sustainable waste management e.g. which products are difficult to dismantle and therefore not suitable for recycling etc.

Historically the waste management sector has not promoted waste prevention but has concentrated on finding the best technology in order to treat the waste. Therefore ISWA sees it as a major goal for the waste management sector to rethink its role and to acknowledge its responsibility to make available their expertise to the waste generators and policy makers.

In order to change the consumption patterns and to create a dialogue between the different sectors of today’s society there is a need for improved communication strategies. Furthermore, ISWA sees communication and social issues as one of the most important aspects in order to build sustainable development. The overall goal is to develop o and communicate new paradigms and change human behaviour patterns.

ISWA will engage in the development of new decision making tools such as developing economic analyses, material flows analysis and other issues. In that way ISWA will be helping decision makers to choose the most sustainable policy option in order to influences the market towards one that internalises the concern for the environment and the social dimension.

ISWA will as well initiate an ISWA Development Fund (IDF) with the aim of supporting for example ISWA Training Courses in developing countries. The plan is to support the already existing ISWA activities in the developing countries, such as training courses via paying the travel cost for the ISWA trainers and for letting people from the developing countries participate in ISWA Working Groups as well as infrastructure and capacity building (e.g. professional networks).

3.6 What does the waste sector needs to do to ensure sustainable waste management?

To reach the target of waste prevention and also to achieve sustainable development there is a need to develop new policy instruments that encompasses the waste problem as an integrated part of the strategy towards a sustainable development.

Integrated product policy is an instrument, seen as a way in which these aspects can be internalised from the input side, This will then in the long run lead to the saving of resources instead of the expensive end of pipe solutions which are current at this time.

Using differentiated fee and tax systems, it is possible to move the waste fractions from one treatment system to another. Through different taxes the government can stimulate the waste handling companies to use for example recycling instead of landfill. ISWA states that to be able to guarantee a high collection rate for eco-deposit-and buy back schemes intervention in the market is necessary and the scheme for batteries has proved an excellent example.
Producer responsibility is an instrument, which might help to create incentives for innovation in eco-design. It is very important to distinguish between producer responsibility and privatisation of the waste management systems. Whether privatisation is a good idea must be seen in a cultural context and be aware of the economic development of the country. It is very important to consider political cultures and behaviour, a system can be successful in one country that never would work in another.

The table below sums up what ISWA could do to assist with waste prevention.

**Table 2: What are the problems and what can be done?**

<table>
<thead>
<tr>
<th>Problems</th>
<th>Virgin Material Extraction</th>
<th>Production and Consumption</th>
<th>Waste</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overuse of resources</td>
<td></td>
<td></td>
<td>Waste caused by ineffective production processes</td>
<td>Too much waste generated</td>
</tr>
<tr>
<td>Hidden flows left in developing countries</td>
<td></td>
<td></td>
<td>Lack of eco-designed products with less toxic substances</td>
<td>Waste still linked to economic growth</td>
</tr>
<tr>
<td>Huge amounts of waste produced during extraction</td>
<td></td>
<td></td>
<td>Over consumption caused by bad quality products</td>
<td></td>
</tr>
</tbody>
</table>

| Objectives / Visions                                                     |                            |                             |                                                                      |                                                                          |
| Sustainable use of resources                                            |                            |                             |                                                                      |                                                                          |
| No dumping of hidden flows in developing countries                      |                            |                             |                                                                      |                                                                          |
| The use of resources that minimise the ecological footprint              |                            |                             |                                                                      |                                                                          |

<table>
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<tr>
<td>produced during extraction</td>
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| What can ISWA do?                                                       |                            |                                                                      |                                                                          |
| Collect information on     |                            |                                                                      |                                                                          |
| hidden flows and           |                            |                                                                      |                                                                          |
| virgin material            |                            |                                                                      |                                                                          |
| extraction.                |                            |                                                                      |                                                                          |
| Promote international      |                            |                                                                      |                                                                          |
| regulation in order to    |                            |                                                                      |                                                                          |
| prevent dumping of hidden  |                            |                                                                      |                                                                          |
| flows                     |                            |                                                                      |                                                                          |
| Provide designers/        |                            |                                                                      |                                                                          |
| manufacturers with        |                            |                                                                      |                                                                          |
| information on different  |                            |                                                                      |                                                                          |
| materials. Also give      |                            |                                                                      |                                                                          |
| information on which      |                            |                                                                      |                                                                          |
| products cause problems   |                            |                                                                      |                                                                          |
| for dismantling and       |                            |                                                                      |                                                                          |
| for environmental sound   |                            |                                                                      |                                                                          |
| waste treatment           |                            |                                                                      |                                                                          |
| Forward the waste         |                            |                                                                      |                                                                          |
| industry’s experience on   |                            |                                                                      |                                                                          |
| campaigns for changing    |                            |                                                                      |                                                                          |
| behaviour in the          |                            |                                                                      |                                                                          |
| population.               |                            |                                                                      |                                                                          |

| What does the industry    |                            |                                                                      |                                                                          |
| need?                     |                            |                                                                      |                                                                          |
| Develop international     |                            |                                                                      |                                                                          |
| legislation               |                            |                                                                      |                                                                          |
| Use political instruments |                            |                                                                      |                                                                          |
| such as producer          |                            |                                                                      |                                                                          |
| responsibility.           |                            |                                                                      |                                                                          |
| Integrated product policy |                            |                                                                      |                                                                          |

| Use better tools for      |                            |                                                                      |                                                                          |
| decision making           |                            |                                                                      |                                                                          |

| Use differentiated waste  |                            |                                                                      |                                                                          |
| fee for different        |                            |                                                                      |                                                                          |
| treatment methods.       |                            |                                                                      |                                                                          |

| Tax on landfilling and    |                            |                                                                      |                                                                          |
3.7 Conclusion

Finally, set out below are the major steps that ISWA considers have to be taken in the next ten years by the waste industry in order to prevent and reduce both the quantities and the hazardous nature of waste:

The Prevention of Waste

- Integration of waste policies into other environmental policies
- Material needs to be conserved and reused and progress is also required to improve the markets for recyclable materials
- Better product design
- From cradle to cradle-to-cradle instead of from cradle to grave
- Develop a waste convention to give legal effect to those policies set out in AGENDA 21
- Coordinated strategy for public information and education to make the public aware of the waste problems but also to increase their confidence in the waste management sector.
- Accessible and transparent data is crucial if strategies are to be successful and sustainable waste management practices achieved. The industry needs to have access to clear, transparent and replicable data and information.
- Standards for the waste industry that include new and emerging technologies and also the management of specific waste types e.g. agricultural waste.
- Considerable investments should be made in emerging technologies and support should be given to research and development.
- Building of new partnerships needs so that all stakeholders can work together towards a common goal.
- The waste industry has to encourage and take part in multiple stakeholder involvement.
- The waste industry must set and achieve sustainability targets.

The Developing Countries

- Is to get from “no control” to a managed situation, and the first step towards that is through so-called “transitional” technologies.
- To train and disseminate information on sound and low-cost technology to the developing countries.
- Assist developing countries to put regulation in place. Help should also be given through education where ISWA can provide training courses and particularly financial help through ISWA’s contacts with International Aid Agencies.
- Make National waste policies more coherent; the legal framework, its implementation and enforcement need to be improved in all parts of the world. Waste management plans at national and local level are needed; these can serve as the basis for the improvement of and investment in waste management systems.
- The practical experience of practitioners and planners, regulators and operators, scientists and researchers in waste management must be made more available to developing countries and economies in transition. Immediate support and transfer of know-how are most valuable, as they facilitate the implementation of sound waste management strategies and practices. In many
cases, a small amount invested in education and “training the trainers” can enable local staff and regional regulators to help them effectively.

- From a global point of view, the most urgent need is to close the gap between developed and developing countries. The first priority in this context is to make sure that there are collection services available to as large a part of the world’s population as possible and to raise the quality of landfill sites.

The ISWA vision

- Progressing towards a waste-free world
- Consolidate evolution in developed countries
- Improve Waste Management in developing countries
  - Generate Less Waste
  - Utilise More waste
- Reduce health and environmental impacts
- Achieve an international waste treaty by 2010
4. 10 years perspective for the ISWA Working Groups

This chapter of the ISWA report contains ISWA’s vision on where we want to see waste management progress to be within 10 years. Because of the unique structure and large variety of members, ISWA can offer a wide perspective of the developments and requirements for the waste industry in the future.

ISWA’s objective is the worldwide exchange of information and experience on all aspects of waste management. ISWA promotes the adoption of acceptable systems of professional waste management through technological development and improvement of practices for the protection of human health and of the global environment in its widest sense as well as the conservation of materials and energy resources. ISWA is founded upon the principle that dialogue and networking facilitates successful waste management strategies. The work of the Association is therefore mainly focussed on disseminating and exchanging information on all aspects of waste management between the Members of the Association as well as to other concerned parties in the international arena such as the WHO, OECD, UNEP and the EU Commission.

ISWA’s members represent all aspects of our field and most regions worldwide: From practitioners and industry to communities, from associations, research institutes and academics to regulatory authorities. The association is the global forum for waste management, with 12 technical working groups covering all relevant aspects of sustainable waste management and with special interest in developing countries issues.

- Economic Analyses for Sustainable Development
- Developing Countries Issues
- Collection and Transportation Technology
- Recycling and Waste Minimisation
- Hazardous Waste
- Health Care Waste
- Sewage and Waterworks Sludge
- Biological Treatment of Waste
- Thermal Treatment
- Sanitary Landfill
- Communication and Social Issues
- Legal Issues

The Working Groups consist of the world’s expert waste practitioners who deal with waste management issues through their daily work. The main objective of the Working Group is to exchange information and experience. But the Working Groups also serve as ISWA’s think tank for ISWA Publications, Conferences, Training courses etc.

Set out below is the input from ten of different ISWA Working Groups of waste management each with their 10-year perspective

4.1. Economic Analyses for Sustainable Development

The ISWA Working Group on Economic Analyses for Sustainable Development states that historically, health and safety have been the major concerns in waste management. These still apply - waste must be managed in a way that minimises risk to human health. Today, society demands more
than this - as well as being safe, waste management must also be sustainable. At the most simple level, sustainable waste management must therefore be:

- Environmentally efficient
- Socially acceptable
- Economically efficient

Furthermore the Group states that in the past, the up front economic costs of a waste management system was the major controlling factor in the decision making process. More recently, however environmental considerations have played a more important role in this process. The inclusion of the social aspects of waste management in the decision making process, although not a new concept in itself, has been limited, as research into how to measure social concerns with respect to waste management systems is only just beginning. The challenge today is however to develop a policy where all three aspects are taken in to consideration. A leading question for development of future waste policy could be "how do we get most environmental and social benefit for our resources?"

To be able to answer these kinds of questions new tools have to be developed, tools that can help the policy makers to make more sustainable decisions.

The goal is not to find one tool that is universal but to use different tools in a combination. The ISWA Working Group on Economic Analyses for Sustainable Development is at the moment discussing the possibility of using the comprehensive (economic) analyses including material flow analyses, and is discussing whether this could be a way, which could be able to clarify complex issues and to deliver a clear strategy for realising Sustainable Development.

New ways of policy-making by structured dialogue among a broad range of stakeholders will be needed. Waste management institutions will be challenged to contribute to that dialogue, dealing as well with the whole picture comprising supply of primary resources, production, trade, transport and consumption. As a result of this comprehensive approach waste minimisation and de-coupling of economic growth and waste generation may finally be achieved.

Waste management should not only be the matter of managing end of pipe problems, but should be an integrated part of the overall environmental policy towards a sustainable development. It seems clear, that the “tail of waste management cannot wag the dog of the entire economy”. Material and substance flow analysis should be more widely applied, showing that only focussing on the waste end may be the wrong approach in many cases.

Dematerialization and “detoxification” of all economic activities applying long-term perspectives should become more important than goals just restricted to waste.

The first objective is to reduce the amount of waste generated. However, even after this has been done, waste will still be produced. The second objective, therefore, is to manage the waste in a sustainable way, by minimising the overall environmental burdens associated with the whole waste management system, minimising the overall economic costs associated with the whole waste management system and maximising the social acceptability of the whole waste management system. The third objective is to move the whole waste debate from a “waste” focus to a “resource” focus. Only when waste management systems evolve into optimised resource management systems will they be truly sustainable.
Therefore to reach the goal of prevention of waste and to achieve sustainable development there is a need for developing new policy instruments that consider the waste problem as an integrated part of the strategy towards sustainable development.

In addition to using the economic analyses to help the decision makers the Working Group on Economic Analyses on Sustainable Development states that economic instruments should be used in order to control the market towards one that internalises the concern for the environment and the social dimension.

Integrated product policy is an instrument, which is seen as a possibility to internalise these aspects from the input side, which then in the long run will lead to the saving of economic resources rather more expensive end of pipe solutions.

The Working Group on Recycling and Waste Minimisation points out that it is very important that such economic analyses are not the only tools used when dealing with environmental policy. It is very important that aspects such as eco-efficiency and the ecological rucksacks are integrated. They state the importance of calculating the material input per unit of service (MIPS) and promote products with most resource-efficiency.

4.2. Developing Countries Issues

The Working Group on Developing Country Issues indicates that millions of people are today living without a waste collection system. Therefore the first step to improve the situation is to work out a legal framework for waste management and then start to collect the waste. A lot can be done in these countries by starting with optimising the already existing collection systems and by introducing cost recovery systems.

Furthermore, the Group states that much can be achieved by small-scale improvements of already existing systems or by the introduction of “transitional technologies”. Furthermore, there is a need for building South - South relations to encourage and facilitate the exchange of information.

Experience from the USA shows that the resources spent on cleaning up past pollution from hazardous wastes far exceed those needed for management of wastes currently being generated. Therefore early action to develop a hazardous waste system will save money in the long term by preventing the problems from arising.

Development of legislation and the establishment of treatment and disposal facilities have proved to take about 10-15 years. Therefore it is important in the short term to develop interim or transitional facilities to allow the phasing out of uncontrolled dumping to take place more quickly. It is not possible to wait until there is detailed waste data and an infrastructure in place before taking action. Transitional technologies can offer the short-term action required. The capital costs for these may be relatively modest, while the long-term costs for sophisticated, possibly high technology facilities will be beyond the resources of the public sector in most developing countries. Therefore an obvious way forward is seen as co-operation between the public and the private sector. In the developing countries there is a need for knowledge, but this should not be an excuse for not taking any action. There is a need to develop facilities, support services and enforcement capabilities simultaneously with the necessary legislation and regulations and in most cases a carrot and stick approach will be needed.
Health care waste represents a high risk for the population in these countries, which usually have other social and economic problems that leave the population vulnerable to disease. This waste stream should consequently have a high priority in the manner in which it is managed. It is very important to classify the waste into categories. Furthermore, it is important 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. Finally it is seen as vital to treat the infectious waste and by disinfection eliminate the pathogens it contains. ISWA has been co-operating with the World Health Organisation for some years in assisting in the development of healthcare waste management programmes for low and middle-income countries but there is still much to achieve.

4.3 Sanitary Landfill

The Working Group of Sanitary Landfill recognizes that as current the most common method of waste disposal for environmentally 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. The focus of the Working Group is the proper closure of unmanaged open dumps, coupled with the construction and proper operation of controlled landfills.

How will landfills be used as a waste management tool in the future? This is a difficult question to answer for many countries and entirely obvious in others. With over 200,000 open dump areas in the world that will require environmental protection and cleanup in the future, the Working Group believes 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 that led to uncontrolled dumping and open dumps. For those countries and population centers that have employed the use of sanitary landfills and managed operations, the advantages of environmental protection can be demonstrated.

A 10-year perspective on the use of sanitary landfills would include the following concepts and goals:

- The cost of sanitary landfilling will remain a low-cost option for waste disposal, relative to other solid waste management technologies. However, the growing use of taxes and fees specific to landfills may serve to make costs more comparable.
- The use of engineered systems, including liners, leachate collection, landfill gas collection, and covers, will increase with time as old open dumps are replaced with new sanitary landfill cells. These systems will demonstrate improved environmental protection, particularly for localized ground water resources and air quality.
- Sanitary landfills will increase in size, in part due to siting and transportation issues, costs for developing and construction engineered systems, and significant increases in solid waste generation. Typical sizes for such landfills will range from about 1 million to 10 million tonnes in place, with about one percent of the landfills having over 100 millions tonnes in place.
- The design, construction, and operation of landfill gas control systems will become minimum requirements for most sites so as to reduce odors, protect adjacent buildings and structures, and allow the capture greenhouse gases.
- The design, construction, and operation of landfill gas energy recovery systems will continue at its current steady pace, particularly as the sites become larger and better managed.
- Land development atop closed landfills will continue at a significant pace.
The need for training the professional solid waste manager will increase significantly as more and more sanitary landfills are constructed. In particular, the current shortage of experienced sanitary landfill operators will continue and the marketplace for such persons will improve. Training will also be needed in related disciplines such as engineering, science, and financial.

Policies to prevent scavengers at open dumps will be adopted for more countries and the presence of such scavengers atop open waste piles will begin its final decline.

4.4. Collection and Transportation Technology

In many countries collection and transportation are large cost elements in municipal solid waste management systems, in particular in developing and transition countries. Waste collection and transportation have received much attention in recent years. In developing countries there was a shift from human and animal driven carts to engine driven collection vehicles. In the more developed world there was and still is a shift or tendency to all kinds of storage facilities for source separated materials, recycling parks, very sophisticated vehicles for specific waste streams, amongst others driver operated side loaders, on board weighing systems and transfer stations. The same counts for integrated systems for road, rail and waterway transport, underground storage and underground transportation of waste. The improvement of labour conditions is a major driving force for these developments. Also waste treatment and logistic data management systems are important for the development of future waste collection systems.

The ISWA Working Group on Collection and Transportation Technology states that the following aspects are important for the next ten years in regard to collection and transportation.

Collection and transportation always should be looked at as a part of the integrated waste management systems and also have a close relation with storage at source and further processing and disposal. It is important to consider that collection and transportation is consuming a considerable part of total disposal costs and also that it has a great impact on the living conditions of the population as well as a great impact on working conditions of the operators.

The Working Group are emphasising the need for the following improvements:

- More mechanisation for better working conditions
- Underground storage will bring systems to save labour
- Specific storage for specific recyclable waste fractions
- Underground transportation to overcome traffic problems
- More sophisticated vehicles for more efficiency
- Side loaders in stead of rear loaders for solid waste
- Advanced pay systems, for example “pay as you throw”
- On board registration and weighing because of “polluter pays principle”
- Tariff differentiation for different kinds of waste
- Integrated multi-modal transportation (road, rail and waterway)
- More sophisticated logistic systems and data management
- Optimised computerised routing of vehicles and containers
- Global positioning systems (GPS) for vehicles and containers

French studies estimates that 15% of all freight transports involves waste and that waste transport accounts for 5% of the transport sector's total energy consumption. Transport distances for waste to
recycling are also much higher than those for disposal. The environmental pressure caused by the transport of waste are likely to increase in the future as waste is separated into more fractions for different treatment (EEA - Environmental Signals 2000: 71). ISWA therefore also sees it as an important political goal to focus on the proximity principle where all regions of the world should be able to treat their own waste, however we have to recognise the benefit of transporting waste for recycling, because this substitutes the transport of virgin material.

The Group also states that it is very important to have good labour conditions and to optimise of waste logistics. Furthermore, the group sees the need for research and developments as well as new regulations concerning standards for waste storage facilities in-/outside premises, transportation equipment and vehicles, equipment and transportation vehicles and guidelines for working conditions (level paying field). Future research should be focussed on the use of information technology (IT) in waste management such as intelligent containers to inform if they are fully filled. Likewise global positioning systems (GPS) for containers and vehicles are seen as a target.

The working group see the need for governments around the world to encourage further development of waste collection and transportation technologies. With a special focus on these items efficiency will increase as well as cost reduction can be achieved.

4.5 Recycling and Waste Minimisation

- **Extension of fields of activities:**

  The Waste management industry should get into contact with other industries to cooperate in the waste prevention/minimisation area. The waste sector should tell manufacturers why some waste components are harmful or problematic for existing (available) collection, transport, sorting and treatment systems. Also, we must participate in developing new systems, which can receive a wider amount of various waste components.

  There is a need for research regarding the market potential for recycled material and a need for improving this for these products.

  Economic aspects are always somehow secondary and relative in a long-term perspective, but acutely we must take care that waste producers are willing to pay costs of their waste management. Therefore it is important to speak about cost level, which also waste producers can accept.

  There should be more focus on other waste streams than household waste e.g. commercial/industrial and hazardous waste. The developed countries should also focus on minimisation on a global level, which means that we should also seek to minimise the hidden flows of our consumed products left behind in other countries, especially in the developing countries.

  The quality of the products should be better in terms of longer lifetime, less toxic and less use of resources. Focus should be on repairable, reusable products or parts of products.

  Waste should be looked at as resources that are already extracted and therefore waste should be utilised to a much higher extend than today. Waste industry must therefore develop better and better reclamation capabilities and manufacturers must develop their capabilities to utilise secondary raw materials or recovered fuels. Also, waste industry (as raw material suppliers)
must develop quality control of their products, etc. Politicians and authorities should look for what they could do.

The producer has to be involved in the total life cycle of their products also when exported to other countries. Responsibility should be extended to personal responsibility. In many countries waste is still considered as a municipal responsibility, but to be able to reach higher goals within the waste management each person, organisation, enterprise need to have a responsibility.

There is a need for technology development because of a trend towards more complex products. Many products today consists of new mixed of material, which makes it difficult to recycle. Furthermore, the products become more complex to dismantle i.e. a modern mobile phone consist of many different materials and without the battery it only weighs 100 gram and it is almost impossible dismantle.

Propose that the word `waste` should be replaced with the expression waste component, waste type and waste class (category). Therefore the Group sees it as old fashion to continue defining "waste". In most aspects, we deal with waste components in the first place and then with various waste types, which are origin from various waste producers.

- **Material flow Management:**
  Integration of waste component information management to overall material flow management. This aspect looks like to be a critical issue for all actors involved in further progress of waste management.

  It is always beneficial to assess our core responsibilities. Waste management is very horizontal and multidisciplinary area of specialisation. Waste management operators (~waste industry) are the main actors within the specialisation. Although it is important for the operators to closely cooperate with legislators, educators, IGOs, NGOs, environmental and technology advisors, etc., it is also imperative that there is a clear division between various actors’ roles; whether it is primary, secondary or even tertiary responsibility.

  Hygienic aspects (occupational health aspects) should be a major force towards developing new technologies in the field of waste management.

- **Socio-economic challenges:**
  During the last decade, a rapid development and world wide expansion of telecommunication infrastructure and corresponding devices has made ever greater number of world population aware of goods and services available also for common people in leading industrial countries. At the same time we have learn to know much more about availability of natural resources and anthropogenic environmental impacts locally and globally. There are strong indications that a way we are doing with present applied technologies for creating welfare does not make it possible to provide much larger number of people with goods and services they desire. The gap between consumption desires and opportunities – which can be called relative poverty and in many cases parallel to absolute poverty - is one of those big socio-economic challenges to be worked for when targeting better sustainability. Relative poverty is most probably the issue, which should not be underestimated as basis for socio-economic and political tensions and consecutive disturbance risks in our societies.
• **Design for reuse/recycling:**
Technological research and development has a great potential and responsibility for increasing availability of goods and services. The clear target is to decrease material and energy intensity in manufacturing and consumption. Design for reuse and recycling will have a key position in future material flow management. A concept of micro system technology is a very prominent strategy, which simultaneously can link environmental, economic and social aspects, including a need for technology transfer to less developed countries, into technological research and development. In present world economy, leading industrial countries have all necessary resources to develop and to innovate new generation products and production as well as reuse and recycling facilities. Perhaps, they should see more intentionally their role as consumer and manufacturer pioneers of new generation and especially their own interest to utilize this opportunity for decreasing not only environmental but also societal security risks. Particularly public financiers have an opportunity to steer technological research and development to be derived from aspects of sustainable development.

• **No export of environmental problems:**
It is important for the developed countries not to export their environmental problems to the developing countries by leaving behind huge amounts of hidden flows produced mainly through the extraction of virgin material. The Working Group refers a study made by the Wuppertal Institute for the European Environmental Agency (EEA), which shows that a great deal of the European total material requirement arises from hidden flows abroad (EEA- environmental signals - 2000:104).

• **Setting international minimum standards for recycling:**
It as a goal for the future to prevent the export of waste going to recycling in the developing countries, where the standards of treatment is not very high and often uncontrolled. Therefore it is a goal to prevent the use of children in the workforce for dismantling of electronic equipment containing hazardous substances. Not only is it a danger to health and for the environment it is also unethical and therefore brings in the social dimension of sustainable development. There is a need for setting international standards for recycling methods.

4.6 **Hazardous Wastes**
Different trends are expected to occur within the next decade in the European waste management system. Most of this evolution is taking place within Western Europe, with the Eastern Europe emerging markets following with a time gap of about 10 years. The Eastern European countries are implementing new EU-legislation on a speed almost similar to Western Europe. Due to the proximity of strongly developed countries and special and hazardous waste management companies, Eastern European countries can be expected to make a faster evolution than most developing countries.

The trends to be mentioned and described for the management of hazardous waste are the following:

• **The changes within industry will affect hazardous waste management industry**
Industrial activities throughout Europe are generating considerable amounts of hazardous waste. Since competition is rather fierce and production costs and costs due to regulations are rather high, industrial activities in Europe are expected to be directed towards more complex processes or the production of more complex products (specialties/fine chemicals/...). This is resulting in decreasing waste amounts but they are more difficult to treat successfully. Therefore there will be a request for highly specialised waste management companies offering the whole chain of
waste management services. Increasing outsourcing of entire waste management to professional waste management companies will become more important.

In some sectors, recycling activities will be organised by the producers of the products. It will be made either due to regulations and programmes like ‘producer responsibility’ or under voluntary schemes as ‘product stewardship’ and companies in business lines initiatives where the whole chain from research and development to disposal is taken into account.

On top of that, a distinction will be made between countries where the legal system still allows landfilling of untreated hazardous waste and other countries where this is no longer the case. In those countries where landfilling of untreated hazardous waste is still allowed, a ban on landfill of untreated hazardous waste will be implemented, thus entailing a rise of the amount of hazardous waste going to thermal treatment with material and/or energy recovery. In those countries where landfilling of untreated hazardous waste is already forbidden, the waste streams to be treated by thermal treatment with material and/or energy recovery are expected to result in a status quo or a slightly decrease, entailing more technical complexity for hazardous waste to be treated.

Specialization and investment in technical competences in order to treat hazardous waste within the legal, environmental, financial and social requirements is expected to be “a competitive advantage” in the next decade all over Europe.

- Higher awareness of priorities in waste management influences the type of developed solutions, without out ruling the thermal treatment and final disposal options

The legal priorities in the treatment of waste management will have an important influence also more and more producers focus on waste prevention and source reduction. In this they are and will be supported by government and professional support programs. This will cause total amounts of waste to decrease, a trend that is neutralised partly by ongoing extended legal definitions and treatment regulations for example WEEE and batteries.

Further on, the legal framework stimulate increased material recovery and recycling activities within the hazardous waste section, with thermal treatment with energy/material recovery to stay a valuable option. Final disposal methods will remain valuable as the final option, but will be much more restricted. Technical, safety and financial aspects inhibit a fast and extensive growth of the hazardous waste recovery and recycling activities.

- Technical development will go on in the sector of recycling, but will focus on the end of the production chain

More and more companies, groups of companies and sector/business organisations develop their own prevention, recycling and recovery program. New techniques are developed in order to respond to the demand for more recycling and recovery. Those new techniques will only survive if all sustainability aspects are in balance. This means that sometimes recovery/recycling techniques will disappear or will not break trough on a larger scale.

It will take a considerable investment, effort and flexibility from waste management companies to incorporate these development activities into their normal working schemes. But if those companies want to grow and stay on top of the solution of integrated waste management, this is a necessary development.
• More attention will be paid to the safe and environmentally sound packaging, logistics and transport of hazardous waste. The quality level of these activities will meet the standards of dangerous goods packaging, logistics and transport
This evolution has already been partially translated into new packaging and transport regulations for waste, entailing tougher control on the safety aspects of hazardous waste packaging and transport. This evolution is asking for an extensive time and knowledge investment on behalf of the hazardous waste generators, collectors, transporters and waste management companies.

• The strictly defined “producers responsibility” for the entire product chain and the stringent legal systems to define the product quality will entail tougher control and higher quality demands on the materials to be recovered, reused or recycled outside the waste management sector
The potential creation of liabilities and their possible negative impact on the economic results of waste producers or waste management companies is the main reason for the development towards higher quality assurance of the final products resulting from waste treatment.

• A better and in depth knowledge of the incineration process and the behaviour of hazardous waste streams in the incineration and co-incineration process will have different effects
It will help to gain confidence with the public and a better acceptability of hazardous waste management plants. The dedication of waste to specialised waste incineration plants or to waste co-incineration plants will in the future be made on more rational grounds thus resulting in minimal environmental effects with maximum material and/or energy recovery.

• Further integration of the ‘prevention/recycling/recovery’ idea in thermal treatment with material and/or energy recovery and final disposal methods
This is demonstrated by material or/and energy recovery in static kiln and rotary incineration processes and physico-chemical treatment plants (waste-to-waste treatment) and landfills.

• Important efforts will be necessary in order to demonstrate the need of hazardous waste management to Authorities and the public
Therefore an adequate management of the information gap, the gap of emotional understanding and mutual respect between industry/hazardous waste sector in the one hand and the public and Authorities in the other hand will have to be developed and implemented. Some ISWA projects already have been implemented with respect to this target e.g. ‘State of the art guide for decision makers’ with support from UNEP and the Basel Convention.

4.7. Health Care Wastes
The healthcare services in reducing health problems and eliminating potential risks to the health of humans and animals ultimately create waste that may be hazardous to health. The waste that is produced in this way carries a higher potential for infection and injury and pollution of the environment than any other type of waste. Therefore reliable systems for its handling are fundamental otherwise there may be very serious consequences to public and animal health and the environment. Throughout the world there are countries where the safe infrastructures for the management of healthcare waste are not in place. This is one of the main factors contributing to the transmission of blood borne pathogens through injections resulting in an estimated 1.3 million deaths per year.
The current situation is as follows:

- Health care waste is a small but very significant waste stream with a highly rated perception of risk.
- It has a high profile in the media and with the public particularly when incidents occur and when it is intended to construct a facility for the treatment of the waste.
- The waste stream contains a wide range of hazardous materials as well as infectious materials i.e. chemicals, pharmaceuticals, cytotoxics, radioactive substances.
- There is a large proportion of materials and equipment used in healthcare that is designed to have a single use and this tendency continues to increase.
- Some materials are totally unsuitable for recycling.
- There is a culture within the healthcare professions and associated businesses of only considering healthcare and not giving consideration to the effects of their activities on the environment but this is changing.
- There is an enhanced public awareness of infectious diseases and their hazards (HIV v CJD) and more recently bio-terrorism.
- There is a significant potential for improvement in waste prevention, segregation and recycling in all countries.
- The hazards of “sharps” play a highly significant part in contributing to the risks associated with this waste stream (both physical and from the risk of infection).
- At the present time incineration is considered to be the only acceptable means of disposal for some materials i.e. body parts, chemicals, etc.
- There is a continuous use of chemicals in healthcare. These are used for cleaning and disinfecting buildings and equipment as well as for patient treatment. This situation requires constant vigilance and for the active promotion of the development and use of environmentally friendly products.

Future Trends for Health Care Waste

- The principle of sustainable development will have to be addressed in the way that healthcare is delivered. International Agreements and the growing public interest in the environment and the demands for improvements will drive it.
- There is likely to be a growth in the use of alternative and novel thermal technology for the treatment of healthcare waste.
- The treatment of patients in the home or community is growing due to improvements in treatment methods, to reduce the costs of the service and to improve the rate of patient recovery. This will require a safe system of management to be established.
- The growth in new healthcare treatment methods and the waste produced from their development and use will have to be carefully monitored e.g. the use of genetically modified micro-organisms and organisms.
- New strains of microorganisms for which effective treatment or preventive measures are not available are emerging.
- The use of scientifically based tools for risk assessment and for the life cycle analysis of materials will continue to increase.

Salient aspects

- Competence will be required for all stakeholders including the continuous professional development of those engaged in healthcare waste management.
• The International recognition of the definitions used in healthcare waste management is already a major priority that needs to be addressed.
• The harmonisation of International Agreements is required for the proper management of healthcare waste.

Need for research and development
• Continuing research on the health and environmental impact of treatment technologies is required.
• An international database is required on waste generation rates in accurate detail for use in the development and management of systems.
• The development of medical devices as alternatives or to make the use of sharps less risky.
• Reduction in the use of packaging and to make necessary packaging easily recycled.
• There is an important requirement for an international health care waste stream consultative body to be established to monitor, improve and endorse developments.
• A global forum needs to be established to enable producers of plant, equipment and consumables to engage in debate on comprehensive materials management to achieve sustainable development.

Need for regulation
• The international standards for the regulation of production, segregation, storage, transport, treatment and disposal of healthcare waste require harmonisation and in particular:
  • To regulate alternative and novel treatment technologies for efficacy and emissions into the environment,
  • To regulate the segregation and storage systems and packaging requirements of hazardous healthcare waste for their transport nationally and internationally,
  • To improve the management and regulation by having international agreement on definitions and waste categories.

4.8 Biological treatment of waste

Biological treatment is an important and useful process for the treatment of waste. There is a trend towards the increased use of biological treatment methods that is likely to continue. Biological treatment methods can be adapted both to large-scale and small-scale projects. Furthermore, it can be used at an expensive high-technology level as well as a less expensive low-technology level. It is a treatment method that is easily adapted to the local and regional circumstances where the waste is generated.

The Working Group finds that biological treatment, and namely composting of source separated materials, has the following advantages:

• It is not really affected by the economy of scale: low-tech small plants can be implemented in remote areas and high-tech large plants can have the benefit of a higher degree of mechanisation and a better environmental control
• It benefits from ongoing technological development
• It can complete more complex waste management schemes, involving material recycling and recovery, by dealing with the organic fraction of the waste streams
• It produces valuable end products
• It can be used as a pre-treatment tool to construct final storage landfills with (close to) zero emissions
• It benefits, most frequently, from a good acceptance from the public and a wide support among environmentalist NGOs; therefore, implementation of a composting plant may be less difficult than other waste treatment facilities.
• Soils need organic matter to keep their fertility and the Biological Treatment of organic waste is one way to compensate for the loss of organic matter of the soils as a result of intensive and mechanised agriculture. Biological Treatment is therefore one of the processes that could benefit to the sustainable development by producing acceptable organic matter, improving soil qualities, substituting chemical fertilisers and adding micronutrients and thus reducing the risk of ground water contamination.
• It fosters the sequestration of humified carbon in the soil, which can thus act as a “sink”, which could help tackling problems related to greenhouse CO2 and climate change.

The Working Group states that the primary aim of biological treatment is the processing of organic waste resulting in the production of valuable end products as: compost, soil improvers, fertilisers, biogas. Biological treatment therefore has a privileged place in sustainable waste management practices and policies (waste management hierarchy).

On the other hand, biological treatment can be used as a way to lower the volume and organic content of MSW prior to landfilling, thus reducing fermentability and tendency to produce methane once landfilled. There is a growing interest in this application. The landfill used in this case can be designed as a final storage (or zero emission) landfill, and would be fully in line with most advanced strategies aiming at reducing externalities of landfilling.

It is important to set a clear cut distinction – as to purposes, requirements, definitions - between biological treatment of source separated materials (deemed for useful application in all kinds of agronomic practices) and treatment of mixed waste (aimed at stabilising the waste before landfilling, or at producing materials deemed for restricted applications e.g. in land reclamation activities).

Trends and development for biological treatment
• The trend towards an increased use of different biological treatment methods will consist of a larger percentage of the total waste stream being handled by different biological treatment methods.
• There will be a clear distinction between biological treatment with the aim of producing end products deemed for application in agriculture and as a pre-treatment prior to landfilling.
• Biological treatment for the production of end products will require separate collection and preventive measures to be able to ensure the quality criteria set for using the end product. The production of a quality product complying with new requirements from the agricultural sector will constitute the background condition for an increasing demand for this soil improver.
• Biological treatment prior to landfilling will also find its role and will be used both as a transitory method for improving waste management but also when there is a lack of resources to make necessary investments or other unfavourable conditions for in incineration of residual waste thus constituting a part of an integrated waste management scheme also in the long term.
• Source separation will further increase and experience will help to optimise it with regards to local and regional circumstances
• The treatment technologies have advanced and allow a perfect control of the microbiological processes and allow managers to tackle all specific operational issues (odour, air, water etc) and to meet the more stringent environmental criteria. The number of different treatment methods will
increase as well, methods will be further improved and will prove to be commercially exploitable. For example, the methanisation methods are well industrialised and might be subject to an increasing demand from the local authorities.

- The up grading of existing compost facilities, regardless of what kind of feedstock is used (mixed or source separated household waste, other organic waste) will increase. The current achievements confirm the possibility to reach a high performance level.
- Quality criteria and certification processes for the end-products may be established at national levels though the increased internationalisation requires that there be a harmonisation of the criteria across countries.
- When an effective regulatory framework is put in place, the trust in the end products will open new markets for the use of the end products. Under this condition, the markets have plenty of opportunities to expand further, as it’s been the case in those Countries where a clear regulatory framework has long been put in place.
- The role of biowaste as a renewable energy source is subject to its proper assessment. Exploitation by means of anaerobic digestion has already been fully assessed as a profitable approach, whereas direct thermal exploitation of biowaste is currently being deeply questioned due to its low caloric value and high CO₂ emissions per unit energy produced. Moreover LCAs are currently enlightening the importance of recovering at least part of organic matter in the form of humified products, so as to displace the production of synthetic fertilisers, diminish the use and production of pesticides, improve the tilth of soils (which requires less energy for its workability), and promote the lock-up of carbon in the soil on the long run. All such effects may show an important contribution to tackling the climate change issues.
- The effect of economy of scale is important in the biological treatment of organic wastes. A careful economic analysis should be performed when comparing decentralized and centralized solid waste management options. Transportation costs – which usually account for more than 70% of the total solid waste management costs – should be carefully accounted for when designing solid waste management systems (for example the idea of various small decentralized landfills versus a large centralized landfill in a region needs to be researched carefully). This is especially true when considering the financial exploitation of methane produced during anaerobic digestion from small and decentralized agricultural farms. However, technologies for both small and large-scale systems do exist. Inexpensive small-scale systems for biogas recovery and exploitation have proved to be suited for effective application.
- Biological treatment of solid wastes should give emphasis to the co-mixing of various organic wastes by trying to achieve optimal initial parameter ranges for the resulting substrate (optimal C/N ratios, bulking agent, proper moisture content). Mixing of agricultural organic wastes and municipal solid wastes might be considered. In addition, not all organic wastes are good substrates when composted alone (e.g. food wastes).
- The “bioreactor landfill” concept should be given more emphasis when considering anaerobic digestion of solid wastes as a treatment option. Despite the extensive research developed during the 70’s to optimise methane generation in solid wastes, a limited number of bioreactor landfills is in operation nowadays. In addition, current legislation does not allow the operation of bioreactor landfills and still “supports” the idea of “dry tomb” landfilling. In such landfills, minimization of water entering the landfill and the slowing down of the degradation processes within the fill are the primary goals. The careful enhancement of solid waste degradation within a landfill will produce a stabilized organic material at faster rates as compared to a typical “dry tomb” landfill. The landfill area can thus be reused and even reclaimed sooner.
- High technology options are not always the best alternatives when considering biological treatment of wastes. For example, composting facilities that operate on turned windrows (without forced
aeration) if proper designed and run – enhancing spontaneous diffusion and convection of air - have shown to achieve more or less the same stabilization rates compared to the higher investment in-vessel composting installations. In most situations, anyway, forced aeration of the biomass – also fitted with odour treatment technologies – has proved to be preferable in biggest facilities above all in sensitive sites, where a thorough control of process dynamics is to be performed.

4.9 Thermal treatment

Waste incineration has been used for more than 100 years to disinfect the waste stream, to reduce its volume and hence to save space on the landfill.

Present and future waste incineration will be only used in the hierarchy for energy recovery.

A number of densely populated industrialised countries practice incineration for 50 - 80 % of their waste stream (e.g. Japan, Switzerland, Denmark). Other countries have a lower rate but this is assumed to increase due to the principal of inertisation prior to disposal.

Every thermal conversion of fuel, whether it is gaseous, liquid, solid or refuse-derived, creates emissions. The quantity of these emissions depends on the pollutants in the fuel, its homogeneity and its combustibility, as well as on the chemical, physical and mechanical conditions during the combustion process. Combustion-dependent emissions, such as carbon monoxide or organic carbon, are kept at very low levels by using an optimised incineration technique by so-called primary measures. Inorganic pollutants and heavy metals, which are released during the incineration process according to their evaporation temperature, depend only on the content of these pollutants in the fuel. Remaining and new released organic pollutants must be controlled by appropriate flue-gas systems/techniques. All of these emissions have to be reduced by secondary measures.

Modern flue-gas cleaning processes not only guarantee the multi-functional use of dedicated technologies to meet the emission values but also consider the quantity and quality of the generated residues which are supposed to be recycled to the greatest possible extent based upon the input of pollutants by the fuel. Ecological and economical aspects can be integrated through an optimum combination of technologies and the use of optimised “Additivetec“ instead of expensive mechanical “Hightec“.

The major aims of municipal solid waste incineration are summarised as follows:

- Destruction of organic pollutants,
- Inertisation of inorganic waste ingredients,
- Utilisation of slag (bottom ash) for material recovery,
- Separation/evaporation of heavy metals, salts and organic pollutions, e.g. dioxins, at high temperatures (> 850°C)
- Separation and sink of heavy metals and salts over the little quantities of hazardous residues out of the flue-gas cleaning system
- Utilisation of the energy inventory of the waste as heat or/and electricity,
- Compliance with the respective air emission regulations
- Minimisation of technical effort and process costs.

The last topic particularly requires an optimisation of the entire process and it seems obvious that the best way to achieve cost reduction is the consequent application of head-end techniques, technologies that improve the incineration process itself and do not rely upon secondary measures.
Today, the care for the environment is an important goal in every country. In line with the establishment of an environmental policy, the incineration of waste (municipal waste, hazardous waste or sewage sludge) is increasingly gaining in importance.

The Working Group of Thermal Treatment states for the next ten years that waste -to-energy is a very flexible solution but that it is very important to get clean inputs, which will assure clean outputs plus better operation conditions and a better energy efficiency. The Group furthermore, states that for the next ten years waste should only be incinerated where energy recovery takes place.

Thermal Treatment in the 10-year perspective

- Only source separated waste to be delivered to the incineration plants, with a continuing reduction in the hazardous and non combustible content
- Higher heat value, with increasing energy recovery efficiency. Improved operation of the plants with improving availability and hours of operation
- Full implementation of the new EU-Directives with low emissions to the environment of the different pollutants
- Due to a cleaner input, there will be less non-burnable residues from the incineration process in the bottom ash as well as from the flue gas cleaning systems
- The flue gas cleaning residues will be handled in an environmental correct and sustainable way
- The energy recovery will increase significantly; to the similar levels as power generation
- New technologies like small-scale incineration and gasification of wastes will increasingly be proven and enter into the market. Initially in a rather small scale which will be essential to prove that the new technologies function
- Waste–to–Energy will significantly increase due to; the bans on landfilling, taxes on landfilling, increased demand for energy and due to the fact that waste-to-energy increasingly proves to be a well functioning waste treatment method saving resources, particularly when carried out in combination with all other waste recycling and treatment methods

4.10 Communication and Social Issues

Today, we as waste managers understand that all we do or leave undone has an impact on the environment: water, soil, air and climate etc. Waste management is in charge of the metabolism of society. We should improve eco-efficiency and the sustainable use of resources in order to create and maintain a stable equilibrium between the generated waste substances and nature's capacity to cope with them. This change of perception has resulted in a more self-confident and also more responsible approach to the task of waste management.

These responsibilities encompass much more than the traditional tasks of waste collection and disposal. Now waste generators, trading companies and consumers are seen as closely connected to the system. This new approach is documented in the respective EU legislation of the last few years: Packaging
Directive, legislation in the field of waste electric and electronic devices, end of life vehicles etc. and the proposal for a directive on biodegradable waste. Other new important players in this formerly purely science- and technology-oriented field are the authorities, the media and the general public. They all fulfil specific functions in a system of divided responsibilities and tasks.

This leads to a demand for public understanding and acceptance of the various rules and regulations within the field of waste management.

Waste management is thus no longer regarded as a system for the mere transportation and treatment of waste. It involves the management of mass streams, which are invariably accompanied by financial transactions and information exchange. The latter is the focus and field of activity of ISWA's Working Group on Communication and Social Issues.

A few years ago, the terms public relations and communication stood for building bridges, whereas today these concepts mean something quite different: the bridges have turned into networks. We of ISWA have successfully participated in this development for more than 30 years in the field of waste management. Today, we are dealing with local, international and global networks. Public relations and communication in the field of waste management fulfil a valuable task as they render an important service to this sector and the public at large.

Just a few years ago, technological aspects were the most prominent topics, but today PR activities in the field of waste management clearly focus on conceptual and strategic approaches. In addition, the examples mentioned in this paper reveal the broad range of approaches regarding information management, scope and design of packaging waste collection systems and the specific way of realising these systems depending on the cultural background of the countries in question.

The common goal of all efforts can be easily identified: to promote acceptance of integrated waste management plans, collection systems, facilities, and a sustainable consumer and disposer behaviour.

The Working Group of Communication and social issues sees the follow aspects as being important to work with in the next decade:

- In order to be successful, we have to validate our partners' desires and requirements, their value systems, beliefs, associations, and emotions. This goes for consumers and co-workers alike. If we cannot agree on a value system, it will be very hard to agree on common targets or strategies.

- In addition, we have to utilise the latest findings in the field of communications actively to influence the value systems and beliefs as well as the cognition mechanisms of our partners.

- This includes the utilisation of the full scope of modern communication techniques to realise the objectives of successful waste management. After all, we are competing with an overwhelming information flood in our effort to make our specific message heard. It is highly important that we increase the visibility of our work. A waste management solution is good if the project in question fulfils its functions efficiently. It is striking if this achievement is also adequately presented to the public.

If we want to create relations based on mutual trust with our stakeholders, we have to render invariably truthful, unbiased and reliable information to them. This aim can be obtained only if we are also able to provide the infrastructure required for sensible solutions in the waste disposal sector: if we promote
separate collection of waste substances, we have to provide simple, sensible and attractive systems for it.

- In order to be successful, we have to use the instruments of defining operational targets and implementing efficiency reviews and market research. Since we use considerable financial resources, in many cases public funds, we are responsible for the sensible and efficient allocation of these funds.

- Another factor in this context – unthinkable only a few years ago - is the critical review of our own positions. If we consider that the implementation periods for waste management projects may last for several years (for instance for the introduction of collection systems or waste treatment plants) and that the developments in our branch are sometimes very dynamic, we have to admit that our own point of view may become obsolete in the course of a project.

In conclusion the Working Group of Communication and Social Issues states that in order to reach a structural change of our society towards less waste of resource and less contaminating behaviour we need to focus more on Communication and social issues. Communication between different stakeholders is very important and the Working Group sees that governments can play an important role in encouraging a dialog i.e. by setting up roundtable discussion etc.

In order to change the consumer values systems, however, it is important to focus on the different waste players, their individual interests and how these interests change in a changing world. We need to be more aware of the interrelations between different social groups with specific living conditions and backgrounds, which all have a major influence on people’s consumption and environmental behaviour on the whole. We need to be aware that there can be conflicting representations of the same thing/idea/place and that people live in different worlds though they share the same locality.

What also needs to be taken into consideration is that environmental awareness may differ from environmental behaviour. People may well see the benefit of using reusable or recyclable products to the environment, but their social needs make them stick to traditional patterns.

Price and convenience are two essential factors here.

Waste management also needs to pay increasing attention to the new role of the media. The impact of the new media – especially the Internet – on the communication of messages needs to be assessed. The Internet, for example, transforms the way in which individuals raise certain issues, e.g. waste issues. There are great potentials (quick distribution of information, the message goes out to people unfiltered and unimpaired), but also great risks (the immediacy of a message may cause a lack of accuracy or detail and search engines often provide access to outdated websites with information that is no longer topical).

Based on the understanding that truthful and unbiased information is important, we also need to investigate the factors that seek to undermine the good intentions of waste management. Sometimes counterproductive forces or simply issues that are beyond the control of waste management communicators and rooted somewhere else overshadow the interest in truthful information.

Communication should have as its responsibility to restore and maintain the credibility and good image of waste management. There are black sheep in every group and not all waste managers are altruists. We must not forget that waste management is a thriving industry, which can be a real magnet to people wanting to make money (“What’s in it for me”).
Finally, there is a strong need for increased co-operation with lawmakers to provide practice-oriented information, which is necessary to make realistic laws.

Part of the solution that environmentalist communicators aim at is to turn an inappropriate behaviour into awareness. There are different strategies to reach this aim. One of them could be penalizing the transgressors, not with fines but with communal activities. People expect solutions, but they must become aware that they, too, are part of the problem. So it is a natural consequence that they have to contribute to a solution.

Waste education will become one of the prime issues in the years to come. An interesting option is to firmly embed environmental issues in the school syllabus (starting at a very basic level), since our children have the tools and will be the direct and valid interlocutors that will internally touch us with their messages. They can do it and they know how to do it. They will also be the ones to correct our daily habits and teach us how to treat the planet we are going to leave to them. It is our responsibility to hand down the best knowledge and best practices in waste management to our children, who are not recyclable.

4.11 Legal Issues

Another of the ISWA crosscutting Working Groups deals with Legal Issues. The Working Group has a long past within ISWA and its importance has increased over the years. The legal framework is of vital importance for the waste industry to achieve set goals. There are a large number of issues that even if not technical, directly affects the industry and it’s functioning. The legal framework, its implementation and its enforcement are among those. There has been a change from traditional command-and-control legislation to the use of a mix of different instruments to encourage and assist the industry to achieve set environmental goals.

The increased trade within and across countries, not only for goods but also for services, has made it obligatory to harmonise legislation and establish a set of general rules defining sustainable waste management. Nevertheless, one must keep in mind that there are large differences between different parts of the world. Just as well as there are countries where the companies are ahead of national legislation and constitute one of the driving forces, there are other countries, which completely lack waste legislation and/or effective enforcement of it.

The two main objectives for the Working Group on Legal Issues in the coming years will be to

- elaborate a set of global policies guiding the waste industry and ensure it takes into consideration the three dimensions of sustainable development; environmental, economical and social
- ensure the establishment, implementation, application and enforcement of a legal framework for waste management across the world

There is an increased attention and importance given to legal issues both for decision-makers and actors within the industry. Other Working Groups within ISWA express the need for uniform rules to ensure sustainable waste management. ISWA has a unique opportunity to take the lead in the global promotion of sustainable waste management and today stands at a crossroad to take the full step to become the association of reference in waste management. That gives ISWA the possibility to initiate the development of a number of overall embracing policies for the waste industry. ISWA Working Group on Legal Issues will investigate the need for such policies and promote and assist the adoption
of a relevant ISWA framework of policies. That will enable the Association to further strengthen its role as the association of reference for waste management.

- The working group has mainly been active in the field of the Basel convention on Transboundary Shipments of Waste and the European Union waste legislation. Europe has put environmental protection high on its political agenda and is today one of the leading forces in environmental legislation. The group will remain with its focus on Europe but will also expand to other geographical areas and other issues of interest.

The legal framework is not static but changes in reaction to changes in the society as a whole. States sometimes make commitment through multilateral agreements as for example the Basel convention or the Convention on Climate Change. In the area of waste legislation there has been changes in both national legislation and international conventions the last years and there will be changes in the years to come. One of the most important steps must be to ensure that a minimum level legal framework is adopted and put into place in those countries and regions without legislation today. That is a development that the WG would be very happy to contribute to. And in those countries that do already have a legal framework, the aim must be to ensure that the framework is coherent and relevant, that it is properly implemented and applied. Furthermore, there must be an efficient enforcement system taking any trespassing of the law seriously. With the trends of internationalisation, there is already today an increased cooperation and exchange of experience and information of inspection authorities. This must be further enhanced and the number of countries concerned further increased.

ISWA will also participate in passing the message that legislation should be enabling and assist the industry to participate in the sustainable development. Legislation should as far as possible be proactive and not reactive.

The Working Group sees in the future a further increase of the use of financial and informative instruments. Experience from different schemes and instruments used will also help to elaborate those differently to make them more efficient

Another important role for ISWA will be the reporting and sharing of experiences on successful legal schemes to promote sustainable waste management. Even if one scheme not can be directly transferred to other conditions, it can play an important role if adapted to the specific circumstances

Trends for the legal aspects on the waste industry in the coming 10 years
- Increased use of different economic and informative instruments
- The use of environmental agreements to achieve set targets
- Changed legal responsibility higher up in the production chain which will inevitably have effects on the waste industry (different form of producers responsibilities, integrated product policy)
- Deregulation and increased liberalisation will require increased efforts to ensure that environmental legislation is not violated