

Unclassified

ENV/EPOC/PPC(97)15/REV2



Organisation de Coopération et de Développement Economiques
Organisation for Economic Co-operation and Development

OLIS : 19-May-1998

Dist. : 22-May-1998

PARIS

Or. Eng.

ENVIRONMENT DIRECTORATE
ENVIRONMENT POLICY COMMITTEE

Cancels & replaces the same document:
distributed 11-May-1998

Group on Pollution Prevention and Control

WASTE MINIMISATION IN OECD MEMBER COUNTRIES

Henrik Harjula, Tel (33-1)45 24 98 18, Fax (33-1)45 24 78 76
E-mail: henrik.harjula@oecd.org, www.oecd.org/env/lists4.htm

65683

Document complet disponible sur OLIS dans son format d'origine
Complete document available on OLIS in its original format

ENV/EPOC/PPC(97)15/REV2
Unclassified

Or. Eng.

FOREWORD

The overall objective of the OECD's 1996-97 Waste Minimisation Work Programme was to evaluate and propose policies for closing material cycles, and to assess policy options meant to reduce the dependence of waste generation on economic activities. The purpose of Project 1 under this programme, the results of which are summarised in this document, was to share information on the status of waste minimisation in OECD Member countries and to review national experiences with meeting the targets that had been set.

However, the information in these documents differs widely with regard to level of detail and timeliness. In order to obtain an overview of current national waste minimisation definitions, concepts, strategies, instruments and experiences, a comprehensive survey was carried out.

The survey results provide an overview of waste minimisation in 21 OECD countries as of mid 1996. They serve as the basis to the OECD Waste Minimisation Work Programme. The major outcome of the OECD Workshop on "Building the Basis for a Common Understanding on Waste Minimisation," held in Berlin in October 1996, has also been incorporated in this document.

Detailed profiles of 18 of the countries surveyed will be found in the companion volume, *Waste Minimisation Profiles of OECD Member Countries* [ENV/EPOC/PPC(97)16/REV2]. Available resources did not allow the elaboration of additional profiles.

The original draft of this document was prepared by the German consulting firm of Lahmeyer International, whose project team consisted of Hans-Joachim Hampel, Bernhard Rasch and Andreas Schlüter. Their work was financed by the German government, which also hosted the Berlin Workshop mentioned above. The final draft was produced within the OECD Secretariat by Laurent Renevier. This document has been prepared for publication with the assistance of a consultant, John Smith.

Delegates to the Pollution Prevention and Control Group have had the opportunity to review all the information presented and have agreed that it should be declassified. This document is published on the authority of the Secretary-General of the OECD.

TABLE OF CONTENTS

Introduction	4
1. Definitions, Terms and Concepts	5
The definition of <i>waste minimisation</i>	5
2. Target-setting	10
3. Political and Administrative Responsibilities	13
4. Waste Legislation	13
5. Key Instruments	15
Plans and programmes	15
Information provision and public relations	22
6. Key Players	31
7. Key Products and Waste Streams	39
8. Costs and Benefits	41
Effects of final disposal fees on waste minimisation	43
Low-waste products	43
Conclusions	44
Common understanding and call for harmonization	44
Successes and failures of waste minimisation activities	45
Recommendations	49
References	51

Introduction

At its first meeting in 1992, the OECD's Pollution Prevention and Control Group (PPCG) selected waste minimisation as one of the topic areas requiring priority attention in its work programme. The PPCG invited the Waste Management Policy Group (WMPG) to develop the issue further.

The central policy question with regard to establishing and implementing comparable waste minimisation programmes in different countries is whether there is a consensus on the definition of waste minimisation and on the hierarchy of relative waste minimisation priorities. The need for a definition of waste minimisation was clearly identified in the 1994-95 OECD Work Programme on Waste Minimisation. Work focusing on the evaluation of existing definitions in different Member countries was carried out, and a working definition was proposed for use in the context of the OECD's work on waste minimisation.

The definition of waste minimisation, as well as that of other terms and concepts, were extensively debated at the Washington Waste Minimisation Workshop organised by the OECD in March 1995.¹ The outcome of this workshop clearly indicated that no consensus existed either on the definition of waste minimisation or on the hierarchy of preferences for addressing wastes. There is general agreement among OECD countries, however, that the highest priority should be given to prevention and source reduction.

Another OECD workshop on "Building the Basis for a Common Understanding on Waste Minimisation" was held in Berlin on October 1996, hosted by the German government. The Berlin Workshop focused on problematic definitional and conceptual issues within waste minimisation. In particular, it addressed definitions, terms and concepts used in waste minimisation, criteria for target-setting, measurement of waste generation and evaluation of waste minimisation, the role of prevention versus recovery/recycling, and the role of incineration in the context of waste minimisation. The major outcome of the Berlin Workshop has been incorporated in this report.

It should be pointed out that in countries with a federal political and administrative structure, such as Australia, Germany and the United States, Canada, Belgium, waste minimisation approaches and the use of instruments may be different in separate states. Some of these differing practices are mentioned in *Waste Minimisation Profiles of OECD Member Countries* [ENV/EPOC/PPC(97)16/REV2].

¹ *Washington Waste Minimisation Workshop*. Volume I: *Five Waste Streams to Reduce*; Volume II: *Which Policies, Which Tools?* OECD, Paris, 1996. (Also published in a French translation.) The Washington Workshop was attended by approximately 180 representatives of government, industry, environmental NGOs and intergovernmental organisations. It was co-hosted by the United States, Canada and Mexico.

1. Definitions, Terms and Concepts

The definition of *waste minimisation*

In most OECD countries the meaning of the term *waste minimisation* has not been defined legally, but is derived from laws/regulations concerning waste. Often the meaning is also based on a general understanding of this term.

Seventeen countries out of the 21 surveyed reported that their domestic definitions of *waste minimisation* corresponded with the working definition of the OECD. Only the definitions used in Spain and the United Kingdom did not correspond. Spain provided the following definition: “preventing and/or reducing waste, improving the quality of waste generated, including reduction of hazard. As well, re-use, recycling and recovery on-site with a favourable environmental balance.” Although the UK agreed to use the OECD working definition for the purpose of the survey (and its participation in related OECD work), so that its situation could be meaningfully compared with that of other countries, *waste minimisation* was defined in that country as the reduction in quantity and hazard of waste at source. Re-use, recycling and recovery were not included in this definition.

In all the countries surveyed, waste minimisation included reduction of the amount of waste at source, as well as the reduction of hazard. The Berlin Workshop confirmed that, despite remaining differences between definitions in use domestically, there was general agreement among countries on the OECD working definition within the framework of the OECD’s ongoing work. Accordingly, waste minimisation encompasses the following three elements, in this order of priority:

- **preventing and/or reducing the generation of waste at source;**
- **improving the quality of the waste generated, such as reducing the hazard; and**
- **encouraging re-use, recycling and recovery.**

Waste incineration, whether or not it includes energy recovery, appears to be the most controversial practice with respect to its contribution to waste minimisation. It was therefore highly recommended at the Berlin Workshop that the OECD should further explore the role of incineration within waste minimisation.

Definitional and conceptual issues, as well as the measurement of waste generation and the evaluation of waste minimisation, are further addressed and discussed in detail in the outcome of Project 2 under the OECD’s Work Programme on Waste Minimisation for 1996-97.

Relative waste minimisation priorities

Twenty of the 21 countries reported that they applied a hierarchy with regard to objectives and measures for waste prevention, recovery and disposal. These hierarchies were generally set out in legal documents. Italy did not have a legally defined hierarchy of this type, but applied a hierarchical structure according to the understanding of waste minimisation in that country.

On the basis of the information summarised in **Table 1**, the following conclusions can be drawn concerning relative waste minimisation priorities:

- In all the countries surveyed, prevention of waste generation (including prevention of hazard) had priority over any recycling or recovery operation.
- In ten countries, on-site recycling had priority over off-site recycling (i.e. use in other processes). Seven countries considered on-site and off-site recycling to have equal priority.
- Countries did not agree on whether reducing the hazard of the waste generated should have priority over reducing the waste amount. Eleven countries gave the same priority to reduction of hazard and reduction of waste amount.
- Material recycling had a clear priority over energy recovery. Material recycling and energy recovery had the same priority in only six countries. In one of these countries, the UK, decisions concerning which to use were based on Best Practicable Environmental Option (BPEO).
- All the countries surveyed gave priority to recycling and recovery over landfilling.

Priorities were widely discussed at the Berlin Workshop, and consensus was reached on a hierarchy of waste minimisation priorities. According to this hierarchy, the highest priority should be given to waste prevention and reduction at source. Prevention is considered the most effective means of waste minimisation. It would be a crucial element in a waste management strategy. However, prevention will never make other forms of waste minimisation unnecessary. At this time, recycling and recovery are the principle means of waste minimisation. Waste prevention should be further developed to fulfil its still great unused potential.

Table 1. Waste minimisation priorities

	Hierarchy exists		Waste prevention over recycling			On-site over off-site recycling			Reduction of hazard over reduction of amount			Material recycling over energy recovery			Recycling/recovery over landfilling		
	Yes	No	Yes	No	=	Yes	No	=	Yes	No	=	Yes	No	=	Yes	No	=
Australia	X		X			X			X			X			X		
Austria	X		X			X			X			X			X		
Canada	X		X			n.a.				X		X			X		
Czech Republic	X		X					X			X	X			X		
Denmark	X		X			X					X	X			X		
Finland	X		X					X			X	X			X		
France	X		X					X	n.a.					X	X		
Germany	X		X					X			X			X	X		
Hungary	X		X					X	X			X			X		
Italy		X ¹⁾	X			X				X		X			X		
Japan	X		X			X					X	X			X		
Korea	X		X			X			X					X	X		
Netherlands	X		X			X					X	X			X		
New Zealand	X		X					X			X	X			X		
Norway	X		X					X		X				X	X		
Poland	X		X			X			X			X			X		
Spain	X		X			X			X			X			X		
Switzerland	X		X				X				X			X	X		
Turkey	X		X				X				X	X			X		
United Kingdom	X		X				X				X			X ²⁾	X		
United States	X		X			X					X	X			X		
Total	20	1	21	0	0	10	3	7	6	3	11	15	0	6	21	0	0

n.a.: no answer; =: same priority

¹⁾ A hierarchical structure is applied according to the understanding of waste minimisation in that country.

²⁾ Case-by-case evaluation is based on Best Practicable Environmental Option (BPEO).

The role of incineration

There are significant differences among OECD countries with regard to whether incineration contributes to waste minimisation. In some countries, incineration is considered a waste minimisation measure only if the process includes energy recovery. **Table 2** shows the positions of the countries surveyed on this issue:

- In 13 countries, incineration or any other type of thermal treatment **with** energy recovery was considered to contribute to waste minimisation. In six countries, it was not.
- In only four countries was incineration or any other type of thermal treatment **without** energy recovery considered to contribute to waste minimisation. In 15 countries, it was not.
- Criteria to distinguish energy recovery from incineration had been defined in four countries. These criteria were often based on the minimum calorific value of the waste concerned (e.g. Canada: 12,700 kJ/kg; Germany: 11,000 kJ/kg). In Norway, such criteria were in preparation. Some countries required maximum energy recovery or a certain waste quality (Austria, Germany). Spain considered incineration to be a recovery operation “when the economic and environmental balances are positive.”
- In Japan, waste incineration with energy recovery for electric power generation was defined as thermal recycling.
- In 13 countries, such criteria were not applied. However, some of these countries did distinguish between incineration with or without energy recovery.

At the Berlin Workshop, the role of incineration within waste minimisation was extensively debated. No definite answer was agreed to the question of whether incineration is a waste minimisation measure. Both the survey results and the Berlin Workshop indicated that the OECD should further explore the role of energy recovery within waste minimisation, including costs and benefits.

Despite disagreement on the role of incineration, the following conclusions were agreed at the Berlin Workshop:

- Incineration is a valid component of an integrated waste management system.
- Incineration has no influence on the reduction of waste generation. Capacity should be planned according to projections of future needs, based on the application of preferred options in the hierarchy of waste minimisation priorities.
- Depending on the circumstances, incineration of waste can be considered a means of recovery or of final disposal.
- Only non-avoidable, non-recyclable waste should be considered for incineration.

Table 2. The role of incineration

	Incineration <u>with</u> energy recovery is considered a waste minimisation measure		Incineration <u>without</u> energy recovery is considered a waste minimisation measure		Criteria exist to distinguish energy recovery from incineration	
	Yes	No	Yes	No	Yes	No
Australia	X		n.a.			X
Austria	X			X	X	
Canada		X		X	X	
Czech Republic	X		X			X
Denmark	X			X		X
Finland	X			X		X
France	X		X		n.a.	n.a.
Germany	X			X	X	
Hungary	n.a.		n.a.			X
Italy	X			X		X
Japan	X		X			X
Korea	X			X		X
Netherlands		X		X		X
New Zealand	not used			X		X
Norway	X			X		X
Poland	X		X		X	
Spain		X		X	X	
Switzerland		X		X		X
Turkey		X		X		X
United Kingdom	X			X		X
United States		X		X	X	
Total	13	6	4	15	6	14
n.a.: no answer						

2. Target-setting

Countries provided priority lists of measures that contribute to waste minimisation. The following targets and priorities were reported:

- reduction of waste generation in general, or of specific waste streams (e.g. construction and demolition waste, green waste, commercial and industrial waste);
- exact figures (e.g. the maximum amount of waste allowed to be generated or landfilled);
- recycling rates for municipal waste in general, for specific waste streams (e.g. used packaging or end-of-life vehicles), for industrial sectors (e.g. leather manufacturing, the textile industry, film processing), or for processes (e.g. dry cleaning, metal finishing);
- quality standards for recycled materials;
- reduction of hazardous waste in general or of specific hazardous waste streams (e.g. reduction or substitution of hazardous components in paints, batteries, fluorescent tubes, refrigerators, or medical waste);
- bans on landfilling of wastes or waste types with a high content of hazardous or organic substances (paints, batteries, industrial sludge) or occurring in large amounts (tyres);
- encouragement of sustainable construction;
- further development, and promotion, of cleaner technologies;
- special waste concepts for different branches of industry; and
- negotiation of voluntary, industry-specific waste reduction agreements, including material-specific targets or detailed arrangements for waste reduction.

The following general conclusions can be drawn from the material provided by countries:

- Eleven of the 21 countries surveyed indicated a preference for voluntary waste minimisation measures. One argument in favour of voluntary measures is that, compared with mandatory measures, they allow industry and other stakeholders maximum flexibility.
- Three countries (Austria, Germany and Korea) preferred mandatory measures. They reported that voluntary approaches often had not been successful. The problem of free-riders was cited as a major stumbling block. Furthermore, some targets had been achieved for only a short

time. Falling prices of virgin materials had often resulted in decreased demand for recycled goods. Consequently, voluntary targets had not been met.

- In spite of their different preferences, most countries used combinations of mandatory and voluntary measures to meet waste minimisation targets.

The Berlin Workshop showed that there is a need for guidelines on setting waste minimisation targets. These guidelines should include practical examples of target-setting, based on the use of the following criteria:

- increasing amounts of generated waste;
- the hazard of substances associated with production, products, and wastes to be landfilled;
- public pressure;
- the difficulty of disposal, and related costs;
- the recovery of valuable components;
- the availability of clean technologies;
- the equitable treatment of the players involved; and
- the recognition of overall environmental impacts.

These guidelines should also provide information on possible approaches to meet targets for specific products or waste streams.

The issue of voluntary versus mandatory waste minimisation approaches was also discussed at the Berlin Workshop. Voluntary measures and targets were regarded as an appropriate starting point, as they allow flexibility. However, unfulfilled voluntary arrangements should be backed up by more prescriptive mandatory approaches.

The measurement and evaluation of waste minimisation are closely related to target-setting. Workshop participants therefore recommended that a monitoring system be developed to provide regular data on:

- waste streams requiring final treatment and/or disposal;
- priority waste streams; and
- the contribution of different elements in the hierarchy of waste minimisation priorities.

The information produced by this monitoring system should be suitable for use in refining targets. The costs and benefits of monitoring waste minimisation should be duly considered. Reporting should be kept to a minimum.

Only a few countries used sanctions or other enforcement measures to achieve waste minimisation targets. The use of sanctions was foreseen, however, especially in the case of failure to meet mandatory targets (e.g. obligatory product labelling, product take-back obligations, deposit-refund

schemes, restricted product use). Some countries reported that failure to comply with mandatory requirements resulted in fines.

3. Political and Administrative Responsibilities

Even in countries whose political and administrative systems are centralised rather than federal, responsibilities for waste minimisation were widely delegated to regional and municipal administrations. Priority-setting, strategic planning, information provision, and public relations were often undertaken by both national and regional/municipal bodies. Approval and control of installations was often delegated to the regional/municipal level. **Table 3** shows the distribution of political and administrative responsibilities reported by the surveyed countries.

4. Waste Legislation

Almost all the countries surveyed had separate (or “autonomous”) waste legislation. Waste minimisation provisions were almost always part of this legislation. Waste minimisation initiatives were also often integrated with other laws/regulations, e.g. those concerning water, chemicals, and pollution control. Only in Denmark, the Netherlands and New Zealand was there no separate central law on waste management. Instead, integrated environmental laws in these countries provided the framework for regulations on waste management and waste minimisation at a lower level.

The products and waste streams most often regulated included:

- industrial waste and packaging;
- municipal waste, organic waste, and waste paper;
- batteries;
- tyres; and
- waste oil and lubricants.

Future priorities included regulation of the disposal of hazardous waste in landfills, and implementation of Extended Producer Responsibility (EPR) and the polluter-pays principle (e.g. through take-back obligations for end-of-life products).

Table 3 Political and administrative responsibilities				
	Administrative system		Tasks of central/federal bodies	Tasks of regional/municipal bodies
	Central	Federal		
Australia		X	1, 2, 3, 4, 5, 6, 7, 8	1, 2, 3, 4, 5, 6, 8
Austria		X	1, 2, 3, 4, 5, 6, 7, 8	1, 2, 3, 4, 5, 6, 7, 8
Canada		X	1, 3, 5, 6, 7	1, 2, 3, 4, 5, 6, 7, 8
Czech Republic	X		1, 2, 3, 4, 5, 6, 7	
Denmark	X		1, 2, 3, 4, 5, 6, 7, 8	
Finland	X		1, 2, 3, 4, 5, 6, 7	2, 3, 4, 6, 8
France	X		1, 2, 3, 4, 5, 6, 7, 8	1, 2, 3, 4, 5, 6, 8
Germany		X	1, 2, 5, 6, 7	1, 3, 4, 5, 6, 8
Hungary	X		n.a.	
Italy	X		1, 2, 5, 7	
Japan	X		1, 2, 3, 5, 6, 7	1, 2, 3, 4, 6, 8
Korea	X		1, 2, 3, 4, 5, 6, 7, 8	1, 2, 3, 4, 5, 6, 7, 8
Netherlands		X	1, 2, 3, 4, 5, 6, 7, 8	3, 4, 7
New Zealand	X		1, 2, 3, 4, 5, 6, 7, 8	1, 3, 4, 5, 7, 8
Norway	X		1, 2, 3, 4, 5, 6, 7, 8	4
Poland	X		1, 2, 3, 4, 5, 6, 7	1, 4, 5, 6, 8
Spain		X	1, 2, 3, 5, 6, 7	1, 2, 3, 4, 5, 6, 7
Switzerland		X	1, 2, 3, 4, 5, 6, 7, 8	1, 2, 3, 4, 5, 6, 7, 8
Turkey	X		1, 2, 3, 4, 5, 7, 8	1, 2, 3, 4, 7, 8
United Kingdom	X		1, 2, 3, 4, 5, 6, 7, 8	1, 2, 3, 6, 8
United States		X	1, 2, 3, 4, 5, 6, 7	1, 2, 3, 4, 5, 6, 8
Total	13	8		
1 Setting of priorities 3 Strategic planning 5 Scientific support 7 International co-operation 2 Enactment of laws 4 Approval and control 6 Information and PR work 8 Disposal itself n.a.: no answer				

5. Key Instruments

The use of various waste minimisation instruments, and countries' views on their effectiveness and further use, are summarised below.

Plans and programmes

Plans and programmes were used to support waste minimisation in all the countries surveyed. General environmental plans and programmes often included sections dealing with waste minimisation, as well as with key products and waste streams. Voluntary plans and programmes (without mandatory provisions) were used more widely than mandatory ones. Support of research and development, and provision of consultancy services, were typically part of voluntary plans and programmes. Mandatory programmes often covered general waste minimisation, key products and waste streams, and the approval, licensing and control of specific installations.

Table 4 shows how plans and programmes were being used in the surveyed countries.

Fifteen countries foresaw more intensive use of plans and programmes in the future. In the Netherlands, Denmark and Germany these instruments had been used for a number of years, and in many areas, and had proven very effective. More intensive use, or extension to new areas, were therefore not foreseen in these countries.

At the federal level, the United States used only voluntary plans and programmes. Turkey reported that only mandatory plans existed in that country. In many countries, plans and programmes (mandatory and/or voluntary) had been established at the regional and municipal level.

Typical positive experiences with plans and programmes included the following:

- They had served an important function by preparing key players for new, more binding waste minimisation targets. General waste minimisation plans and programmes had been supplemented by more specific measures, such as laws and technical standards.
- Voluntary approaches had been successful, as industry had met the targets.
- Publicising the deficiencies of the waste management system, and at the same time proposing solutions, had increased public acceptance of measures to be taken.
- Developing plans in co-operation with stakeholders had facilitated mutual understanding of the roles of authorities, industry, and others.

Typical problems or obstacles included:

- Target groups were not always willing to co-operate (e.g. industry and administrative officials on a lower level).
- Plans and programmes define (and are used to disseminate information on) new waste minimisation targets. They are also used to initiate some basic measures. However, acceptance of these measures is often poor. It is therefore necessary to follow up on and support them with additional/stronger instruments.
- Free-riders do not accept the targets, and therefore take advantage of voluntary programmes.
- There are economic obstacles, such as increases in waste management costs.
- Development and implementation often take a long time. Plans and programmes also tend to become outdated fairly quickly as technologies change, and therefore should be updated regularly.
- Financial aid programmes are often set up to support plan realisation. Acceptance may depend on the general economic situation. Good acceptance is probable if economic advantages can be achieved.
- Adequate means may not be available to control the progress of plans/programmes. Sufficient information on their actual performance and effectiveness is therefore often unavailable.

Table 4 Plans and programmes (mandatory/voluntary)

	Area of application			Area of support		
	1	2	3	4	5	6
Australia	v	v	v	v	v	v
Austria	v	v	v	v	m	v
Canada	m/v	m/v	m/v	v		m/v
Czech Republic	m	m	v	v	v	m
Denmark	m/v	v	v	v	v	m
Finland	m/v	m/v	m/v	v		m/v
France	m	m	n.a.	n.a.	n.a.	n.a.
Germany	m/v	m/v	m/v	v	m\ v	m
Hungary	n.a.	v	m	n.a.	n.a.	n.a.
Italy	m	v	m/v	v	v	
Japan	m/v	m/v	m			m/v
Korea	v	m	m	v	v	m
Netherlands	v	v	m/v	v		m/v
New Zealand	v	v	v			
Norway	v	v	v	v	v	v
Poland	v	v	v	v	v	v
Spain	v	v	v			
Switzerland	m/v	m/v	m/v		m/v	m/v
Turkey	m	m	m	m	m	m
United Kingdom	m	v	m/v	v	v	m
United States	v	v	v	v	v	v
Total (m/v)	11/15	9/ 17	11/16	1/14	4/11	11/10

1 Municipal waste

2 Key industrial sectors

3 Key products and waste streams

4 Research and development

5 Provision of consultancy services

6 Approval and control for specific plants

m: mandatory v: voluntary

n.a.: no answer

Mandatory instruments

The main areas of application of the mandatory instruments used in the surveyed countries are shown in **Table 5**.

Technical standards for production, recycling and recovery processes

Legally binding technical standards for production, recycling and recovery processes were in force in eight countries. The Netherlands did not have legally binding standards, but a separate institutional body was in charge of supporting authorities by formulating regulations concerning waste prevention and recycling to be included in the licensing process. Germany reported that in existing plants the state-of-the art in waste minimisation was to be achieved via mandatory measures issued by the licensing authorities.

In general, standards were set for specific industrial sectors as well as for specific recycling processes, plants, and production sectors. Three countries reported that standards were legally binding for all plants and production processes.

Almost all the countries that used technical standards considered them an effective instrument and foresaw their intensified use in the future. Most of the countries that did not apply legally binding technical standards also did not consider them effective and did not foresee their greater use in the future.

The following are typical benefits of applying technical standards to production, recycling and recovery processes:

- Stringent end-of-pipe control regulations generate high costs for industry, especially costs related to final disposal, thus stimulating implementation of waste minimisation measures at earlier production stages.
- Minimum technical standards for all waste recycling facilities are absolutely necessary in order to prevent waste being transported to less expensive plants that use lower level technologies.
- Harmonization of technical standards is a good way to guarantee safe treatment/disposal of all waste streams.

Negative experiences with technical standards included the following problems and obstacles:

- The establishment of technical standards was a very complicated process, as the target groups often had conflicting interests.
- Implementing new technical standards for production processes created technical and economic problems for industry.
- Agreement to adopt new technical standards required the use of considerable persuasion.

Product bans and restrictions

Product bans and restrictions were used in 15 countries. The main areas of application were deposit-refund schemes, product labelling, and take-back programmes. Product bans had often been implemented for reasons other than waste minimisation (e.g. banning of CFCs to protect the ozone layer; banning of PCBs and PCTs because of their persistency and health/environmental hazards).

Batteries, packaging and packaging waste in general, and especially beverage containers were typically restricted for waste minimisation purposes. Several countries reported that they applied such restrictions to the disposal of hazardous waste and of used oil and tyres.

Eleven countries considered bans and restrictions to be effective waste minimisation instruments. Most of these countries foresaw intensification of their use in the future.

The following are typical examples of countries' experience with product bans and restrictions:

- Product restrictions should be used if voluntary agreements with industry are impossible or have failed. Use of this mandatory instrument may increase the readiness of industry to set waste minimisation targets.
- Product bans should be used only as a last resort, in cases where products are expected to cause considerable environmental damage.
- Deposit-refund schemes and product take-back obligations can produce high return rates.

Typical problems and obstacles include:

- Free-riders gain economic advantages by ignoring legal restrictions.
- Developing and formulating product restrictions is a complicated process. Economic impacts on industry must be considered.
- Easy-to-use tools to control and monitor restrictions (e.g. recycling rates) are not yet available. Evaluating performance therefore remains difficult.

Table 5 Mandatory instruments								
Technical standards for production, recycling and recovery processes			Product bans and restrictions					
	Used	Areas of application	Used	Areas of application				
				1	2	3	4	5
Australia			X	n.a.			X	
Austria	X	1, 2, 3, 4	X	X	X	X	X	X
Canada			X	X			X	X
Czech Republic								
Denmark			X	X		X	X	X
Finland	¹⁾		X	X	X	X	X	X
France	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Germany	X	1, 2, 3, 4	X	X	X	X	X	X
Hungary	n.a.	n.a.	X	X	X	n.a.	X	n.a.
Italy	X	2, 4						
Japan	X	3	X	X		X	X	X
Korea	X	2, 3, 4	X	X	X	X	X	X
Netherlands	¹⁾	n.a.	X	X		X		X
New Zealand								
Norway								
Poland								
Spain			X		X	X		X
Switzerland	X	2, 3	X	X	X	X	X	X
Turkey	X	1, 2, 3, 4	X	X	X	X	X	X
United Kingdom	X	3	X	X	X		X	X
United States			X			X	X	
Total	8		15	12	9	11	13	12
1 All plants and production processes 2 Specific plants and production processes 3 Specific industrial sectors 4 Specific recycling/recovery processes ¹⁾ There are no legally binding technical standards, but waste minimisation requirements are integrated into the licensing process.			1 Product bans 2 Product restrictions 3 Product labelling 4 Deposit refunds 5 Product take-back n.a.: no answer					

Economic instruments

Table 6 shows the main areas of application of the economic instruments used in the countries surveyed.

Taxes and duties

Economic instruments are mainly applied in the form of taxes and duties (including fees and licenses) for waste treatment and landfilling. There may also be special taxes and duties on hazardous waste. Seven countries levied taxes/duties on raw materials, resources and energy. Six countries levied them on waste-intensive products such as packaging, in particular non-refillable and non-recyclable containers.

Nine out of 15 countries reported that the revenues from taxes/duties were spent in ways that supported waste minimisation or waste management. In six countries these revenues were not devoted to waste minimisation.

All the countries considered taxes and duties to be effective waste minimisation instruments. Most foresaw more intensive use of these instruments the future.

Taxes and duties have been effective because waste producers implement waste minimisation measures in order to avoid paying them.

A typical problem reported is that some waste producers try to avoid paying disposal duties by using dubious recycling measures. Duties may also encourage illegal dumping.

Financial aid and economic incentives

All the countries surveyed except Turkey indicated that financial aid and economic incentives were used to promote waste minimisation. The main areas of application were:

- research and development related to waste prevention/recovery technologies;
- pilot projects;
- investment in low-waste production/products;
- consultancy services;
- innovative solid waste recycling technologies; and
- eco-balances, life-cycle assessments, and eco-auditing.

Financial aid and economic incentives most often took the form of subsidies, low-interest credits, cost-free consultancy services, and sureties.

In almost all countries funds were obtained and used by the central government, but this was often done by regional and municipal governments as well. Only three countries reported that industry funded projects related to waste minimisation. Some countries foresaw increased industry involvement in this area in the future.

In most countries government institutions, industry and waste managers, universities, and research institutes applied for financial aid. Almost all countries considered financial aid an effective instrument. Ten countries foresaw more intensive use in the future. Some countries indicated that financial aid was already significant. Some were considering replacing subsidies with measures based on the polluter-pays principle.

The following are typical examples that support the use of financial aid and economic incentives:

- Financial aid clearly promotes the achievement of desired outcomes. It makes a considerable contribution to improving waste management.
- Public financial aid stimulates further private investment.
- Financial aid can be used to maintain a company's competitiveness while new environmental technology is being implemented.

However, it was often mentioned that:

- Providing financial aid is a financial burden on the government.
- Procedures used to apply for financial aid are sometimes complicated and time-consuming.
- Co-ordination of efforts is essential in order to avoid giving support to counterproductive measures.

Suasive instruments

Table 7 gives an overview of the application of suasive instruments used in the surveyed countries.

Information provision and public relations

Information and public relations campaigns are widely used to support waste minimisation. The following are some of the main areas of application:

- provision of information through public information offices serving private households or industrial waste producers, and the creation of information systems and databases to disseminate state-of-the-art waste minimisation techniques;
- initiation of pilot projects by public authorities; and
- creation of trading opportunities for recycled goods and products.

Table 6 Economic instruments											
Taxes and duties					Financial aid and economic incentives						
	Used	Areas of application			Used	Areas of application					
		1	2	3		1	2	3	4	5	6
Australia	X			X	X	X	X		X	X	
Austria	X	X		X	X	X	X	X	X	X	X
Canada	X		X	X	X	X	X	X	X	X	X
Czech Republic	X	X		X	X	X	X	X	X	X	X
Denmark	X	X	X	X	X	X	X	X	X	X	X
Finland	X	X	X	X	X	X	X	X	X	X	X
France	X	n.a.	n.a.	X	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Germany	X ^{1) 2)}		X ^{1) 2)}	X ^{1) 2)}	X	X	X	X		X	X
Hungary	X	n.a.	X	n.a.	X	n.a.	n.a.	X	n.a.	n.a.	n.a.
Italy	X	X		X	X	X	X		n.a.	X	
Japan					X	X	X	X	X	X	X
Korea	X	X	X		X	X	X	X		X	
Netherlands	X	X		X	X	X	X		X	X	
New Zealand					X	X	n.a.	n.a.	X	n.a.	X
Norway											
Poland	X			X	X	X	X	X	X	X	
Spain					X	X	X	X	X	X	X
Switzerland	X			X	X	X	X		X		X
Turkey	X			X							
United Kingdom	X			X	X	X	X		X	X	X
United States	²⁾				X	X	X	X	X	X	X
Total	16	7	6	14	18	17	16	12	14	15	12
1 Raw materials, resources or energy 2 Waste-intensive products 3 Treatment and landfilling n.a.: no answer ¹⁾ Only in some states and cities ²⁾ Not applied on the federal level					1 Research and development on waste prevention/recovery technologies 2 Pilot tests 3 Investments in low-waste production/products 4 Consultancy services 5 Innovative solid waste recovery technologies 6 Eco-balances, life-cycle assessments, eco-auditing						

Table 7 Suasive instruments					
Information provision and public relations				EMS, environmental reports, eco-labelling, etc.	
	Form of application			Area of implementation	
	Pilot projects	Information services	Waste exchanges	Environmental Management Systems, reports and waste balances	Eco-labelling
Australia	X	X	X	X	X
Austria	X	X	X	X	X
Canada	X	X	X	X	X
Czech Republic	X	X	X	X	X
Denmark	X	X	X	X	X
Finland	X	X	X	X	X
France	X	X	X	n.a.	n.a.
Germany	X ¹⁾	X	X	X	X
Hungary	n.a.	n.a.	n.a.	X	X
Italy	X	X	X	X	X
Japan	X	X	X	X	X
Korea	X	X		X	X
Netherlands	n.a.	n.a.	n.a.	n.a.	n.a.
New Zealand	X	X	X	X	X
Norway					X
Poland	X			X	
Spain	X	X	X	X	
Switzerland		X		X	
Turkey	X	X	X	X	X
United Kingdom	X	X	X	X	X
United States	X	X	X	X	X
Total	17	17	15	18	16

n.a.: no answer ¹⁾ Only in some states

Half the surveyed countries reported that information and consultancy services had been established for specific target groups by law. In most cases, administrative bodies (central, regional and municipal) had set up these services. In seven countries, industry and related associations provided information and consultancy services.

Fourteen countries considered information and public relations initiatives to be effective. Fifteen countries foresaw more intensive application of these instruments in the future.

The following are typical positive experiences:

- Information provision and consultancy are part of an interactive process (i.e. information exchange). They can therefore be (self-developing) educational instruments that are widely accepted by authorities, industry, businesses, and the general public.
- These instruments have proven effective in all industrial sectors. Industry has often benefited financially from the use of suasive instruments.
- It is important to ensure uniform transfer of information to all target groups. Adequate information leads to good acceptance of governmental measures, and thus to more efficient use of resources.

The following problems and obstacles were reported:

- It was difficult to judge the success of campaigns aimed at influencing the behaviour of consumers and private households.
- Print, electronic media, and other advertising might provoke strong negative reactions.
- Consumer-orientated information/public relations campaigns needed to be co-ordinated with educational programmes in schools and universities, as they might then be more efficient and be carried out on a higher level.
- Consultancy services on the municipal level needed to be better co-ordinated.
- Several countries aimed at setting standards for nation-wide information and public relations campaigns. So far, the co-ordination of measures at the regional and local level had not been satisfactory.

It was widely agreed at the Berlin Workshop that suasive instruments contributed significantly to waste minimisation. Good communications, consultation, wide participation, access to information, and flexibility in implementation are all usually important for success in waste minimisation.

EMS, environmental reporting and eco-labelling

Companies in most of the countries surveyed used Environmental Management Systems (EMS) and produced environmental reports. However, most of the countries reported that the number of companies actually applying these measures was rather small. In some countries environmental and waste reports were mandatory. Such reports were expected to be mandatory in other countries in the future.

Eco-labelling systems had been initiated in most countries. The number of products and services that had been awarded an eco-label in each country differed considerably. There were indications that eco-labelling had been interpreted in some countries as simply requiring manufacturers or retailers to provide information on their products (e.g. components, recycling methods).

Fifteen countries considered Environmental Management Systems, environmental reports and eco-labelling to be effective instruments and foresaw their more intensive use in the future.

Typical positive experiences included the following:

- The review of waste management concepts undertaken as an integral part of EMS had resulted in reduction of waste generation, as well as in cost savings.
- Waste or environmental reports had been useful in waste planning and had proved essential when future waste minimisation policies were decided upon.

Problems and obstacles included:

- With respect to environmental reports and waste management concepts, knowledge of obligations and possibilities was not sufficiently widespread among companies. These instruments had so far only been used by large or innovative companies.
- Some countries still lacked sufficient information to be able to quantify the success of EMS and eco-labelling.

Eco-labelling was considered to provide good support for waste minimisation policies. Eco-labelling systems were increasingly important in many countries.

Typical positive experiences included:

- Products that had been awarded an eco-label usually gained market advantage.
- Eco-labelling could have important secondary effects on waste minimisation. For example, during the development and fulfilment of eco-labelling criteria, various features of the production process might be scrutinised.

Problems and obstacles included:

- The measurable contribution of eco-labelling to waste minimisation might be rather small.
- Developing criteria for specific products and services could be time-consuming. In addition, the composition of the issuing bodies (which might include representatives of government, administration, industry, or environmental groups) could be controversial.

Mixes and prioritisation of instruments

Table 8 suggests how countries use instrument mixes. Plans and programmes, financial aid, economic incentives, and suasive instruments were used in almost all countries. Taxes and duties, and product bans and restrictions, were widely used. Technical standards were used in fewer countries.

Only a few countries furnished detailed information on their experiences with instrument mixes. It appears that overall the use of such mixes to meet waste minimisation targets may not yet have been studied thoroughly. Canada remarked, for example, that successful instruments were generally regarded as being successful on their own rather than being analysed in combination with others.

The Berlin Workshop provided the opportunity for countries to compare experiences with regard to various instruments' effectiveness. Most countries used a mix that corresponded to national and local circumstances and to specific waste streams. Each type of instrument had advantages and disadvantages. For example:

- Plans and programmes were essential to establish a framework, and to give coherence and direction.
- Use of mandatory instruments could ensure that minimum standards were being observed and eliminate free-riders.
- The use of economic instruments demonstrated that proven results in using the power of the market, equitable distribution of the burden of payment, and the generation and allocation of revenues were key issues.
- Suasive instruments had an essential supporting role, for example in relation to consumers and small and medium-sized enterprises.

Many instruments had demonstrated cost-effective results, especially with regard to the promotion of clean technology. However, the most effective outcome was likely to involve the use of a combination of instruments. Assessment tools in this area, such as full-cost accounting and life-cycle analysis, were relatively weak.

Potentially wider impacts included job creation, health and safety implications, improved economic efficiency, and greater benefits in terms of sustainability. Barriers to progress included the need to obtain financing and resources, resistance to change, short-term perspectives, and competing priorities.

Failures have occurred, due for example to poor enforcement of mandatory instruments, inappropriate voluntary agreements, and inappropriate use of taxation.

Table 9 shows the prioritisation of the instruments that have been discussed, as reported by countries. For example, Denmark, New Zealand, the United States, and to some extent Canada gave low priority to mandatory plans and programmes and other mandatory instruments. These countries gave higher priority to voluntary plans and programmes. Canada, Denmark and New Zealand also gave high priority to economic and suasive instruments. The Czech Republic, Italy, Korea and Turkey gave high priority to mandatory plans and programmes and to other mandatory instruments.

Although lack of data from four countries (Australia, France, the Netherlands and Norway) may have introduced some distortion, the statistical analysis presented here generally illustrates the situation in

the countries surveyed. While average rankings of the instruments are quite close, standard deviations differ significantly, demonstrating that the extent of agreement on these instrument among countries was very uneven. Thus, the low standard deviation for economic instruments indicates that they were given relatively high priority by all countries. There was less agreement on the use of the other four instruments.

Table 8 Instrument mixes														
	Plans and programmes		Mandatory instruments				Economic instruments				Suasive instruments			
			Technical standards		Bans and restrictions		Taxes, duties (licenses)		Financial aid and economic incentives		Information, public relations		EMS	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Australia	X			X	X		X		X		X		X	
Austria	X		X		X		X		X		X		X	
Canada	X			X	X		X		X		X		X	
Czech Republic	X			X		X		X		X		X		X
Denmark	X			X	X		X		X		X		X	
Finland	X			X	X		X		X		X		X	
France	X		n.a.	n.a.	n.a.	n.a.	X		n.a.	n.a.	X		n.a.	n.a.
Germany	X		X		X		X		X		X		X	
Hungary	X		n.a.	n.a.	X		X		X		n.a.	n.a.	X	
Italy	X		X			X	X		X		X		X	
Japan	X		X		X			X	X		X		X	
Korea	X		X		X		X		X		X		X	
Netherlands	X			X	X		X		X		n.a.	n.a.	n.a.	n.a.
New Zealand	X			X		X		X	X		X		X	
Norway	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Poland	X			X		X		X		X		X		X
Spain	X			X	X			X	X		X		X	
Switzerland	X		X		X		X		X		X		X	
Turkey	X		X		X		X			X	X		X	
United Kingdom	X		X		X		X		X		X		X	
United States	X			X	X			X	X		X		X	
Total	20		8	10	15	4	16	4	18	1	18		18	
n.a.: no answer														

Table 9 Prioritisation of waste minimisation instruments					
	Mandatory plans and programmes	Voluntary plans and programmes	Mandatory instruments	Economic instruments	Suasive instruments
Australia	n.a.	n.a.	n.a.	n.a.	n.a.
Austria	1	1	5	3	1
Canada	3	5	3	4	5
Czech Republic	5	2	4	3	1
Denmark	1	5	3	5	5
Finland	3	2	5	5	5
France	n.a.	n.a.	n.a.	n.a.	n.a.
Germany	3	2	1	4	3
Hungary	4	4	5	5	5
Italy	4	3	5	3	1
Japan	5	5	5	5	5
Korea	5 ¹⁾	3 ¹⁾	5 ¹⁾	4 ¹⁾	4 ¹⁾
Netherlands	n.a.	n.a.	n.a.	n.a.	n.a.
New Zealand	1	4	1	3	4
Norway	n.a.	n.a.	n.a.	n.a.	n.a.
Poland	3	5	4	5	4
Spain	4	4	2	4	3
Switzerland	3	3	3	4	5
Turkey	5	4	4	5	1
United Kingdom	3	4	3	5	5
United States	2	4	1	4	3
Average	3.2	3.5	3.5	4.2	3.5
Standard deviation	1.35	1.19	1.46	0.78	1.58
Ranking from (1) for low to (5) for high priority n.a.: no answer			¹⁾ Corrected according to the description given in the questionnaire		

6. Key Players

Key players' overall positions on waste minimisation

As shown in **Table 10**, the overall positions of key players with regard to waste minimisation vary from country to country:

- Industry and related associations were generally neutral or supportive with regard to waste minimisation (average: 3.7). In none of the countries surveyed were they reported to clearly oppose waste minimisation in principle.
- Consumers and private households were also neutral or supportive (average: 3.8). Some countries reported that consumers were often not sufficiently interested in taking an active role in waste minimisation.
- Environmental groups and other NGOs supported, or strongly supported, waste minimisation (average 4.5).
- The waste disposal industry's position on waste minimisation was neutral (average 3.4).

Industry in general, and the waste disposal industry in particular, have crucial roles to play in developing and implementing waste minimisation policy instruments. A detailed analysis of these groups' positions on various types of waste minimisation instruments thus provides insight into the level of support such instruments could expect to attract from key players. **Table 11** summarises the positions of industry and related associations and the disposal sector on waste minimisation in principle and on the five specific instruments discussed above.

A general observation can be made concerning the information presented Table 11. Key industrial and business players were on average neutral or supportive with regard to the general goal of waste minimisation. When it came to specific policy instruments, however, they were somewhat less supportive. Only voluntary plans and programmes received their strong support.

Industry and related associations gave high priority to voluntary plans and programmes and suasive instruments, but they opposed mandatory instruments and, above all, direct regulation. Their position on economic instruments could be considered neutral, as it would depend on whether these instruments took the form of financial aid or of taxes and duties.

Table 10 Key players' overall positions on waste minimisation				
	Industry and related associations	Consumers and private households	Environmental groups and other NGOs	Waste disposal industry
Australia	4	4	5	3
Austria	3	4	3	3-4
Canada	3	3-5	5	4
Czech Republic	3	3	4	n.a.
Denmark	5	4	5	5
Finland	3	4	5	3-4
France	n.a.	n.a.	5	n.a.
Germany	2	4	5	4
Hungary	n.a.	3	4	n.a.
Italy	5	3	n.a.	n.a.
Japan	4	n.a.	5	3
Korea	4	4	4	n.a.
Netherlands	4	5	5	3
New Zealand	3	4-5	4	3
Norway	5	5	5	4
Poland	3	2	3	3
Spain	4	3	5	1
Switzerland	4	5	5	3
Turkey	4	3	4	3
United Kingdom	4	4	5	4
United States	3	4	5	4
Average	3.7	3.8	4.5	3.4
Standard deviation	0.80	0.78	0.67	0.84
Ranking from (1) = active resistance to (5) = strongly supportive n.a.: no answer				

Most countries considered the position of the waste disposal industry to be largely neutral. This could be attributed to the fact that while new restrictions or conditions are likely to be an economic burden, they may also result in a demand for new facilities and services. Some countries reported that the waste disposal industry only met legal requirements and made no further efforts with regard to waste minimisation on a voluntary basis.

Participation in the development of waste legislation

Industry and related associations participated in the development of waste legislation and waste minimisation policies in almost all the countries surveyed. Industry's views were often taken into account during the legislative process. Industry and related associations were also invited to draft implementation plans or to comment on them. There were special consultative procedures in some countries. In Spain, for example, industry and related associations were represented on environmental advisory councils and participated in commissions whose purpose was to elaborate legislative projects.

It was often reported that industry practised strong lobbying in order to influence waste-related legislation. The same was true of the waste disposal industry. Environmental groups and other NGOs took part in the development of waste legislation and waste minimisation policies in most countries.

Support/hindrance of waste minimisation

Industry and related associations had taken a number of initiatives to support waste minimisation, including:

- Product advertising and public relations campaigns had been carried out.
- Associations had often provided information and consultancy services to industry, or had supported research and development.
- Low-waste products had been developed.
- In some countries, voluntary agreements on the recycling of products such as end-of-use vehicles and waste tyres had been supported by industry; in others, industry had initiated separate collection and recycling schemes for certain products.
- In some countries, industry had committed itself to voluntary take-back and recycling programmes for certain waste streams.

However, it had resisted the imposition of waste minimisation targets, for example through:

- intensive lobbying against waste minimisation legislation;
- opposing taxes and additional fees;
- in some countries, boycotting voluntary agreements or ignoring regulations in order to gain competitive advantages (free-riding); and
- not participating sufficiently in the minimisation of packaging waste.

Table 11 Industry positions on waste minimisation				
Instruments	Industry and related associations		Waste disposal industry	
	Average	Range	Average	Range
Mandatory plans and programmes	2.1	1-5	3.1	1-5
Voluntary plans and programmes	3.9	3-5	3.0	3-5
Mandatory instruments	2.0	1-4	3.1	1-5
Economic instruments	2.9	1-4	3.1	1-4
Suasive instruments	3.4	1-5	3.2	2-5
Waste minimisation in general	3.5	3-5	3.2	1-5

Consumers and private households had also taken various initiatives to support waste minimisation. Examples included:

- a high rate of acceptance of existing recycling facilities and curbside collection programmes;
- home composting; and
- in some countries, support for low-waste products.

Consumers and private households had hindered waste minimisation through:

- reacting to unpopular landfill disposal fees by illegally dumping household waste;
- rejecting user-pays programmes;
- giving insufficient support to separate collection systems; and
- continuing to buy over-packaged goods.

Examples of ways in which *environmental groups and other NGOs* supported waste minimisation included:

- In almost all countries, the main goal of environmental groups had been to inform the public and politicians. They had also:
 - contributed to the development of industrial waste reduction agreements;
 - developed waste management concepts;
 - taken part in law enforcement oversight.

- In some countries, they had organised voluntary material recycling campaigns.

Examples of initiatives taken by the *waste disposal industry* to support waste minimisation included:

- promotion of recycling technologies (recycling measures were generally reported to receive more support than waste prevention activities);
- participation in consultations on separate collection;
- implementation of Environmental Management Systems; and
- participation in pilot projects aimed at the collection and recycling of waste streams.

It was reported, however, that research projects and the results of projects sponsored by the waste disposal industry were sometimes questionable.

Separate collection and recycling

One of the main ways consumers and private households contributed to waste minimisation was to sort waste for separate collection. Three countries reported that separate collection of recyclable wastes was mandatory. In most other countries, waste separation and the collection of sorted wastes were voluntary. The success of such programmes largely depended on willingness to use existing recycling opportunities.

Average national collection/recycling rates for 1995 are shown in **Table 12**. It was not always clear whether these figures referred to waste from private households only or included commercial waste. The recycling rates in the table vary considerably. In some countries, almost all recyclable waste streams appear to have been collected and recycled effectively. In others, only some waste streams were collected separately and recycling rates were low. Waste paper and waste glass were recycled in most countries.

Table 13 shows the collection/recycling rates reported by some countries for specific types of waste.

Some countries did not provide information on recycling rates. Reasons for this could include:

- Waste was not collected separately in these countries, or recycling opportunities were not available.
- Not all countries were in a position to provide statistics on recycling rates, despite the fact that these statistics would have been of great help in measuring the effectiveness of waste minimisation measures.
- Statistical data may be organised differently in different countries, which often makes comparisons between countries difficult.

Table 12 Average national collection and material recycling rates (%) for household waste (1995)

	Biological waste		Waste paper		Waste glass		Packaging waste		Batteries		Scrap metals	
	coll	recy	coll	recy	coll	recy	coll	recy	coll	recy	coll	recy
	%	%	%	%	%	%	%	%	%	%	%	%
Australia	-	-	-	47	-	42	-	-	-	-	-	65 ⁴⁾ 23 ⁵⁾
Austria	65	65	68	68	75	75	60	57	65	-	³⁾	³⁾
Canada	-	-	-	40	-	25	-	-	-	-	-	-
Czech Republic	-	-	-	-	-	-	-	-	-	-	-	-
Denmark		85				80						
Finland	10	10	60	60	45	45	34	34	-	-	20	20
France	-	-	-	-	-	-	-	-	-	-	-	-
Germany	50	48	87	87	78	78	75	73	35	35	65	65
Hungary	-	-	-	30	-	20	-	13	-	-	-	-
Italy	-	-	-	-	-	-	-	-	-	-	-	-
Japan	-	-	-	-	-	55	-	-	-	-	-	60
Korea	-	-	-	53	-	57	-	-	-	-	-	17
Netherlands	-	-	-	-	-	-	-	-	-	-	-	-
New Zealand	-	-	-	-	-	-	-	-	-	-	-	-
Norway			45	45	60	60						
Poland	-	-	-	-	-	-	-	-	-	-	-	-
Spain	-	-	40	-	25	-	-	-	-	-	12 ²⁾	-
Switzerland	40 ¹⁾	40 ¹⁾	61	-	84	-	-	-	60	60	85 ⁴⁾	-
Turkey	-	-	-	-	45	27	45	27	-	-	-	-
United Kingdom	-	-	-	-	-	-	-	-	-	-	-	-
United States	-	14	-	35	-	23	-	34	-	-	-	36

coll: collection rate (% collected out of total amount of waste material generated)
recy: material recycling rate (% recycled out of total amount of waste material generated)
-: no answer
¹⁾ green waste ²⁾ pilot project ³⁾ 90,000 t ⁴⁾ Al cans ⁵⁾ Fe cans and other metals

	Textiles		Lead-acid batteries		Tyres		Waste electrical and electronic appliances	
	coll %	recy %	coll %	recy %	coll %	recy %	coll %	recy %
Australia	-	-	-	95	-	-	-	-
Canada	-	-	-	-	-	36	-	-
Finland	-	-	-	-	-	20	-	17
Germany	75	75	95	95	94	92	-	10
Hungary	-	13	-	-	-	-	-	-
Norway	-	-	-	-	-	35	-	-
-: no answer coll: collection rate (% of total waste amount) recy: material recycling rate (% of total waste amount)								

Significance of the key players

The countries surveyed estimated the relative significance of the key players in developing waste minimisation policies and in meeting waste minimisation targets. Their estimates were as follows:

- Industry and related associations were considered to have the greatest influence (almost half the total influence of the key players).
- Consumers were considered to have significantly less influence.
- Environmental groups and other NGOs were considered to have even less influence. In particular, they were considered to have very little influence with regard to meeting waste minimisation targets.
- The waste disposal industry was considered to have only marginal influence on waste minimisation policies. However, their importance in meeting waste minimisation targets was considered to be almost as great as that of consumers and private households.

Increased participation by key players in waste minimisation policy development

All the countries surveyed considered that industry and related associations should be more closely involved in developing waste minimisation policies in the future, or foresaw their closer involvement. Norway considered the level of participation to be adequate, but extension of the current consultative processes to other waste streams was being evaluated.

Countries identified the following areas as ones on which future efforts should be focused:

- development of industrial waste reduction agreements and review of existing agreements;
- improvements in product design;
- promotion and supply of a better selection of low-waste products;
- Extended Producer Responsibility (e.g. taking back end-of-life products);
- implementation of Environmental Management Systems; and
- transfer of technical know-how with regard to waste minimisation.

Seventeen countries considered that consumers and private households should be more closely involved in waste minimisation efforts in the future. In particular, attention should be given to improved information dissemination with regard to:

- environmental impacts of processes and products;
- separate collection and recycling opportunities, and how to use existing facilities; and
- raising public awareness.

Fourteen countries considered that environmental groups and other NGOs should be more closely involved in waste minimisation in the future, in order to facilitate:

- provision of information on waste minimisation objectives and targets aimed at increasing public awareness; and
- multi-stakeholder consultations.

Twelve countries considered that the waste disposal industry should be more closely involved in waste minimisation efforts. The means favoured were:

- stakeholder consultations on waste legislation;
- application of experiences with waste treatment and recycling to production processes;
- certification of recycling technologies; and
- integration of high-quality recycling.

Countries that did not foresee closer integration of target groups into the development of waste minimisation policies had generally already achieved a high level of participation. The Netherlands, for example, reported that the waste policies it had pursued since the early 1980s were successful and that further involvement of these groups need not be envisaged in the foreseeable future.

At the Berlin Workshop the need to ensure public participation and public access to information was emphasised.

7. Key Products and Waste Streams

Countries' waste minimisation policies may emphasise different key products and waste streams, as shown in **Table 14**. The waste streams most often mentioned by the countries surveyed were:

- packaging waste;
- construction and demolition waste (CD waste); and
- industrial waste.

Waste minimisation activities with regard to the following waste streams in particular were to be initiated in the future:

- end-of-life vehicles;
- waste of electrical and electronic equipment (WEEE);
- used oil; and
- waste tyres.

Country	Key products	Waste streams	Waste streams
Australia	Waste paper	CD waste	Packaging waste
Austria	CD waste	Packaging waste	Industrial solid waste
Canada	Waste paper	CD waste	Packaging waste
Czech Republic	n.a.		
Denmark	Waste paper	Packaging waste	Commercial/industrial waste
Finland	Packaging waste	WEEE	CD waste
France	Packaging waste	End-of-life vehicles	
Germany	Packaging waste	WEEE	End-of-life vehicles
Hungary	Packaging waste		
Italy	n.a.		
Japan	Packaging waste	Industrial solid waste	
Korea	Waste paper	Packaging waste	Industrial solid waste
Netherlands	Biowaste	CD waste	End-of-life vehicles
New Zealand	Used oil	Packaging waste	CD waste
Norway	Biological waste	WEEE	Packaging waste
Poland	Packaging waste	Commercial/industrial waste	End-of-life vehicles
Spain	Used solvents	Electroplating sludge	Packaging waste
Switzerland	Electroplating sludge	Beverage containers	WEEE
Turkey	n.a.		
United Kingdom	Packaging waste	WEEE	End-of-life vehicles
United States	Waste paper	WEEE	Electroplating sludge

CD: Construction and demolition
n.a.: no answer
WEEE: Waste of electrical and electronic equipment

8. Costs and Benefits

Economic impacts of waste minimisation measures

As shown in **Table 15**, countries perceived waste minimisation measures as having more positive economic impacts than did consumers and private households. Industry was reported to consider them as having generally neutral effects, which appears to indicate a balance between positive effects (e.g. for the disposal industry) and negative ones (e.g. increases in disposal costs).

Examples of costs and benefits included:

- Voluntary industrial waste reduction agreements can lead to increased production efficiency, reduced disposal costs, lower expenditure on plant rehabilitation, the creation of markets for secondary goods, and less dependence on natural resource extraction. However, they may also result in additional administrative costs for planning, monitoring and reporting.
- Increased waste disposal fees can lead to waste prevention and increased recycling, more intensive use of resources, and less intensive use of landfills.
- Home composting leads to cost savings for private households, especially in rural areas. Separate collection of biological waste leads to reduced disposal costs for consumers. Both measures encourage less intensive use of landfills.
- Quantity-based disposal fees for municipal waste lead to cost savings for consumers who sort their waste.
- Regulations concerning packaging and packaging waste can stimulate the development of innovative packaging. They have also encouraged international competitiveness among packaging producers. However, consumers may have to pay higher product prices.
- A draft ordinance on waste electrical and electronic appliances had stimulated the development of new recycling technologies. Industry had provided technological leadership.
- Higher technical standards for waste disposal have stimulated sizeable investments in state-of-the-art disposal facilities, while also leading to significant increases in recycling and disposal costs.
- Information provision and technical assistance, in combination with financial aid, have led to reduced pay-back periods for investments in clean technologies.

Table 15 Perceived economic impacts of waste minimisation measures			
	Government	Industry and related associations	Consumers and private households
Australia	3	3	4
Austria	4	3	3
Canada	4	2	4
Czech Republic	3	2	3
Denmark	5	3	5
Finland	n.a.	n.a.	n.a.
France	n.a.	n.a.	n.a.
Germany	4-5	2-3	3
Hungary	5	5	4
Italy	n.a.	n.a.	n.a.
Japan	3	3	3
Korea	4	3	4
Netherlands	4	4	2
New Zealand	4	n.a.	n.a.
Norway	4	3	4
Poland	5	3	1
Spain	5	3	3
Switzerland	4	3	4
Turkey	2	2	3
United Kingdom	4	4	3
United States	4	3	3
Average	4	3.0	3.3
Standard deviation	0.79	0.74	0.89
Ranking from (1) impeding to (5) promoting n.a.: no answer			

Effects of final disposal fees on waste minimisation

Almost all the countries surveyed shared the opinion that the level of fees charged for final disposal services affected waste minimisation.

Examples included:

- Future waste disposal costs were incorporated into the purchase price of products. This promoted product design and production processes that took future disposal, recovery or repair costs into consideration.
- Landfilling was made more expensive through the imposition of disposal fees, in order to make waste prevention and recovery more attractive (this was very successful in regard to commercial waste).
- Quantity-oriented disposal fees for municipal waste generally led to reduced waste generation and enhanced separate collection.
- In Japan, recycled goods were subsidised in order to facilitate and promote their trade on existing markets (price-lowering effect).

However, some countries reported that:

- Raising disposal fees had led to exporting of waste to other countries or to illegal dumping (e.g. of end-of-use refrigerators).
- In some cases, waste producers had chosen low-quality recycling in order to avoid disposal fees.

Low-waste products

Countries were asked whether waste minimisation policies had led to increased availability of low-waste products. Most countries responded that this had not happened, or did not give a response.

Two reasons in particular may have led to this result:

- It is difficult to distinguish the effects of waste minimisation policies from those related to product development.
- The effects of low-waste products on waste minimisation had not yet been identified in many countries.

Austria, Canada, Germany and Japan reported that waste minimisation policies had given a boost to producers of low-waste products. Examples included packaging (e.g. refillable packaging for beverages or cleaning agents, reduction in the amount of packaging through marketing of concentrated products).

Conclusions

Waste minimisation policies in OECD countries differ considerably, as shown in this report and the accompanying country-specific Waste Minimisation Profiles. In these Conclusions, areas of common understanding and of disagreement are summarised. Information is presented on the success or failure of various waste minimisation policies, and a perspective is given on issues that could be addressed in future OECD activities with regard to waste minimisation.

Waste minimisation is a fundamental element of a policy aiming at sustainable development, which is the long-term objective of all OECD countries. Waste minimisation activities promote sustainable development through:

- low-waste technologies that lead to reduced resource extraction;
- the design and development of low-waste products and services;
- the reduction of hazardous emissions and of environmental impacts in general;
- the reduction of total production volume through the use of products designed for prolonged use; and
- changes in consumption patterns.

Common understanding and call for harmonization

The survey and the Berlin Workshop, both carried out under the OECD Waste Minimisation Work Programme, have revealed a wide variety of approaches to waste minimisation. They have also demonstrated that waste management systems are not comparable between Member countries. In some countries, up-to-date and fully equipped waste management systems (i.e. separate collection systems, waste treatment facilities, recovery programmes, information systems, comprehensive legislative frameworks, with public awareness of environmental issues) exist, while other countries have only started building up and implementing these elements.

Keeping these national differences in mind, countries are attempting to establish harmonization of waste minimisation standards and are examining international policy approaches. Areas of common understanding, and areas in which countries are calling for harmonization, include the following:

- According to the survey and the outcome of the Berlin Workshop, **there is a broad consensus on the working definition of waste minimisation** and on the important role of waste minimisation within the overall goal of sustainable development. Moreover, **there is**

general agreement on waste minimisation priorities, with waste prevention being given the highest priority.

- There was intensive discussion at the Berlin Workshop of the controversial issue of incineration's role in the context of waste minimisation. Agreement could not be reached on whether waste incineration lies within the scope of waste minimisation. A few countries have established criteria to distinguish energy recovery from incineration and have established minimum standards for incineration plants. **Due to these differences, waste incineration will remain a key issue for discussion.**
- Waste recycling facilities are subject to licensing procedures in all the countries surveyed. However, only some countries have enacted or enforced legally binding technical standards with regard to the operation of these facilities. Recycling standards vary from country to country, or even within countries, and different recycling standards lead to different prices being charged for recycling services. As a consequence, waste may be transported to the facilities that operate most cheaply, which usually use lower level technologies. Low-quality recycling leads to the production of low-quality secondary materials, with drastically reduced market competitiveness. Nevertheless, these materials often remain more expensive than the virgin raw materials they could replace. Moreover, low-quality recycling processes often have negative environmental impacts and produce goods that are harmful to human health as well as the environment. Minimum technical standards applicable to all waste recycling facilities, and acceptable to all countries, would be a means of preventing the above-mentioned effects. **As a minimum, a framework of technical standards could be initiated on an international level.**
- Landfill planning and construction are regulated by technical standards in several countries. In some cases, landfilling of certain wastes is prohibited and landfill operations have to meet specific standards. The construction of landfills may also be restricted to certain areas. **These standards could serve as a basis for the development of common technical standards for landfill planning, construction, operation and aftercare.**
- Eco-labelling schemes exist in several countries and are continuously being expanded. The type and number of eco-labelled products and services differ. Countries report that developing labelling criteria for products or services is very time-consuming, as these criteria must be strict in order to ensure that the label is valid and that not all products can easily meet the requirements. An open exchange of information on eco-labelling criteria, which might lead to speeding up the process of labelling products or services, is desirable. **In the future, the concept of an international eco-label might be of interest.**

Successes and failures of waste minimisation activities

The survey and the Berlin Workshop have made available extensive information on waste minimisation instruments currently available and currently applied, and on various aspects of the implementation of these instruments. Many countries also provided valuable information with regard to their experiences with waste minimisation activities and instruments. However, assessing the effectiveness of various instruments is difficult and cannot be carried out in all cases.

Only a few instruments can be directly linked to visible and measurable success or failure. Successful waste minimisation usually depends on the use of more than one measure. The relative

effectiveness of a single measure often cannot be determined at all. Furthermore, country-specific circumstances that influence effectiveness usually cannot be summarised in a few words. The successes and failures of several instruments were nevertheless reported, and the conditions that had promoted or hindered effective implementation were described.

Bearing in mind the above remarks, it should be emphasised that the examples cited here are sometimes derived from information provided by only one or a few countries. Accordingly, they should not be understood to be “recipes”. Individual adaptation and fine-tuning would be necessary to ensure maximum success.

- **Waste minimisation instruments are used in many different combinations in OECD countries.** Their implementation, or lack thereof, depends on the overall approach to waste policy (for example, whether voluntary or mandatory instruments are favoured). Countries that traditionally use a legal approach to influence target groups tend to follow the same approach with regard to waste minimisation. However, many countries rely completely on voluntary or suasive instruments. Either approach may be effective, or ineffective. Effectiveness ultimately depends on technological, social, economic and cultural factors. It is one of the principle responsibilities of policy-makers to discover which combinations of instruments can best be applied.
- **Waste minimisation is a societal challenge.** Providing, and assuring the dissemination of, the best possible information to all concerned individuals and groups is of the utmost importance. All the countries surveyed consider information provision and public relations, along with other suasive instruments, to be important and effective instruments. In particular, countries that have already made great efforts in regard to waste minimisation, including the creation of comprehensive legislative frameworks, report that information dissemination is crucial to ensure the best possible law enforcement. The same applies to the propagation of clean technologies – they need to be publicised and marketed in order to gain market shares.
- **Clear emphasis is placed on education,** which plays a major role in building up future public awareness of waste minimisation. Education is not an “end-of-pipe” instrument: it is just the opposite. A well educated and well informed society is a prerequisite for successful implementation of waste minimisation measures.
- Experience shows that **waste minimisation measures tend to be accepted by target groups as long as they fit within these groups’ “comfort zone”.** Each individual or group naturally wishes to forward its own interests, especially economic ones. Multi-stakeholder consultations have therefore been initiated in some countries in order to discover ways and means to achieve full acceptance by all the groups involved at an early stage. This strategy has been effective in several countries.
- **Voluntary industrial waste reduction agreements, based on bilateral or multi-stakeholder consultations, have usually led to positive outcomes.** This is particularly true where there is a strong possibility that stringent legislation may come into force unless a voluntary agreement can be reached. These agreements also have a potential disadvantage: free-riders may gain competitive advantages through not complying with such agreements.

- **Enactment of laws appears to take place much more rapidly than law enforcement.** The survey results demonstrate that there is an obvious need to narrow this gap. One solution might be to inform groups targeted by new laws (e.g. industry, private households, public authorities) well in advance of upcoming mandatory waste minimisation measures.
- **Along with efforts to increase material re-use and recycling, there should be promotion of the use of recycled materials in products.** This is one important means of closing material cycles and using raw materials and energy more efficiently. Secondary products are traded on existing markets. They therefore compete most often with comparable products made of virgin raw material, which may be even cheaper than the secondary products. This economic barrier for secondary products could be avoided. Marketing instruments have proven useful in this regard. For example, some countries have established standards for secondary goods (for example, re-refined engine oil, gravel made from CD waste) to promote consumer acceptance and fair competition with virgin products. Another instrument used is a tax on the use of virgin material in certain products. Without such measures, recycled material will not achieve pay-back and subsequent efforts to reduce waste generation will be of no economic interest to the waste generator.
- **Activities aiming at efficient use of resources, and hence waste prevention in the early stages of a product's life-cycle, are receiving increasing attention and finding wide acceptance.** Some countries operate clean technology programmes whose purpose is to avoid waste generation through innovative product design or changes in manufacturing technologies. This approach appears increasingly important, as countries are calling for the dissemination of information on innovative clean technologies. An at-source approach is essential for the minimisation of waste resulting mainly from production processes. It is also a prerequisite for successful minimisation of post-consumer waste, as product design and advanced manufacturing processes can reduce post-consumer waste and may facilitate more efficient recycling and recovery of the remaining waste.
- **Extended Producer Responsibility schemes are being planned and implemented in several countries.** Examples are mandatory take-back schemes for end-of-life vehicles, and voluntary schemes for a number of products. Usually manufacturers or retailers are legally obligated to take back end-of-life products and to ensure their appropriate recycling and safe disposal. This measure contributes to closing material cycles by feeding recycled materials back into the product chain. One unsolved problem concerns the ecological responsibility for a product, which does not lie merely with the consumer or manufacturer but should be shared by others in the product chain. Recycling and safe disposal costs now tend to be passed on to the last person in the chain, the consumer. Extended Producer Responsibility schemes can have a direct impact on manufacturing processes, for example product design. Their implementation seems especially appropriate in combination with clean technology programmes. As a prerequisite, Extended Producer Responsibility schemes require wide public awareness and acceptance.
- **Other voluntary industry waste reduction agreements include not only a set of targets, but also a code of good waste management practice or guidelines for waste management in different industrial sectors.** These voluntary agreements have led to reduced waste generation and other reductions in environmental impact. Moreover, industry has gained financial benefits through decreases in waste management costs, enhanced productivity, and an improved public image.

- **Separate collection of municipal waste varies greatly, reflecting regional differences.**
The most common collection schemes are voluntary: private households may collect, for example, waste glass or paper separately and take them to collection points, or these types of waste may be collected regularly via curbside programmes. Providing such opportunities is seen as one of the measures that create awareness of the fact that wastes contain valuable components, and that source separation is an essential part of successful recycling programmes.

Recommendations

The OECD survey provided information on the status of waste minimisation policies in the majority of OECD countries in 1996. The country-specific Waste Minimisation Profiles published in a separate volume, together with this report and the outcome of the Berlin Workshop, constitute a comprehensive set of information on waste minimisation programmes in OECD countries.

To continue work on the issues addressed by these OECD activities, and to fill in remaining information gaps, the following recommendations might be considered:

- The **significant unused potential of waste prevention** should be further explored, and exchange of information in this regard should be facilitated.
- As part of current work in the OECD's Waste Minimisation Work Programme, **guidelines for waste minimisation target-setting** should be developed, updated, and disseminated to a wide audience including all stakeholders.
- The **role of energy recovery within waste minimisation** should also be further explored. Work could be undertaken with the aim of arriving at a better understanding of the costs and benefits of incineration.
- The reporting of waste minimisation performance in OECD countries would be efficiently accomplished using a **standardised monitoring system**, which could be progressively refined. The feasibility of indexing waste to units of production could be explored. Wide dissemination of monitoring results by all available means should be ensured.
- Taking full advantage of the sharing of information and experience that takes place among OECD countries, policy guidance could be developed on **the best use of waste minimisation instruments under different circumstances** and the use of tools to assess effectiveness.
- As there is no clear overall preference for voluntary or mandatory waste minimisation approaches in OECD countries, there could be **further exploration of the conditions under which both voluntary and mandatory approaches have been effective**.
- As part of voluntary waste reduction agreements in some countries, industry has an undefined **waste management code of practice**. A similar code could be worked out at the OECD level.

- Several countries successfully operate eco-labelling schemes. Consideration could be given to the **creation of an international eco-labelling programme**, with criteria for the labelling of products and services established on an international rather than national level.
- The 1989 Waste Strategy of the European Community was reviewed in 1996. The programmes and legislation of the European Union are of particular importance in EU Member States, which must implement them in national legislation. Project 1 did not specifically examine **EU waste minimisation policies**. Consideration might therefore be given to how relevant information could best be integrated.
- The country-specific Waste Minimisation Profiles could be the basis of an **OECD Waste Minimisation Database**. Using this database, it would be possible to monitor changes in national and OECD-wide waste minimisation policies, the successes and failures of countries' waste minimisation initiatives, and the development of legislative frameworks.

References

- BALKAU, F. (December 1990), The Minimization and Treatment of Hazardous Waste, Keynote Address at the Asia and Pacific Regional Workshop on Hazardous Waste Minimization and Reduction, UNEP Industry and Environment centre, Paris.
- DEPARTMENT OF THE ENVIRONMENT (May 1993), Waste Minimisation in the United Kingdom.
- ENVIRONMENT CANADA'S ENQUIRY CENTRE (1993), Federal Waste Reduction Perspectives, Minister of Supply and Services.
- ENVIRONMENT CANADA'S ENQUIRY CENTRE (1995), Pollution Prevention: A Federal Strategy for Action, Minister of Supply and Services, Canada.
- ENVIRONMENT CO-ORDINATION UNIT (November 1993), UNIDO Fact Sheet on Hazardous Waste Management, United Nations Industrial Development Organization, Vienna, Austria.
- ENVIRONMENT PROTECTION AGENCY AUSTRALIA (1995), Government Approaches to Waste Minimisation and Recycling of Packaging Waste in Australia.
- ENVIRONMENTAL CHARGE COMMISSION (1990), SOU 1990:59, Proposal submitted by the Environmental Charge Commission, Part on Waste, Swedish Government.
- EUROPEAN COMMISSION, DIRECTORATE-GENERAL XI (1994), Proposal from the Working Group to the European Commission for a Recommendation on the Prevention, Recovery and Disposal of Used Pneumatic Tires, Brussels.
- EUROPEAN COMMISSION, Directorate-General XI, Environment, Nuclear Safety and Civil Protection (1994), Waste Management: Clean Technologies – Update on Situation in Member States, Brussels.
- EUROPEAN COMMISSION, PROJECT GROUP FOR THE TREATMENT OF END-OF-LIFE VEHICLES (February 1994), Proposed Strategy of the ELV Project Group for the Treatment of End-of-life Vehicles, Paris.
- FEDERAL FACILITIES ENFORCEMENT OFFICE (July 1995), Federal Facility Pollution Prevention Project Analysis: A Primer for Applying Life Cycle and Total Cost Assessment Concepts, United States Environmental Protection Agency, Office of Enforcement and Compliance Assurance, Washington, D.C.
- HANRAHAM, D. (1995), Barriers to Cleaner Production, Pollution Management Unit, Environment Department, World Bank, Washington, D.C.
- IRC (1995), Moving Towards an Economy in Closed Loops, 8th International Recycling Congress. Berlin, December 5-7, 1995, International Congress Center Berlin, Proceedings, Berlin.

ITALDEL (December 1993), Italie : Le soutien financier du gouvernement pour la promotion d'une production plus propre et de produits plus propres.

MINISTER OF HOUSING, PHYSICAL PLANNING AND THE ENVIRONMENT, PREVENTION AND RECYCLING BRANCH (January 1991), Progress Report Prevention and Recycling, Screening of Waste Materials, Stage I National Environmental Policy Plan Plus 1990-1994, The Hague.

NORWEGIAN POLLUTION CONTROL AUTHORITY (December 1995), A Study of Financial Support for Cleaner Production Assessments in Norway which evaluates the implementation of cleaner production assessments in 246 enterprises, Oslo.

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT (1993), Monitoring and Control of Transfrontier Movements of Hazardous Wastes, Environment Monograph No. 34, Paris.

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT (1995), Clarifying the Concepts, OECD Workshop on Sustainable Consumption and Production, Rosendal, Norway 2-4 July 1995, Final Report, Paris.

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT (1995), Environmental Taxes in OECD Countries, Paris.

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT (1995), Evaluating the Efficiency and Effectiveness of Economic Instruments: A Conceptual and Empirical Analysis, Paris.

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT (1995), Implementation Strategies for Environmental Taxes, Paris.

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT (1995), Looking to the Future: Priorities for the 1997-98 Programme in Pollution Prevention and Control, Paris.

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT (1995), The OECD Control System for Transfrontier Movements of Wastes Destined for Recovery Operations, Guidance Manual, OECD Environment Monograph No. 96, Paris.

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT (1995), The OECD in Figures, Statistics on the Member Countries, Paris.

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT (1995) Technology and Environment: The Life Cycle Approach: An Overview of Product/Process Analysis, Paris.

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT (1995), Technologies for Cleaner Production and Products, Towards Technological Transformation for Sustainable Development, Paris.

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT (1996), Environmental Performance Review in OECD Countries, Progress in the 1990s, Paris.

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT (1996), Extended Producer Responsibility in the OECD Area, Phase 1 Report, OECD Environment Monograph No. 114, Paris.

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT (1996), Pollutant Release and Transfer Registers (PRTRs), A Tool for Environmental Policy and Sustainable Development, Guidance Manual for Governments, Paris.

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT (1996), Washington Waste Minimisation Workshop (Volume I: Five Waste Streams to Reduce; Volume II: Which Policies, Which Tools?), Paris.

SYMONDS TRAVERS MORGAN/ARGUS (April 1995), Priority Waste Stream: Construction and Demolition Waste, Draft Final Information Document, European Commission, Construction and Demolition Waste Project Group.

SYMONDS TRAVERS MORGAN/ARGUS (August 1995), Report of the Project Group to the European Commission, Part 3 – Recommendations of the Project Group, European Commission, Construction and Demolition Waste Project Group.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY (1995), Expanding Community Right-to-Know: Recent Changes in the Toxics Release Inventory, Washington, D.C.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, OFFICE OF ENFORCEMENT AND COMPLIANCE ASSURANCE (1994), Federal Facility Pollution Planning Guide, Washington, D.C.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, OFFICE OF ENFORCEMENT AND COMPLIANCE ASSURANCE (1995), Federal Facility Pollution Prevention Project Analysis: A Primer for Applying Life Cycle and Total Cost Assessment Concepts, Washington, D.C.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, OFFICE OF FEDERAL FACILITIES ENFORCEMENT (1994), Pollution Prevention in the Federal Government: Guide for Developing Pollution Prevention Strategies for Executive Order 12856 and Beyond, Washington, D.C.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, OFFICE OF POLLUTION PREVENTION AND TOXICS (1994), Expansion of the Toxics Release Inventory (TRI) to gather chemical use information: TRI-Phase 3: Use Expansion, Washington, D.C.

WORLD BUSINESS COUNCIL FOR SUSTAINABLE DEVELOPMENT, WORKING GROUP ON SUSTAINABLE PRODUCTION AND CONSUMPTION (1995), Sustainable Production and Consumption: A Business Perspective, Switzerland.

ZEHRA AYDI (September 1993), Commission on Sustainable Development: The First Information Bulletin, Center for Our Common Future.