

**DEPARTMENT OF ENVIRONMENTAL
AFFAIRS AND TOURISM**

**PROGRAMME FOR THE IMPLEMENTATION OF THE
NATIONAL WASTE MANAGEMENT STRATEGY**

Starter Document for Waste Recycling

**Background Document of Post Consumer Recycling in
South Africa and Internationally**

Final Draft

May 2000

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Comp. HNSW & JH & JB
Contr. JB & HW
Appd. W. Scott

EXECUTIVE SUMMARY

This Background Document reviews post consumer recycling initiatives that have been implemented in South Africa and internationally, and assesses the reasons for the relative success and/or failure of these initiatives. Based on the experience of the ongoing initiatives, the implications for promoting waste recycling in South Africa are evaluated with regard to the social, environmental and economic impacts.

Waste management in South Africa is currently characterised by a range of problems, including *inter alia* a lack of direction concerning waste recycling. The National Waste Management Strategy was undertaken to identify and address these problems. Central to the development of the strategy was a hierarchical approach to waste management that promotes waste prevention, minimisation, recycling and re-use, with treatment and option disposal being seen as the last resort options.

Recycling activities are mainly undertaken by private recycling companies, especially those associated with the packaging industry. Notwithstanding the absence of legislative requirements to recycle, the following rates of recycling are currently achieved in South Africa (Table 1)

Table 1: Status of Recycling in South Africa

Commodity	Year	Quantity Recycled	Percentage Recycled	Potential for Recycling
Paper	1998	720 000 tpa	38	Nil
Glass	1999	104 550 tpa	18	175 000 tpa
Plastic	1997	115 000 tpa	13	n/a
Beverage Cans	1998/99	61 000 tpa	63	n/a
Oil	1998/99	52 ML/a	58	90 ML/a

tpa: tonnes per annum, ML/a: Megalitre per annum, n/a: not available
(Source: Information supplied by the recycling companies in South Africa)

Many local authorities have established voluntary drop-off facilities and buy-back centres. Certain local authorities have implemented the kerbside collection of separated recyclables with their normal waste collection services. A number of ongoing education and awareness programmes that promote recycling support these initiatives.

The level of recycling is influenced by socio-economic and demographic factors. Monetary incentives are of prime importance in the lower socio-economic income groups and environmental concerns drive recycling behaviour in the middle to upper income groups.

The benefits of recycling include:

- Job creation
- Litter abatement
- Reduction in the waste stream itself
- Reduction in pollution and the conservation of natural resources
- Conservation of energy and reduces costs in manufacturing sector

The key to sustainable recycling is finding the balance between securing the supply of recyclable materials and promoting the demand for products that are made from these materials, while appraising the social, environmental and economic impacts. In South Africa a number of private sector organisations are currently active in recycling initiatives. The success of these initiatives has been dependent mainly upon the economic viability of recycling. Internationally, government recycling initiatives fall into two broad categories: formalised, as in the case of the EU and the USA; or less structured, as implemented in Kenya, India and Botswana. Formalised structures rely on government intervention to enhance market conditions to promote recycling. Policy instruments that have been implemented include directive-based regulations, economic instruments, voluntary agreements and education/information activities. (A summary of international post consumer recycling initiatives is provided in Table 2). Although these initiatives have generally resulted in an increase in the level of recycling, they have not always significantly impacted upon the total quantity of waste generated.

Although the design of an environmentally and economically effective recycling system is dependent upon local conditions, a number of lessons relevant to South African policy-makers can be derived from international experience. These include:

- Prior to the implementation of a recycling programme, a detailed evaluation of the economic, environmental and social impacts of recycling must be undertaken. This should include an assessment of the life cycle costs associated with recycling, as compared with alternative methods of disposal.
- Markets for recycled commodities need to be stimulated to promote more profitable recycling and job creation.
- A National Forum should be constituted comprising stakeholders of all sectors making up the recycling chain, as a forum to discuss mechanisms to promote recycling and monitor their effectiveness.
- The co-ordinated implementation of policy measures aimed at: integrating recycling within waste management planning, increasing public awareness of the benefits and methods of recycling, and stimulating the ongoing adoption of market-driven recycling initiatives.
- An investigation into extended producer responsibility needs to be undertaken to identify its feasibility and desirability for promoting recycling.

- Co-ordination of the proposed evaluation of recycling with a project currently ongoing with government in partnership with DANCED to identify and evaluate market-based instruments appropriate to waste management, including recycling.
- One initiative or approach will not necessarily meet all the identified needs in South Africa and geographical, demographic and socio-economic differences will have to be taken into account in designing localised recycling programmes.

A number of practical considerations to the collection of recyclable material were identified including separation at source, kerbside collection and drop-off and buy-back centres. These steps should be followed in the future when designing and implementing of an effective recycling programme.

This document represents one of the outputs of the waste recycling component of the Phase 1 of the Department of Environmental Affairs and Tourism National Waste Management Strategy Implementation Programme. The overall aim of the programme is to produce '*Starter Documents*' for areas that have been identified to be high priority, which will be used to consult widely with relevant stakeholders as part of the National Waste Management Strategy implementation process.

Table 2: Summary of International Comparative Review

The following table presents a summary of key data relating to recycling in a number of foreign countries. Further detail on the nature of recycling policies in these countries is provided in Section 4 and Appendix A.

Country	Total mass	Percentage Recycled	Recycling Target	Mechanisms to Promote Recycling
European Union (Appendix A1)	Figures below are for 1996	Figures below are for 1996		
Total waste stream (1996) (EU and Norway)	1 300 m tonnes		Recovery of 50-65% by weight of packaging waste Recycling of 25-45% by weight of packaging materials, with minimum of 15% recycled for each packaging material	1994 Directive on Packaging and Packaging Waste European Community Strategy for Waste Management Directive on Landfilling of Waste Directive on End-of-life Vehicles Extended Producer Responsibility for Electrical and Electronic Waste Introduction of Integrated Product Policy (Proposed)
Paper & cardboard (EU and Norway)	64 m tonnes	49%	As above	As above
Glass (EU and Norway)	13.3 m tonnes	55%	As above	As above
Plastic waste (EU and Norway)	17.5 m tonnes	20% (material & energy recovery)	As above	As above

Country	Total Mass	Percentage Recycled	Recycling Target	Key Institutional Players	Mechanisms to Promote Recycling
NETHERLANDS (Appendix A2)					
Total waste stream	51m T/a ¹	73%	80%	Central government, provincial and local authorities. Private enterprise. Target groups are identified for priority waste streams, and multi-party organisations are often created in order to achieve the goals more efficiently (e.g. ARN for end-of-life vehicles, Stibat for batteries)	National Environmental Policy Plan Provincial Environmental Policy Plans Waste Tax Landfill Ban Process Covenants Product Covenants (producer responsibility)
Paper & cardboard	1.6 m T/a of packaging	47%	85%	Central government, provincial and local authorities. Private enterprise. Paper Recycling in the Netherlands (PRN)	Packaging and packaging waste regulation
Glass	0.5 m T/a of packaging	84%	90%	Central government, provincial and local authorities. Private enterprise. Glass recycling Foundation (SKG)	Packaging and packaging waste regulation
Plastic waste	0.5 m T/a of packaging	10%	27%	Central government, provincial and local authorities. Private enterprise. Association for Environmental Management of Plastics Packaging (VMK), Association of Plastics Recyclers (VKR).	Packaging and packaging waste regulation
Beverage cans	Data not available	Data not available	Data not available	Central government, provincial and local authorities. Private enterprise. Tin Recycling Foundation (SKB), Metals Recycling Federation (MRF).	Packaging and packaging waste regulation

¹ m T/a = million tonnes per annum

Country	Total Mass	Percentage Recycled	Recycling Target	Key Institutional Players	Mechanisms to Promote Recycling
DENMARK (Appendix A3)					
Total waste stream	12.8 m T/a	63%	64%	Danish Environmental Protection Agency. Local and regional councils. Private enterprise.	National Plan Waste 21, and local and regional waste plans Waste tax and other specific taxes, e.g. packaging taxes Deposit-refund scheme for beer and soft drink refillable packaging Voluntary agreements for specific waste fractions (e.g. PVC, construction and demolition waste)
Paper & cardboard	1.3 m T/a	Data not available	Data not available	As above	Packaging tax
Glass	0.19 m T/a	Data not available	Data not available	As above	Deposit-refund scheme on refillable packaging for beer and soft drinks. Packaging tax
Plastic waste	0.24 m T/a	Data not available	Data not available	As above	Packaging tax
Beverage cans	Data not available	Data not available	Data not available	As above	Ban on metal packaging for beer and soft drinks.

Country	Total Mass	Percentage Recycled	Recycling Target	Key Institutional Players	Mechanisms to Promote Recycling
GERMANY (Appendix A4)					
Total waste stream	337 m T/a	25%	Data not available	Federal and local government. Private enterprise. German Federal Environmental Agency. Duales System Deutschland (DSD). The Jury Umweltzeichen, the German Institute for Quality Assurance and Labelling, and the German Federal Environmental Agency administrating the Blue Angel.	Product Recycling and Waste Management Act Ordinances on specific waste streams (e.g. packaging waste, end of life vehicles, batteries, organic waste) Green Dot scheme for take-back of packaging
Paper & cardboard	Data not available	Data not available	Data not available	Federal and local government. Private enterprise. German Federal Environmental Agency. DSD. Blue Angel administrative bodies.	Green Dot scheme
Glass	Data not available	Data not available	Data not available	As above.	Green Dot scheme
Plastic waste	3.2 m T/a	58%	Data not available	As above.	Green Dot scheme
Beverage cans	Data not available	Data not available	Data not available	As above.	Green Dot scheme

Country	Total Mass	Percentage Recycled	Recycling Target	Key Institutional Players	Mechanisms to Promote Recycling
USA (Appendix A5)					
Total waste stream	217 m T/a	28%	35% by 2005	Local and state government, with federal support Private enterprise Green Seal Eco-labelling organisation Partnerships, such as the National Recycling Coalition, National Waste Prevention Coalition and the Vehicle Recycling Development Centre	State and local government waste management plans Landfill bans Jobs Through Recycling Grants Programme Pay-As-You-Throw waste charges Deposit-refund schemes for beverage containers & batteries Government procurement policy WasteWise programme Public education campaigns by US EPA and other organisations
Paper & cardboard	84 m T/a	42%	No specified targets	Local and state government, with federal support. Private enterprise. Packaging industry Green Seal Eco-labelling organisation	Recycled content mandates Eco-labelling requirements
Glass	12 m T/a	24%	No specified targets	As above	Deposit-refund schemes for beverage containers Eco-labelling requirements
Plastic waste	22 m T/a	5%	No specified targets	As above	Recycled content mandate Deposit-refund schemes for beverage containers
Beverage cans (aluminium)	1.9 m T/a	49%	No specified targets	Local and state government, with federal support. Private enterprise. Packaging industry	Deposit-refund schemes for beverage containers

Country	Total Mass	Percentage Recycled	Recycling Target	Key Institutional Players	Mechanisms to Promote Recycling
INDIA (Appendix A6)					
Total waste stream (urban areas)	12-3 m T/a	40%	No specified targets	Local government NGOs CBOs Private enterprise	Municipal waste management programmes. Deposit-refund systems (?) Government subsidies, grants and loans. Ecomark ecolabelling scheme. Voluntary initiatives.
Paper & cardboard (urban areas)	4 m T/a	Data not available	No specified targets	As above	Voluntary initiatives.
Glass (urban areas)	1 m T/a	Data not available	No specified targets	As above	Voluntary initiatives.
Plastic waste (urban areas)	1.5 m T/a	Data not available	No specified targets	As above	Recycled Plastics Manufacture and Usage Rules
Beverage cans (urban areas)	Approx. 0.4 m T/a	Data not available	No specified targets	As above	Voluntary initiatives.
KENYA (Appendix A7)					
Total waste stream (Nairobi)	0.34 m T/a	Data not available	No specified targets	Local government NGOs & CBOs Private enterprise	Public awareness campaigns Voluntary initiatives
Paper & cardboard (Nairobi)	0.06 m T/a	Data not available	No specified targets	As above	No specific mechanisms.
Glass (Nairobi)	0.03 m T/a	Data not available	No specified targets	As above	No specific mechanisms.
Plastic waste (Nairobi)	0.015 m T/a	Data not available	No specified targets	As above	No specific mechanisms.
Beverage cans (Nairobi)	Approx. 0.05 m T/a	Data not available	No specified targets	As above	No specific mechanisms.

Country	Total Mass	Percentage Recycled	Recycling Target	Key Institutional Players	Mechanisms to Promote Recycling
BOTSWANA (Appendix A8)					
Total waste stream (1997)	0.325 m T/a	Data not available	Data not available	Local government NGOs & CBOs Private enterprise	Waste Management Act Public awareness campaigns Voluntary initiatives
Paper & cardboard	Approx 0.027 m T/a	22%	Data not available	Private enterprise	No specific mechanisms.
Glass	Data not available	Data not available	Data not available	Private enterprise	Beverage returnable containers
Plastic waste	Approx. 0.0118 m T/a	5%	Data not available		No specific mechanisms.
Beverage cans	Approx. 0.06 m T/a	58%	Data not available	Private enterprise	No specific mechanisms.

TABLE OF CONTENTS

EXECUTIVE SUMMARY	I
TABLE OF CONTENTS	XI
1. INTRODUCTION.....	1
1.1 PROJECT BACKGROUND AND DESCRIPTION.....	1
1.2 SCOPE OF BACKGROUND REPORT.....	1
1.2.1 <i>Definition of Waste Recycling</i>	2
1.3 LIMITATIONS OF STUDY	2
1.4 THE SOUTH AFRICAN POLICY CONTEXT	3
1.4.1 <i>National Environmental Management Act</i>	3
1.4.2 <i>White Paper on Integrated Pollution and Waste Management</i>	3
1.4.3 <i>National Waste Management Strategy</i>	5
1.4.4 <i>Waste Minimisation and Recycling Action Plan</i>	6
2. RECYCLING IN SOUTH AFRICA – CURRENT STATUS	8
2.1 NATIONAL POLICY AND LEGAL/INSTITUTIONAL FRAMEWORKS FOR RECYCLING	8
2.1.1 <i>Legal Provisions Relating to Recycling</i>	9
2.1.2 <i>Role of Government Bodies in Promotion of Recycling</i>	11
2.1.3 <i>Market structure for Recycling in South Africa</i>	12
2.1.4 <i>Recycling Chain Stakeholders</i>	12
2.2 WASTE STREAMS.....	13
2.2.1 <i>Paper and Board</i>	13
2.2.2 <i>Glass</i>	14
2.2.3 <i>Plastics</i>	16
2.2.4 <i>Metal</i>	18
2.2.4.1 <i>Collect-a-Can</i>	18
2.2.4.2 <i>Aluminium Can Recycling Association</i>	20
2.2.5 <i>Building Rubble</i>	20
2.2.6 <i>Organic Materials</i>	20
2.2.7 <i>Specific Product Types</i>	21
2.2.7.1 <i>Tyres</i>	21
2.2.7.2 <i>Oil</i>	22
2.2.8 <i>Packaging Waste</i>	22
2.2.9 <i>Public/Private Initiatives</i>	24
2.2.9.1 <i>Greater Johannesburg Metropolitan Council</i>	24
2.2.9.2 <i>Eastern Gauteng Services Council</i>	25
2.2.9.3 <i>Cape Metropolitan Area</i>	26
2.2.9.4 <i>Fairest Cape Association</i>	27
2.2.9.5 <i>Durban Solid Waste</i>	28
2.2.9.6 <i>Art and Crafts from Waste</i>	29
2.2.9.7 <i>DEAT Waste Management Campaign</i>	29
3. COMPARATIVE REVIEW OF INTERNATIONAL INITIATIVES	30
3.1 COMPARISON AND ANALYSIS	40
3.1.1 <i>Recycling Programmes: Common Features and Anticipated Trends</i>	40
3.1.2 <i>Evaluation of Results of Recycling Initiatives</i>	42
4. IMPLICATIONS FOR RECYCLING INITIATIVES.....	48
4.1 BENEFITS OF RECYCLING	48
4.1.1 <i>Job Creation</i>	48
4.1.2 <i>Reduces Pollution and Conserves Natural Resources</i>	49

4.1.3	<i>Conserves Energy and Reduces Costs in Manufacturing Sectors</i>	49
4.1.4	<i>Litter Abatement</i>	49
4.1.5	<i>Reduction of Waste Stream</i>	49
4.2	BARRIERS TO RECYCLING	50
4.3	LESSONS FROM SOUTH AFRICAN AND INTERNATIONAL EXPERIENCE.....	51
4.3.1	<i>South Africa Experience</i>	51
4.3.2	<i>International Experience</i>	52
4.4	PRACTICAL CONSIDERATIONS FOR COLLECTION OF RECYCLABLE MATERIALS	53
4.4.1	<i>Source Separation</i>	53
4.5	ROLES AND DUTIES	54
4.6	ENHANCEMENT OF MARKET CONDITIONS THROUGH POLICY INSTRUMENTS	55
4.6.1	<i>Regulatory Instruments</i>	55
4.6.2	<i>Market-based Instruments</i> :	55
4.6.3	<i>Information/Education strategies</i>	56
4.6.4	<i>Co-regulatory and self-regulatory strategies</i> :	56
4.6.5	<i>Impact of existing policies</i>	56
4.7	DESIGNING AND IMPLEMENTING AN EFFECTIVE RECYCLING PROGRAMME.....	57
4.7.1	<i>Defining Political Goals and Priorities For Recycling</i> :	57
4.7.2	<i>Gathering background information on current recycling status</i>	58
4.7.3	<i>Implementing the recycling programme: Practical considerations</i>	59
5.	CONCLUSIONS AND RECOMMENDATIONS	61
	REFERENCES	63
	APPENDIX A	
	REVIEW OF INTERNATIONAL INITIATIVES	
1.	EUROPEAN UNION.....	72
1.1	LEVELS OF WASTE GENERATION AND RECYCLING	72
1.1.1	<i>Paper and cardboard</i>	72
1.1.2	<i>Container glass</i>	73
1.1.3	<i>Plastic waste</i>	73
1.2	EU POLICY MEASURES RELATING TO WASTE AND RECYCLING	74
1.2.1	<i>European Community Strategy for Waste Management (1989)</i>	74
1.2.2	<i>General Directives Relating to Waste Management</i>	74
1.2.3	<i>The Council Directive on Packaging and Packaging Waste</i>	75
1.2.4	<i>Additional Specific Actions to Promote Recycling</i>	77
1.3	EVALUATION OF RECYCLING INITIATIVES WITHIN THE EU	78
2.	THE NETHERLANDS.....	82
2.1	LEVELS OF WASTE GENERATION AND RECYCLING	82
2.2	GENERAL POLICY FRAMEWORK ON WASTE AND RECYCLING	84
2.3	REGULATORY MEASURES	85
2.3.1	<i>Waste (Landfill Ban) Decree</i>	85
2.3.2	<i>Decree on the Disposal of Car Wrecks</i>	86
2.3.3	<i>Decree on the Disposal of Batteries</i>	86
2.4	MARKET-BASED INSTRUMENTS	86
2.4.1	<i>Waste Tax</i>	87
2.5	CO-REGULATION AND SELF-REGULATION.....	87
2.5.1	<i>End of Life Vehicles (ELV)</i>	88
2.5.2	<i>White and brown goods</i>	89
2.5.3	<i>Packaging and packaging waste</i>	89
2.5.4	<i>Impacts of the Covenant</i>	91
2.6	INFORMATION AND EDUCATION	92
3.	DENMARK	94
3.1	LEVELS OF WASTE GENERATION AND RECYCLING	94

3.1.1	<i>Household waste</i>	95
3.1.2	<i>Industrial waste</i>	96
3.2	GENERAL POLICY ON WASTE AND RECYCLING.....	96
3.2.1	<i>Waste Planning</i>	97
3.2.2	<i>The Danish Waste Model</i>	98
3.3	REGULATORY MEASURES.....	99
3.4	MARKET-BASED INSTRUMENTS.....	99
3.4.1	<i>Waste Tax</i>	100
3.4.2	<i>Deposit and return systems, charges, taxes and subsidies</i>	101
3.4.3	<i>Packaging taxes</i>	101
3.4.4	<i>Specific taxes</i>	102
3.4.5	<i>Subsidy schemes</i>	103
3.5	CO-REGULATION AND SELF-REGULATION.....	103
4.	GERMANY	104
4.1	LEVELS OF WASTE GENERATION AND RECYCLING.....	104
4.2	GENERAL POLICY ON WASTE AND RECYCLING.....	105
4.3	REGULATORY MEASURES.....	105
4.3.1	<i>Ordinance on Avoidance of Packaging Waste</i>	107
4.3.2	<i>Ordinance on the Return and Disposal of Used Batteries and Accumulators</i>	108
4.3.3	<i>Draft ordinance on electric and electronic products</i>	108
4.3.4	<i>Ordinance on end of life vehicles</i>	108
4.3.5	<i>Ordinance on Organic Waste</i>	108
4.4	MARKET-BASED INSTRUMENTS.....	109
4.4.1	<i>The “Green Dot Scheme”</i>	109
4.5	CO-REGULATION AND SELF-REGULATION.....	114
4.5.1	<i>The Eco-label Blue Angel</i>	114
5.	USA	115
5.1	LEVELS OF WASTE GENERATION AND RECYCLING.....	115
5.1.1	<i>Generation of municipal solid waste</i>	115
5.1.2	<i>Treatment of municipal solid waste</i>	116
5.1.3	<i>Generation and treatment of non-hazardous, non-municipal waste</i>	117
5.2	GENERAL POLICY ON WASTE.....	118
5.3	REGULATORY MEASURES.....	119
5.3.1	<i>Landfill bans</i>	119
5.3.1.1	<i>Waste separation laws</i>	119
5.3.1.2	<i>Recycled materials laws</i>	119
5.4	MARKET BASED INSTRUMENTS.....	120
5.4.1	<i>“Pay-As-You-Throw” programmes</i>	120
5.4.2	<i>Procurement Guidelines</i>	121
5.4.3	<i>Deposit-refund systems</i>	122
5.4.4	<i>National Battery Take-Back Initiative</i>	123
5.4.5	<i>Green Seal Eco-label</i>	124
5.5	CO-REGULATORY AND VOLUNTARY INSTRUMENTS.....	124
5.5.1	<i>WasteWise</i>	124
5.5.2	<i>Jobs Through Recycling</i>	125
5.5.3	<i>Extended Product Responsibility</i>	126
5.6	INFORMATION AND EDUCATION.....	126
5.6.1	<i>Partnerships</i>	127
5.7	EVALUATION OF RECYCLING INITIATIVES.....	128
6.	INDIA	129
6.1	LEVELS OF WASTE GENERATION AND RECYCLING.....	129
6.1.1	<i>Industrial waste</i>	129
6.1.2	<i>Rural areas</i>	129
6.1.3	<i>Urban areas</i>	129
6.2	GENERAL POLICY ON WASTE.....	131

6.3	REGULATORY MEASURES	131
6.3.1	<i>Municipal Solid Wastes (Management and Handling) Rules, 1999</i>	131
6.3.2	<i>Ban on plastic bags</i>	132
6.3.3	<i>Recycled Plastics Manufacture and Usage Rules, 1999</i>	132
6.4	MARKET BASED INSTRUMENTS.....	132
6.4.1	<i>Subsidies</i>	132
6.4.2	<i>Tax exemptions</i>	133
6.4.3	<i>Littering fines</i>	133
6.4.4	<i>Deposit-refund systems</i>	133
6.5	CO-REGULATORY AND VOLUNTARY INSTRUMENTS	133
6.5.1	<i>Ecomark</i>	133
6.5.2	<i>Partnerships</i>	134
6.5.3	<i>Information collection</i>	134
6.6	EVALUATION OF RECYCLING INITIATIVES.....	134
7.	KENYA	136
7.1	LEVELS OF WASTE GENERATION AND RECYCLING	136
7.1.1	<i>Solid waste generation</i>	136
7.1.2	<i>Responsibility for waste treatment</i>	137
7.1.3	<i>Waste treatment</i>	137
7.2	GENERAL POLICY ON WASTE	137
7.3	CO-REGULATORY AND VOLUNTARY INSTRUMENTS	138
7.3.1	<i>Mathare Youth Sports Association</i>	138
7.3.2	<i>Machuma Schools</i>	138
7.3.3	<i>Rescue Centres</i>	138
7.3.4	<i>Composting groups</i>	138
7.3.5	<i>Clean-up Nairobi Campaign</i>	139
7.3.6	<i>“Green Towns”</i>	139
7.3.7	<i>Recycling technology development</i>	139
7.3.8	<i>Local Agenda 21 Programmes</i>	139
7.3.9	<i>Waste Recycling in Nairobi, Kenya, 1990-1995</i>	140
7.4	EVALUATION OF RECYCLING INITIATIVES.....	140
8.	BOTSWANA	142
8.1	LEVELS OF WASTE GENERATION AND RECYCLING	142
8.1.1	<i>Glass</i>	142
8.1.2	<i>Beverage Cans</i>	143
8.1.3	<i>Paper</i>	143
8.1.4	<i>Oil Containing Wastes</i>	143
8.2	GENERAL POLICY ON WASTE AND RECYCLING	144
8.3	SPECIFIC POLICY INSTRUMENTS TO PROMOTE RECYCLING	144
8.3.1	<i>Regulatory Measures</i>	144
8.3.2	<i>Environmental Education</i>	145
8.3.3	<i>Economic Instruments</i>	145
8.4	EVALUATION OF RECYCLING INITIATIVES.....	145
9.	NAMIBIA	146
APPENDIX B		147
RECYCLING IN THE NWMS (STRATEGY FORMULATION PHASE)		
APPENDIX C		152
DEAT WASTE CAMPAIGN PROJECTS		

1. INTRODUCTION

1.1 *Project Background and Description*

The Department of Environmental Affairs and Tourism (DEAT) has launched a number of projects to fast track implementation of the National Waste Management Strategy. These projects relate to:

- Integrated waste management planning
- A waste information system
- Waste collection services for high density unserved areas
- Waste recycling
- Safe management of health care wastes.

The overall aim of these projects is to produce *Starter Documents* for the above five high priority activity areas. After finalisation of these documents at the end of March 2000, DEAT intends to consult more widely with relevant stakeholders as part of its NWMS implementation process.

1.2 *Scope of Background Report*

One of the projects that had to be undertaken as part of the DEAT NWMS Implementation Programme was an investigation of recycling on a national and international level with the following *outputs*:

- A background document analysing the existing experiences with recycling, both nationally and internationally. (This document)
- A draft framework for establishing sustainable post consumer recycling in South Africa.
- A draft legal framework for implementation of sustainable recycling.

This project utilises the National Environmental Management Act (NEMA), Act 107 of 1998, and the DEAT NWMS Action Plan for Waste Minimisation and Recycling (Version 'C', DEAT, September 1999) as a basis for developing starter documentation for the implementation of a work plan for waste recycling in South Africa.

The following specific outputs form part of this project:

- A *Background Report on Waste Recycling* (this document), which includes:
 - A review of recycling initiatives and related policy measures that have been implemented in South Africa and internationally, with an assessment of the reasons for the relative success and/or failure of these initiatives;
 - A description of the current mass of commodities that are recycled locally and internationally, and a preliminary assessment of the future potential for recycling in South Africa;
 - Identification of the constraints to recycling, the issues that require further investigation, and the role of the different stakeholders in recycling;
 - Evaluation of the potential for job creation through the implementation of sustainable community based recycling initiatives;
 - A review of current legislation in South Africa to identify the legislation that promotes recycling and to identify the deficiencies.
- A *Draft Framework Document* outlining a proposed mechanism for implementing sustainable recycling in South Africa.
- A *Draft Legal Framework* that would support sustainable recycling in South Africa.

1.2.1 Definition of Waste Recycling

In the National Waste Management Strategy, the term recycling is used in its broadest sense, and refers to the related processes of resource recovery, waste re-use and the processing of recyclable materials recovered from both the general and hazardous waste streams. The recycling of waste forms an important part of the waste management hierarchy, one of the overriding principles upon which the NWMS is based.

The recycling of waste is distinguishable from waste minimisation. In terms of the NWMS, *waste minimisation* comprises any activity that is undertaken *by the generator of waste* to prevent or reduce the volume and/or environmental impact of waste that is generated, treated, stored or disposed of. Waste minimisation may for example include activities taken by a waste generator relating to *internal* recycling. For the purposes of the NWMS, *waste recycling* only refers to initiatives aimed at the *external* recovery, re-use and/or reprocessing of post-consumer and post-production wastes. Recycling does not include the reuse of production waste.

1.3 Limitations of Study

This study is limited to an overview of recycling initiatives that have been implemented nationally and internationally, highlighting the reasons for their success and/or failure. It is not an exhaustive study and the following issues have not been addresses:

- A detailed economic feasibility assessment of the various recycling options.
- A full public participation process.
- A complete analysis of every provincial or local government, private sector or informal sector recycling initiative.
- Complete national breakdown of the waste volumes and compositions.
- Evaluation of environmental impacts of the packaging materials.
- Cost estimates of implementing the various recycling options.

1.4 The South African Policy Context

1.4.1 National Environmental Management Act

The Consultative National Environmental Policy Process (CONNEPP) resulted in the development of the Environmental Management Policy for South Africa and the promulgation of the National Environmental Management Act (NEMA) (Act 107 of 1998). This Act provides for co-operative environmental governance by establishing principles and procedures for decision-making on matters affecting the environment. An important function of NEMA is to serve as an enabling Act for the promulgation of legislation to effectively address integrated environmental management.

Whereas the Environmental Management Policy delineates government's broad policy on environmental management, the White Paper on Integrated Pollution and Waste Management (IP&WM) (RSA 2000) provides more specific detail of government's policy on pollution and waste management. This White Paper formed the point of departure and the framework for the National Waste Management Strategy.

The principles used in the development of the NWMS are *inter alia* those of the Constitution of the Republic of South Africa (Act 108 of 1996), the Bill of Rights contained in the Constitution, the Environmental Management Policy for South Africa (No. 18894 of 1998), the Environmental Management Act (Act 107 of 1998) and the White Paper on Integrated Pollution and Waste Management for South Africa (2000). Some of the principles on which the NWMS is based are – Accountability; Affordability; Cradle to Grave Management; Equity; Integration; Open Information; Polluter Pays; Subsidiarity; Waste Avoidance and Minimisation; Co-operative Governance; Sustainable Development; and Environmental Protection and Justice. A brief overview of key legislation that has a direct bearing on recycling in South Africa is provided in section 2.1.1. A more comprehensive legislative review of waste management issues in South Africa is provided in a separate report (*Integrated Waste Management Planning: Review of Current Legislation*) that was undertaken within the scope of this project.

1.4.2 White Paper on Integrated Pollution and Waste Management

The White Paper on Integrated Pollution and Waste Management (RSA 2000) represents a paradigm shift in South Africa's approach to waste management. Historically, pollution control generally focused on reactive impact management and remediation of pollution. However, to ensure sustainable development, the focus has

moved to pollution prevention. The NWMS process was undertaken to ensure that the IP&WM policy is translated into practice. Central to the development of the strategy for integrated waste management has been:

- The pollution avoidance, prevention and waste minimisation approach that focuses on the source of waste and moves away from “end-of-pipe” solutions;
- The need to extend waste collection, waste transportation, treatment and disposal services to an acceptable level to all communities and provide waste management services for the country as a whole.

During the development of the NWMS, the following problems relating to waste recycling were identified:

- There is insufficient data pertaining to recycling, both in terms of the potential and the *status quo*.
- The South African public is insufficiently informed, or unaware of the need for recycling.
- The current viability of recycling certain waste streams in South Africa is insufficient to make it work on a large scale.
- Until recently, the government has not pro-actively supported recycling.
- Uncontrolled informal salvaging at landfills is problematic, particularly in regard to the safety and health aspects.

As a means of addressing these problems, the White Paper on IP&WM has identified the following specific short-term deliverables relating to recycling:

- Identifying all successful existing recycling initiatives and implementing measures to ensure their ongoing success and viability.
- Separation and recovery of resources as early as possible in waste-generating processes in both the commercial and domestic sectors.
- Resource recovery at waste transfer stations, waste treatment facilities and waste disposal sites.
- Subsidising recycling campaigns in order to make them economically viable.
- Engaging with the mining and power generation industries regarding the investigation, promotion and implementation of minimisation and recycling of their wastes.
- Developing and implementing a programme for disseminating information by the Department on the techniques, opportunities and benefits associated with cleaner production, waste minimisation and recycling. Specific outputs include:
 - establishment of Waste Minimisation and Recycling Centres;
 - dissemination of information on waste minimisation by developing a directory of case studies and sector-specific guides;

- implementation of demonstration projects;
- promotion of information and awareness campaigns about waste minimisation and recycling by the Department, in collaboration with local government.
- Amending educational curricula to reflect cleaner production, waste minimisation and recycling approaches to waste management.

1.4.3 National Waste Management Strategy

These general policy objectives for recycling were further refined in the National Waste Management Strategy: Version D (DEAT 1999), in terms of which the Government committed itself to making recycling in South Africa more economically viable, and to further encouraging the private sector to undertake recycling initiatives.

More specifically, the Government identified the following priority initiatives relating to recycling:

- Implementing measures to promote the separation of wastes at source.
- Promoting the viability of general waste recycling through carefully researched legislation.
- Provision of economic and regulatory incentives to promote recycling by 2002.
- Conducting an investigation that will identify sectors or generators that generate abundant, marketable recyclable materials, and researching and developing appropriate methods of recycling e.g. source separation, composting and tyre recycling. The information generated by this investigation will be used to set waste recycling targets in the future.
- A tyre-recycling project, aimed at alleviating the problem of disposing of tyres. This project was initiated in 1997 and will be implemented in 1999.
- Promoting recycling centres, following separation at source in order to discourage salvaging on landfills. An appropriate government or private sector initiative will implement the tyre-recycling project. The cost of recycling tyres could be financed through a levy system.
- Addressing the problems associated with litter and its collection, recycling and disposal during the development of Action Plans and as part of the Law Reform Process. This issue will also be included in waste management awareness campaigns.
- It is recognised that the success of the recycling initiatives of the NWMS Strategy will be dependent on compliance by all associated with waste, as well as appropriate enforcement of regulations. However, institutional measures to ensure compliance and the success of these initiatives still needs to be further investigated as part of the Action Plan development process. There are other approaches such as a negative publicity campaign against a company that does not comply with recycling regulations and a positive

campaign highlighting good companies. Such publicity campaigns would cost a great deal less than administering a fine system or having to take transgressors to court. These and other alternatives will be reviewed in the Law Reform Process and is outside the scope of the NWMS.

- The use of targets in the implementation and further development of resource recovery and recycling strategies will be further investigated during the Action Plan Development Phase.
- Public awareness campaigns will promote separation at source for domestic waste. The DEAT will develop a programme for the expansion of industry initiatives to include domestic wastes. The long-term environmental impact of domestic waste also bears a cost that will be taken into account when reviewing the viability of recycling initiatives.
- Specific initiatives to promote the recycling of oil, batteries and organic solvents were to have been implemented by the end of 1999.
- Some initiatives, such as the recycling of batteries and oil by industry, are already being implemented. The DEAT Recycling Team will develop a programme for expansion of these industry initiatives to include household generated waste, and to promote recycling on a national level. This programme will include consultation with currently successful recycling initiatives, as well as the National Recycling Forum.
- Recycling of pesticide waste is not viable due to product quality requirements and the environmental risks involved.
- Recycling of medical waste is not viable due to the potential health risks. Capacity building and waste management education programmes need to be implemented before medical waste recycling can become an option. This issue will be addressed in the Action Plans as a longer-term objective of the NWMS.
- Research is to be undertaken to identify the possibilities of reclaiming or recycling mining and power station wastes and to investigate the formulating of necessary regulatory mechanisms for such reclamation and recycling. The results of these studies will be available by 2002. A Stakeholder Task Team, possibly comprising representatives of the DEAT (Recycling Team), DME, DWAF, CNS and industry, as well as I&APs will be formed to co-ordinate this investigation.

1.4.4 Waste Minimisation and Recycling Action Plan

On the basis of the NWMS, the *Waste Minimisation and Recycling Action Plan* (DEAT 1999) was developed in consultation with stakeholders. The Action Plan resulted in the following general outputs (relating specifically to recycling) being envisaged by 2004:

- The introduction and enforcement of ***appropriate regulatory instruments*** that provide for the identification and reduction/elimination of priority pollutants and waste streams, and that promote the more widespread adoption of recycling practices by DEAT by the end of 2002. Specific outputs include:
 - defining priority waste streams and targets for recycling;
 - identifying and removing barriers for recycling in existing legislation;
 - examining the feasibility of introducing product-based regulations as a means of promoting recycling.
- The development and implementation of ***appropriate economic instruments and other financial incentives*** based on the results of a study to be undertaken by DEAT with the participation of the Departments of Finance and of Trade and Industry by the end of 2001. Specific outputs include:
 - the introduction of economic instruments and incentives to promote recycling, including for example the possible introduction of levies on specific products or materials with high environmental impact;
 - the implementation of deposit-return schemes for certain refillable or recyclable containers.
- The adoption of measures aimed at ***facilitating and co-ordinating*** the more widespread implementation of existing successful recycling initiatives by DEAT in close co-operation with the private sector from 1999 onwards. Specific outputs include:
 - facilitating the exchange of information between provincial/local governments and industries with the aim for example of encouraging the more widespread implementation of recycling initiatives;
 - identifying all successful existing recycling initiatives and implementing measures to ensure the ongoing success and viability of such initiatives;
 - holding discussions with the mining and power generation industry regarding the investigation, promotion and extension of recycling of wastes generated by these industries.
- The development and implementation of a programme for the ***dissemination of information*** regarding techniques, opportunities and benefits associated with recycling by DEAT by the end of 2001. Specific outputs include:
 - the possible establishment of Waste Minimisation and Recycling Centres;
 - the implementation of demonstration projects;
 - the promotion of information and awareness campaigns about recycling, in collaboration with local government;
 - amending educational curricula to reflect cleaner production and recycling approaches.

2. RECYCLING IN SOUTH AFRICA – CURRENT STATUS

This chapter provides an overview of the current status of recycling in South Africa. After outlining the existing national policy and legislative framework for recycling, it reviews current private sector initiatives for each of the significant waste streams. A brief overview of certain local government initiatives is then provided.

2.1 National Policy and Legal/Institutional Frameworks for Recycling

Recycling statistics for the amount of waste recycled in South Africa are depicted in Table 2.1.

Table 2.1: Recycling Statistics in South Africa

Waste	Percentage Recycled				
	1990	1992	1994	1996	1998
Paper	29	28.4	38	38	38
Tinplate	21	26.3	29.9	51	67
Aluminium	36	29.6	22.8	50	45
Plastics	11	14.8	17	17	12
Glass	14	22.4	19.4	17.6	20.8

(Source: Lombard, 1999 and The Glass Recycling Association, 2000)

At present, recycling of waste is not generally viewed as an essential part of waste management in South Africa. Consequently no standard mechanism exists for implementing and funding recycling. The majority of initiatives have been developed on an *ad hoc* basis and have been funded by the private sector, with minor financial inputs from the authorities. Some schools are involved in the collection of recycled material, especially cans, paper and returnable bottles, partly as part of the education in environmental issues, and partly to earn money for the school budgets.

Recycling centres and garden waste drop-off centres are established in some of the larger cities, to which waste is separated into different waste stream such as glass, paper/cardboard, cans, scrap metal, plastics, garden waste and other waste, may be delivered by members of the public. Separation of this waste is often poor, thus hampering recycling. Collection banks are used on a small scale for glass and paper.

A number of capital-intensive recycling plants have been unsuccessful in South Africa, including for example Robinson's Deep Waste Flow Plant in Johannesburg, and the Resource Recycling Plant in Randburg. A labour intensive initiative in Durban, Tempo Recycling, also failed. Although the plants worked from a mechanical point of view, their failure has been attributed to an overestimation of the value of recoverable materials, unrealistic requirements of the municipalities involved, a down-turn in the economy at the time that the projects were launched and decreases in the value of

recycled materials. A number of attempts at kerbside recycling in Durban and Johannesburg have also failed due to public apathy (Lombard, 1999).

There are no formalised systems for source separation of waste in South Africa, although various trials are underway, e.g. Benoni City Council. Due to the large quantities of recyclable materials in the waste arriving at landfill sites, informal salvaging is widespread in South Africa. This practice leads to unacceptable health and safety risks for the salvagers, as well as operating problems for the landfill manager. The poor co-ordination of the collection for recycling and the lack of data on the amount of waste suitable for recycling have impeded the recycling process.

Private recycling companies, especially those within the packaging industry, mainly carry out recycling activities. These activities include the recycling of paper, plastics, aluminium, glass, oil, and rubber (scrap tyres). In the informal sector, especially in less developed areas, waste is recycled by, for example, converting it into bags, mats, toys and other items that are used within the household or sold. The main areas of recycling are described further below for each of the main waste streams.

2.1.1 Legal Provisions Relating to Recycling

This section provides a brief overview of key legislation that has a direct bearing on recycling in South Africa. A more comprehensive legislative review of waste management issues in South Africa is provided in a separate report (*Integrated Waste Management Planning: Review of Current Legislation*) that was undertaken within the scope of this project. This comprehensive review also outlines the division of environmental responsibilities between the national, provincial and local spheres of government.

As indicated in the accompanying legal report, existing legislation regulating waste management in South Africa is characterised by fragmentation and duplication of functions, at national, provincial and local levels of governments, as well as between government departments. There is a diverse range of national and provincial statutes and regulations, as well as local ordinances and by-laws, which either deal directly with, or else impinge upon, waste management. There are many statutes, regulations and by-laws that may have an impact (positive or negative) on recycling activities, without necessarily having an exclusive focus on environmental or waste issues. These include for example provincial and local by-laws that may affect the siting, operation and use of facilities involved in recycling, as well as statutes that have a bearing on the costs of products, processes and services associated with recycling. Rather than seeking to identify all such items of legislation, this section focuses only on national statutes that have a direct bearing on recycling.

At a national level, the principal items of legislation that have a direct bearing on recycling are the National Environmental Management Act 107 of 1998 (NEMA), and the Environment Conservation Act 73 of 1989 (ECA).

NEMA was enacted to provide for, amongst other priorities, co-operative environmental governance by establishing principles for environmental decision-making, as well as new institutional structures and procedures for co-ordinating

environmental functions exercised by organs of state. Section 2 of NEMA sets out the environmental management principles that apply throughout South Africa to the actions of all organs of state (including local and municipal government) that may significantly affect the environment. These principles serve *inter alia* as guidelines as reference to which any organ of state must exercise any function when taking any decision in terms of NEMA. One of these principles requires that development must be socially, environmentally and economically sustainable (section 2(3)). In terms of section 2(4)(a)(iv), sustainable development requires that “waste is avoided, or where it cannot be altogether avoided, minimised and reused or recycled where possible and otherwise disposed of in a responsible manner.”

In terms of section 28(1) of NEMA every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring. The potential for using environmental co-operation agreements is recognised in terms of section 35(1) which provides for the Minister of Environmental Affairs and Tourism, as well as MECs and municipalities, to enter into environmental management co-operation agreements with any person or community for the purpose of compliance with the principles laid down in the Act. Section 35 also lays down certain requirements relating to the conclusion of such agreements, while section 45 enables the Minister to make regulations on certain defined issues pertaining to such agreements.

Section 46 of NEMA enables the Minister to make model bylaws aimed at establishing measures for the management of environmental impacts of any development within the jurisdiction of a municipality, which may be adopted by a municipality as municipal bylaws.

The Environment Conservation Act, which provides for the effective protection and controlled utilisation of the environment, has a number of provisions relating to littering (section 19 and 24A), waste management (sections 20 and 24) that are still in effect and that may have a bearing on recycling matters. These are examined in more detail in the accompanying report. Evidently, as identified above, there are various local government regulations that may impact on the range of activities associated with recycling. For example, in terms of Section 101 of the Local Government Ordinance 1939, in Johannesburg the Council has adopted a by-law in terms of which the Council shall provide a service for the collection and removal of business and domestic refuse from premises at the tariff charge. The bylaws provide for the delivery of bins or containers; the placing of bins, bin liners and the use and care of bins and containers; and include the requirement in certain instances for the occupier of premises on which business or domestic refuse is generated to compact such refuse put it into an approved container or wrapper.

An assessment of key considerations that need to be provided for within the environmental law reform process, as a means of promoting sustainable recycling practices in South Africa, is provided in the *Draft Legislative Framework for Promoting Recycling Document*.

2.1.2 Role of Government Bodies in Promotion of Recycling

Following is a description of the general role of the different governmental bodies that are either currently involved in and/or have a future responsibility in promoting the adoption of effective recycling strategies in SA. Further detail on the division of environmental responsibilities between the different spheres of government is provided in the separate report on *Integrated Waste Management Planning: Review of Current Legislation*.

- *DEAT – Lead Agent*: will have overall responsibility for implementing the Waste Minimisation and Recycling Action Plan.
- *DWAF*: as the NWMS partner with DEAT, will be involved in implementing many of the specific activities.
- *Department of Minerals and Energy (DME)*: will be involved initiatives relating to minimisation and recycling of mining, coal combustion and radioactive wastes. In addition, the DME will be involved in the possible integration of policy initiatives on energy efficiency measures with the NWMS initiatives, as part of the development of a broader national strategy for cleaner production.
- *Department of Health (DoH)*: will be involved in initiatives (including for example demonstration projects) aimed at minimising the generation of certain medical wastes.
- *Department of Trade and Industry (DTI)*: will participate in an inter-departmental working team, to investigate the feasibility of introducing economic instruments to promote waste minimisation and recycling and will assist in identifying any existing counteracting incentives. The DTI will also participate in the development and implementation of certain demonstration projects; and may serve as a source of possible funding for co-operative waste minimisation initiatives. In addition, the DTI will have an important role to play in technology transfer initiatives, and will be involved in investigating the desirability of a National Waste Minimisation and Recycling Centre.
- *Department of Transport*: may be involved in ensuring that statutory controls relating to the transportation of certain industrial wastes do not hinder legitimate efforts to divert material from the waste streams for recovery and re-use.
- *Department of Finance*: will participate in the investigation into appropriate funding mechanisms and financing for Waste Minimisation and Recycling, and will make the final decision regarding the possible introduction of economic instruments to promote waste minimisation and recycling.
- *Provincial Environmental Departments*: will be responsible for integrated waste management planning including waste minimisation and recycling; will play a role in the promotion and implementation of a number of the action plan initiatives; and may be involved in the government waste minimisation demonstration project.
- *Local Governments*: will be responsible for general waste management planning including waste minimisation and recycling; have a key role to play in establishing structures at local level to promote increased recycling, including,

for example, providing recycling centres and promoting partnerships with local entrepreneurs and small scale recyclers; will be involved in the promotion of initiatives such as waste minimisation clubs, and will be active in the collection of data required for the regional waste information system. A possible area of conflict between the activities of local government and implementation of cleaner production initiatives relates to the cross-subsidisation of local government activities through the use of disposal charges; in many instances these charges are used as principal sources of revenue which may conflict with the desire to achieve a change in behaviour towards waste minimisation. Note also the possible role of the South African Local Governments Association (SALGA), which represents local government interests in forums and plays an important role in councillor training. SALGA can assist with the implementation of capacity building programmes for local government in Waste Minimisation and Recycling.

2.1.3 Market structure for Recycling in South Africa

A number of *private sector organisations* are currently very active in recycling initiatives including for example: Mondi, Sappi, the Glass Recycling Association; Collect-a-Can, the Plastics Federation of South Africa; the Packaging Council of South Africa (PACSA); the Tyre Recycling Association; and the National Recycling Forum. The private recycling sector plays a significant role not only in directly recycling material, but also in co-ordinating the collection of recyclable material through local agents. Although many of these private sector organisations have expressed the opinion that recycling is currently taking place wherever it is economically viable, and that additional legislative initiatives are thus not required they have nevertheless contributed to the development of initiatives arising from the NWMS Action Plan for Waste Minimisation and Recycling and this study.

2.1.4 Recycling Chain Stakeholders

Stakeholders who comprise the complete recycling chain include:

- Consumers (Households, retailers, industries, SMEs, service sector and institutions);
- Collectors (Municipalities, private organisations, informal sector and municipalities);
- Waste processors (private sector companies, informal sector);
- Brokers – who buy and sell recyclable materials;
- Converters – who buy recyclable material and alter it into a form that is readily useable by a manufacturer, e.g. recycled plastic pellets to be used by plastic extruders;
- End-use markets – who purchase recovered/converted materials to make new feedstock;
- Waste disposal (private sector, municipalities);

- Policy makers;
- NGOs, Community and Consumer Groups;
- Research groups.

2.2 **Waste streams**

2.2.1 **Paper and Board**

Paper and fibre recycling is well developed in South Africa, with four large paper companies (Sappi, Mondi, Nampak and Swazi Paper) utilising waste paper products. Agents receive collected paper products, which are sorted into the different grades of paper. This is then baled and transported to the appropriate factories for recycling.

The paper industry recycles 720 000 tonnes per annum (1999), which is the maximum quantity that the paper mills are currently equipped to recycle. This represents 38% of the paper that is produced, which has increased from 29% in 1984 (Table 2.2).

Table 2.2: Paper Recycling in South Africa

Year	Recovery Rate (%)	Tonnes Recycled ('000)
1984	29	360
1989	29	540
1994	34	607
1995	35	624
1996	36	640
1997	37	665
1998	38	720

(Source: Mondi Recycling, 2000)

Almost every type of paper produced in South Africa has a recycled content. For example, newspaper contains 25% recycled paper, cardboard boxes 50% and cartons 100%. The benefits of recycling paper include (Mondi Recycling, 2000):

- A reduction in raw material consumption: 17 pine trees are required to produce 1 tonne of virgin paper.
- Reduction in landfill space: 1 tonne of paper waste would occupy 3 m³ of landfill space.
- Water usage is reduced by 55%.
- Energy consumption is reduced by 40%
- Air pollution is reduced by 70%
- Water pollution is decreased by 35%.

There is also an active informal 'industry' collecting waste paper and cardboard. Mondi implemented the 'Ronnie' bag initiative for kerbside collection in 1994, as well as Mondi 'buy-back' centres at strategic locations. Paper is accepted at the buy-back centre and cash paid on a paper weight basis. A number of loyal collectors have also been identified, to whom Mondi have sold a barrow for the price of R1 that is used to collect and transport paper. This ensures that the collector takes ownership and responsibility for their barrow. A total of 80 barrows have been distributed. Small entrepreneurs have also established their own buy-back centres where they sort the paper in order to receive higher rates when it is sold at the depots. The Ronnie bag collection system has recently been contracted out to entrepreneurs. Mondi supports paper recycling by assisting small entrepreneurs and promoting the initiative through education and public awareness campaigns.

Sappi Waste Paper has been operating since 1990. This is a national initiative to promote the paper recycling and campaigns under the slogan of 'War on Waste'. The initiative also disseminates information about effective recycling and educates people about the benefits of recycling through the use of plays, puppet show, videos, and slide presentations. It is estimated that paper recycling has created about 10 000 jobs, the majority of which are small entrepreneurs.

Of the 38% recycled, 24% is post consumer paper comprising 20% from the wholesalers and retailers, 2% domestic and 2% offices. It is estimated that the potential for additional recycling from wholesalers and retailers is 19% (362 tpa), for domestic sources 17% (317 tpa) and 10% (194 tpa) from offices.

However, should additional paper be recovered, then the price paid for the recovered paper may be reduced and some providers would not be paid for their paper, although this would probably be at the pre-consumer level. Paper recycling is currently completely market driven and is designed to operate at a profit. Buy-back centres are located at centres where a high level of paper can be collected at the gate. Areas that would incur high transport costs are not considered viable centres, as paper is a low price commodity. The main incentive for the paper industry to recycle is to reduce the cost of paper that is generated at the mills in order to compete more competitively in the international market. At present the converters can buy paper from international manufacturers at prices that are equal to, or lower than, the cost of paper in South Africa. International experience has shown that when legislation is implemented that is prescriptive, paper is collected in excess of what can be economically recycled and must then be exported or disposed of.

2.2.2 Glass

The Glass Recycling Association was formed in 1986 by Consol Glass and Metal Box Glass with the objective of developing an industry approach to the recovery of glass containers from a wide spectrum of the domestic and industrial sectors. The Association is operated as a Section 21 company with a Board of Directors comprising senior management from Consol Glass and Metal Box Glass.

Glass is collected for recycling, as cullet (crushed glass), broken glass or as whole bottles, which may be cleaned and reused. Glass is collected via collection depots (bottle banks) or containers at individual businesses, as well as from landfill sites.

Collection of glass has grown from 54 370 tonnes in 1986 to 104 550 tonnes in 1999 (Glass Recycling Industry, 2000). The total tonnage of glass packaging produced in 1999 was 520 500 of which 104 550 tonnes was recycled. The tonnage converted into reusable containers was 110 000 tonnes. The recycled glass packaging was sourced as follows:

- Bottlers 38 000 tonnes
- Bottle banks 31 500 tonnes
- On premise consumption outlets 18 250 tonnes
- Informal trade (hawkers) 7 250 tonnes
- Neighbouring states 5 500 tonnes
- Schools and charities 4 050 tonnes

The tonnage collected in the form of returnable bottles was 32 130 tonnes in 1999. These bottles were recovered from users such as SAB and Coca Cola and were bottles that have reached the end of their useful life. This tonnage is particularly high due to the change over from 1 litre soft drink bottles to the 1.25 litre size. Approximately 8 000 tonnes of the old 1 litre size bottles were culled.

The maximum amount of cullet that can be recycled at the current levels of production is 175 000 tonnes. Alternative markets are continuously being explored and waste glass has successfully been used in the manufacture of abrasives, road-marking paint, ceramics and as an aggregate in road making.

Currently, 1 500 bottle banks have been provided for voluntary drop off points in all major centres, as well as smaller cities and towns. The glass industry has embarked on an initiative in Gauteng to recover waste glass from high-density areas by assisting with vehicles, containers, training programmes and public awareness. This initiative will be extended to other provinces at a later stage. Glass is either recycled from on the premises of consumption outlets, e.g. restaurants and bars, from voluntary drop off points in the bottle banks and a small amount from scavenging at landfills. Not all on-premise consumption outlets however are prepared to sort their glass and participate in recycling, particularly some of the fast food restaurants.

Glass can be re-melted without losing any of its chemical properties. The benefits of recycling glass include the fact that recycled glass melts at a lower temperature than virgin material and thus saves energy and also produces a more malleable molten glass. However, waste glass requires sorting and processing before it can be converted into new glass. Non-glass material must be removed and the glass crushed to the required size. Processing plants are located at Germiston and Bellville, which are in close proximity to glass producing factories. The barriers to glass recycling include:

- Transport costs for glass collected from areas further away from processing plants.
- The low value of glass. New glass is made from plentiful and relatively cheap raw materials.
- Colour separation must take place at source, as the supply and demand is difficult to match, particularly for green glass.
- The quality of glass entering a furnace has to be of a high standard to avoid the manufacture of inferior glass and damage to the furnace.
- Lack of conveniently placed containers and public apathy towards recycling.
- The lack of funding for the establishment of entrepreneurs in high-density areas.

The glass recycling industry receives no subsidies or additional funding and is completely self-supporting. The price paid for the recycled glass is determined by the market price of glass and the technical requirement of the glass by the glass manufacturer. The glass recycling industry relies on entrepreneurs to colour separate before transporting it to the depot, as well as collecting the glass in some instances. Glass from the voluntary drop-off point is also sorted in this way. For this the entrepreneur is given a price based on the quantity and colour of the glass. Payment is often made to a charity organisation for the glass that is collected at the voluntary drop-off points.

The economic viability of glass recycling centres based on the costs of collection and transport, as the value of waste glass is low and the transport costs high. Subsidising the cost of transport or implementing economic incentives to the glass industry could promote recycling. The Glass Recycling Association is of the opinion that the implementation of market based economic instruments would be preferred to the command and control type regulations. They would also like to see bylaws promulgated that ban the disposal of glass at landfill sites.

There is limited information on the promotion of glass recycling in comparison to the other recycled commodities. The Glass Recycling Association is in the process of designing and setting up various public awareness, education and advertising campaigns but is constrained by the lack of funding.

2.2.3 Plastics

There are approximately 100 companies recycling plastics in South Africa. Under the auspices of the Plastics Federation, the Plastics Enviromark initiative was launched in January 1997. This initiative aims to:

- Join the companies within the plastics industry in an environmental responsibility initiative.
- Provide a tangible expression of the plastics industry's commitment to environmental responsibility.

- Highlight, and as far as possible, address the problem of plastic littering.
- Educate relevant target audiences on recycling and reuse.
- Spread a positive message about plastics through the media, at exhibitions and through the dissemination of educational material.

Raw material suppliers and plastic converters who contract to support the programme are allowed to use the Enviromark logo on their stationery and products. A licensing fee, based on the tonnage converted, is payable to the Plastic Federation to fund various environmentally orientated projects. Approximately 80% of the plastic packaging industries are currently contributing to this programme.

There are more than 60 different types of plastic resins and the Plastic Federation of South Africa has adopted a voluntary coding system for each category to aid in their sorting by material type for recycling. The most common resin types are:

- PET (polyethylene terephthalate);
- HDPE (high density polyethylene);
- PVC (polyvinyl chloride);
- LDPE (low density polyethylene);
- PP (polypropylene);
- PS (polystyrene).

The total tonnage of virgin plastics produced in 1997 was 905 000 tonnes, of which 445 000 tonnes was converted into packaging. The tonnage of plastics recycled, including non-packaging items, was 115 000 tonnes (13%), which places South Africa in the forefront of plastics recycling worldwide (PACSA, 1999).

The main limitation to the greater use of recycling is the problem of segregation from the waste stream and collection. Most collectors and recyclers are located in large towns in Gauteng, Natal and the Eastern and Western Cape. The distances to the recyclers from other areas makes the transport cost of the collected material too high to make recycling economically viable. In addition, the rising labour and service costs are forcing recyclers to become more selective about the quality and type of materials collected and recycled. The time and expenses associated with litter collection make this activity a non-viable option for plastic recyclers. Plastic waste is sorted into the major plastics types and often by colour, and is then compressed and baled. The bales are delivered to the recycler where the plastic articles are shredded. After washing and drying, the pieces are fed into an extruder where they are melted, extruded and cut into pellets for re-use. The selling prices for recycled polymer are limited to about 60% to 70% of the virgin polymer prices, which are in turn subject to the normal supply/demand market forces. Prices range from R350 per tonne for dirty material to R1 200 per tonne for clean material (Steyn, 1999).

All plastics recycling projects undertaken to date have been initiated by the private sector on the basis of market opportunities. About 100 small entrepreneurs and

organisations are involved in the collection of plastic waste. Recycling of plastic is operated on a commercial basis. The recycler is unable to pay high prices for the collected material, as this, as well as the cost of reprocessing, must be kept low enough to sell the recycled product at a price that is competitive with virgin polymer. Recyclers only recycle a limited number of plastics types and are reluctant to increase this if there is only a limited market for their recycled product.

The 'Green Cage' initiative was introduced in 1997 for the collection of plastic, which is sponsored by an annual fee. Currently 120 Green Cages are in place and the intention is to increase this number to 200. This initiative has to date created 70 new job opportunities. The cost of providing the Green Cage amounts to R10 000 per annum. Collected plastic waste contained a mixture of plastic types, which then have to be sorted. Companies and organisations are encouraged to sponsor the Green Cages in order to expand the programme more quickly. This initiative has however not been a success in the previously disadvantaged areas.

A number of companies have introduced additives in plastic production that cause the material to decompose with time, notwithstanding the fact that conditions in landfill sites are not conducive to biodegradation. Polyethylene products, e.g. checkout bags at chain stores, are photo-degradable and therefore break down into smaller pieces, which become incorporated into the soil without causing any harmful effects. This however can be problematic to the recycling and re-use of the material that is treated for biodegradability. Furthermore, it does not address the problem of littering.

A major focus of education was the funding of the Edutainment section of Keep South Africa Beautiful. The project was designed to educate the youth about the importance of a clean environment, as well as the recyclability of plastic. The Plastic Federation strongly believes that public awareness and education programmes are the key components in changing attitudes to litter and the promotion of recycling. The Federation has a Training Division that offers public courses, in-house programmes, skills development, and training brokerage of 'soft skills'.

2.2.4 Metal

2.2.4.1 *Collect-a-Can*

Collect-a-Can was established in 1976 as a joint initiative of Iscor, Metal Box and Crown Cork in order to recover steel beverage cans for recycling. Collect-a-Can is a non-profit company, established with the objective of pre-empting pending environmental legislation that could have resulted in cost implications for manufacturers of non-returnable packaging. Collect-a-Can has been proactive in the recycling field and has been promoting the recovery of beverage cans for the last six years. To ensure the success of the recovery of beverage cans, Collect-a-Can subsidises the collection system. A variable rate, which is fixed for about 18 months, is paid for each tonne of material that is delivered to either the depot or the steel mill. The price paid is dependent on the quality of the cans.

Collect-a-Can's recovery rate for all the steel beverage cans sold in Southern Africa has grown from 18% in 1992 to 63% in the 1998/99 fiscal year (Collect-a-Can, 2000). In

terms of quoted international recovery rates, the region now ranks in the top five in the world. Collectors often form their own collection networks and deliver their cans directly to the recycling centre or steel mill. The tin-bearing scrap is electro-chemically processed to recover the pure tin, tin oxide, and high-grade steel scrap. The tin is sold for manufacturing new tinfoil and the steel is also sold for re-smelting and re-use.

The tonnage of tinfoil produced in 1997 was 302 857 tonnes, with an additional 13 625 imported. The total converted into packaging was 275 000 tonnes. The tonnage recycled was 129 000 tonnes of which 61 000 tonnes was from steel beverage cans.

The number of registered collectors has increased from 1 500 in 1992 to over 37 000 in 1999. An analysis of the collectors in May 1999 showed that more than 80% of them would otherwise have been unemployed with no alternative source of income. To date six recovery centres have been established in South Africa.

Collect-a-Can has expressed its views on what would promote sustainable recycling initiatives in South Africa. These include:

- Should targets be set, these should be realistic and should be equal for all commodities in the same sector. These targets should not be influenced by international trends but should reflect the principles given in NEMA. Industry should implement its own policies for meeting the targets and should not be forced into mandatory recycled contents, as this may prove to be a less cost-effective option.
- The collection systems to be established should not be prescriptive but rather the specific industry should be allowed to implement the system that will meet their requirements.
- As an incentive to industry to recycle rather than dispose of their waste, local authorities could be encouraged to offer a rate rebate to those industries that meet their prescribed targets.
- Industry should introduce an accurate information system that is independently audited to prove to government that they have complied.
- Deposit refund systems would not necessarily increase the rate of recovery of beverage cans as a high percentage of beverage cans are currently recovered even though a deposit system is not imposed.
- The imposition of a raw material charge to fund recycling initiatives should be at the discretion of the industry and not dictated by government. However, where raw materials are imported, industry may approach government to impose a recycling levy to ensure that the material is effectively recycled. Eco-labelling is viewed as a double taxation, which would require a substantial infrastructure to administer.
- Should environmental agreements be introduced, these should be negotiated at national government level. Voluntary agreements, however, would be dependent upon the region in which they are to be implemented and should be administered at the local or provincial level of government.

- As the custodian of the environment, government would be expected to have a shared responsibility to create public awareness and initiate education programmes to promote recycling.

2.2.4.2 Aluminium Can Recycling Association

In 1997, the Aluminium Can Recycling Association (ACRA) reported that 60% of aluminium cans are recycled. Although the beverage cans are recycled quickly, the average age of recycled aluminium is about 10 to 12 years. The total domestic consumption of aluminium was 180 000 tonnes of which packaging accounts for 37 000 tonnes. The tonnage recycled, including non-packaging items was 38 000 in 1997. The annual recovery rate of 62% is ahead of the average global recovery rate of about 53%. Aluminium can recycling rates achieved in other countries are UK (32%), US (65%), Australia (65%), and Brazil (68%) (PACSA, 1999).

However, due to market forces aluminium cans are no longer used in the beverage market, which has resulted in the closure of ACRA and the ultimate cessation of post consumer recycling.

2.2.5 Building Rubble

Building rubble is used as fill and cover material at landfill disposal sites and building sites. Crushed building rubble also has a number of useful applications. However, no readily accessible information on building rubble recycling could be found for South Africa.

2.2.6 Organic Materials

Currently, very little recycling of organic waste currently takes place. Small-scale composting is practised, but large scale composting of organic waste from households, commerce and industry is rare. There appear to be retail markets available for high quality compost, and a potential for municipal use of compost at sports facilities and public parks.

In Cape Town there are three large municipal composting facilities, which are not financially viable within the current situation. However, with acceptable landfills near areas where waste is generated becoming scarce, and transfer stations being implemented to move waste further away, composting of waste is becoming more viable. Home composting is a low cost operation that can be successful and could divert organic domestic waste away from landfill sites. However, poorly operated compost heaps can create health risks and aesthetic problems.

A newly established company SA Organics has proposed the manufacture of bio-organic fertilisers from domestic waste. Recyclables would be separated from the domestic waste stream before processing the bio-organic waste into organic fertiliser. To date two local authorities have signed contracts with SA Organics but the system has still to be implemented (Urban Management, 2000).

2.2.7 Specific Product Types

2.2.7.1 Tyres

According to a feasibility study undertaken for the South African Tyre Manufacturing Conference (SATMC) (SATMC, 1998), 160 000 tonnes of scrap tyres are generated in South Africa each year. More than 28 million used tyres are dumped illegally or burnt to recover the steel wire, which is sold as scrap metal, a figure that is thought to increase by 9.3 million annually. Tyres are not readily accepted at landfill disposal sites as they are not easily compacted and occupy a considerable volume. Tyre casings are also being imported for retreading purposes. However, some of the casings are sold as second hand tyres or dumped if they do not meet the retreading requirements. A market survey is being undertaken with the assistance of DWAF to confirm the stockpile of tyres and the extent to which they are burnt. There is however no legislation in place that controls the indiscriminate disposal of tyres and no incentives to promote the recycling of the rubber from the scrap tyres. Minimising the number of scrap tyres by retreading used tyres is limited due to the poorly enforced legislation of requiring a minimum tread depth of 1 mm. Often tyres are used beyond the level that enables retreading to take place.

The SATMC have commissioned a study and compilation of a business plan to identify economically feasible options for the recycling and reuse of scrap tyres. Options that have been considered include the reclamation of tyre components, gasification as a source of energy, the incorporation of waste tyre into road building, and the recycling of the rubber for other rubber products, such as boots, floor cover material and vehicle insulation.

In order to improve the collection of scrap tyres, the South African Tyre Manufacturers Conference and the majority of SA Tyre Dealers through the Tyre Dealer Association, support the implementation of a tyre levy (SATMC, 1998). It is proposed that a levy be imposed on all tyres purchased and that this levy would be reclaimed at the end of the life of the tyre, when the tyre is delivered to approved tyre reclaimers. Small entrepreneurs would be encouraged to collect tyres and deliver them to approved collection sites, from where they would be transported to transfer sites for shredding and storage. From this location they would be dispatched to the end users. To promote this process route, the tyre industry considers that it is necessary to implement and enforce the following legislation:

- Enforce a deposit on new tyres or implementation of an exchange system;
- Enforce compliance of the minimum tread of 1 mm;
- Enforce regulations pertaining to the illegal importation and selling of second hand tyres;
- Enforce the disposal of tyres at approved collection sites.

It is estimated that up to 350 direct jobs will be created through the implementation of this system, with additional opportunities being created for the end users of the scrap rubber.

2.2.7.2 *Oil*

The Rose Foundation was formed in 1995 and is run by a chief executive officer and a Board comprising representatives from all the main lubricant marketing organisation in the country. It was formed after the government withdrew support for the used oil re-refining industry in 1994. Previously lubricants were taxed to subsidise the recycling process. The Rose Foundation operates on a non-profit basis. Although the cost of collecting oil exceeds the income, the members contribute additional funding to meet the shortfall.

Used lubricating oil, such as motor car oil and hydraulic oil, is collected for re-refining. In 1996/1997, 29 million litres of oil were collected, which increased from to 37 million litres in 1998/1999. About 321 million litres of new lubricating oil was sold in 1998. Of this 50% is consumed or destroyed during its use. It is estimated that 90 million litres per annum of oil is available for recycling of which a total of 52 million litres is currently being recycled. (<http://www.rosefoundation.org.za/about/main.html>)

Used oil mini tanks are placed at sites generating used oil for storage from where the oil is collected before transporting to depots in Johannesburg, Cape Town or Durban, from where it is sold to the recyclers for refining.

The Rose Foundation aims to increase their recovery rate to 60 million litres per annum. In order to achieve this objective the Foundation has over the last 18 months embarked on a marketing campaign aimed at private and industrial users of lubricating oil. In addition, an educational poster was inserted in five major newspapers and forwarded to several environmental, wildlife and educational organisations. In parallel to this, an advertising campaign was run that was aimed at increasing general awareness among the industry and the public.

A handy container called the 'Sumpy' is to be marketed for use by the general public. This will be supported by a campaign aimed at taxi drivers and taxi service depots throughout Gauteng.

2.2.8 **Packaging Waste**

The Packaging Council of South Africa (PACSA) is a national voluntary association for raw material suppliers, packaging manufacturers, packaging users, retailers, packaging designers, consultants and other organisations with similar aims. It commenced operation in 1984 as a mechanism to provide leadership and representation on external and internal packaging related matters.

The packaging chain is facing increasing pressure from the anti-litter lobby and environmentalists who are looking for stricter packaging regulations and increased recycling. However, in 1997, it was estimated that South Africa generated a total of 15 million tonnes of urban solid waste per annum of which only 8.7% is estimated to be packaging waste (PACSA, 1997).

Much of PACSA's environmental effort to date has been aimed at helping to develop effective and appropriate methods of solid waste management and the control of litter.

The recovery and reuse of packaging material has increased significantly since the establishment of PACSA in 1984 (Table 2.3).

Table 2.3: Tonnages of Material Converted into Packaging and Tonnages Recycled

Material	Total Produced in 1997 (t)	Packaging in 1984 (t)	Recycled in 1984 (t) *	Packaging in 1997 (t)	Recycled in 1997 (t) *
Paper and Board	2 372 500	672 000	365 000	866 000	665 000
Plastics	905 000	172 000	37 000	445 000	115 000
Tinplate	302 000	185 000	6 000	275 000	129 000
Aluminium	180 000	17 000	28 000	37 000	38 000
Glass	485 000	365 000	50 000	485 000	224 025
Total	4 244 500	1 411 000	486 000	2 108 000	1 035 225

* Tonnages recycled include non-packaging items
(Source: PACSA, 1997)

One major contribution towards waste minimisation is the packaging industry's ongoing programme to reduce the amount of material used in the manufacture of packaging material. In addition, there is a proliferation of concentrated products and refill packs, which substantially reduces the amount of packaging material that would otherwise be used.

The beverage industry operates a voluntary deposit system. In 1997, about 76% of all malt beer sold in South Africa was packed in returnable bottles and 21% in one-way packaging. The market share of cans has increased from 7% to 13%. In the soft drink industry, 58% was packaged in returnable containers in 1997, which has reduced from the 1990 figure of 65%. The non-refillable total volume had increased from 35% to 42% and cans from 14% to 24% (PACSA, 2000). One major impact on the beverage market has been the introduction of the PET containers, which are cheaper to manufacture with also a lower capital investment cost. The current volume of PET manufactured in 1999 was 10 000 tonnes, which is expected to increase to 40 000 tonnes by the end of 2001. The CSIR is currently investigating the recycling of the PET containers, to identify the economic viability of recycling and the potential end use markets of the recycled material (PACSA, 2000).

The packaging industry is opposed to the introduction of a mandatory container deposit system as a means of promoting recycling. Although this appears to be a mechanism by which litter and solid waste can be reduced, experience in other countries, such as Australia and the USA, have indicated that the costs of implementation far exceed the benefits. Problems identified, included:

- Negligible effect on reducing litter;
- The price of the beverage was found to increase, which led to a reduction of sales;
- Additional storage space required at the retailer to store the returned containers;
- Refillable containers have to be more robust and are therefore heavier and bulkier. The energy consumed in their manufacture is higher and heavier trucks are required for their delivery and collection;
- Considerable quantities of water and chemicals are required for cleansing purposes;
- The size of the deposit creates problems. If it is too small there is no incentive to return the container, but if it is too large this results in a further increase in the cost of the beverage.

The packaging industry believes that the responsibility for recycling should be shared between the public and private sector and that this should be equally applied for all commodities. The saving to the local government in reduced waste loads to be disposed at the landfill sites should be used to provide services for recycling, e.g. separation facilities.

2.2.9 Public/Private Initiatives

2.2.9.1 Greater Johannesburg Metropolitan Council

In 1998, the GJMC and all its associated local councils adopted a recycling policy statement with guiding principles for recycling initiatives. The current (1999) status quo of recycling is as follows:

Greater Metropolitan Local Council: As part of the national Waste Management Campaign, national government has awarded a grant of 2 million Rand for funding waste management projects in Yeoville and in Alexander. Buy-Back centres are to be developed.

Northern Metropolitan Local Council: Glass, plastic and papers are recycled at 12 Garden Sites. Kerb side paper recycling is carried out in Randburg and parts of Johannesburg by Mondi, and Nampak recycle paper collected at the council office.

Southern Metropolitan Local Council: Limited recycling is taking place at three Garden Sites. An Environmental Impact Assessment is currently being evaluated by the SMLC for a private company to conduct recycling.

Eastern Metropolitan Local Council: A buy-back centre is to be operated at one of the garden sites. A project has been initiated in conjunction with Mondi recycling to reduce the use of plastic bags and to replace them with paper bags at all major shopping centres.

Western Metropolitan Local Council: A Buy-Back centre for paper, glass and cans is to be augmented with satellite centres in the main business areas. 54 000 households are serviced by kerbside paper collection. An agreement is to be negotiated for the composting of garden waste at one Garden Site.

2.2.9.2 *Eastern Gauteng Services Council*

Containers for the collection of glass, paper, cardboard, cans and plastics are provided on all of the EGSC waste disposal sites, as part of the public disposal facilities. The income generated from the recycling at some waste disposal sites is donated to a charity organisation, as an incentive for the local community to support the voluntary recycling initiatives. On other waste disposal sites payment is made to an entrepreneur who is appointed by the main contractor to service and maintain the facility. Statistics on materials recovered are kept and reported at the monthly “Waste Aware” meetings. The latter is an education and awareness initiative by the EGSC, with members from the industries, business, recyclers, waste managers, local authorities, NGOs and members of the public. One of the main problems is to ensure the commitment from the recyclers to collect the materials once the containers are full, as it results in litter and broken glass on site if not serviced regularly. The recyclers however do not find it viable to collect individual containers. More drop off centres are required in an area to make it viable for the recycling companies to send vehicles out more frequently. An office paper recovery programme has been implemented at all ESGC offices.

The Plastic Federation provides and services containers at the waste disposal sites, which have to be paid for by the owner of the facility due to the low value of the unsorted plastics. This additional overhead is difficult to reconcile, but is provided as part of the service to the community.

Building rubble is received free of charge provided it is smaller than 300mm in size and does not contain any reinforcing material. Used oils are collected at oil recycling containers provided at the landfills as part of the Rose Foundation initiative. An awareness campaign and targeting of service stations in the region has been implemented to promote the use of this service. Batteries are collected in special bulk containers as part of the domestic hazardous waste stream to promote the separation at source.

Garden waste is separated and composted at the EGSC landfills. There is a tariff incentive for the separated waste for the larger disposers. Up to 1 tonne of material is disposed of free to combat the problem of illegal dumping. To date the compost has been used on site or by the parks department, a tender has been circulated for contractors who are interested in purchasing the material for marketing to the public.

No scavenging is allowed on any of the ESGC landfill sites, with the exception of tyres and steel objects that could create operational problems. The scrap metal is sold to fund the labour required to remove the articles. The tyres are stored on site for use in subsurface drainage systems.

The experience that the EGSC has had with waste collection and recycling initiatives, has resulted in the formulation of views on what mechanisms could promote recycling.

Financial incentives, such as tax exemption for recyclers purchasing new equipment, are considered to be more effective than legislation, which will be difficult to enforce. Regulations should be introduced to promote the minimisation and recycling by industry, commerce and business. Limited separation at source is undertaken at present, and limiting the amount of waste that will be collected has resulted in illegal dumping, which is more expensive to collect. This is exacerbated by the lack of enforcement of legislation and by-laws. Voluntary recycling should be promoted. Education and public awareness are seen to be key to the promotion of recycling. Implementing the process of 'train the trainer' would be more effective and permit the message to be altered according to the target audience's needs. The centralised development of educational material through a network of organisations will prevent duplication and minimise the cost for this initiative.

The market value of the recycled material is low, which makes it difficult to implement viable recycling initiatives. More focus is required on creating markets for recycled materials, which could be stimulated by a government undertaking that it would use only recycled materials in its offices. Public/private partnerships should be promoted, providing the roles and objectives of the partners are contractually defined.

2.2.9.3 Cape Metropolitan Area

The Cape Metropolitan Council published their '*Feasibility study towards an integrated solid waste management plan for the Cape Metropolitan Area (CMA)*' in June 1999 (Wright-Pierce et al, 1999). One chapter is dedicated to the 'Evaluation of projected needs and alternatives for processing and recovery facilities', which promotes working within the waste management hierarchy.

Recycling of domestic, commercial and industrial materials, such as metal, plastic, glass and paper, composting of domestic waste and the beneficial reuse of waste water treatment plant sludge accounts for approximately 24% of the total waste stream, which is equivalent to 485 000 tonnes per annum. Of this, approximately 60% is recycled industrial waste, 18% is recycled residential and commercial waste, 14% is beneficially reused wastewater sludge and 8% is composted domestic solid waste. Projected recycling rates are given in Table 2.4.

Table 2.4: Projected Material Recycling Rates

Material	Recycling Rate (%)			
	1998	2010	2020	2030
Paper	10	20	30	40
Glass	7.5	15	20	25
Metal	45	47	49	50
Plastic	6	8	9	10
Organics	0	10	18	25
Other	0	0	0	0
Total	6.9	12.4	17.3	21.9

(Source: Wright-Pierce et al, 1999)

Metals: Collect-a-Can is the primary steel beverage can recycler in the CMA. Metal cans and other light metal scrap can be dropped off at Collect-a-Can depots but the majority of the waste is collected at drop-off centres or from pickers at the landfill sites. The success of metal recycling is attributed to the efforts of Collect-a-Can to promote metal recycling.

Waste paper and cardboard: Sappi and Nampak have mills in the CMA and Mondi transports to a mill outside the CMA. Sappi is the primary recycler in the area and has developed a network of agents, and recycling centres, which are supported by Sappi's awareness campaign. The mills in the CMA are currently operating close to capacity. Mondi and Nampak have no plans for expansion in the CMA but Sappi have indicated they will expand if it becomes economically feasible.

Glass: Consul Glass is the only recycler of glass cullet in the CMA. Of the 26 500 tonnes of glass recycled each year, bottle washing and reuse, e.g. wine bottles, account for 42%, mixed cullet from bottling companies 38%, and 20% from the 350 bottle banks. The market for glass cullet is however poor.

MSW Composting: Approximately 72 000 tonnes per year of collected domestic solid waste is composted at three composting facilities in the CMA. Recyclable materials are removed prior to composting at only one of the facilities.

Compost: Compost is produced at two facilities. Approximately 41 000 tonnes per year of waste is composted annually, which represents 2% of the total waste stream. Organic waste comprises 18% of the total waste stream that is currently landfilled. Compost is marketed in bulk and bags. There is no capacity to compost additional organic waste.

Residential and commercial recycling that takes place in the CMA is done in an informal way, with no underlying mandate or programmes that are led by any levels of government. Drop-off centres provide opportunities for a number of entrepreneurs. Several schools have implemented recycling centres as a source of revenue and several community-based operations are operational, which create jobs, protect the environment and produce recycled goods for use by the less fortunate, e.g. fuel bricks for cooking fires.

The Cape Metropolitan Council has recently developed a web site for an industrial waste exchange. The motivation for implementing this initiative is to reduce the volume of waste going to the landfill sites that are running out of available space and to encourage waste minimisation at source. This would also allow recycling entrepreneurs to look for market outlets and possibly better prices for collected recyclables. Included in the service is a starter pack with guides on waste reduction and improving energy and water efficiency; a free CMC consultancy visit and list of specialist environmental services; and a bimonthly newsletter with an industrial waste and other information.

2.2.9.4 *Fairest Cape Association*

The Fairest Cape Association (FCA) has been involved in promoting recycling for many years and has identified successes and constraints to sustainable recycling.

Local authority role: The councils are supportive of recovery providing that they do not have to pay for the collection. Training courses have been run for officials that promote integrated planning, including recycling, but a change of institutional structures with new roles and functions are required before any meaningful results can be expected. For example, one municipality encourages recycling but another department is closing buy-back centres in the CBD; once complaints are received about the collection banks, the agent is instructed to remove them.

Education and public awareness: The FCA has been very involved in creating awareness and implementing educational programmes. A community project in Langa is still operational after 2 years and a project in Hout Bay has just been launched where recyclables are to be collected for the benefit of the community. The FCA 'Wise up on Waste' educational booklet that is used for school programmes, teachers and community train-the-trainer workshops, as well as a guide for community groups, has been updated for the third time. The FCA maintains a directory on recovery, which is updated and published in the local press. This is a networking and information exchange system for the Cape Town area.

Recycling experiences: To promote sustainable recycling the local authorities need to have goals and objectives, which may differ for each area. Due to the high collection and transport costs, kerbside collection of separated waste has proven to be problematic and not viable. Mondi were forced to stop their paper collection as the paper was collected by other collectors before Mondi. Collection depots are no longer economically viable with the lower prices paid and a declining returnable bottle situation.

2.2.9.5 **Durban Solid Waste**

A Waste Minimisation and Recycling division was established during 1995 to save landfill space by promoting the components of integrated waste management to the public. The promotion of income to collectors of recyclables was later identified as a secondary objective. Integrated waste management is promoted as a whole, including waste minimisation, composting, recycling and disposal, as a more sustainable approach to waste management. The activities of the division include education of institutions, communities and business and industry.

Educational Institutions: A practical manual entitled "Let's Reduce and Recycle Manual for Solid Waste Awareness" is distributed free to teachers in the region through a workshop system. Monthly newsletters are sent out to all schools.

Community Outreach: A manual and information pamphlets are available for distribution to community organisations and the general public.

Business and Industry: Several multi-material buy-back centres have been established in the greater Durban area by recycling companies with the support of Durban Solid Waste. A waste minimisation and recycling service is offered to minimise the amount of waste requiring disposal and to separate recyclables at source.

A library and resource centre was started in 1996 with technical papers on waste avoidance and management. The centre disseminates information on recycling programmes in the area and is establishing a waste exchange for business and industry.

2.2.9.6 *Art and Crafts from Waste*

Initiatives have been launched that successfully turn waste into a saleable product. Curios are fashioned out of the waste material that can command higher prices than the value of the commodity. One such initiative, Amandla Waste Creations, was launched by the Gauteng Directorate of Environment in 1996, which operates from a backyard structure in Soweto. Facilities include a production workshop, recycling centre and a community art gallery. To date, 150 unemployed youths and women have been trained in waste minimisation and the manufacture of art and crafts from waste materials. Workshops are also held to create awareness on environmental problems within the community. Other community initiatives are also ongoing (Appendix B).

2.2.9.7 *DEAT Waste Management Campaign*

A waste management campaign is currently ongoing at DEAT to raise awareness of waste management and to initiate and projects associated with recycling (Appendix c). The initiatives are community-based projects, which are financed by DEAT.

3. COMPARATIVE REVIEW OF INTERNATIONAL INITIATIVES

This section of the report provides a tabular overview of recycling initiatives that have been undertaken in the following countries and regions: The European Union, Germany, The Netherlands, Denmark, USA, Kenya, Botswana, and Namibia. Further detail on the recycling policies and programmes in each of these countries is provided in Appendix A, along with full details on the sources of the data quoted in the tables.

As far as is possible, using readily accessible data, this comparative review provides:

- A description of the volume/mass of waste generated in each key waste streams.
- Recent estimates of the percentage of each waste stream that is recycled.
- A brief outline of the main policy measures that have been implemented (or that are anticipated) as a means of promoting recycling and reuse within the waste streams.
- Identification of the underlying reasons for the success and/or failure of the existing recycling initiatives. (See Appendix A)

This comparative review forms the basis for undertaking a comparative evaluation of the current situation regarding recycling in South Africa, which in turn serves as the basis for the recommendations in the final section of the report.

THE NETHERLANDS (Appendix A 2)	
All waste	51 m. tonnes (73% reused or recycled)
Paper	1.6 m. tonnes of packaging per annum (47% recycled)
Glass	0.5 m. tonnes of packaging per annum (84% recycled)
Plastics	0.5 m. tonnes of packaging per annum (10% recycled)
General Waste Policy	The implementation of the waste policy in the Netherlands is largely decentralised: the central government establishes the main points of policy while the provincial and local authorities work out the details and actually implement the policies. The Dutch waste policy places a central role on the use of Covenants, and has been giving attention to producer responsibility for an increasing number of product groups.
Regulatory instruments	
Recycling targets	30 priority waste streams have been identified, for which reduction and recycling targets were set, and concrete actions negotiated with the relevant groups. Depending on the waste stream, the targets are either legally binding or set on a voluntary basis between the parties involved. The recycling target for household waste is 60%. Specific recycling targets are set for packaging waste.
Requiring recycling plans	The disposal capacity is planned in the Provincial Environmental Policy Plans.
Landfill bans	The landfill decree bans the landfilling of 32 categories of waste coming both from households and companies, including household waste, cleanable contaminated soil, hazardous waste, paper and board, organic household waste, packaging, batteries, tyres and car wrecks, reusable construction and demolition waste, wood waste and horticultural foils.
Other laws	Packaging and Packaging Waste Regulation, Decree on the Disposal of Car Tyres, Decree on the Disposal of Car Wrecks and Decree on the Collection of Waste Oil.
Market-based instruments	
Waste taxes	The waste tax is levied on waste that is landfilled or incinerated, and is calculated on the basis of weight. As the aim of the tax is to make alternatives such as incineration, recycling and prevention preferable to landfilling, the tariff for landfilling is higher than for incineration, and nil for recycling.
Co-regulation & self-regulation	
Voluntary agreements	<p><i>Process-related agreements:</i> Sectoral agreements on waste management have been reached in target group consultations, for example in the basic metal, printing and chemical industries. These agreements are recorded in covenants, and are worked out in more detail by individual companies in the form of environmental plans.</p> <p><i>Product-related covenants:</i> Covenants have been concluded between the different parties involved in the product chain of certain product groups, such as packaging, end of life vehicles, packaging, waste paper and board, white and brown goods, batteries. Some of these agreements have been underpinned by specific regulation.</p>

	DENMARK (Appendix A 3)
All waste	12.8 m. tonnes per annum (63% recycled)
Paper	1.3 m. tonnes per annum
Glass	0.19 m. tonne per annum
Plastics	0.24 m. tonne per annum
General Waste Policy	“Waste 21” sets the agenda for the Danish waste policy up to the year 2004. It aims to curtail the amount of waste, and to improve the quality of waste management. The overall authority in waste matters is the Danish Environmental Protection Agency.
Regulatory instruments	
Recycling targets	The overall recycling target is 64%, and specific recycling targets for various sectors are laid down in Waste 21.
Requiring recycling plans	Local and regional councils are in charge of the practical administration of waste management, and have to survey waste amounts and to draw up waste management plans.
Recycled content laws	Rules may be made to require specified materials or products to contain specified quantities of recycled or recyclable materials or products.
Market-based instruments	
Waste taxes	<p>There is a general waste tax that is differentiated so that it is most expensive to landfill waste, cheaper to incinerate it and tax exempt to recycle it.</p> <p>Packaging taxes are levied on a number of products, including soap and detergents, lubricants, perfume, margarine, non-carbonated soft drinks, vinegar and edible oil, plastic foil foodstuff packaging manufactured from soft PVC, paper and plastic carrier bags, and disposable ware.</p> <p>A specific tax is levied on NiCd batteries, and the raw materials tax has been introduced to supplement the waste tax incentive to recycle construction and demolition waste.</p>
Deposit refund schemes	A Statutory Order stipulates that mineral water, beer and carbonated soft drinks may only be placed on the market in refillable packaging. The packaging is covered by a deposit and return system.
Subsidies	In the subsidy programme to promote cleaner products and recycling, funds have been allocated to projects on recycling, cleaner technology and waste.
Co-regulation & self-regulation	
Voluntary agreements	Voluntary agreements have been concluded for the following products: PVC, construction and demolition waste, CFC-bearing refrigerators, solvents, used tyres, and transport packaging.

	GERMANY (Appendix A 4)
All waste	337 m. tonnes per annum (25% recycling)
Paper	Data not available
Glass	Data not available
Plastics	3.2 m. tonnes per annum (58% recycling)
General Waste Policy	The objective on the German waste policy is to achieve a recycling-based economy. A fundamental element of this policy is product responsibility, as defined in the <i>Product Recycling and Waste Management Act</i> .
Regulatory instruments	
Recycling targets	Several Ordinances have been issued that aim to promote the recycling of specific waste streams, including: Ordinance on Avoidance of Packaging Waste, Ordinance on the Return and Disposal of Used Batteries and Accumulators, Ordinance on End of Life Vehicles, and Ordinance on Organic Waste.
Landfill bans	Waste consigned to landfill after 2005 must have a combustible content of less than 5%, which means that much of the organic waste will need to be eliminated (or recovered) prior to final disposal.
Market-based instruments	
Deposit refund schemes	The Packaging Ordinance entails a special regulation concerning beverage containers for which an exemption from the deposit/refund scheme can only be granted if the % of refillable bottles in consumption does not fall below 72% (20% for milk packaging). If the market share of the refillables falls below these values, the Government may introduce deposits on one-way packaging in the specific sector.
Information / education	
Eco-labelling requirements	The Blue Angel eco-labelling programme was created in 1977. As of December 1996, 920 manufacturers or importers had been awarded the Blue Angel for a total of 4 100 products in 76 different product categories.
Co-regulation & self-regulation	
Voluntary agreements	Several voluntary agreements have been initiated, but had to be underpinned by regulation (e.g. end of life vehicles and batteries).

	USA (Appendix A 5)
All waste	217 m. tonnes per annum (28% recycled)
Paper	84 m. tonnes per annum (42% recycled)
Glass	12 m. tonnes per annum (24% recycled)
Plastics	22 m. tonnes per annum (5% recycled)
General Waste Policy	Local government and private enterprise are responsible for waste collection and treatment. The US EPA encourages these organisations to recycle waste using a “collaborative” approach.
Regulatory instruments	
Recycling targets	The USEPA has non-statutory goals relating to waste management, including to reduce waste generation to 712 kg per person per year and to increase the MSW recycling rate to 35% by 2005.
Requiring recycling plans	State and local governments are responsible for preparing waste management plans promoting waste recovery. The USEPA provides technical and financial assistance for development of plans.
Landfill bans	All but two states have banned whole tyres from landfill. More than half of the states have banned the landfilling of yard trimmings, and many have also banned white goods, electrical scrap and batteries. The yard trimming bans have been particularly successful.
Recycled content laws	At least thirteen states have passed laws requiring mandatory recycled content in newsprint, while eleven states have voluntary agreements. Minimum recycled content laws have also been passed in three states for telephone books. Two states have laws requiring plastic packaging sold in-state to contain a certain level of recycled material, be re-usable a certain number of times, or have the plastic recycled at a fixed level within the state. While these laws have reduced paper and packaging waste and increased recycling rates, some claim that they are impractical and not necessarily environmentally and economically beneficial.
Market-based instruments	
Grants & subsidies	“Jobs Through Recycling” (JTR) is a multi-million dollar grants programme developed by the USEPA to create markets for recycled products and stimulate job growth in the recycling industry. Since launching JTR in 1994, the EPA has awarded more than US\$7.2 million in grants. A review of four programmes initiated through JTR shows that an investment of US\$1 million in grants has helped businesses create more than 1700 jobs and \$290 million in capital investment.
Waste taxes	The USEPA encourages communities to adopt a “Pay-As-You-Throw” approach, charging residents for the collection of MSW based on the amount thrown away. Over 4000 communities (serving 20 million people) have implemented PAYT. Most communities adopting PAYT have achieved recycling of at least 50%, with some communities’ recycling rates increasing by 500%.
Deposit refund schemes	Ten states have introduced mandatory deposit-refund systems for beverage containers. Generally, the deposit is imposed on beverage manufacturers, and retailers are given responsibility for taking back containers from customers. The deposit-refund systems have increased the return rates of beverage containers to between 70% and 98%. Virtually all containers that are collected are recycled, with recycling rates being highest for aluminium cans. However, opponents of the deposit-refund systems claim that the laws unfairly discriminate against certain types of packaging are too expensive to administer, and impose unrealistic paperwork requirements.

Information/ education	USA (Continued)
Eco-labelling requirements	Green Seal's eco-label criteria include recycled content requirements for paper and glass products. For example, paper products must contain between 50% and 100% recovered material, and 10% to 50% post-consumer material (depending on the specific product). Window glass must contain 25% post consumer material.
Government procurement policies	All federal, state and local government agencies must ensure that procurement guidelines do not present barriers to purchasing products with recycled material. The USEPA has also issued "Comprehensive Procurement Guidelines" designating products for which government agencies must develop affirmative procurement programmes. "Recovered Materials Advisory Notices" recommend recycled content levels for products listed in the guidelines. Since the introduction of these guidelines, government procurement of recycled content products has increased by over 50%.
Information on availability of recyclable material	The Chicago Board of Trade Recycling Partnership provides a formal recovered materials market exchange. The market helps to remove uncertainties over the price and availability of recovered materials. It also helps standardise the quality of recycled materials.
Public awareness programmes	The USEPA distributes a large amount of information relating to waste management, such as information on waste management programmes and policies, and ideas on how individuals, communities, businesses and others can reduce, reuse and recycle waste. The USEPA also runs public education campaigns, like its recent "Buy Recycled" programme. Other organisations, like the National Waste Prevention Coalition, also run education campaigns.
Co-regulation & self-regulation	
Public voluntary programmes	WasteWise is a free, voluntary USEPA programme. Participating organisations commit to achievements in waste prevention, recycling and the purchase or manufacture of recycled products. Participating companies may use the WasteWise logo in their advertising. The programme began in 1994 and there are now over 500 companies participating.
Eco-labelling initiatives	Green Seal is an independent, non-profit organisation that issues a third party eco-label to "environmentally preferable" products, including re-useable, recyclable and recycled products. To date, more than 300 products in 27 product categories have been awarded the Green Seal. This is somewhat "limited", considering the size of the market, although participating manufacturers have reported an increase in market share after certification.
Other voluntary initiatives	The Rechargeable Battery Recycling Corporation (RBRC) is a non-profit organisation that has established a take back programme for dry-cell rechargeable nickel-cadmium batteries. Over 22 000 retail, industrial, commercial and governmental facilities voluntarily participate as collection centres. Over 250 battery manufacturers fund the RBRC by paying a license fee in return for the right to display the RBRC symbol on their packaging.

	INDIA (Appendix A 6)
All waste	12-30 m. tonnes per annum in urban areas (approx. 40% recycled)
Paper	Approx. 4 m. tonnes per annum in urban areas
Glass	Approx. 1 m. tonnes per annum in urban areas
Plastics	Approx. 1.5 m. tonnes per annum in urban areas
General Waste Policy	The Indian government's recycling initiatives have tended to focus on quality issues in an attempt to ensure that recycling processes and recycled products are safe to humans and the environment. Government intervention in both the formal and informal waste management industries is minimal. In the past, issues of poverty, population growth and unemployment have sidelined the issue of waste management.
Regulatory instruments	
Recycling targets	None formally specified
Requiring recycling plans	The Municipal Solid Wastes (Management and Handling) Rules 1999 require municipalities to: <ul style="list-style-type: none"> - Organise programmes to raise awareness about waste segregation and recycling; - Ensure that biodegradable waste is composted, anaerobically digested or otherwise biologically processed; and - Ensure that all recoverable materials are reused or recycled.
Other laws	In response to concerns on the health implications of using recycled goods for food preparation and storage, the government has introduced rules banning the use of recycled plastic bags or containers for storing, carrying, dispensing or packaging food stuffs, and requiring recycled plastic bags to be manufactured in accordance with the Indian Quality Standards.
Market-based instruments	
Tax exemptions for recyclers	To encourage the recycling of industrial waste, the government applies an excise duty exemption to the production of building materials using fly ash or phosphogypsum. A custom duty exemption is also applied to imports of equipment and machinery for the conversion of industrial wastes for useful purposes.
Grants & subsidies	During the 1990s, government and semi-government bodies have provided several economic incentives for private companies to become involved in waste recycling and composting by providing: <ul style="list-style-type: none"> - Highly subsidised land; - Free supplies of waste; - 100% depreciation on machinery; - Grants and loans.
Deposit refund schemes	According to the United Nations Commission on Sustainable Development (UNCSD1999, p.6), deposit-refund practices are quite widespread in the consumer industry in India. However, other literature on waste management in India fails to mention the existence of any such schemes.

Co-regulation & self-regulation	INDIA (Continued)
Eco-labelling initiatives	<p>The Indian Government launched the Ecomark ecolabelling scheme in 1991. The Ministry of Environment and Forests, with the technical advice of the Central Pollution Control Board, manages the programme. The Ecomark label is issued to products that meet specified environmental criteria, one of which is that the product must be “recycled, recyclable, made from recycled products or bio-degradable, where comparable products are not”. In addition, “the material used for product packaging shall be recyclable, reusable or biodegradable”. To date, no products bear the Ecomark symbol, even though two products have been licensed to use the symbol. This is seen to be due to a lack of consumer and industry interest in the environmental performance of products. It may also be due to the costs involved in applying for the Ecomark.</p>
Other voluntary initiatives	<p>A number of other initiatives have been introduced by municipalities and non-governmental organisations (NGOs) in recent years, including:</p> <ul style="list-style-type: none"> - The formation of community-based organisations, to encourage public participation in the collection, segregation and disposal of waste; - The building of public/private partnerships; - Applying technological innovations to improve waste recovery. <p>Some of these initiatives have been in the form of internationally funded pilot projects or through bilateral agreements. Others are funded through “matching grants” that are offered to research and development institutions by the Indian Government.</p>

	KENYA (Appendix A 7)
All waste	340 000 tonnes per annum in Nairobi
Paper	Approx. 60 000 tonnes per annum in Nairobi
Glass	Approx. 30 000 tonnes per annum in Nairobi
Plastics	Approx. 15 000 tonnes per annum in Nairobi
General Waste Policy	The Kenyan Government's environmental policy its commitment to developing comprehensive waste management policies, strengthening institutional capacities, and implementing national awareness programmes. However, little has been done to achieve these goals. Despite the lack of governmental leadership, CBOs and NGOs have been quite active in promoting waste collection, reuse and recycling, generally focusing on increasing waste collection (for health and sanitation reasons) and generating employment for Kenya's urban poor.
Information/ education	
Public awareness programmes	In 1992, Nairobi residents formed a coalition for the "Clean up Nairobi" campaign. The campaign attempted to increase public awareness about waste reduction and composting. Members of the coalition also worked with the community to collect and compost waste. Originally the local council provided equipment for the campaign, but has since withdrawn support. This led to the collapse of the project.
Co-regulation & self-regulation	
Other voluntary initiatives	Various NGOs and CBOs have established programmes to encourage community involvement in waste management. These programmes focus particularly on low-income settlements in urban areas. The initiatives have increased public awareness about waste management, although their influence on recycling rates has been limited due to the limited market for recycled materials, lack of funding, and a lack of government support.

	Botswana (Appendix A 8)
All waste	325 000 tonnes per annum
Paper	Data unavailable
Glass	Data unavailable
Beverage cans	52% recycling rate
Plastics	Data unavailable
General Waste Policy	Botswana developed a waste management strategy in 1998, which embodies the basic premise to minimise environmental pollution. The main objective of the strategy is to minimise and reduce waste and maximise environmentally sound waste reuse and recycling, collection, treatment and disposal.
Regulatory instruments	
Recycling targets	None formally specified
Requiring recycling plans	The Waste Management Act (1998) requires the local authority to prepare a recycling plan as part of its waste management plan.
Market-based instrument	
Deposit refund schemes	In 1999, returnable bottles accounted for 20% of the total packaging of soft drinks and 15% of the total packaging of beer.
Information/ education	
Public awareness programmes	Environmental education is still at an early stage of development. A number of programmes are emerging from NGOs. Initiatives include the promotion of the use of reusable bags instead of plastic bags.
Co-regulation & self-regulation	
Other voluntary initiatives	Recycling of beverage cans is promoted by the South African company Collect-a-Can. The informal sector are largely responsible for collecting the cans from the urban centres and outlying areas. Scavenging on landfill sites is also practiced. School competitions are held to promote collection. Waste paper is collected in Gaborone and Francistown.

3.1 Comparison and analysis

This section identifies some of the common features within the above recycling initiatives, briefly reviews the effectiveness of these initiatives in promoting appropriate levels of recycling, and identifies some key considerations and constraints that will need to be provided for in the development of an effective and sustainable recycling programme in South Africa. A more detailed review of the status and results of the recycling initiatives in each country is provided in Appendix A.

While the design of an appropriate recycling system is dependent upon local circumstances and conditions, there are nevertheless a number of generic lessons that may be derived from the international experience with recycling that may be of relevance to policy-makers in South Africa. Hence, this comparative review serves as a basis, for the development of recommendations for South African policy makers, taking into consideration the specific socio-economic and environmental circumstances in South Africa.

3.1.1 Recycling Programmes: Common Features and Anticipated Trends

An overriding objective of government policy for recycling should be to enhance the market conditions for achieving an optimal level of recycling. An appropriate balance needs to be found between, on the one hand, securing the supply of recyclable materials and promoting demand for products made from these materials, while at the same time achieving the policy goals relating for example to equity, environmental effectiveness and economic efficiency.

The section outlines some of the common features and anticipated trends within the recycling initiatives of the countries examined above. At a general level it is possible to distinguish between, on the one hand, the more formalised recycling programmes found amongst certain member states of the EU and in the US, and on the other hand the less structured recycling initiatives evidenced in India, Kenya and Botswana. While both approaches rely on the use of the market for the achievement of certain levels of recycling, in the examined EU countries and the US there has been a more structured intervention by government with the aim of enhancing the role of the market in promoting recycling activities.

The following review focuses primarily on this more structured approach to recycling that is evidenced in the selected EU countries and the USA:

- These more structured governmental programmes for recycling demonstrate comprehensive and *integrated use of the full range of policy instruments*, including directive-based (“command-and-control”) regulations, economic instruments, voluntary agreements and education/information activities.
- Each of these programmes makes *formal statutory provision* for recycling. This includes provision for recycling within national environmental and/or waste policy frameworks, within waste management planning activities, as well as through the implementation of specific regulatory measures regarding particular products and/or waste streams. In some instances, such as Germany, a “framework law” on recycling has been implemented empowering the government to implement various regulations to promote recycling.
- *Statutory provision* for recycling has included for example the following:
 - Setting legally required recycling targets for particular waste streams;
 - Imposing landfill bans and/or recycling requirements for particular waste streams and/or products;
 - Requiring local governments to provide for recycling within their waste management plans;
 - Introducing product take-back requirements;
 - Mandating product labelling schemes to indicate recyclable and/or recycled content;
 - Specifying minimum mandatory recycled content;
 - Mandating the use of certain packaging types, such as the use of reusable containers for particular beverages;
 - Introducing government procurement requirements at national, provincial and/or local level;
- An important feature of many of the recycling programmes within the US and member states of the EU, is the *setting of targets* for preferred levels of recycling of particular waste streams. The objective of these targets should be to achieve the “socially optimum” level of recycling. To ensure this, targets should be based on reliable background data relating for example to the market conditions for recycled products and raw materials, and including full consideration for the environmental impacts throughout the life-cycle of the recycling chain for the particular waste stream. The targets should be measurable, realistic yet challenging, and developed with effective participation of stakeholders.
- There is increasing use within these programmes of *economic instruments* that are aimed at providing incentives for recycling, recovering the full social costs of waste disposal, and/or providing funds to initiate recycling. These instruments include:
 - Waste taxes (such as landfill taxes) aimed at promoting a shift up the waste management hierarchy;

- Taxes on certain forms of packaging or products (such as batteries) with the aim of reducing their use and/or recovering the full costs associated with their disposal;
- Deposit refund schemes, particularly for beverage containers;
- “Pay-as-you-throw” schemes charging households for the collection of domestic waste based on the volume of waste discarded;
- Provision of government grants and subsidies, for example for infrastructure, transportation, and/or recyclable materials, to assist in initial stimulation of markets for recycled products;
- The increasing use of *co-regulatory instruments* including:
 - Negotiated environmental agreements (or industry covenants) in terms of which industry sectors or individual firms enter into an agreement with national, provincial, and/or local government departments with formal commitments relating to recycling within particular processes and/or of products;
 - Public voluntary programmes, including eco-labelling schemes, in terms of which government provides technical, financial and/or marketing incentives for waste generators to participate in recycling initiatives;
 - Unilateral industry programmes, in terms of which industry sectoral organisations, with government recognition, provide incentives for industry members or individual waste generators to undertake recycling;
- The promotion of recycling practices through *public education, information and awareness* initiatives;
- In addition to the integrated application of these various policy instruments, there is an increasing trend towards the adoption of new *product-based policies* aimed at promoting more environmentally effective management of products throughout their entire life cycle, including where appropriate increasing the potential for recycling throughout the product chain, through initiatives such as “design-for-disassembly” and “design-for-recycling;”
- Related to this last trend, provision is increasingly being made for the recycling of a larger number of *product types*, including for example motor vehicles, electronic products and “white goods.”

3.1.2 Evaluation of Results of Recycling Initiatives

In assessing the impact and effectiveness of these structured governmental policies for recycling, a key consideration is to evaluate the extent to which these policies have resulted in increased levels of recycling. In addition, it is important to enquire:

- Whether any increase in recycling rates has been sufficient to offset any concomitant increases in the levels of waste disposed to landfill or incineration; and

- Whether the resulting level of recycling is in fact the economically and environmentally most effective response.

Examining first the extent to which formalised government intervention has resulted in increased rates of recycling, it is evident that in most of the countries there has been an increase in levels of recycling. Within the EU, for example: (EEA 1999)

- Paper and paperboard recycling has increased from 36% in 1985 to 49% in 1996;
- Glass has increased from 43% in 1990 to 55% in 1996
- Plastics recycling has increased by 4% per annum since the mid 1980s.

However, these improvements in recycling rates have generally not been sufficient to reduce, or even stabilise, the overall quantity of waste generated, which has risen by nearly 10% between 1990 and 1995, as compared with an economic growth rate of approximately 6.5 % (EEA 1999). In particular there has been an increase in the generation of glass and plastics waste. (COM (99) 543 Final 1999). For municipal waste, landfilling remains the most common treatment. From 1985-1995 there has been an increase in the amount of municipal waste landfilled from 86 million tonnes to 104 million tonnes. Even if part of this increase may be due to better registration it is reasonable to conclude that in absolute figures, the EU countries land-filled more municipal waste in 1995 than in the period 1985-90. As outlined in Appendix A, this trend is similarly apparent in a number of the individually examined member states of the European Union.

Assessing the environmental and economic costs and benefits of the government-imposed recycling programme is a complex exercise. It is dependent upon local conditions and requires access to detailed levels of information. Although it is not feasible – or necessarily conclusive (bearing in mind the dependency upon local conditions) – to provide a detailed evaluation of the costs and benefits of each of the above recycling programmes, it nevertheless may be useful to consider the findings of certain recent evaluations of the efficiency and effectiveness of different recycling initiatives.

The aim of briefly including the results of these studies is to highlight the need for a considered evaluation of the economic, environmental and social impacts of recycling initiatives, before a potentially costly government recycling programme with inappropriate environmental results, is implemented. It is essential that detailed cost-benefit analyses of the various policy options are undertaken prior to introducing policy aimed simply at increasing the level of recycling.

It is emphasised however that the results of studies conducted in Europe or the United States should not be seen as necessarily indicative of the results that would be found for similar reviews in South Africa. Furthermore, it is not intended in this section to provide a comprehensive review of all such recent studies, of which there are many.

Improving the Competitiveness of the European Recycling Industry

In July 1998, the European Commission published a report (*Communication on the Competitiveness of the Recycling Industries* (COM (98) 463 Final 1998)), with the aim of promoting competitiveness and improved environmental performance within the European recycling industries. This Communication was the product of an intensive survey of the competitiveness issues associated with recycling within the EU, and was undertaken in the belief that if the markets are given the right signals, the recycling sector would in many instances become profitable and would generate significant energy savings and create new jobs. A summary of the key findings and recommendations arising from the survey is provided in Box 3.1, with discussion in Appendix 1. One of the immediate consequences of the Communication was the establishment of the EU Recycling Forum bringing together key interested parties in the public and private sector to examine means for increasing the competitiveness of the recycling industry. The recommendations of the Forum will be presented in their Final Report which is due to be published in April 2000.

The Costs of Increasing Plastics Recycling in Europe

According to a recent study carried out for the European plastics manufacturers' association (APME) by the Dutch research institute TNO, increasing the EU target for plastic packaging waste recycling from its current level of 15% would result in limited environmental benefits at a substantially increased cost. The findings of this study have been used by APME to support its view that the EU should abolish packaging recycling targets and replace them with a requirement to stabilise the amount of waste going to landfill. Comparing the "eco-efficiency" of six waste management scenarios for plastics packaging, the study found that environmental impacts were progressively reduced up to a 50% recycling rate, but that the extra environmental benefits of much higher recycling were small.

The study did not assign monetary costs to the environmental impacts of the scenarios, but used a life-cycle analysis to measure the environmental impact of the scenarios and simply compared this to the economic costs of each one. The scenarios studied were:

- landfilling all waste;
- the "current situation" of 12% mechanical recycling,
- 3% feedstock recycling (in which plastic is broken down chemically)
- 15% energy recovery and 70% landfilling;
- 15% mechanical recycling and 85% energy recovery,
- and three further scenarios of combined recycling rates of 25%, 35%, 50% and the remainder incinerated with energy recovery.

According to this study, of all these scenarios the greatest environmental benefit at least cost, was provided by 15% recycling and 85% energy recovery (ENDS, 2000).

Review of Sweden's Waste Packaging Recycling Policy

In terms of a recent study undertaken for the Swedish finance ministry, by Luleå university and the Stockholm-based think-tank SNS, Sweden's waste packaging recycling policy is “exceedingly inefficient” and should be replaced by policies encouraging more incineration and landfilling of waste. The study suggests that the cost to Swedish society of reaching the high recycling levels aimed at for packaging waste are as much as 20 times greater than the environmental benefit achieved, and concludes that incineration and landfilling should be increased in place of recycling.

The main reason for the imbalance, it says, is a failure to undertake any cost-benefit analysis of increased recycling compared to other waste management options. In particular, the report finds, the policies have been structured to “impose a huge burden” on households, which have to clean, sort and transport waste to collection points. Assuming a cost to households of SKr60 per hour (Euros 7) for this service, and quantifying the environmental damage caused by each waste treatment method, the report concludes that recycling packaging waste costs Swedish society just over SKr34,000 per tonne, while incineration costs SKr1,842 and landfilling SKr1,840. Virtually all the estimated costs to society of the recycling option are due to the costing of householders' time taken in cleaning, sorting and transporting waste.

However, comparing the three options in purely environmental terms, recycling actually emerges as the most preferable one. The results of the study contradict an environment ministry review of recycling policies published last year, which concluded that recycling of packaging should be increased. They also run counter to the EU's current approach on recycling, which is to progressively increase rates. (ENDS, 1999)

BOX 3.1 - PROMOTING COMPETITIVENESS IN EU RECYCLING INDUSTRIES

This Box presents a summary of the European Commission's *Communication on the Competitiveness of the Recycling Industries* (COM (98) 463 Final 1998), that was published in July 1998 with the aim of promoting competitiveness and improved environmental performance within the European recycling industries:

EC Communication on The Competitiveness of the Recycling Industries

As outlined in Appendix A.1, this Communication was the product of an intensive survey of the competitiveness issues associated with recycling within the EU, and was undertaken in the belief that if the markets are given the right signals, the recycling sector would in many instances become profitable and would generate significant energy savings and create new jobs. Following is a summary of the key findings and recommendations arising from the survey.

Situation Analysis: The basic structure of the industry is seen to be the source of many of the problems connected with its viability. In particular, the industry is characterised by the co-existence of two major types of waste source (industry and household) with households generating more heterogeneous and lower quality waste than industry. This has tended to result in the establishment of a waste collection system that is characterised by the vertical integration of the various activities up to the sorting level. It is suggested that increasing the scale of operations and promoting greater specialisation would result in considerable savings in both branches.

Despite the disparity between the different branches of recycling, it is possible to identify a number of factors of competitiveness common to both branches. These relate to production, the supply and demand for recycled products and the manner in which the markets operate. The key identified factors operating at the production and supply level are:

- structural aspects, notably the increase in the cost of recycled products, caused by the growth of domestic as opposed to industrial waste;
- technical aspects affecting the cost of collecting and sorting, such as the complexity of products and insufficient information on them, which impedes their rapid dismantling.

At the demand level, the competitiveness of recycling activities is hampered by:

- the lack of interest on the part of processing industries for recycled raw materials on account of their technical features, limited possibilities for their use, and their negative image;
- the absence of pertinent industrial standards or the tendency for some standards or specifications to ignore or to discriminate against recycled materials or products.

In addition, the Commission identifies the following factors as affecting the functioning of the markets and the business framework:

- a lack of transparency, revealed by the almost total absence of indicators and statistics, and market fragmentation. This fragmentation is caused to a large extent by the lack of technical standards or common testing methods;
- a lack of consistency in the way in which existing Community regulations are applied (in particular, those relating to the definition, classification and transfer of waste), thus contributing to the fragmentation and distortion of the market.

Recommendations: On the basis of the analysis, the Commission identifies four types of action to increase the competitiveness of recycling companies and to boost activities in this sector:

- standardisation,
- the development of the market and of its transparency,
- measures in favour of innovation
- regulatory measures.

Among actions in the area of *standardisation*, the Commission proposes:

- a review of industrial standards to ensure that design favours the suitability of products for recycling and to eliminate obstacles to the use of secondary raw materials;
- the substitution of hazardous substances by other substances in products;
- the harmonisation of specifications and testing methods for recycled products;
- the development of marking systems aimed at facilitating the identification of substances and at aiding consumers to separate types of waste.

The following actions could help to *develop the market and improve its transparency*:

- the creation of exchanges for recyclable waste and secondary raw materials;
- a study of the savings to be made when using secondary raw materials throughout the life cycle of a product;
- improvement of the knowledge of markets through the compilation of statistics and studies of long-term trends for supply and demand.

Innovation can be stimulated by the following measures:

- targeted use of the 4th and 5th Framework Programmes for research;
- dissemination of research results and examples of good practices or national practices;
- development of quality management strategies in recycling businesses;
- use of the Community training programmes.

The Commission advocates the following *regulatory measures*:

- increased transparency of the regulatory framework and better supervision of its transposition;
- simplification of Community legislation (in particular administrative procedures);
- increased use of both market-based and regulatory instruments, to ensure that recycling is a competitive solution compared with other methods of waste disposal, such as landfilling;
- the drawing up of new regulatory measures to reduce the volume of dangerous substances, to increase the amount of recycled materials in some specific products and to encourage selective collection and the composting of biodegradable waste. The Commission will also study whether specific waste streams with a high quantity of recyclable waste or a high content of dangerous substances should be targeted through legislation.

The EU Forum on Recycling

The establishment of the EU Recycling Forum was one of the immediate consequences of the Communication, bringing together key interested parties in the public and private sector to examine means for increasing the competitiveness of the recycling industry. The recommendations of the Forum will be presented in their Final Report which is due to be published in April 2000. The report will be available at the following web-site: <http://europa.eu.int/comm/dg03/directs/dg3c/recycling/recycling.htm>

4. IMPLICATIONS FOR RECYCLING INITIATIVES

As a developing country, South Africa has a number of priority issues that require attention of which waste management is perceived to be of lower importance. South Africa also has a responsibility to address poverty through the implementation of sustainable development. The country is characterised by the growing urban population and the establishment of informal settlements where waste management facilities are usually non-existent. The rapidly growing urbanisation is resulting in increasing masses of refuse that must be disposed of, illegal dumping and litter. All have impacts of human health and the environment. In the light of the detrimental impact of urban influx on the environment and the natural resources of the city, and as part of the reconstruction and development process, Durban, Johannesburg and Cape Town have initiated Local Agenda 21 programmes in compliance with the Agenda 21 mandate adopted at the United Nation's 1992 Rio Earth Summit. These programmes aim to develop policies, processes and projects that will promote and ensure sustainable and environmentally acceptable regional development in South Africa.

The NWMS recognises the need to move away from end-of-pipe disposal to that of waste prevention, minimisation, recycling and re-use. Due consideration must be given to the integration of social, environmental and economic implications in achieving these objectives. The direct application of initiatives that have been implemented in developed countries are not necessarily the solution to the South African problem but cognisance should be given to the experience that has been gained in their operation.

4.1 *Benefits of Recycling*

Despite the absence of legislation mandating recycling in South Africa, an industry has developed primarily in the informal sector that has been driven by market forces. Recycling has evolved for a number of reasons including:

- Job creation
- Reduces pollution and conserves natural resources
- Conserves energy and reduces costs in manufacturing sectors.
- Litter abatement
- Reduction of the waste stream itself.

4.1.1 **Job Creation**

Within the current socio-economic climate, the informal and small business sector play an important role in job creation. The key issue is to achieve sustainable development, while providing for basic needs and alleviating poverty. Experience to date has illustrated that recovery, recycling and reuse of waste materials provides a livelihood for poor individuals and informal groups. For example, the establishment of a pilot Multi-material Buy-back Centre in Durban found that thirty three collectors were making use of the facilities within weeks of it opening (McClellan, 1998). It was found that 10 collectors were supporting a total of 43 people. The study also demonstrated

that the collectors wanted to be recognised as performing a useful service to the community and requested that they be issued with identifiable clothing, such as a T-shirt to ensure recognition and prevent harassment from the police and shop owners. This would also facilitate the removal of recyclables from the shops by the collectors. The difficulties of transporting material long distances without any means to do this were highlighted.

A policy of integrating collectors into formal waste management would contribute to sustainable management of resources, while strengthening employment and income generating programmes (McClean, 1998)

4.1.2 Reduces Pollution and Conserves Natural Resources

Life cycle assessment can be used to measure the potential environmental impacts across the life cycle of a defined system. Recycling is not a *panacea* for environmental problems and should not be pursued to the point of diminished returns or at any cost. A full appraisal of the environmental and economic benefits and cost of recycling, in comparison with one way consumption and disposal of used products and packaging is essential to define the appropriate role for recycling.

4.1.3 Conserves Energy and Reduces Costs in Manufacturing Sectors

Materials collected for recycling have already been refined and processed once, so the re-processing usually consumes less energy. In a study undertaken in the USA, recycling of newspaper, metal, glass and plastic containers compared to manufacture from virgin material was found to yield a net reduction in energy consumption of 16.8 million Btus (Franklin, 1993).

Paper manufacturers have built pulp and paper mills that are designed to recycle used paper in response to the increasing supplies of waste paper available and the fact that the operating costs are lower, thus allowing global competitiveness. Glass recycling also reduces energy consumption, as lower temperatures are required to melt the cullet, which results in an extended life of the furnace.

4.1.4 Litter Abatement

A number of informal sector initiatives have developed in the main urban centres to collect commodities that can be recycled. This has impacted positively on the litter problem that is encountered in these areas.

4.1.5 Reduction of Waste Stream

The economic value of recycling is usually viewed in terms of the value of the recovered material without considering the reduced cost of transporting and disposal of the waste, particularly with decreasing capacity of the landfill sites.

A comparison was undertaken for the Cape Metropolitan Area into the impact that increasing the rate of recycling would have on landfill requirements and costs. Should the current recycling rate of 7% be increased to 22% by the year 2030 a total of 36.2

million Rand per annum and 344 800 m³ of landfill capacity would be saved (Wright-Pearce, 1999).

4.2 Barriers to Recycling

A number of barriers to sustainable recycling in South Africa have been highlighted that will need to be investigated and addressed. These are discussed below.

The key to sustainable recycling is finding the balance be found between securing the supply of recyclable materials and promoting the demand for products that are made from these materials, while appraising the social, environmental and economic impacts. In South Africa a number of private sector organisations are currently active in recycling initiatives, whose success has been dependent upon the economic viability of recycling. Internationally, recycling initiatives are formalised as in the case of the EU and the USA or less structured as implemented in Kenya, India and Botswana. Formalised structures rely on government intervention to enhance market conditions to promote recycling. Policy instruments that have been implemented include directive-based regulations, economic instruments, voluntary agreements and education/information activities. These have resulted in an increase in the level of recycling but have not impacted on the total quantity of waste generated.

Although the design of an environmentally and economically effective recycling system is dependent upon local conditions, a number of findings can be derived from international experience that are relevant to South Africa. These include:

- Prior to the implementation of a recycling programme, a detailed evaluation of the economic, environmental and social impacts of recycling must be done. This should include an assessment of the life cycle costs associated with recycling, as compared with alternative methods of disposal.
- Markets for recycled commodities need to be stimulated to promote more profitable recycling and create jobs.
- A National Forum should be constituted comprising stakeholders of all sectors of the recycling chain, as a forum to discuss mechanisms to promote recycling and monitor their effectiveness.
- The co-ordinated implementation of policy measures aimed at: integrating recycling within waste management planning, increasing public awareness of the benefits and methods of recycling, and stimulating the ongoing adoption of market-driven recycling initiatives.
- An investigation into extended producer responsibility needs to be undertaken to identify its feasibility to promote recycling.
- Co-ordination of the proposed evaluation of recycling with a project currently ongoing with government in partnership with DANCED to identify and evaluate market-based instruments appropriate to waste management, including recycling is recommended.

- One initiative or approach will not necessarily meet all the identified needs in South Africa and geographical, demographic and socio-economic differences will have to be taken into account in designing localised recycling programmes.

4.3 Lessons from South African and International Experience

4.3.1 South Africa Experience

Despite the lack of legislation to drive recycling in South Africa, there is a relatively high level of recycling practiced, which is influenced by socio-economic and demographic factors. Monetary incentives are of prime importance in the lower income groups with environmental concerns driving recycling behaviour in the middle to upper income groups (McClean, 1998)

Market forces determine the levels of recycling and limited subsidisation of the collection process takes place. Recycling of waste, however, is not generally viewed as an essential part of waste management in South Africa. Consequently no standard mechanism exists for implementing and funding recycling. The majority of initiatives have been developed on an *ad hoc* basis and have been funded by the private sector, with minor financial inputs from the authorities. Recycling centres and garden waste-drop-off centres are established in some of the larger cities, which rely on voluntary separation and delivery to the site.

The reasons for the failure of capital-intensive recycling plants has been identified to include the overestimation of the value of recoverable materials, unrealistic requirements of the municipalities involved, the economy experienced a down turn at the time that the projects were launched, informal pickers had removed recyclable materials from the waste stream at source, and decreases in price of recycled materials. The success of kerbside collection of separated material has also been found to be limited due to public apathy.

The issues surrounding the viability of recycling in South Africa are complex. A full appraisal of the social, environmental and economic benefits and cost of recycling, in comparison with one way consumption and disposal of used products and packaging is essential to define the appropriate role and mechanisms for recycling. Different solutions may be appropriate for different geographic locations in South Africa. Initiatives need to be promoted to review the end markets for the recycled material and mechanisms to promote their implementation.

The implementation of successful recycling initiatives is not a short-term activity but rather an ongoing initiative that must be reviewed and revised based on the experience that is gained. A continued campaign will be required to change people's behaviour and to take responsibility for their waste. All stakeholders must take responsibility and their activities integrated into holistic waste management planning.

4.3.2 International Experience

Waste management in European countries and the USA is characterised by a plethora of legislation that controls the amount of waste that must be recycled.

State subsidisation in Europe has created administrative difficulties in the recycling industry. An oversupply of material has created stockpiles, which are either incinerated or dumped in other countries, which damages the recycling industry in that country. Subsidised companies are paid to use recycled material, which disadvantages competitors in countries that do not subsidise recycling. This economic advantage will lead to the emulation of the German legislation by those countries that can afford the additional cost, e.g. France.

The University of East Anglia has researched the validity of the current European Union policy of setting landfill as the least favoured waste management technology. Their findings have refuted the basis on which that strategy was devised but also shows that recycling is economical when drop-off collection points are established (Lombard, 1999). The cheapest option for managing domestic waste was recycling, followed by landfill, incineration and then composting (Table 4.1).

Table 4.1: Comparative Costs of Waste Disposal in Europe

Disposal Method	Disposal Cost (EU/tonne)		
	Economic Cost	Environmental Cost	Nett Cost
Landfill	95.3	2 to 20	97 to 115
Incineration	156.1	11 to 23	167 to 179
Drop off recycling	80.8	-282 to -17	-201 to 64
Kerb side recycling	109.8	-230 to -41	-120 to 69

(Source: Lombard 1999)

Internationally, deposit refund systems have generally proven to be an expensive solution and target only a narrow range of packaging material. Vendors would be obliged to collect the returned container which would incur additional costs, increased handling and storage and could be a health hazard, e.g. vermin. The sale of the product has shown to fall due to the increased cost of marketing a reusable container. Studies in Canada have shown that deposit/refund systems costs five times what it costs Ontario residents to operate multi-material kerbside recycling systems (Corporations Supporting Recycling, 2000).

Recycling has not always proven to be the most cost effective solution to the waste problem. Studies undertaken into the environmental and economic impact of recycling waste paper compared to other methods of disposal have shown that the most appropriate method of disposal should be incineration with energy recovery (New Scientist, 1997). In Australia, a national shortfall of \$100 million was identified in the recycling operation in Australia despite the strong public participation for kerbside collection and support from government and industry. A study is presently ongoing to

undertake a life cycle assessment of landfilling and recycling of paper and packaging waste (Lundie et al, 2000). The results of this study will be available later this year.

4.4 **Practical Considerations for Collection of Recyclable Materials**

Social problems are crosscutting issues in waste management and cannot be ignored in developing and implementing recycling options. Recycling programmes could be made more viable if markets are created for products that contain recycled materials. Waste reduction or minimisation and reuse should also be implemented together with (or before) recycling programmes. For example, the recycling of paper should run concurrently with a reduction in the amount of packaging waste generated.

It is important that proper planning is carried out prior to recycling programmes. Markets need to be assessed, expertise built, realistic goals set the public must be involved. The waste stream becomes almost irretrievable after disposal but material can be collected between the point of generation and the point of disposal.

4.4.1 **Source Separation**

There are advantages and disadvantages to source separation and material recovery from mixed waste (Table 4.2). In general, source separation is preferred over mixed waste recovery because of the limited marketability of the dirty recyclables extracted from the waste stream at high cost. The selection of the most appropriate system involves evaluating social factors, collection and processing economics and product markets.

Table 4.2 Advantages and Disadvantages of Source Separation versus Mixed Waste Material Recovery

Source Separation	Material Recovery from Mixed Waste
<i>Advantages</i>	
<ul style="list-style-type: none"> • Cleaner recyclables with higher market demand • Generators bear cost and responsibility for partial separation • Higher recovery rates than mixed waste separation • Low cost, drop-off facilities can be used 	<ul style="list-style-type: none"> • Requires no change in generators habits • No need for education of generators • No change in collection system • Appropriate for multi-family homes or apartments with high turnover and/or lack of environmental ethic
<i>Disadvantages</i>	
<ul style="list-style-type: none"> • Separate collection system or compartmentalised trucks required for kerbside collection • Requires education of generators • Added cost of recyclables containers • May require clean material recovery facility • Potential for theft of bins and materials 	<ul style="list-style-type: none"> • Contamination of recyclables resulting in lower market demand or unmarketable materials • Requires 'dirty' material recovery facility • Lower recovery rate than source separation unless system included production of compost or refuse derived fuels

(Source: Wright and Pearce, 1999)

Four levels of separation are possible:

- *Two-stream sort:* Recyclable materials are separated from the general refuse.
- *Three-stream sort:* Recyclable fibre (Paper and cardboard); glass, metal and plastic; and general refuse.
- *Four-stream sort:* Recyclable fibre (Paper and cardboard); glass, metal and plastic; organic waste; and general refuse.
- *Multi-stream sort:* Complete separation of each of the recyclable commodities.

Garden waste makes up a large portion of the residential and commercial organic waste stream and can be easily separated at source from the general waste stream.

Kerbside Collection: Kerb side collection of recyclables is possible for those communities that have kerbside refuse collection services. The collection of recyclables from informal areas is of a low priority until an effective general waste collection service has been established. The costs of collection are the most expensive part of the recycling operation.

Drop-off or Buy-back Centres: Drop-off or buy-back centres typically require all material to be completely separated. The advantages of drop-off facilities include:

- The cost for material separation and delivery becomes the responsibility of the waste generator.
- Infrastructure requirements are simple and reduced labour force for processing the material.
- Improved health and safety standards.

The disadvantages include the reduced rates of collection compared to kerbside collection and the need to have a means to transport the material to the centre. Drop off points in South Africa form a major part of current recycling initiatives but sites within urban areas have become a social problem, as informal salvagers are encouraged to break open or tip out the contents of the containers to find the waste with a high value.

4.5 Roles and Duties

All stakeholders must be committed to the recycling policy. The stakeholders involved in recycling all have a shared responsibility to ensure the success of the process. The industry responsible for introducing the commodity into the market place should according to NEMA have a responsibility to ensure that the commodity is re-usable or recyclable. Consumer goods are to a great extent produced without any responsibility for what happens to these items after their use. The damage to the environment and the cost for remediation is thus shifted to the public and society. Stakeholders should ensure that they use only those commodities that are recyclable or re-usable.

The establishment of public/private partnerships should be designed such that industry is not able to abdicate their responsibility for their waste.

4.6 *Enhancement of Market Conditions Through Policy Instruments*

An important objective of government policy should be to enhance the market conditions for recycling by finding an appropriate balance between securing the supply of recyclable materials and promoting demand for products made from these materials, while at the same time achieving the social, environmental and economic principles.

This section presents a brief outline of the different types of policy instruments that may be used to promote recycling. The instruments have been divided into four broad groups:

- Regulatory approaches
- Market-based instruments
- Information / education initiatives
- Co-regulatory and voluntary initiatives.

4.6.1 *Regulatory Instruments*

One of the driving forces for change in the waste management industry in South Africa could be regulation together with the appropriate enforcement.

There are a number of different regulatory instruments that government may use to directly or indirectly mandate behaviour towards greater recycling. These include for example:

- Setting and enforcing targets for the recycling of particular waste streams;
- Banning particular non-recyclable products and packaging;
- Specifying and mandating the recycling content of particular products;
- Requiring the preparation of recycling plans;
- Imposing recycled product labelling laws;
- Imposing requirements to procure recycled products.

Regulatory instruments should be used as controlling tools to ensure that the desired result is achieved.

4.6.2 *Market-based Instruments:*

As a means of providing the right incentives for recycling, and for ensuring the efficient operation of the market, there are a number of market-based instruments that government could introduce, including for example:

- Product-related charges: e.g. reduced sales tax on products with recycled material;
- Tax exemption for recyclers purchasing new recycling equipment;

- Provision of low interest loans for purchase of capital equipment;
- Raw material charges;
- Landfill charges;
- “Pay-as-you-throw” charges;
- Deposit refund schemes;
- Recycling credits.

4.6.3 Information/Education strategies

In addition to seeking to change behaviour through the introduction of regulations and incentives, government also has a potentially important role in supporting initiatives aimed at increasing awareness and understanding amongst all public and private-sector stakeholders (see section 2.1.4) regarding the benefits and techniques associated with recycling, as well as assisting consumers in identifying products which contain recycled material. Possible strategies include:

- Introduction of eco-labelling requirements;
- Promotion of government procurement policies;
- Provision of information regarding the availability/benefits of recyclable material;
- Promotion R&D into appropriate recycling technologies;
- Enhancing general public awareness through appropriate programmes.

4.6.4 Co-regulatory and self-regulatory strategies:

Finally government may promote recycling by providing a policy framework that supports the effective introduction and development of self-regulatory and co-regulatory policy instruments. These include, for example:

- Public voluntary programmes: such as the USA EPA Waste Wi\$e strategy
- Negotiated environmental agreements: such as the Dutch Packaging Covenant
- Unilateral industry initiatives: such as the South African Collect-a-Can.

4.6.5 Impact of existing policies

In addition to implementing any new appropriate policy instruments, it is important also to consider the impact (both positive and negative) of existing regulations and other instruments on recycling. Issues to consider include for example:

- To what extent is recycling currently facilitated or promoted through existing legislation and related policy instruments; what measures can be taken to further enhance this potential?

- Are there any legal incentives/barriers for the creation of recycling centres (e.g. zoning, permits, business regulations, ordinances etc)?
- Are there any legal incentives/barriers for waste separation and minimisation at source?

4.7 *Designing and Implementing an Effective Recycling Programme*

The following elements should be considered in designing an effective recycling programme, be it at a national, provincial, local or community level:

- Defining legislation/political priorities for recycling (e.g. NEMA, NWMS and Action Plans);
- Gathering background information for decision-making (e.g. this report);
- Implementing supportive policy framework;
- Introducing supportive technical measures.

These elements are considered in more detail in the accompanying reports on integrated waste management planning and should be read in conjunction with these reports.

4.7.1 *Defining Political Goals and Priorities For Recycling:*

The preparation of strategies that encompass the waste management hierarchy will take political will, as well as the will of the people to accept these changes. It is important that visible improvements result from improved methodology and sound transparent financial management (Novella, 1999).

The first step in the development and implementation of an effective recycling programme is to ensure that there is clarity as to the overriding goals of the programme. There are a number of different goals that may underlie the motivation for a recycling programme:

- The promotion of the most economically efficient recycling option (as evidenced for example by the behaviour of the market with minimal government intervention);
- The promotion of job creation opportunities;
- The minimisation of short-term and long-term environmental impacts;
- The implementation of other political objectives (relating for example to addressing existing inequalities between economic and/or racial groups).

Some of the above goals may be supportive of each other, while others may involve making trade-offs. Resolving such trade-offs (e.g. between economic efficiency and environmental effectiveness) involves making a political decision, which ideally should be taken in consultation with appropriate stakeholders, as guided where possible by the earlier agreed principles.

In terms of the recycling programme for South Africa, the principal goals and priorities to guide the development and implementation of the programme are reflected at a general level in the requirements of the Environmental Management Policy for South Africa and the National Environmental Management Act (NEMA), as well as more specifically within the White Paper for Integrated Pollution and Waste Management for South Africa, and the National Waste Management Strategy and associated Action Plans. The key priorities of these policy initiatives – as they relate to recycling – are outlined in Section 1 of this report.

4.7.2 Gathering background information on current recycling status

The next step in the implementation of an effective recycling programme is to ensure the availability of appropriate information on which to base policy decisions. Relevant information should be gathered (as far as possible using existing available information sources) with the aim of evaluating the potential for enhancing existing recycling initiatives, and for identifying an appropriate role for government in promoting recycling.

Current figures for commodity recycling include a range of estimates. To be measurable, it will be necessary for industry to initiate an acceptable auditing mechanism.

The type of information that should be gathered include:

- Identify existing mass of recyclable material currently being diverted to recycling operations within:
 - Traditional sectors such as: glass, paper, metal, plastics;
 - Emerging sectors such as: building rubble, used oils, batteries, tyres, electronic waste, cars, and electrical and electronic industries;
- Identify mass of potentially recyclable wastes currently being sent to landfills;
- Compare against international figures for recycling, noting the different socio-economic conditions and environmental constraints;
- Analyse potential to improve recycling by identifying:
 - Reasons why current volumes are being recycled, and potential to further enhance this potential;
 - Existing barriers against greater volumes being recycled, relating for example to marketability, and economic and legal constraints;
 - Existing barriers against completely new waste streams being recycled;
- Identify relevant environmental considerations (positive and negative of the recycling initiative);
- Identify key stakeholder sentiments relating to recycling;

- Identify nature of existing systems for recycling including for example:
 - Waste collectors/transporters;
 - Recycling processors/material recovery facilities;
 - Waste recycling brokers;
 - Waste converters;
 - End-use markets;
 - Current level of informal / community involvement;
 - Status of technologies for different waste streams;
- Assess availability of governmental and private sector resources;
- Gather comparative information on experiences in other countries (*this document*);
 - Compare volumes of generated waste and the recycling rates achieved;
 - Identify nature and focus of comparative policy instruments, assessing their effectiveness in achieving stated recycling objectives;
 - Identify nature of other measures that adopted to promote recycling;
- Assess relevance of this information for development of policy in SA.

4.7.3 Implementing the recycling programme: Practical considerations

The final stage in implementing an effective recycling programme is the need to address the various *technical considerations* associated with recycling. These include for example:

- Identifying the appropriate method for collecting recyclable material, of which there are a number of possible options:
 - Drop-off recycling;
 - Kerb side collection;
 - Buy-back centres;
 - Mixed waste collection with manual /mechanical separation;
- In identifying the appropriate collection method, provision should be made for the nature of the waste source, noting for example the following possible waste types:
 - Restaurant waste;
 - Institutional waste (government and offices);
 - Retail waste (packaging);
 - Demolition waste;
 - Appliances and electronic waste;
 - Recyclable material associated with automobiles.

Provision also needs to be given to the processing method to be used for recycling, which obviously will vary depending on the nature of the waste type.

A twelve step programme that summarises the steps to be followed when implementing a recycling programme are shown in Box 4.1.

Box 4.1: A 12-Component Recycling Programme Plan

Based on (US EPA, 1995)

1. Identify goals.
2. Characterise recyclable quantity, composition, and accessibility.
3. Assess and generate political support.
4. Assess markets and market development strategies for recyclables.
5. Assess and choose technologies for collection and processing.
6. Develop budget and organisation.
7. Address legal and siting issues.
8. Develop start-up approach.
9. Implement education and publicity programme.
10. Begin programme operation.
11. Supervise ongoing programme and continue publicity and education.
12. Review and adjust programme.

5. CONCLUSIONS AND RECOMMENDATIONS

The key to sustainable recycling is finding a balance between securing the supply of recyclable materials and promoting the demand for products that are made from these materials, while appraising the social, environmental and economic impacts.

In South Africa a number of private sector organisations are currently active in recycling initiatives, whose success has been dependent upon the economic viability of recycling. Internationally, recycling initiatives are formalised as in the case of the EU and the USA or less structured as implemented in Kenya, India and Botswana. Formalised structures rely on government intervention to enhance market conditions to promote recycling. Policy instruments that have been implemented include directive-based regulations, economic instruments, voluntary agreements and education/information activities. These have resulted in an increase in the level of recycling but have not significantly impacted on the total quantity of waste generated.

Several European studies have demonstrated diminishing returns on the environmental benefits with increasing recycling rates. Life cycle analyses of some wastes, e.g. plastics and paper identify the incineration of the waste with energy recovery as providing the greatest environmental benefit and most cost-effective solution. Incineration is favoured over landfilling of waste.

Although the design of an environmentally and economically effective recycling system is dependent upon local conditions, a number of lessons learnt from international experience and South Africa experience. These include:

- Prior to the implementation of a recycling programme, a detailed evaluation of the economic, environmental and social impacts of recycling need to be undertaken. This should include an assessment of the life cycle costs associated with recycling, as compared with alternative methods of disposal.
- Markets for recycled commodities need to be stimulated to promote more profitable recycling and create jobs.
- A National Forum should be constituted comprising stakeholders of all sectors of the recycling chain, for discussing mechanisms to promote recycling and monitor their effectiveness.
- The co-ordinated implementation of policy measures aimed at: integrating recycling within waste management planning, increasing public awareness of the benefits and methods of recycling, and stimulating ongoing adoption of market-driven recycling initiatives;
- An investigation into extended producer responsibility needs to be undertaken to identify its feasibility to promote recycling.
- Co-ordination of the proposed evaluation of recycling evaluation with a project currently ongoing with government in partnership with DANCED to identify and evaluate market-based instruments appropriate to waste management, including recycling.

- One initiative or approach will not necessarily meet all the identified needs in South Africa and geographical, demographic and socio-economic differences will have to be taken into account in designing localised recycling programmes.

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APPENDIX A

Review of International Initiatives

This appendix provides information about recycling initiatives that have been undertaken in the following countries and regions: The European Union, Germany, The Netherlands, Denmark, USA, Kenya, Botswana, and Namibia. As far as is possible, using readily accessible data, this review provides:

- A description of the mass of waste generated in each key waste streams.
- Recent estimates of the percentage of each waste stream that is recycled.
- An outline of the main policy measures that have been implemented (or that are anticipated) as a means of promoting recycling and reuse within the waste streams.
- Identification of the underlying reasons for the success and/or failure of the existing recycling initiatives.

1. EUROPEAN UNION

1.1 Levels of Waste Generation and Recycling

The reported total waste generation within the 15 member states of the EU and Norway increased by nearly 10% between 1990 and 1995, while economic growth was about 6.5% in constant prices. (EEA 1999). The total amount of waste generated in 1995 (excluding agricultural waste) was estimated to be 1.3 billion tonnes (approximately 3.5 tonnes per capita), approximately 36 million tonnes of which was hazardous waste. (EEA 1999) Half of the waste comes from the manufacturing industry and construction and demolition activities, while municipal waste, mining waste and waste from other sources each contribute about one sixth of the total. (EEA 1999)

Currently, limited systematic and consistent data hinders the development of projections for future waste trends. Nevertheless, it is predicted that most waste streams are likely to increase over the next decade. By 2010 it is estimated that the generation of paper and cardboard, glass and plastic waste will have increased by around 40 to 60% as compared with 1990 levels. The number of scrapped cars will also increase around 35% compared to 1995 levels. (EEA 1999)

In most EU countries landfilling is still the most common treatment route for waste. In terms of the EU's commitment towards recycling (see details below), there has been most evidence of increased recycling (as opposed to energy recovery and landfilling) of paper and glass.

However, this development has been only a partial success, as the total volume of waste paper and glass has also increased during the same period. In the EU and Norway the recycling rate for paper and paperboard increased from 36% in 1985 to 49% in 1996. However, a 3.5% per annum increase in total consumption meant that the quantity of paper waste incinerated or landfilled also rose. Similarly, while recycling for glass has increased almost 50% from 5 million to 7.4 million tonnes per year, the amount of waste glass for disposal was only reduced by 12% from 6.7 million to 5.9 million tonnes due to the increase in waste glass. (EEA 1999)

1.1.1 Paper and cardboard

The figures for the generation of paper and cardboard waste in EU are based on the known levels of consumption, in the belief that consumption levels present a reasonable proxy for waste levels. During the period 1983-1996 the consumption of paper and cardboard increased by 46 % (from 41 million to 64 million tonnes) corresponding to an average increase of 3.5 % per year. The levels of per capita consumption of paper and cardboard vary significantly amongst the EU member countries, ranging from 49 kg per person per year in Portugal (1993) to 260 kg per person per year in Belgium (1990). Projection results indicate a likely increase in paper and cardboard consumption within the EU in the range of 44% - 62 % from 1995-2010. It is estimated that if no initiatives are taken to reduce consumption, the generation of paper and cardboard waste will have reached an actual level of between 92 and 105 million tonnes by the year 2010. (EEA 1999)

The level of recycling for paper is generally seen to be high. In the EU and Norway recycling has increased proportionately from 36 % in 1985 to 49 % in 1996. However, because of the increase in consumption, more paper is presently incinerated and landfilled compared to the situation in 1985. In 1996, 32.5 million tons of paper and cardboard were incinerated and landfilled compared to 28.3 million tonnes in 1985. (EEA 1999) To ensure that there is no increase in the incineration and land-filling of paper and cardboard by 2010, it has been estimated that this will require a growth of 100% in recycling, equivalent to an increase of more than 2 million tons per annum.

1.1.2 Container glass

During the period 1990-1996 the consumption of glass for packaging increased in the EU countries and Norway by almost 14% from 11.7 million to 13.3 million tonnes. On the basis of these results it is estimated that from 1995-2010 there will be a likely increase in the amount of glass waste within EU of between 24 to 53 % (The increase of 24% is based on the model using constant coefficients, while the increase of 53 % is based on the model using long historical observations). About 75% of container glass production is used for beverages, excluding return bottles (which are only regarded as waste when the bottle is finally discarded). The balance of glass production for packaging is used for food, pharmaceuticals, cosmetics and chemical products.

As with paper, there has been some progress in achieving targets for recycling, with recycling levels for the EU and Norway levels increasing from 43% in 1990 to 55% in 1996. However, due to the increasing levels of consumption, it has been estimated that up to 14 million tonnes of waste glass would need to be recycled by 2010, simply to ensure stabilisation of the amount of glass currently landfilled. This is an increase of 35% to a 90% level of recycling. (EEA 1999)

1.1.3 Plastic waste

It is estimated that the mass of plastic waste in the EU has been increasing by 4% per annum since the mid-1980s. ((EEA 1999) quoting (SOFRES 1996)). In 1990, 13.6 million tonnes of post-use plastic waste was generated in the EU, Norway and Switzerland, and in 1994 the quantity reached 17.5 million tonnes. Only 20 % of plastic waste is subjected to material or energy recovery, while an average of 80 % is disposed of, either through incineration without energy recovery, or to landfill. ((EEA 1999) citing (APME 1996))

Approximately 60% of plastic waste is found in the municipal waste stream. This hampers the ability for effective recycling initiatives for two reasons: firstly comprises municipal waste comprises different fractions and types of plastic waste, thus requiring complicated sorting techniques which make provision for health and safety concerns; and secondly such waste is often contaminated with foodstuffs, requiring labour and energy intensive separation and recycling methods. Projections indicate that the amount of plastic waste within municipal waste streams will increase by 63% from 1993 to 2005. ((EEA 1999) citing (APME 1996)).

1.2 EU Policy Measures Relating to Waste and Recycling

In the 1957 Treaty of Rome, which established the European Economic Community, no formal provision was made for the environment. The initial focus of EC waste legislation was thus on ensuring the approximation of national regulations that had a direct impact on the economic goals of the common market. In 1972 the Member States asked the Commission to draw up an environmental policy, resulting in the publication of the first Action Programme on the Environment. Four further Action Programmes have followed every five years, with the latest (“Towards Sustainability – The Fifth EC Environmental Action Programme”) being published in 1993. Following promulgation of the Single European Act (1987), the Maastricht Treaty (1992), and the Treaty of Amsterdam, there has been a significant increase in the adoption of European legislation that deals directly with the environment, as well as more specifically with waste management issues.

1.2.1 European Community Strategy for Waste Management (1989)

The cornerstone of European waste policy is the Community Strategy for Waste Management, which was adopted in 1989 by the European Commission. In addition to a number of detailed measures the strategy sets out the following general objectives:

- The promotion of the waste management hierarchy, which prioritises waste prevention, followed by re-use and recycling, and finally the optimisation of its disposal (including, for example, energy recovery);
- The Proximity Principle which requires that waste is dealt with as closely as possible to its source;
- The promotion of self-sufficiency of waste management at every level.

In the 1996 review of the strategy a number of new objectives were added, including:

- An undertaking to introduce targets for waste minimisation and recovery;
- Incorporation of the principle of Producer Responsibility, ensuring that the producers of goods are involved in managing the waste arising from those products;
- Addressing the lack of quantified and standardised information;
- Promoting the adoption of more sophisticated policy measures, such as economic instruments and voluntary agreements.

1.2.2 General Directives Relating to Waste Management

Following approval of the 1989 Waste Management Strategy a number of directives relating to waste management were promulgated. These may be divided broadly into three groups:

- The “Framework Directives on Waste”: These Directives, which include reference to more detailed directives such as those on Hazardous Waste and Waste Shipment, place a heavy emphasis on the promotion of the waste

management hierarchy, and in particular on encouraging waste recovery and recycling;

- Directives on specific waste streams: These include measures aimed at promoting the prevention of waste, as well as the development of common rules for the separate collection and treatment of particular waste streams. Examples include the Directive on Packaging and Packaging Waste (examined further below), as well as Directives relating to batteries, waste oils, sewage sludge and PCBs;
- Directives aimed at reducing the impact of waste treatment and disposal: These set out common technical standards for the operation of treatment facilities, and include for example Directives relating to the incineration of municipal solid waste, and the management of hazardous waste and landfills.

1.2.3 The Council Directive on Packaging and Packaging Waste

The 1994 Directive on Packaging and Packaging Waste (Council Directive 94/62/EC 1994) is the most explicit of the various EU Directives as regards the implementation of the waste management hierarchy and the promotion of recycling activities. The aim of the Directive is to harmonise national measures concerning the management of packaging and packaging waste, with the goal of reducing environmental impacts while at the same time ensuring the efficient operation of the internal market. To achieve this, the Directive provides for the adoption of measures aimed firstly at preventing the production of packaging waste, and secondly at promoting the reuse and recycling of packaging waste. The Directive covers all types of packaging and packaging wastes, including sales packaging, grouped packaging, and transport packaging, regardless of the material used.

In terms of Article 6 of the Directive, Member States must establish systems for the return, collection and recovery of packaging waste such that the following targets are reached by 30 June 2001:

- The recovery of between 50%-65% by weight of the packaging waste;
- The recycling of between 25% and 45% by weight of the totality of packaging materials, with a minimum of 15% being recycled for each packaging material.

To achieve the targets, governments are required *inter alia* to:

- Introduce effective systems for the return and/or collection of used packaging and/or packaging waste from the consumer, or other final user of the waste stream (Article 7);
- Ensure within a stipulated time frame that packaging is clearly marked, indicating the nature of the packaging material/s used (Article 8);

- Indicating the nature of the packaging material(s) used and to specify which materials are subject to the identification system. To assist in this, the Decision establishes the numbering and abbreviations on which the identification system is based;
- Ensure that sum of concentrations of certain heavy metals present in packaging or packaging components do not exceed stipulated levels (Article 11);
- Introduce effective databases on packaging and packaging waste so as to monitor the implementation of the objectives of the Directive (Article 12)l;
- Implement measures (within a specified time-frame) to ensure that the users of packaging (including in particular consumers) obtain the necessary information regarding the available return, collection and recovery systems (Article 13).

Following approval of the Directive, a number of implementing measures have been undertaken. These include in particular:

- A proposal for a Directive on the marking of re-usable and recyclable packaging (to be practised on a voluntary basis by economic operators), and on the establishment of a conformity procedure for packaging. This was put forward by the Commission in November 1996 (COM (96) 191Final 1996); an amended proposal is currently awaited from the Commission.
- A Commission Decision (European Commission 1997) establishing the identification system for packaging materials (in terms of Article 8(2) of the Packaging Directive) was approved in January 1997. This Decision establishes the numbering and abbreviation on which the identification system is based, indicating the nature of the packaging materials used and specifying which material are subject to the identification system.

In response to the Packaging Directive, most European countries have introduced some form of packaging regulation and operate a packaging recovery and recycling scheme. These include for example: (Waste Watch 1998)

- *Germany*: The German Packaging Ordinance and the Green Dot scheme was introduced in 1991, making it one of the first European attempts to implement the principle of Extended Producer Responsibility. The German system Duales System Deutschland (DSD) is funded by the Green Dot scheme whose license fee is calculated according to material type and weight. The Green Dot symbol indicates to the consumer that the packaging should be disposed of in one of the collection systems organised by the DSD. (The implementation and overall effectiveness of the scheme is examined in section 4.4.1 of this appendix).
- *Austria*: The scheme for implementing the EC Directive on Packaging and Packaging Waste in Austria, Altstoff Recycling Austria (ARA), is similar to the German system but it collects transit packaging as well as consumer packaging. The fees are also levied by material and weight. A significant

difference of the Austrian scheme is that limits on the quantities of different packaging materials disposed of in landfill have been imposed. In 1994, a 5% reduction in the amount of packaging material consumed was reported.

- *Sweden:* The concept of producer responsibility for waste has been extended beyond packaging in Sweden. Economic and physical responsibility for collection, recovery and recycling has been given to producers of packaging, newspapers, journals and old tyres. Further expansions to include hazardous batteries and electronic goods are planned, along with a voluntary scheme for demolition waste and old furniture. Similar approaches to producer responsibility exist in Denmark, Taiwan and Japan.
- *France:* The French scheme Eco Emballages is funded through compulsory contributions from the manufacturers responsible for the packaging of household goods sold in France. Local authorities are paid by the industry to collect packaging material separately for recycling.

Further analysis of the national implementation of the Packaging Directive in Germany and the Netherlands is provided in section 2 and 4 of this appendix, along with an assessment of other related recycling measures.

Proposed Revision of the Packaging Directive

It is anticipated that the European Commission will propose changes to the Packaging Directive during April 2000. There remains some uncertainty regarding the nature of the proposal, and it is expected that there will be some tough negotiations within the Commission before anything emerges. In terms of the 1994 directive, by the end of June 2001 the EU should approve “substantially increased” targets for 2006. Under pressure to meet this legislative deadline, the Commission's environment department has recently released its latest thoughts on how to proceed. According to some observers, it is expected that a legislative proposal will be formally adopted by April, and that the scope of this proposal will be limited to changes to the Directive's recovery and recycling targets, with a broader revision to be undertaken at a later date. In recent meetings, a main area of focus has been on possible derogations on the presence of heavy metals in glass. Under the Directive, these must be restricted to no more than 100 parts per million by 30 June 2001, and member states discussed proposals to allow derogations for recycled glass and decorated glass.

1.2.4 Additional Specific Actions to Promote Recycling

In addition to the above waste-related Directives, a number of new initiatives are under way within the European Union that either directly or indirectly seeks to promote waste recycling. These include:

- **The Introduction of Integrated Product Policy:** Based on the current levels of waste generation, and on expected trends within the EU, there is growing recognition that while existing policies provide some degree of improvement, this will not be sufficient to stabilise waste arisings and achieve EU targets for sustainability. An important new policy initiative that may have a potentially significant impact on the amounts of waste is the EU's recent

investigation into Integrated Product Policy (IPP). Recognising the need to consider the total life cycle of products and services, and the importance of using preventative measures at source, the Commission is currently investigating the potential for introducing product based policies, and has recently undertaken a detailed study into this issue. (Ernst and Young 1998);

- *Extended Producer Responsibility for Electrical and Electronic Waste*: In recognition of the problems associated with the increasing stream of discarded electrical and electronic equipment, measures have been proposed aiming at improving product design for recycling, and establishing appropriate collection, treatment and recovery systems;
- The proposed *Directive on the Landfilling of Waste* which establishes targets for the reduction of biodegradable municipal waste going to landfills;
- The proposed *Directive on End-of-life Vehicles*: An important feature of this proposed Directive is the introduction of targets for the re-use, recycling and recovery of such vehicles;
- *The Communication on The Competitiveness of the Recycling Industries* (COM (98) 463 Final 1998): Published on 22 July 1998, the Communication on The Competitiveness of the Recycling Industries is the product of an intensive survey of the industrial competitiveness issues associated with recycling. The survey was undertaken in recognition of the fact that current recycling industries are confronted with insufficient demand and excessive competition from non-recycled material, and in the belief that in many cases the recycling sector could become profitable and generate many new jobs, as well as resulting in effective energy savings. The resulting Communication identifies key factors for enhancing the competitiveness and environmental performance of recycling industries, including for example the nature of existing economic structures, the functioning of the market and the technical and regulatory context. A summary of the conclusions of the Communication is presented in Box A1.1;
- *The EC Recycling Forum*: One of the immediate results of the Communication was the establishment in January 1999 of the EC Recycling Forum, which was given the mandate of reporting back to the Commission by the beginning of 2000 with recommendations on how best to improve the competitiveness and performance of the recycling industries. The Forum, which comprises representatives from government, industry and other organisations, established four separate working groups: Environmental, Economic and Social Diagnostics (Working Group A), Standardisation and Market Development (B), Innovation and Research (C), and Regulatory Approaches (D). The final report of the Recycling Forum is due to be published in March 2000.

1.3 Evaluation of recycling initiatives within the EU

The evidence of a general increase in waste generation (of nearly 10% between 1990 and 1995, as compared with an economic growth rate of approximately 6.5 % (EEA 1999)) suggests that waste prevention initiatives have generally not been sufficient to

reduce, or even stabilise the quantity of waste. As identified earlier, while the recycling of certain wastes has been successful in a number of EU member states it has not been sufficient to result in an overall reduction in the generation of some of these waste streams, particularly glass and plastics waste. (COM (99) 543 Final 1999). For a number of specific countries it is possible to identify an increase in recycling and a reduction in landfilling for the period 1985-1995, but for most countries landfilling is still the most common treatment method.

For municipal waste it is possible to demonstrate trends in treatment in the EEA member countries. Even though there has been an increase in the rate of recycling, landfilling remains the most common treatment and in 1995 was on the same level as in 1985-90. In the same period there has been an increase in the amount of municipal waste landfilled from 86 million tonnes to 104 million tonnes. Even if part of this increase may be due to better registration it is reasonable to conclude that in absolute figures, the EEA countries land-filled more municipal waste in 1995 than in the period 1985-90.

A more detailed assessment of the implementation of the key EU Directives relating to waste management is undertaken below in the context of the national initiatives for implementing the EU directives

BOX A.1.1 - PROMOTING COMPETITIVENESS IN EU RECYCLING INDUSTRIES

This Box presents a summary of the European Commission's *Communication on the Competitiveness of the Recycling Industries* (COM (98) 463 Final 1998), that was published in July 1998 with the aim of promoting competitiveness and improved environmental performance within the European recycling industries:

EC Communication on The Competitiveness of the Recycling Industries

As outlined in section A.1.2.4 above, this Communication was the product of an intensive survey of the competitiveness issues associated with recycling within the EU, and was undertaken in the belief that if the markets are given the right signals, the recycling sector would in many instances become profitable and would generate significant energy savings and create new jobs. Following is a summary of the key findings and recommendations arising from the survey.

Situation Analysis: The basic structure of the industry is seen to be the source of many of the problems connected with its viability. In particular, the industry is characterised by the co-existence of two major types of waste source (industry and household) with households generating more heterogeneous and lower quality waste than industry. This has tended to result in the establishment of a waste collection system that is characterised by the vertical integration of the various activities up to the sorting level. It is suggested that increasing the scale of operations and promoting greater specialisation would result in considerable savings in both branches.

Despite the disparity between the different branches of recycling, it is possible to identify a number of factors of competitiveness common to both branches. These relate to production, the supply and demand for recycled products and the manner in which the markets operate. The key identified factors operating at the production and supply level are:

- structural aspects, notably the increase in the cost of recycled products, caused by the growth of domestic as opposed to industrial waste;
- technical aspects affecting the cost of collecting and sorting, such as the complexity of products and insufficient information on them, which impedes their rapid dismantling.

At the demand level, the competitiveness of recycling activities is hampered by:

- the lack of interest on the part of processing industries for recycled raw materials on account of their technical features, limited possibilities for their use, and their negative image;
- the absence of pertinent industrial standards or the tendency for some standards or specifications to ignore or to discriminate against recycled materials or products.

In addition, the Commission identifies the following factors as affecting the functioning of the markets and the business framework:

- a lack of transparency, revealed by the almost total absence of indicators and statistics, and market fragmentation. This fragmentation is caused to a large extent by the lack of technical standards or common testing methods;
- a lack of consistency in the way in which existing Community regulations are applied (in particular, those relating to the definition, classification and transfer of waste), thus contributing to the fragmentation and distortion of the market.

Recommendations: On the basis of the analysis, the Commission identifies four types of action to increase the competitiveness of recycling companies and to boost activities in this sector:

- ☐ standardisation,
- ☐ the development of the market and of its transparency,
- ☐ measures in favour of innovation
- ☐ regulatory measures.

Among actions in the area of *standardisation*, the Commission proposes:

- ☐ a review of industrial standards to ensure that design favours the suitability of products for recycling and to eliminate obstacles to the use of secondary raw materials;
- ☐ the substitution of hazardous substances by other substances in products;
- ☐ the harmonisation of specifications and testing methods for recycled products;
- ☐ the development of marking systems aimed at facilitating the identification of substances and at aiding consumers to separate types of waste.

The following actions could help to *develop the market and improve its transparency*:

- ☐ the creation of exchanges for recyclable waste and secondary raw materials;
- ☐ a study of the savings to be made when using secondary raw materials throughout the life cycle of a product;
- ☐ improvement of the knowledge of markets through the compilation of statistics and studies of long-term trends for supply and demand.

Innovation can be stimulated by the following measures:

- ☐ targeted use of the 4th and 5th Framework Programmes for research;
- ☐ dissemination of research results and examples of good practices or national practices;
- ☐ development of quality management strategies in recycling businesses;
- ☐ use of the Community training programmes.

The Commission advocates the following *regulatory measures*:

- ☐ increased transparency of the regulatory framework and better supervision of its transposition;
- ☐ simplification of Community legislation (in particular administrative procedures);
- ☐ increased use of both market-based and regulatory instruments, to ensure that recycling is a competitive solution compared with other methods of waste disposal, such as landfilling;
- ☐ the drawing up of new regulatory measures to reduce the volume of dangerous substances, to increase the amount of recycled materials in some specific products and to encourage selective collection and the composting of biodegradable waste. The Commission will also study whether specific waste streams with a high quantity of recyclable waste or a high content of dangerous substances should be targeted through legislation.

The EU Forum on Recycling

The establishment of the EU Recycling Forum was one of the immediate consequences of the Communication, bringing together key interested parties in the public and private sector to examine means for increasing the competitiveness of the recycling industry. The recommendations of the Forum will be presented in their Final Report which is due to be published in April 2000. This report will be available at the following web site: <http://europa.eu.int/comm/dg03/directs/dg3c/recycling/recycling.htm>

2. THE NETHERLANDS

2.1 *Levels of Waste Generation and Recycling*

The Netherlands are the highest per capita generators of waste within the European Union. In 1993, for example the average solid waste production of households and industries in the EU was 363kg per capita, while in the Netherlands this figure was 497kg per capita. (Eurostat 1993) It is estimated that in 1996 the Netherlands had approximately 51 million tons of waste. (This excludes the estimated 60 million tons of animal manure, dredging sludge, contaminated soil and radioactive waste, as these wastes are managed under a separate policy framework). Of the 51 million tons of general waste, approximately 73% is estimated to have been reused or recycled in 1996. (See Table A2.1).

Total household waste production in 1996 amounted to 6 175 000 tons. Of this quantity almost 44% was collected separately for reuse. The percentages for separate collection were as follows: 74% of the total amount of glass, 58% of the organic household waste, 47% of the paper and board, 21% of the textile and 1% of the plastic. The recycling target for household waste as a whole is 60%. For non-returnable glass packaging the target is 90%, for paper and board 85% and for textiles 50%. (VROM 1998) A more detailed breakdown of recycling levels for packaging waste is provided below.

Recent developments in the Recycling of Packaging wastes: The recycling percentages since 1993 and the recycling obligations for the Industry for the year 2001 are shown in Table A2.2. The total recycling percentage according to the “new” measuring system decreased to 49%, largely due to the low estimated value for recycled packaging made of paper and cardboard.

The recycling percentage for paper and cardboard packaging increased slightly according to the “old” measuring system. For packaging glass the recycling percentage is 9% higher than in 1997 according to the “new” measuring system, and is approaching the minimum recycling percentage of 90%. According to the “old” measuring system, a slight increase was seen in the recycling percentage. This difference can be traced back to the difference in the total quantities of packaging glass in the double measurements. Recycling of metal packaging continued to grow. In 1998, 26 kilotons of Metal packaging were disposed of in landfills, by which most of this material will become available for recycling as the shift from dumping in landfills to incineration of residual wastes continues. This could contribute to achieving the minimum recycling obligation of 80% in 2001. For plastic packaging the recycling percentage continues to be too low, as a result of which the agreed recycling percentage remains out of reach. For wooden packaging the recycling percentage 1998 was 23%, which is far higher than the minimum percentage agreed to for 2001. (Packaging Committee 1999)

Table A2.1: Estimated Waste Volumes in the Netherlands

Dutch waste (000 tonne)	1985		1996	
	Reuse / recycling	Landfill / incineration	Reuse / recycling	Landfill / incineration
Consumers				
- Household	940	3830	2510	3665
- Bulky household	50	565	685	635
Traffic				
- Car wrecks	390	105	180	70
- Shipping	800	480	725	40
- Other	30	85	225	50
Agriculture			1395	250
- Agricultural waste	520	250		
- Other	165	30		
Industrial				
- Phosphoric acid gypsum		2000		1460
- Jarosite		220		190
- Treatment sludge	735	365	605	480
- Soil residues		1250	775	100
- Waste oleaginous seed	2400		3270	
- Blast furnace slag	1200		1325	
- Phosphorous slag	600		605	
- Other	6670	2390	8350	1860
Trade / Public sector				
- Office/shops/services	415	2180	1005	1750
- Sweepings	170	1030	460	495
- Other	65	75	200	135
Construction waste	6050	6180	12700	1200
Energy supply	505	150	1200	55
Refineries	25	60	460	50
Treatment sludge	1965	1580	365	1435
Total	22950	23600	37040	

Source: (VROM 1998)

Table A2.2: Recycling percentages since 1993 and recycling obligations for 2001 (figures for 1997 and previous years are based on the monitoring system applied for the first covenant)

Packaging Material	Recycling percentages packaging waste							2001 Recycling obligation (%)
	1993	1994	1995	1996	1997	1998 'old'	1998 'new'	
Paper/ Cardboard	57	56	62	62	64	65	47	85
Glass	66	72	74	72	75	76	84	90
Metals	36	32	39	60	69	74	78	80
Plastics	9	10	11	11	14	14	10	27*
Total	47	47	50	52	56	57	49	65
Wood	-	-	-	-	-	-	23	15

* In addition to this 27%, an additional obligatory effort amounting to 8% material recycling was agreed to in the Covenant. (Source: Packaging Committee, 1999).

2.2 General Policy Framework on Waste and Recycling

In response to increasing evidence of environmental pollution in the late 1960s, the Dutch government drafted a series of sectoral-based environmental laws. This fragmented sectoral approach was significantly revised in the 1990s with the promulgation of a single piece of legislation: the Environmental Management Act of March 1993. This is a framework act that promotes an integrated approach to environmental problems, both in terms of industry permitting as well as public administration. (VROM 1998)

Regarding waste issues, the relevant provision of the earlier Chemical Waste Act (1976) and the Wastes Act (1977) have been incorporated into Chapter 10 of the Environmental Management Act. This sets out the key rules and principles relating to waste management, and makes specific provision for the promulgation of regulations (as required) relating for example to:

- Implementation of the waste management hierarchy;
- The prohibition of landfilling or incineration of waste;
- The prohibition of the manufacture or import of certain products;
- Requiring producers and importers to take back a product at the waste stage and to dispose of it or have it disposed of in a prescribed manner;
- Obliging companies and waste collectors to separate waste, to keep it separate, to hand it in separately or to process it in a different way on the spot.

In the wake of the National Environmental Policy Plan (NEPP), the Dutch waste policy has been based in the 1988 Memorandum on the Prevention and Recycling of Waste. It sets reduction and recycling targets for 29 priority waste streams (now 30), and defines the way in which concrete actions should be negotiated with relevant target groups.

The Third NEPP aims for 80% re-use by 2010 by:

- Giving more responsibility to producers;
- Optimising and expanding waste separation at source;
- Extending the prohibition on the dumping of waste. (VROM 1998).

Extended producer responsibility (EPR) was early recognised as an important tool for achieving waste reduction and increased recycling as agreed in the memorandum of 1998, and today the concept underpins the Dutch waste policy. It is the connecting link to the product policy promoted by the Dutch environmental ministry. The concept of EPR was given a legal basis when it was included in the waste chapter of the Environmental Management Act in 1994.

Priority waste streams (1990)	
Dredging materials	Plastic waste
Manure	Scrap vehicles
Construction and demolition waste	Glass (non-refillable)
Household waste	Jarosite
Sewage sludge	Shredder waste
Packaging waste	Hospital waste
Commercial waste	Blasting grid
Phosphoric acid gypsum	Scrap in household waste
Shipping waste	Oxylime sludge
Waste paper/cardboard	Waste oil
Street waste, market waste	Car tyres
Power plant ash	Halogenated hydrocarbons
Municipal waste incineration residue	Paint waste/spray painting waste
Bulk household waste	Pickling acid
Polluted soil	Batteries

The implementation of waste policy in the Netherlands is largely decentralised. Central government establishes the main points of policy while the provincial and local authorities work out the details and actually implement the policies. Examples of these are the planning of the disposal capacity in the Provincial Environmental Policy Plans and the granting of licenses to companies that collect and process waste and to businesses that produce waste. (VROM 1998)

The local authority is designated in the Environmental Management Act as the agency responsible for collecting household waste. The Environmental Management Act also obliges local authorities to collect organic household waste separately door-to-door. As a result of provincial environmental regulations, local authorities are obliged to collect paper and board, glass, textiles and small chemical waste separately. (VROM 1998)

2.3 **Regulatory measures**

A number of waste orders have been promulgated by the Minister for Housing, Spatial Planning and the Environment including for example: the Waste (Landfill Ban) Decree, the Decree on the Disposal of Car Tyres, the Decree on the Disposal of Car Wrecks and the Decree on the Collection of Waste Oil. The organisation of producer responsibility for the product groups batteries, plastic agricultural foils and packaging had also to be underpinned with regulation. Some specific regulatory measures are described in more detail below.

2.3.1 **Waste (Landfill Ban) Decree**

This decree bans the landfilling of 32 categories of waste coming both from households and companies. Since 1 October 1995, there has been a ban on the landfilling of household waste, cleanable contaminated soil, hazardous waste, paper and board,

organic household waste, packaging, batteries, tyres and car wrecks. Since 1 January 1997, the ban is valid for reusable construction and demolition waste, wood waste and horticultural foils. (VROM 1998)

2.3.2 Decree on the Disposal of Car Wrecks

The EPR scheme for ELV (discussed in section A.2.5.1) is an example of a voluntary agreement with no formal basis in legislation. However, at the request of industry and in order to avoid the problem of free riders, the waste disposal fee that is imposed when a car is first registered was enshrined in the Environmental Management Act. This fee has been declared generally binding by the Ministry of Housing, Spatial Planning and Environment.

2.3.3 Decree on the Disposal of Batteries

In 1995 the Environment Ministry introduced the Decree on the Disposal of Batteries, making the producers and importers responsible for organising and financing the disposal of batteries they put on the market. They had to ensure that by 1 January 1998 90% of batteries were collected separately and reprocessed. The obligations are difficult for individual companies to implement, and the producers and importers set up the Batteries Foundation (Stibat) in order to achieve the goals. The foundation is responsible for organising the transport, sorting and treatment of batteries, but shares collection responsibilities with municipalities and retailers. Batteries from consumers in particular are collected through municipal collection (small scale chemical waste) and through facilities in retail stores (battery banks). The batteries are handed free of charge to collectors contracted by Stibat. The cost of collecting from the households is covered by the local authorities, and the remaining costs are carried by the producers. In practice, this means that Stibat charges these costs on the participating companies according to the type of battery. The producers cover the extra costs by internalising them in the price of the product. (Dijkzeul 1996)

In addition there are a number of relevant provincial bylaws relating to the disposal of commercial and hazardous waste such as rules on collection and rules on reporting the submission or receipt of commercial waste and hazardous waste. Supplementary regulations may be laid down in terms of provincial environmental bylaws for the collection of household waste by the local authority, in those instances where the disposal of the household waste is seen to be a matter that extends beyond the interests of the local authority. Local authority waste bylaws mainly include rules on the disposal of household waste such as specifying which components have to be kept separate, the frequency of waste collection and the agencies carrying out the collections. (VROM 1998).

2.4 Market-based instruments

Financial instruments are deployed to promote waste prevention. Examples are fiscal schemes such as the Green investment scheme the scheme for accelerated early depreciation on environmental investment, and the waste tax.

2.4.1 Waste Tax

The Dutch Waste Tax entered into force on January 1, 1995 as a part of the Act on Taxes with an Environmental Base. The waste tax is an important part of the policy presented in the Second National Environmental Policy Plan for raising landfill costs to match those for incineration. It was expected that the increase in the costs of landfilling would make preferable alternatives such as incineration, recycling and prevention. The waste tax is levied on waste that is delivered to landfills and incinerators, and is calculated on the basis of the weight of the waste. Since one of the aims of the tax is to decrease the cost difference between incineration and landfilling, the tariff for landfilling is higher than for incineration (Dfl 29.81 or US\$ 13.53 per ton and nil, respectively). The tariff for combustible waste that is landfilled was in 1999 Dfl. 65.55 (US\$ 30) per ton. The revenue raised by the waste tax is estimated to be about Dfl. 200 million per year (US\$ 90 million). The revenue is not earmarked for environmental policy, but it is allocated to the general budget. (VROM 1998)

The proprietor of and establishment where waste matter is delivered for processing is liable for the waste tax. Normally, they will pass the tax on to the suppliers of the waste. In some cases the waste delivered consists of refuse collected by the municipalities. These municipalities can pass the cost increase on to their citizens by raising the local waste disposal charge (an earmarked municipal charge financing the collection and disposal of municipal waste). (VROM 1998)

The waste tax does generally not distinguish between different kinds of waste. While there may be environmental reasons to use a differentiated tariff for different waste streams, it was decided not to do that for practical reasons. For some waste streams, however, there are special provisions in the Act. For example, vegetable, fruit and garden waste, which is offered separately to a landfill, is not taxed (in the Netherlands, organic waste is collected separately to be composted). Additionally, non-purifiable polluted dredging sludge and soil, de-inking residue (taxing these kinds of waste would make paper recycling more expensive than the alternative, thus stimulating the use of primary material), and asbestos are not taxed. (VROM 1998)

In June 1997, the government sent an evaluation report on taxes with an environmental basis to the parliament. Although it was not possible to give quantitative data about the environmental effects of the waste tax, because of the short period of experience, it was found that the tax played a role in the mix of instruments which are used in the environmental policy. The waste tax has contributed to the desired shift from dumping to prevention, recycling and incineration. Important negative effects or economic problems were not found. (VROM 1998)

2.5 *Co-regulation and self-regulation*

The Dutch National Environmental Policy Plan (NEPP), which was introduced in 1989, has placed a central role in the use of Covenants to implement environmental policy objectives. While maintaining existing legal instruments, the purpose of a Covenant, as an agreement between authorities and companies under private law, is to increase the flexibility to choose the optimal and most efficient ways of improving the environmental performance of activities through self-regulation. The NEPP has

identified the major themes to be considered, “disposal of waste” being one of them. The NEPP has also identified target groups that have a major influence on the implementation of environmental objectives.

In the context of the target group approach, two types of Covenants can be distinguished:

- *Product-related Covenants* are focused on the group of companies involved in the production or handling of a particular product. Examples include the packaging and car wreck covenants. In the implementation of these Covenants, special institutional structures are usually set up for implementation and monitoring.
- In the case of *process-related agreements*, the corporations belonging to the different sectors are invited by the provincial administration to make plans concerning how they will meet the sector level goals. The provincial authorities are also involved in monitoring and enforcement, when necessary. (OECD 1998)

At industry level, agreements are reached in target group consultations on measures to restrict the amount of waste or to dispose of the waste in a different way. These agreements are recorded in covenants and are worked out in more detail by individual companies in the form of company environmental plans. This has been done for the basic metal industry, the printing industry and the chemical industry.

Among the thirty priority waste streams that were identified, three product groups were identified in which a lot of different waste categories came together: end-of-life vehicles (ELV), waste from electric and electronic equipment (WEEE) and packaging waste. The government’s philosophy was a clear preference for self regulation by industry. (Clement 1999)

2.5.1 End of Life Vehicles (ELV)

Auto Recycling Nederland BV (ARN) was set up in October 1993 by RAI (car manufacturers and importers), STIBA (car dismantlers), BOVAG (garages), SVN (shredder companies), and FOCWA (damage repair companies). SVN no longer exists and therefore is not a member of ARN. This organisation was the result of a request from the Ministry of Environment to the industry to prepare a plan to tackle the problem of ELV, and follow up discussions among different stakeholders.

Under the ARN scheme, transport and processing costs are funded by internalising the costs of disposal in the product price (advance disposal fee). This fee is charged by the producers when a new car is purchased and goes to a fund managed by ARN. The last owner has no hand in the obligation, but he can do it in quite a dense net of dismantling companies free of charge, in order to de-register his vehicle and be exempted from the ownership tax. Licensed car dismantling companies that are members of ARN are contractually obliged to dismantle certain materials and have them disposed of. The same contract binds ARN to pay a premium for activities carried out to this end. These companies should meet certain environmental requirements in their operations. They

should also issue a certificate of destruction to the last owner in order to exempt him from tax expenses and other obligations.

ARN arranges contracts with companies for collecting and recycling the reusable components. Collection and recycling companies selected by ARN are bound by contract to accept the dismantled materials and subject them to high-grade recycling. Under the same contract ARN undertakes to pay a premium for all such activities performed. ARN gives subsidies for research on new methods of dismantling, collection and processing for existing materials. This way, ARN intends to encourage the development of recycling that might not be profitable in the beginning. (ARN 1998) The ARN system is resulting in more recycling of materials. Moreover, the ARN system is resulting in an improvement in business operations in car dismantling companies.

2.5.2 White and brown goods

In the Netherlands, about 125 000 tons of white and brown goods are discarded annually. After years of discussion, industry was not able to achieve a voluntary system, which would really guarantee an environmentally friendly approach. (Clement 1999) As a result, the “Disposal of White and Brown Goods decree” was approved by the government in 1997. Under the system that took effect at the beginning of 1999, larger household appliances were required to be recycled and manufacturers and importers to bear the costs. All smaller household electrical and electronic appliances, except lighting, are now covered as well. The Netherlands Association for Disposal of Metaelectro Products (NVMP) was created by manufacturers and importers to manage collection and recycling. It imposes a disposal levy on each new product marketed in the Netherlands, to be paid by consumers at the point of purchase.

2.5.3 Packaging and packaging waste

The Packaging Covenant, signed on 6 June 1991, was the outcome of intensive discussions between industry and government. In practice all large enterprises felt obliged to participate, with the result that about 60% of total packaging volume, (about 2000 of a total of 400 000 individual firms) were partners in the covenant.

The text of the covenant reaffirms some of the general goals of the 1998 Memorandum on the Prevention and Recycling of Waste regarding the avoidance, reuse and recycling of packaging and packaging waste. Among the general objectives that were already contained in the 1998 Memorandum are to achieve:

- no increase in the amount of packaging generated;
- elimination of landfilling for packaging waste; and
- qualitative waste reduction by substituting hazardous compounds with more environmentally benign materials.

The Packaging Covenant reinforced some of the general objectives of the Memorandum and introduced additional goals:

- to substitute hazardous packaging materials with less hazardous materials by the year 2000. Beyond 2000, packaging should not contain any hazardous substances, for example, heavy metals;
- to reduce the total amount of packaging at least to the 1986 level, and to attempt a further 10% reduction;
- to promote re-usable packaging, as well as meeting the 60% recycling target for disposable packaging. (OECD 1998)

In order to give due consideration to the environmental and economic impacts of packaging materials and packaging waste, including costs of collection and handling, recyclability, energy recoverability, among others, life cycle analysis and market economic analysis are used as guidelines for implementing the Covenant's targets. (OECD 1998)

By the end of 1994, the European Commission published the packaging directive that obliged individual Member States to enact legislation on packaging. As a result, the Dutch Packaging and Packaging Waste Regulation was published on 4 June 1997 and entered in force on 1 August 1997. In the Covenant II, mutual agreements are made between government and industry at the level of branches or sectors of industry and at the level of material chains. Only by joining the covenant an individual enterprise may be exempted from the complicated and costly implementation of the obligations from the Regulation. (VROM 1999)

The Packaging and Packaging Waste Regulation (July 1997) states that with effect from 1 August 1998, producers or importers shall ensure that of the amount of packaging made available by them to another party, in so far as this is not reused as a product, such an amount is taken back that:

- 65% by weight is recovered;
- 45% by weight is recycled as a material, and
- per packaging material as high a percentage by weight as possible is attained in material recycling, but as a minimum 15% by weight for each packaging material

The basic idea underlying the Regulation is that attaining the targets set out in the Directive calls for effort from all those involved in placing packaging on the market and disposing of it. This reflects the principle of chain responsibility:

Disposers of waste, being consumers and businesses, are expected to co-operate in the separate collection of recyclable packaging materials. Just as in the present situation, disposers of industrial waste must pay for the costs of disposal themselves, although they are expected to be encouraged by producers and importers to intensify the separation of packaging waste with a view to its reprocessing.

Local authorities are responsible for setting up collection systems at least for glass and paper/cardboard originating from private households.

Every *producer or importer* who places packed products on the market is responsible for prevention and for achieving specific percentages of recovery and material recycling.

Raw materials producers are expected to take all measures that may reasonably be demanded of them to recycle the packaging materials submitted separately. In practice, this will mean *inter alia* that they must ensure there is adequate processing capacity to be able to achieve the specified percentages and that they must share equally in the burdens and costs of meeting the obligations.

The *other links in the packaging chain* will also be required to take all measures that may reasonably be expected of them to enable the producers and importers to discharge their obligations. In addition, both private collectors and carriers or logistic services providers -in so far as they do not pack, process or treat products- are in fact intermediaries between parts of the chain and do not in themselves constitute part of it.

2.5.4 Impacts of the Covenant

According to the information available, the competitiveness of the Dutch industry neither increased nor decreased because of the packaging measures. Further, trade aspects, such as the disturbance of trade caused by the implementation of the Covenant, have not been identified. (OECD 1998)

In order to reach the goals of the Covenant, various changes in products and processes were implemented. Two main types of innovations or improvements with respect to products can be distinguished:

- first, there have been incremental innovations concerning packaging which needs only minor modifications or partial elimination. Such initiatives have led not only to a decrease in the use of resources, but also to reduction of production costs. For example, several producers/importers of packaging have eliminated the cardboard box for individual tooth paste tubes; and
- second, there have been more sophisticated innovations such as the introduction of hybrid packaging (composed of returnable and non-returnable parts), as well as new product designs (OECD 1998).

The OECD report on the Packaging Covenant argued that a key problem has been that not all corporations in the packaging chain undersigned the original Covenant, creating a free-rider problem. The same report presented the following elements for improvement:

- increased involvement of consumer organisations;
- better monitoring of trans-frontier movements of packaging wastes;
- better engagement of consumers in the procedure;
- better interaction of Covenant and other environmental policy instruments.

The report from the Packaging Committee concerning the year of 1998 concluded that the quantity of packaging waste that was dumped in landfills or incinerated continued to

grow. The results indicated that the objective defined in the Covenant cannot be achieved without additional effort. (Packaging Committee 1999).

2.6 Information and education

The level of waste generation in the Netherlands is monitored both in terms of waste stream and method of disposal. On the basis of the results of this monitoring, individual surveys are also made of the waste levels within the different sectoral target groups. In 1993 a “Waste Monitoring Platform” was established to co-ordinate the different waste monitoring activities and to obtain uniformity in the method of monitoring. The Waste Monitoring Platform comprises public and private sector organisations that collect and processes information as well as organisations that formulate and review policy using the processed information. (VROM 1998).

The provision of information is an instrument that is mainly deployed for the consumer target group. An endeavour is made by means of publicity campaigns such as “Less waste is up to you” to urge the public at large to do more to prevent the arising of waste.

BOX A.2.1 – The UK and Dutch Packaging Agreements Compared

By comparing the Dutch Covenant on Packaging Waste with the failed attempt at developing a UK covenant on packaging, this box provides a useful demonstration of the impact of certain structural conditions on the efficacy of negotiated agreements. It is not proposed in this box to examine the background and details of the agreements, but rather only to highlight the impact of the different structural conditions, which led to the comparative success of the Dutch Covenant, and to the failure of the UK initiative.

The Dutch Covenant on Packaging Waste

Institutional conditions:

- ❑ A legal framework authorising the Minister to issue Decrees on the reduction of waste, thereby acting as an incentive for industry to invest time and effort in a negotiated approach;
- ❑ A competitive structure of branch organisations throughout the different sections of the packaging chain, thus promoting the active participation of each member in the packaging chain;
- ❑ The presence of a high level of public credibility of both the government body (VROM) and the representative packaging organisation (SVM) set up specifically to manage the environmental concerns associated with packaging. Contributing to the credibility was the fact that both parties had experience in participating in agreements, and had developed an appropriate operational structure for administering such agreements;
- ❑ A high level of awareness of environmental issues amongst the various parties;
- ❑ The presence of effective and vocal environmental and consumer organisations which were able to exert significant public pressure on key organisations in the packaging industry;
- ❑ The evident social responsiveness of some of the leading firms which contributed (through peer pressure) to greater responsiveness throughout the sector;

Conditions within the agreement:

- ❑ Provision within the agreement for a concrete timetable with specified final and interim targets;
- ❑ The use of an independent committee (the “Commissie Verpakking”) to conduct annual reviews;
- ❑ The requirement of annual public performance reporting through the Packaging Evaluation Committee (which comprises members of VROM, industry and an independent chairperson);
- ❑ The requirement on companies to implement an annual Implementation Plan, thereby ensuring that the provisions of the covenant are suitably internalised into business practice.

The Failed UK Packaging Waste Agreement

The UK’s experience in seeking to develop a co-regulatory approach to the problem of packaging waste, is most interesting in that it started off (July 1993) with a strong commitment by government to introducing a voluntary approach to regulation, yet ended up (by 1994) with industry calling for national legislation and external regulation by government. The reasons for this failure relate largely to the lack of certain structural conditions, the implications of which are relevant in assessing the potential for negotiated agreements in South Africa.

Institutional Conditions that were lacking:

- ❑ A lack of shared vision between government and industry: there was no consensus on the negotiation procedure to be adopted, and no real clarity as to the exact roles of the various parties;
- ❑ Indecision and lack of clarity regarding the legal status of the agreement, and the scope of the negotiation process;
- ❑ A most significant weakness related to the structure and composition of the industry association which was set up by business in response to the Minister’s “challenge.” The initial group (PRG) was principally comprised of retailers, rather than producers of either packaging or the raw materials. This lack of representativeness was not conducive to consensus building, a problem further hampered by poor organisational skills.
- ❑ Few individual companies demonstrated visible commitment to voluntarily addressing the issues;
- ❑ These last two aspects contributed to a general lack of credibility of the organisation, not assisted by the fact that the body had no experience in developing or implementing agreements;

3. DENMARK

3.1 Levels of Waste Generation and Recycling

The generation of waste in Denmark amounted to 12.8 million tonnes in 1997. Total amounts of waste are distributed as follows: building and construction 27%, households 22%, industry 21%, institutions, trade and offices 7%, power plants 13% and wastewater treatment plants 10%. (Danish Ministry of Environment and Energy 1999)

The total volume of waste has increased in recent years but it stagnated in 1997 compared to 1996. This is largely due to a heavy decrease in the volume in residual products from coal-fired power plants. In 1997, 63% of the total waste generated in Denmark was recycled, 20% was incinerated, and 16% landfilled (Figure A3.1)

Table A3.1: Waste generation in Denmark in 1997 by source and treatment option (in '000 tonnes)

Source	Total		Recycling			Incineration			Landfilling		
	tonnes	%	tonnes	%	target 2000 (%)	tonnes	%	target 2000 (%)	tonnes	%	target 2000 (%)
Households	2776	22	818	29	49	1602	58	44	343	12	7
<i>Domestic waste</i>	1621	13	239	15	40-50	1298	80	50-60	83	5	0
<i>Bulky waste</i>	588	5	98	17	25	241	41	38	248	42	38
<i>Garden waste</i>	443	3	428	97	85	8	2	15	6	1	0
<i>Other</i>	125	1	52	42	0	55	44	0	5	4	0
Institutions/trade/offices	861	7	324	38	60	352	41	40	170	20	0
Manufacturing	2736	21	1590	58	57	389	14	33	707	26	10
Building and construction	3427	27	3136	92	58	21	1	11	264	8	32
Wastewater treatment plants	1248	10	872	70	50	245	20	0-50	130	10	0-50
Slag, fly ash, etc	1775	14	1300	73	56	0	0	0	475	27	44
Other	34	0	6	18	0	13	38	0	15	44	0
Total	12857		8046	63	54	2622	20	25	2104	16	21

Source: (Danish EPA 1998)

The overall objectives that were set in the *Action Plan for Waste and Recycling 1993-97* for the year 2000 have been attained, namely: 54% recycling, a maximum of 25% incineration, and a maximum of 21% landfilling. In 1997 total recycling was already 9% above the objective for year 2000, and landfilling was reduced to a level below the objectives set for year 2000. (Danish Ministry of Environment and Energy 1999) The objectives for recycling of waste from manufacturing industries, the building and construction sector, wastewater treatment plants, and coal-fired power plants were attained by a good margin. By contrast, the objectives for recycling of waste from households and institutions, trade and offices are far from being attained. (Danish EPA 1998)

Jobs gained in the waste and recycling sector resulting from the implementation of the Action Plan were assessed at approximately 2,500/year. The investments assumed in the Action Plan, which includes the establishment of new plants, will result in additional jobs representing about 6.55 person/year. (UNCSD 1997)

3.1.1 Household waste

Waste generation in households 1997 was 526 kg per capita or 1,161 kg per household (Table A.3.2). The composition of household waste is shown in Fig. A.3.1

Table A.3.2: Waste generation in households in Denmark in 1997 per capita and household (in kg)

Fraction	Per capita	Per household
Households total	526	1,161
Of which		
Mixed domestic waste	316	698
Separately collected		
Domestic waste/paper	31	68
Domestic waste/glass	12	27
Domestic waste/food waste	9	20
Hazardous waste	2	6
Garden waste	84	185
Bulky waste	111	246
Of which		
Paper	4	9
Glass	1	2

Source: (Danish EPA 1998)

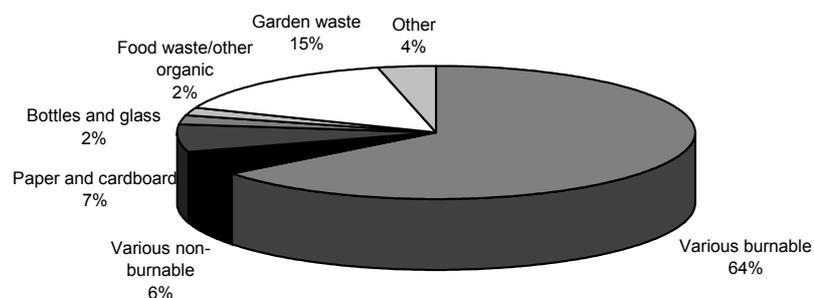


Fig. A.3.1: Waste generation in households by fraction (in tonnes)

Source: (Danish EPA 1998)

3.1.2 Industrial waste

Fifty-eight percent of waste from industry was recycled in 1997, corresponding to some 193 000 tonnes more than in 1996. However, these amounts are still far from meeting the targets that were set in the Action Plan. (Danish Ministry of Environment and Energy 1999)

Additional information is provided for each of the key waste streams.

- *Paper and cardboard:* Consumption of virgin paper in Denmark amounted to 1 349 million tonnes in 1997. 43% of this paper was collected in the same year, from the manufacturing industry, households and institutions, trade and offices in almost identical amounts. (Danish EPA 1998)
- *Glass:* Recycling of bottles and glass from primary sources amounted to 89,000 tonnes in 1997. Consumption of glass packaging has been increasing throughout the 1990s. Collection and recycling of glass have also been increasing throughout the 1990s. In 1996, 126 109 tonnes of glass were collected, corresponding to 71% of total consumption. (Danish EPA 1998) (Note: Bottles for beer and soft drinks manufactured for reuse are not included in this statement. Refillable glass bottles, on average, make 35 trips. If these bottles were manufactured as single-use bottles, it would give an increase in waste glass of around 350,000 tonnes).
- *Ferrous metal:* Total potential of ferrous scrap is not known precisely. Recycling industries normally estimate a recycling rate in excess of 90% for ferrous scrap. (Danish EPA 1998)
- *Organic waste:* In 1997, 817,000 tonnes of organic waste were delivered to composting, wood chipping, and bio-gasification. This represented a significant increase from 1996, which indicates that municipal collection and bring schemes for garden waste are becoming more widespread and extensively used. (Danish EPA 1998)
- *Tyres:* In 1997, 17 229 tyres were collected, representing 93,6% of the total number of tyres covered by the take-back scheme that has been set up in 1995. (Danish EPA 1998)
- *Waste from building and construction:* In 1997, waste from the building and construction sector amounted to a total of 3 427 000 tonnes, which is an increase of 11 % or 339,000 tonnes compared to 1996 amounts. As can be seen from Table A.3.2, by far the largest proportion of waste the building and construction sector is recycled. In 1997, only 1 % of waste was incinerated and 8 % landfilled, the remaining 91 % having been recycled. (Danish EPA 1998)

3.2 General Policy on Waste and Recycling

The ruling principle for the waste policy in Denmark is prevention. The waste hierarchy underlying this policy prioritises different forms of waste management: first recycling,

followed by incineration, and finally landfilling. Environmental protection measures are directed at the entire life cycle of polluting materials and products circulating in society.

The Danish waste model is based on a combination of traditional administrative instruments (Acts, Statutory Orders, Circulars), and various economic instruments covering taxes and charges, as well as subsidy schemes and agreements. (Danish EPA 1998)

3.2.1 Waste Planning

In 1992 the objectives of the Danish waste policy were described in the Government's "Action Plan for Waste and Recycling 1993-97". The government's waste plan for 1998-2004, "Waste 21" sets the agenda for the Danish waste policy up to the year 2004. The new plan reiterates the most important objective on Danish waste policy, namely to curtail the amount of waste. At the same time, the quality of waste management is to be improved. (Danish EPA 1999)

"Waste 21" paves the way for expansion of source separation so that more types of waste will be separated at source. The following eight types of waste will have to be sorted in the future: organic waste; paper and cardboard; cardboard packaging; PVC; impregnated wood; waste electrical and electronic equipment; end-of-life vehicles; batteries. The aim is to improve the quality of waste treatment by source sorting and treating waste with a high content of substances with a heavy impact on the environment separately before the other part of the waste is incinerated or recycled. This applies especially to PVC waste, impregnated wood and electrical and electronic products. Reuse must be increased by expanding the collection of paper cardboard and organic waste in Denmark. (Danish EPA 1999)

New national objectives for waste management are 64% recycling, 24% incineration and 12% landfilling by year 2004. Sector-specific recycling targets are as presented in Table A.3.3.

Table A.3.3: Recycling targets for various sectors laid down in "Waste 21"

Sector	Target 2004
Domestic waste	30%
Bulky waste	25%
Industry waste	65%
Institutions, trade and offices	50%
Waste from incineration plants	70%
Construction and demolition waste	90%
Wastewater treatment plants	50%
Residues from coal-fired power plants (bottom ash and fly ash)	90%

In addition, environmental management should make enterprises aware of the volume of waste from production. The government will support a systematic development of

new technologies for treatment of future waste, for instance sorting and collection systems, logistics and treatment technology. (Danish EPA 1999) Responsibility for implementation of “Waste 21” lies with the Municipalities and the Counties. Great emphasis is placed on information and taxes as the means to make the public and enterprises more responsible and active in waste management.

3.2.2 The Danish Waste Model

The Danish waste model is a comprehensive system covering waste prevention, collection and treatment. In contrast to many other countries, Denmark has chosen to manage household waste, industrial and commercial waste in a comprehensive waste management system, covering both packaging waste and hazardous waste. (Danish Ministry of Environment and Energy 1999)

The overall authority in waste matters is the Danish Environmental Protection Agency. Local and regional councils are in charge of the practical administration of waste management. All local councils are under the obligation to survey waste amounts and to draw up waste management plans. It is also the responsibility of local and regional councils that sufficient incineration and landfill capacity is available.

The practical organisation of waste management is different from one municipality to another. (Danish EPA 1999) By law, local councils are under an obligation to establish a collection scheme in areas with more than 1 000 inhabitants. Often, several local councils operate joint inter-municipal waste companies, but both in the cases of municipal and inter-municipal waste disposal, these companies normally use private waste carriers and collectors. Private companies have been established to operate mainly within collection of household waste and industrial and commercial waste, as well as recycling. (Danish EPA 1999)

Municipal schemes for household waste are normally operated by local councils, municipal companies and private waste companies. The management of industrial and commercial waste is normally contracted to private companies. The collection of both household and industrial and commercial waste is typically contracted to private companies. Waste recycling is mostly carried out by private companies. However, several inter-municipal companies also operate within waste recycling, as a means to ensure environmentally correct recycling of waste independent of, for example, fluctuating market demand for recycled materials. (Danish Ministry of Environment and Energy 1999)

Waste producers are either covered by a collection scheme or an assignment scheme. In a collection scheme, the local council is responsible for collecting waste. In an assignment scheme, the local council assigns treatment plants, but the waste producer is in charge of transport to the plant. (Anderson, Dengsoe et al. 1997) Municipal councils may charge fees to finance their waste management. Also, for certain types of products such as tyres and lead accumulators, special fees are charged to finance collection and recycling. (Danish EPA 1999)

For the collection of waste (domestic waste and some recyclable waste fractions) from households and enterprises, the local council normally fixes a waste collection fee. The

fee is rarely fixed on the basis of weight, but more often on the basis of volume.(Anderson, Dengsoe et al. 1997) Regarding assigned industrial and commercial wastes, enterprises have a certain freedom of choice between plants and disposal forms. Waste can be used directly by other enterprises, for example so-called homogeneous by-products, may be delivered directly to other enterprises.

3.3 Regulatory measures

The legal framework laying down the obligation of local authorities to manage waste is given in the Danish Environmental Protection Act and subsequent Statutory Orders and Circulars. The most important Statutory Order is the Statutory Order on Waste no. 299 of 30th April 1997.

Part 6 of the Danish *Environmental Protection Act* (1991, last amended 1998) lays down regulations on waste. It requires manufacturers and importers to maximise product life and recyclability and ensure that final disposal does not cause environmental damage. All users or consumers must contribute to the promotion of recycling and limitation of waste disposal problems. (Perchards 1999)

The Environmental Minister may set binding targets to limit the use, discharge or disposal of specified products, substances or materials. The Minister may also lay down rules to restrict or ban the use of specified materials in products or goods for specified purposes, and to require specified materials or products to contain specified quantities of recycled or recyclable materials or products. (Perchards 1999)

The Minister may lay down rules on deposit and rebate schemes, and is empowered to delegate the administration of deposit and rebate schemes to manufacturers or retailers of the products concerned, or to their organisations, wherever such private schemes will secure environmentally sound collection, recycling or disposal. (Perchards 1999)

Several waste streams are covered by regulations relating to special collection requirements. Local councils must assign or collect the following waste fractions for recycling: (Anderson, Dengsoe et al. 1997)

- Paper, cardboard, carton and cardboard material and products made of cardboard materials from enterprises and public and private institutions;
- Waste transport packaging in the form of plastic from enterprises;
- Steel drums from industrial and commercial enterprises;
- Newspapers, magazines and similar as well as glass packaging from private households;
- Food waste from catering centres.

3.4 Market-based instruments

There is a general state tax on waste. There are also so-called “green” taxes on for example packaging, plastic bags, disposable tableware and nickel-cadmium batteries. In addition, deposit and return systems have been established for a number of packaging types. (Danish EPA 1999)

Following is a more detailed review of the different market-based instruments that have been introduced in Denmark.

3.4.1 Waste Tax

In 1986 it was agreed to introduce a waste tax in Denmark. The purpose of introducing a waste tax was described as follows:

“The purpose of the proposed tax is to reduce the amount of waste going to incineration or landfills. The tax will promote recycling and incite companies to apply low waste technologies.” (Lovforslag nr. L176, sp. 4425)

In the initial implementation phase, the rate of DKK 40/tonne proved too low to have a general effect on waste management. However, an effect could be seen for construction and demolition waste, and heavy industrial and commercial waste, as waste amounts fell from 1987-1988 by some 200 000 tonnes. In 1990, the waste tax was increased to DKK 130/tonne. (Anderson, Dengsoe et al. 1997)

In an evaluation of the waste tax performed in 1991, it was noted that a number of players in the waste field had limited possibilities of action and avoidance in relation to the waste tax, especially householders whose fees to municipal waste companies were not based on the weight of their waste. Additionally, differences between municipal fees for landfilling and incineration led to an economic favouring of landfilling. As a result, it was decided to increase and differentiate the waste tax: the rates of DKK 195/tonne for waste to landfills and DKK 160/tonne for waste to incineration took effect on 1 January 1993.

The waste tax is differentiated so that it is most expensive to landfill waste, cheaper to incinerate it and tax exempt to recycle it.

“For household waste, a tax on final disposal will make it more profitable for the waste collection services in each municipality to establish recycling and separation systems. For each tonne of waste delivered for recycling, the waste collection services will save the corresponding fee.”

The objective was to influence professional waste companies into establishing facilities that allow householders to separate their waste. The waste tax also aims to provide an incentive for recycling companies to prevent residual waste, by granting a refund on their waste tax.

In 1997, a further differentiation of the waste tax was made, so that from 1997 a distinction is made between incineration plants with and without energy recovery in the form of power or combined power and heating generation. Rates today are DKK 375/tonne waste for landfilling, DKK 330/tonne of waste incinerated and DKK 280/tonne of waste incinerated at plants with a minimum of 10% power generation. Recycled waste is not taxed. (Danish Ministry of Environment and Energy 1999)

The waste tax is meant to serve environmental purposes, but more exact environmental effects of the waste tax were only estimated for the increase that took effect in 1990. For the other increases, reference was made to action plans for waste and recycling.

3.4.2 Deposit and return systems, charges, taxes and subsidies

Ban on one way packaging for beer and soft drinks

Statutory Order No 300 of 30 April 1997 stipulates that mineral water, beer and carbonated soft drinks may only be placed on the market in refillable packaging. The packaging shall be covered by a deposit and return system ensuring that a significant part is returned after emptying for refilling. The refill packaging systems have to be approved by the Danish EPA and have to show proof that they fulfil the following aspects: (European Commission 1998)

- a certain number of fillings is completed per lifetime of the packaging;
- the technical requirement of reusability are met;
- not too many systems using the same technique and size are on the market.

Beer and carbonated soft drinks imported to Denmark shall be covered by a deposit and return system ensuring that the packaging is either refilled or that the material is recycled. Marketing of beer and soft drinks in metal packaging is not permitted for beverages produced in Denmark or for imported beverages. (Danish Ministry of Environment and Energy 1999)

The ban on one-way packaging just for carbonated beverages was argued for by comparing the greater environmental burden of cans and one-way glass bottles to reuse bottles. A certain exemption is accepted for imports. Reuse packaging systems, which are granted permission by the Government, are open to foreign producers who want to export to Denmark under the same conditions as Danish pool members. (European Commission 1998)

The return rate for glass bottles for beer and soft drinks has been close to 99% for many years. For PET bottles the rate is almost as high. The bottle return system means that each year approximately 390 000 tons of waste are avoided, corresponding to 20% of the total amount of domestic waste collected from households. (Danish Ministry of Environment and Energy 1999)

3.4.3 Packaging taxes

Packaging taxes are levied on a number of products. Since 1978 a volume based tax on packaging for most beverages has been in effect. The tax is divided into six volume categories and two material-based rates. The tax is levied on new packaging and thereby gives an incentive to use refillable packaging. (Danish Ministry of Environment and Energy 1999)

The basic idea is to tax packaging material in relation to its ecological influence and by quantity of packaging material brought into the market. The fixing of the tax level is

based on LCA outcomes. The tax has to be paid by the filler of the packaging. The new tax is a follow up on the packaging tax on beverage containers, which has been in force since 1978. The motive is to steer decision makers to use less packaging material with a better eco-balance outcome. The tax is actually the motor for many activities for reusing beverage containers. Whether or not it will have the same influence on other packaging markets, in which there are none or very little reuse packaging systems on the Danish market, cannot be evaluated at this time. (European Commission 1998; European Commission 1999)

Furthermore, from 1 April 1998 a volume-based tax has been levied on bottles and drums. Since 1 January 1999 the tax has been divided into 13 material and packaging types. The tax is levied on packaging for a number of products, including soap and detergents, lubricants, perfume and margarine. Non-carbonated soft drinks, vinegar and edible oils also fall under the weight-based tax as from 1 January 1999. Furthermore, as from the same date, a weight-based tax is levied on plastic foil foodstuff packaging manufactured from soft PVC. Finally, since 1994 a weight-based tax on paper and plastic carrier bags has been in effect, and since 1998 a value tax on disposable tableware. (Danish Ministry of Environment and Energy 1999)

3.4.4 Specific taxes

As a supplement to the general waste tax, more specific taxes have been introduced aimed at products that either demand special treatment after use or where consumption should be limited or shifted to more environmentally friendly products. (Danish Ministry of Environment and Energy 1999)

- *Batteries*: Almost 55 million portable batteries weighing 2 500 tonnes are sold each year in Denmark, according to the Danish EPA. 90% of these are general purpose zinc-carbon or alkaline-manganese cells. The rest are either rechargeables (8%) or button cells (2%). Additionally, some 14 900 tonnes of lead acid accumulators are sold each year. Municipal efforts have managed to recover 40-50% of the general purpose batteries, 20% of the NiCds, some sealed lead acid batteries and a few nickel metal hydride (NiMH) batteries. The Government has imposed tough eco-taxes on NiCd batteries. The charge means that NiCds cost around the same as the newer NiMH or lithium ion (li-ion) technologies. As a result, the quantities of NiCds recovered leapt from 35 tonnes to 95 tonnes between 1996 and 1997, following the introduction of the eco-tax. The potential amount available for collection is estimated to lie between 70 and 200 tonnes, giving a recovery rate in Denmark of between almost 50% to more than 100%. The Government and the lead acid battery industry have negotiated an agreement to achieve a collection rate of 99.9% for lead accumulators by 2000. The rate has already grown from more than 90% in 1993 to nearly 100% in the end of 1998, through the use of economic instruments. (Warmer Bulletin 1998)
- *Raw materials*: The raw materials tax was introduced in 1989 and amounts to DKK 5/cu.m. The purpose of the tax was to supplement the waste tax incentive to recycle construction and demolition waste. (Anderson, Dengsoe et al. 1997)

3.4.5 Subsidy schemes

In the subsidy programme to promote cleaner products and recycling, funds have been allocated to projects on recycling, cleaner technology, and waste. (Danish EPA 1998)

3.5 Co-regulation and self-regulation

The Environmental Protection Act empowers the Environmental Minister to make agreements with industry sectors on take-back arrangements. Negotiations were opened with the following sectors: EEE, refrigerators and freezers, cars and car components, tyres, building materials, glass packaging and transport packaging. It was originally intended that agreements would be finalised by the end of 1994, but not all have yet been concluded. (Perchards 1999)

Voluntary agreements on recycling have been concluded for the following products:

- *PVC* is covered by an agreement with the plastics industry, and includes the establishment of a private recycling scheme for PVC construction materials;
- *Construction and demolition waste* - an agreement has been entered with the Danish Contractors' Association on selective demolition of building materials;
- Local councils must establish assignment or collections schemes for *CFC-bearing refrigerators* to ensure environmentally acceptable disposal and recycling;
- A voluntary agreement to limit the use of *solvents* in specified household appliances was concluded in mid 1993;
- A voluntary agreement on take back of *used tyres* to limit the disposal of tyres by landfilling. In 1995, the Minister for Environment and Energy entered an agreement with a number of organisations, on a take-back scheme for used tyres from cars, vans and motorcycles. The scheme is financed by a statutory order levying fee (DKK 8 per tyre) on tyres covered by the agreement and marketed in Denmark. The objective was a take-back rate of 60% in 1995, and 80% for 1997 onwards. (Anderson, Dengsoe et al. 1997)

An agreement on recycling of *transport packaging* has been established with the Confederation of Danish Industries, the Danish Plastics Federation and the Packaging Industry.

4. GERMANY

4.1 Levels of Waste Generation and Recycling

In Germany, as in most industrialised countries, packaging and organic wastes form the two largest categories of waste, although each category contains a variety of material. Between 1990 and 1993, waste volumes produced in Germany fell by 10% from 374 Mt to 337 Mt. At the same time, the rate of recycling rose from 20% to 25%. (German Federal Environmental Agency 1998)

Figure A4.1: Waste volumes disposed of or recycled, by type (in thousands of tonnes) for 1990 to 1993

Source	Total		Disposal		Recycling	
	1990	1993	1990	1993	1990	1993
Domestic	50 085	43 486	43 285	30 516	6 800	12 970
Mining/Quarrying	88 841	67 917	10 753	9 094	78 088	58 719
Manufacturing	97 329	77 451	52 728	30 517	44 600	46 932
Construction	132 122	143 098	120 446	127 288	11 676	15 807
Hospitals	83	68	80	61	3	6
Sewage	5 543	5 475	4 560	4 448	983	1 027
Total	374 002	337 392	299 188	251 550	74 813	85 836

Source: Environmental Federal Agency, <http://umweltbundesamt.de/uba-info-presse-e/index.htm>

More recent data were collected at the end of 1998 from 590 locations across Germany. The results from this empirical study, undertaken by the Rheinisch-Westphalian TUV (technical monitoring agency) on behalf of the Packaging and Environment Association in Bonn (AGVU), concluded that packaging waste accounts for 47% of total litter and discarded waste. Over half of this is plastic bags and sheeting. Cardboard boxes including cigarette packets make up 19% of discarded packaging, and plastic packaging accounts for 10%. Non-packaging waste from domestic and commercial sources makes up 52%, comprising 32% newspapers and paper. Organic waste/garden waste and bulky waste each make up 17%. (German Federal Environmental Agency 1998) According to the same study, whilst double the amount of litter was found in cities than in villages and small towns, litter patterns do not vary significantly between Federal States, even between old and new States.

Following is a brief description for some key waste sources:

- *Paper and cardboard:* While paper consumption remained approximately the same between 1991 and 1996 (15 739 Tsd. t and 15 471 Tsd. t), the return quota increased from 50% to 71%. (German Federal Environmental Agency 1998)
- *Glass:* Since the collection of used glass began in 1974, recycling has become more and more significant. In 1991, approximately 2.3 million tons of glass was recycled (corresponding to a recycling rate of 61%), producing some 54% of all glass containers produced in Germany. In 1997, the total glass packaging consumed in Germany amounted to 3 470 t, and the total recovered was 2 737 t, which represented a recovery quota of 79%. (German Federal Environmental Agency 1998)
- *Organic waste:* The Federal Environment Ministry estimates total annual organic waste production at 10 to 12 million tons. The separate collection and treatment of organic waste is gaining importance in Germany. Between 5 and 6 million tons of organic waste is currently treated in 500 composting plants, compared with 1 million tons in 1990. (German Federal Environmental Agency 1998)
- *Plastic:* In 1997, 3.2 Mt of plastic waste was generated. In the same year, 1.85 Mt were recovered, and the remaining 1.35 Mt were landfilled or incinerated without energy recovery. (German Federal Environmental Agency 1999)
- *Batteries:* Each year 900 million batteries and accumulators are sold in the Federal Republic of Germany. In 1996, these included 370 million zinc-carbon and 310 alkaline-manganese batteries, together weighing more than 23 000 tonnes. 3 500 tonnes of other batteries containing heavy metals such as mercury and cadmium - button cells and nickel-cadmium accumulators - were sold in 1994. Starter batteries for vehicles amount to 12 to 14 million per year. Germany generates approximately 30 000 tonnes of appliance batteries per year. (Warmer Bulletin 1998)

4.2 General Policy on Waste and Recycling

The objective of the German Government's policy on waste is to achieve a recycling-based economy that conserves resources and the environment. In order to promote an economy based on closed substance cycles, a waste management options hierarchy is introduced, where avoidance has the highest priority, followed by recovery, and finally disposal. A fundamental element of this policy is product responsibility, whereby whoever is responsible for the production, distribution and consumption of goods shall be responsible for the avoidance, recovery and environmentally sound disposal of wastes occurring.

4.3 Regulatory measures

The *Kreislaufwirtschafts- und Abfallgesetz (Product Recycling and Waste Management Act)* came into force in October 1996. This new legislation, in contrast with the previous 1986 Waste Act, makes the owner or producer responsible for its correct

disposal. Again, third parties can be used, but now the actual duty itself can be transferred to them. This transfer of responsibility means that local authorities may refuse to handle waste covered by take-back ordinances. The Act has changed the former scope of the term “waste”, decisively expanding it. According to the new concept of the Act, waste is considered to be everything that arises in production, manufacture, processing or consumption, the generation of which was not original intention of the process.

The Product Recycling and Waste Management Act has three main principles:

- Production and consumption must be organised in such a way as to prevent waste from the very beginning;
- Unavoidable waste must be recovered using high-quality techniques;
- Non-recoverable waste must be disposed of.

The Act gives priority to waste avoidance, and so empowers the Government to issue “producer responsibility” ordinances. These will cover:

- The development, manufacture, and marketing of multi-use, durable goods which can be recycled without damage to the environment;
- The priority use of recyclable waste or secondary raw materials in the manufacture of new products;
- The marking of products containing hazardous substances;
- Indications on the product as to how it may be returned or reused;
- Information on the product concerning reuse and deposit requirements;
- Manufacturers’ obligation to take back their products after use; and
- A requirement that used products be properly reprocessed outside the public waste disposal system and without damage to the environment.

To ensure that manufacturers meet their responsibilities, the Act gives the Government powers to ban, restrict or require the marking of certain products; to require manufacturers, importers or distributors to take back used products or to operate a deposit system; to require certain products to be taken back at the place of sale or at the place where they arise as waste; and to determine who bears the cost of returning, recycling or disposing of the end of life products.

Sectors where “producer responsibility” is in place or likely to be introduced - either through specific legislation or a voluntary agreement under the Act - include electronic scrap, batteries, end of life vehicles, construction waste, textiles, furniture and graphic papers.

The following directives supplement the Act:

- The Waste Certification Ordinance;
- The Ordinance Introducing The European Waste Catalogue;

- The Ordinance On Designating Waste Requiring Special Supervision;
- The Ordinance On Recycling Waste Requiring Special Supervision;
- The Transport Authorisation Ordinance;
- The Ordinance On Waste Management Plans And Waste Audits;
- The Ordinance On Waste Disposal Firms And The Guidelines For The Activities And Recognition Of Waste Disposal Firms.

Germany's waste management legislation (TA Siedlungsabfall) requires that waste consigned to landfill after 2005 must have a combustible content of less than 5%, which means that much of the organic content will need to be eliminated (or recovered) prior to final disposal.

4.3.1 Ordinance on Avoidance of Packaging Waste

The Ordinance on the Avoidance and Recycling of Packaging Waste came into force in Germany on 12 June 1991. It places a legal obligation on retailers and manufacturers to take back and recycle transport, secondary and sales packaging. Its purpose is to prevent and reduce waste occurrence, and return recyclable materials to the materials loop. The ordinance was amended in summer 1998 to meet the requirements of the EU Packaging Directive, and came into force on 28 August 1998.

Retailers and manufacturers can be exempted from their individual obligation to take back sales packaging if they join a comprehensive, publicly accessible system for the collection, sorting and recycling of used sales packaging. This role has been taken on by Duales System Deutschland AG (see section A.4.4.1 for a more complete description of the system). (DSD 1999)

The packaging ordinance sets quotas for the recycling of post-consumer sales packaging, which differ according to the type of material (Table A.4.2).

Table A.4.2: Target recycling quotas, applicable from 1 January 1999 (DSD 1999)

Material	Recovery quota
Glass	75%
Paper/cardboard	70%
Plastics	60%
Tinplate	70%
Aluminium	60%
Composites	60%

The revised ordinance also includes a quota for the mechanical recycling of plastic packaging (i.e. the direct use of plastic waste for the manufacture of new products). Of the total (60%) recycling quota, at least 60% must be met by mechanical recycling (i.e. 36% of all licensed plastic waste). The remaining 40% may be achieved with the aid of feedstock recycling or by means of incineration with energy recovery.

In addition to the recycling quotas, the Packaging Ordinance entails a special regulation concerning beverage containers for which an exemption from the deposit/refund scheme can only be granted if the percentage of refillable bottles in consumption does not fall below 72%. In the case of milk packaging, the refillable quota must not fall below 20%. If the market share of refillables falls below these threshold values, the Government may introduce deposits on one-way packaging in the specific sector.

4.3.2 Ordinance on the Return and Disposal of Used Batteries and Accumulators

In 1988, the Federal Government invited industry and commerce to enter into a voluntary commitment for the return and recovery system for batteries containing harmful substances. This system failed to deliver the anticipated results. Consumer behaviour proved disappointing, even where return facilities were made available. Therefore, legislation was prepared and in April 1998, the Ordinance on the Return and Disposal of Used Batteries and Accumulators came into force. From October 1998, it became compulsory to accept the return of all batteries, irrespective of their harmful content.

The battery industry, together with the association of electrical engineering and electronics industry, which represents the manufacturers and importers of more than 90% of the batteries sold on the German market, has set up a foundation (GRS Batterien) to manage the battery return system. The Ordinance is expected to be amended in early 2000 in order to harmonise it with the current EU legislation.

4.3.3 Draft ordinance on electric and electronic products

The Federal Government has proposed a draft ordinance on the disposal of electronic and electrical IT equipment, requiring manufacturers and importers to take back and recycle their products free of charge. The directive was approved by the German Cabinet in May 1998, but it is still under discussion.

4.3.4 Ordinance on end of life vehicles

The Scrap Vehicle Ordinance was adopted in April 1997 and came into force on 1 April 1998, underpinning a voluntary agreement signed by the German automotive industry in 1996. This legislation includes a take back obligation of ELVs to approved collection points. By 2002, 15% of the average weight of the empty vehicle prior to dismantling must be directed to reuse or recovery, but there are no material-specific targets. Also by 2002, no more than 15% by weight may be disposed of as waste. (Perchards 1999)

4.3.5 Ordinance on Organic Waste

The German government has proposed an organic waste ordinance to regulate the composting, quality and end use of organic waste such as food production residues, kitchen and garden waste. The proposal aims to ensure the environmentally sustainable application of organic waste - with or without treatment - in agriculture, forests and horticulture. (UK Government 1997)

4.4 **Market-based instruments**

4.4.1 **The “Green Dot Scheme”**

The Packaging Ordinance described above provides the legal framework for the management of packaging waste. Under this Ordinance, all producers and distributors have equal responsibility. In practice, the filler of packaging material has assumed responsibility for compliance. To assist producers, a ‘producer responsibility organisation’ (PRO) scheme was introduced to assume responsibility for collection, sorting and recycling of regulated materials — the *Duales System Deutschland (DSD)*. In basic terms, the producer or responsible party pays fees to the PRO in proportion to the amount of waste products contributed to the system. (OECD 1998)

The DSD was organised in September 1990 in anticipation of the passing of the Packaging Ordinance. The DSD was established as the organisation responsible for a private-sector collecting and sorting system for sales packaging from 95 companies in the packaging and consumer goods industry and the retail sector. Its aim is to establish a comprehensive infrastructure for collecting used packaging, and to organise subsequent recycling. The DSD passed from start-up in September 1990 into full operation in January 1993 with the declaration by the 16 State Environment Ministers that fully established State-wide collection, sorting and recycling systems were in place. (OECD 1998)

The DSD operates as a non-profit firm, covering its costs through the sale of the *Green Dot symbol*. A license fee is paid based upon the amount and type of packaging introduced into the marketplace by a given producer on an annual basis. The Green Dot symbol is then placed on packaging by the producer to identify the product for the PRO. Thus, the Green Dot acts as a license symbol to identify the products of companies participating in the DSD collection system. Through the Green Dot the costs of collecting, sorting and processing packaging material are borne by the manufacturer or the retail sector in line with the “polluter-pays principle”.

Structure of the system

The Packaging Ordinance demands that existing systems for collecting recyclable materials be integrated when dual systems are introduced. Therefore, there is no uniform collecting system for sales packaging in Germany. The collection of used sales packaging varies according to the packaging material. Glass and paper are collected using the existing collection and container points (“drop-off-systems”). Packaging from tinplate, aluminium, plastics or composites is collected by the consumer in the bins or “bags for recyclable materials” available to households. Municipal or private waste disposal companies are responsible at local level for collecting packaging accumulated in this way and for the subsequent manual or industrial sorting of the packaging. (OECD 1998)

In order to carry out these activities, DSD has signed *waste disposal contracts* with the relevant companies. In parallel to the DSD, a partnership was created with recyclers having experience in the various packaging materials sectors. DSD organised an association of recycling (guarantee givers) from the major recycling sectors who are

committed to accept all sorted waste from the DSD system. As the DSD recycling partners, they are responsible for recycling (themselves or through third parties) of all DSD waste and for documenting recycling activities and reporting data to the DSD. This procedure was essential to prevent that fluctuations of recycling markets disturb the functioning of the DSD system. Packaging from foreign companies is also collected under the DSD scheme if a relevant recycling guarantee has been given for the packaging material concerned. (OECD 1998)

By having to supply annual data - so-called mass flow verification - the Dual System can demonstrate to the Ministers for the Environment of the federal states that post-consumer sales packaging is being properly collected, sorted and recycled. (DSD 1999)

Impacts of the Packaging Ordinance

In 1998, DSD collected a total of 5.622m tonnes of packaging waste. Including impurities (wrongly collected waste) this corresponds to a per capita collection of 75.7 kg. Having passed on a total of 5,48m tonnes of packaging for recycling in 1998, DSD achieved the recycling and recovery targets stipulated in German packaging legislation. Figures according to materials are as presented in Table A.4.3.

Table A.4.3: Amounts of different materials collected by DSD for recycling in 1998

Material	Amounts collected for recycling (tonnes)
Glass	2 700 000
Paper/cardboard	1 420 000
Plastics	600 000
Tinplate	375 000
Aluminium	43 000
Composites	345 000

Source: (UK Government 1997)

Environmental impact

The Packaging Ordinance reduced the annual production of waste by more than 1.3 million tonnes between 1991 and 1998, and significantly increased recycling quotas for all packaging materials. (Warmer Bulletin 1998) Current recycling levels have reduced the weight of packaging waste going to landfill and incineration by approximately 66%. However, the influence of DSD collection on reduction of the total amount of waste destined for incineration is estimated to be only about 8%. In some regions, however, the waste volumes are no longer available to support existing incineration and energy recovery facilities.

The Ordinance has had important effects on packaging design and usage by producers. Due to differences in the license fees for different materials and the fees themselves, changes in the packaging market can be seen. Packaging has become lighter and smaller, and in some cases useless packaging has been eliminated. Some packaging with proportionally higher license fees (e.g. plastics, glass) has been replaced by

packaging with lower fees (e.g. cardboard). In the field of transport packaging there is a trend towards reusable packaging. (Elsner 1998)

The Ordinance has also resulted in an increase in Germany's recycling capacity for all packaging material. In 1990 Germany had a recycling capacity of 20 000 tonnes. This capacity had increased to over 50 000 tonnes by 1997. (Elsner 1998) At the time the Packaging Ordinance was passed, technologies and capacities were available for glass, paper/cardboard and metal as a result of recycling programmes predating the packaging legislation. For those materials, capacities in 1993 were adequate to cover quotas for 1995. New capacity was developed early for composite beverages cartons. The primary problem has been with plastics recycling, and thus the development of new technologies has occurred primarily in the area of plastics. (OECD 1998)

Where collection schedules for waste to landfill continue on a weekly basis, it may be argued that energy consumption for transport and collection has doubled due to parallel collection by DSD.

In its initial implementation phase, a cause for concern was the transportation of DSD materials for recycling outside Germany. More than one third (34%) of the DSD recovered packaging was being exported outside the EU, mainly to Asia, and another 14% remained in the EU. (Warner Bulletin 1998) As a result of the 1998 amendments to meet the requirements set in the European Packaging Directive, most of the packaging material collected will be recycled in Germany. The much criticised exports to far away countries will thus be stopped.

An important area of debate regards the selection of recovery methods for DSD materials. The optimal amount of recycling depends on the characteristics of the product under consideration, as well as on local environmental factors and the location of the involved industries. These different features cannot be captured by fixed quotas. Consequently, it has to be expected that the sorting quotas required by the Packaging Ordinance are either too low or too high from an overall cost-benefit perspective. (Klepper and Michaelis 1996) The same authors defend a more market-based approach, whereby the packaging ordinance would be complemented by environmental taxes on waste disposal and energy consumption. With such taxes, mandatory sorting quotas would no longer be necessary. Instead, it could be left to the market to decide in each individual case whether the material under consideration should be recycled or disposed of.

It is often questioned whether it would be environmentally preferable to recycle paper and plastics packaging or recover their energy. According to the association of the German packaging industry, the environmentally optimal choice of waste management option is hindered or even precluded by the strict quotas set in the Packaging Ordinance (DVI 1997) In a DSD study on the ecological effects of different plastic recovery processes reveals complex results: material recycling of well separated mono-fractions has clear ecological superiority over all recovery processes, provided that the secondary product substitutes virgin material in a relation close to 1:1. (OECD 1998)

Criticism of quotas on refillable containers has been based on both environmental and legal terms. Life cycle assessments have been used to compare the environmental

advantages of reusable and one way packaging for beverages. A new LCA on different types of beverage packaging is expected to be ready by the summer of 2000. The refillable quotas have been receiving criticism from the European Commission, the paper industry and beverage trade companies, on the basis that it results in negative trade effects. The packaging industry contended that the law was discriminatory, and formal complaints by Member States have been logged with the EC Commission. It is still under discussion whether the European Commission should pursue legal action against Germany over the legal refillable quotas.

Economic impacts

Under the original structure of the Green Dot System, the license holders pay for collection and sorting while the material industries pay for recycling, with the exception of plastics, whose recycling costs have been included in the fees. The development and subsidising of new technologies for plastics is a major cost factor. Not included in the costs shown for the DSD system are the costs to regulators and industry with reporting and compliance. (OECD 1998)

The Green Dot system has been heavily criticised on the basis of its excessively high operation costs. A comparison between Germany and France shows the French consumer is paying 90% less for packaging waste management (DVI 1997). Total costs amount to 4 DM/kg of plastic material, or even 6.5 DM/kg for small plastic packaging with a weight below 10g, whereas the average virgin raw material cost is 1.2 DM/kg. (Brandrup 1998)

The total costs for a tonne of material in the DSD system which would otherwise have gone to final disposal was in 1994 723 DM. DSD reported a material volume of 4.7 million tonnes in 1994, with total system costs of 3.4 billion DM. In 1995, the total cost for a tonne of material increased to 784 DM. (OECD 1998)

Costs of 700 DM for recycling a tonne of municipal waste exceed the cost of incineration. Landfill prices are expected to increase as a result of tightening legislation. In the next decade, landfill capacity will disappear, leaving incineration and recycling as the main waste management options to be competitive with incineration costs of 300 DM to 500 DM, recycling costs for plastics must therefore be reduced. Indirect effects related to employment shifts in the waste management sector are generally seen as positive. It is estimated that 20 000 new jobs have been created in the sorting industry. Some jobs have been lost in the skilled labour sector. However, the waste management industry in Germany, which enjoys growth rates of up to 10% a year, has created a large number of highly qualified jobs. (OECD 1998)

Problems and facilitating conditions related to implementation

If a similar system to the DSD is to be introduced in South Africa then provision will need to be made for the following potential problem areas:

- *Free-riding*: “Free riding” refers to situations when wastes for which Green Dot licenses have not been paid enter the DSD system, or when non-packaging wastes are disposed of in the yellow bin. Free riders can also pay

for less packaging than they actually produce and than the system has to dispose of. It is estimated that free riders cost DSD 400 million DM annually.(OECD 1998) To control free riders the amended Packaging Ordinance now requires firms not participating the green Dot system to demonstrate through annual reporting that they are able to reach the same quotas as the DSD.

- *The PRO as a monopoly:* Some concerns have been raised regarding PRO schemes, since they may create waste management monopolies. The opportunity for a PRO to engage in price fixing or other forms of non-competitive trade practices varies depending upon the system itself. In the German system, the PRO was required to co-ordinate with existing local systems, which gave waste managers the advantage in negotiations. Waste managers had the advantage in setting standards and prices for waste contracts. Nonetheless, a cartel complaint was issued by the EU against the German PRO for providing material to recyclers at no cost. Critics argue that the Green Dot system has created profitable waste management monopolies for private waste managers and municipalities, at the expense of consumers.
- *Negotiation:* A major problem for the DSD in the start-up phase was the negotiation, on a State-by-State basis, of contracts with waste managers. The requirement for State-level organisation of waste management systems, and the strong language of the Packaging Ordinance requiring harmonisation with existing systems, resulted in the establishment of many different systems on a regional or community basis. No common system could be developed; instead, newly established DSD collection systems represent some combination of services of existing municipal and private waste managers. This has the advantage of serving regional differences and allowing intact systems to continue to operate, but has the disadvantage that the system cannot be optimised or overseen as effectively as in a single uniform system. The necessity to negotiate a large number of contracts with waste managers operating within different local, political and structural frameworks led to excessive costs for waste management. (OECD 1998)

Public participation and information

Extensive public information efforts are essential to the implementation of legislation. The role of consumers in separating waste for recycling determines the success of recycling programmes. Consumer acceptance of products with minimal display and sales packaging, and of refillable and returnable packaging, influences producer decisions to switch to environmentally improved packaging.

In Germany, acceptance of the Packaging Ordinance and participation in the Green Dot system were immediate. The success of the German law rests on the predisposition of the German consumer for sorting waste, and the DSD maintains an active consumer information programme to ensure continued support for the Green Dot.

The economic incentive for households participating in the sorting and collecting of packaging waste that could come through reduced waste disposal fees paid to local collection authorities seems to play a less important role. Most communities in

Germany rely on fees for waste collection, which are based on the size of the household or at most on the size of the waste bin. Hence there is little connection between the volume of waste and its cost of disposal such that a reduction of waste volumes does only marginally reduce disposal fees. In addition, disposal fees of the local waste collection authorities are too low from a welfare perspective. German regulations allow only to charge the direct cost of disposal whereas the scarcity rents of disposal space and the environmental damage from disposal facilities is not included in the price. (Klepper and Michaelis 1996)

4.5 Co-regulation and self-regulation

4.5.1 The Eco-label Blue Angel

The Blue Angel eco-labelling programme was created in 1977. The Federal Republic of Germany was the first country to implement a national eco-labelling programme for consumer products and served as a model for other countries' efforts. As of December 1996, 920 manufacturers or importers had been awarded the Blue Angel for a total of 4 100 products in 76 different product categories. (OECD 1997)

The German government views its eco-labelling programme as a “soft instrument” of environmental policy, since the programme cannot establish binding requirements or bans, and because participation in the programme is completely voluntary. The primary goals of the Blue Angel are 1) guiding the consumer in purchasing quality products with fewer adverse environmental impacts, 2) encouraging manufacturers to “develop and supply environmentally sound products”, and 3) using the eco-label as a “market-oriented instrument of environmental policy”.

5. USA

5.1 Levels of waste generation and recycling

5.1.1 Generation of municipal solid waste

In 1997, 217 million tonnes of municipal solid waste (MSW) was generated in the USA, the equivalent of 730 kilograms per person per year. (MSW includes durable goods, non-durable goods, packaging, food scraps, yard trimmings, appliances, tyres, newspapers, clothing and wood pallets. It does not include construction waste, end-of-life vehicles, municipal sludge or industrial process wastes). The level of waste generation has increased steadily since 1960, when 88 million tonnes of waste was produced. It is expected that waste generation will continue to increase in the future, reaching approximately 240 million tonnes in 2005 (Franklin Associates 1999).

Figure A.5.1 indicates the composition of MSW in 1997, and the expected future composition. As illustrated in the graph, paper and paperboard is the largest waste fraction, accounting for 39% of the total waste stream. In the next five years, it is expected that all waste fractions will increase, with the exception of yard trimmings and glass. A decline in yard trimmings is anticipated due to recent state legislation that bans the landfilling of trimmings, as well as associated source reduction measures such as backyard composting (Franklin Associates 1999). Glass waste is expected to decrease as glass packaging continues to be replaced by plastic and composite alternatives (OECD 1993).

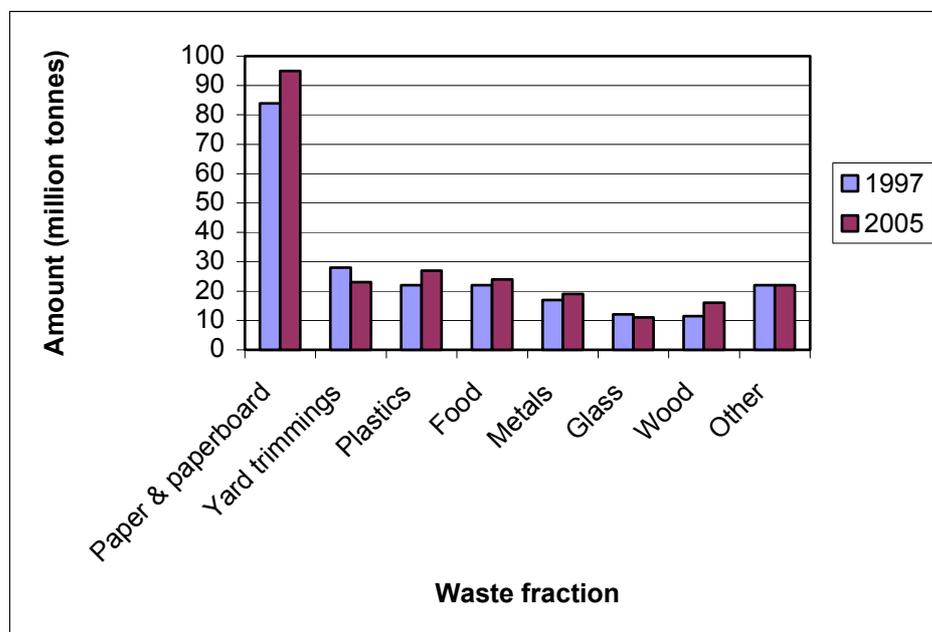


Figure A.5.1: Materials in MSW by weight, USA, 1997 Source: Based on data from (Franklin Associates 1999), pp.11, 16

The MSW stream can also be divided into product categories. In 1997, containers and packaging accounted for 30% of MSW (72 million tonnes); non-durable goods accounted for 27% (59 million tonnes) of MSW; and durable goods for 15% (33 million tonnes) (Franklin Associates 1999).

5.1.2 Treatment of municipal solid waste

There are nearly 9,000 kerbside recycling programmes in the USA, as well as 3,500 yard trimmings composting programmes and more than 12,000 drop-off centres for recyclable materials and products. About 380 materials recovery facilities are used to process recyclable materials. (Franklin Associates 1999)

In 1997, 61 million tonnes (28%) of MSW waste was “recovered”, as presented in Tables A.5.1 and A.5.2: 22% of waste was recycled, and 6% was composted. (This includes composting of yard trimmings and food waste; it does not include mixed MSW composting or backyard composting). This compares to a recovery rate of 10% in 1980 and 17% in 1990. It is expected that the overall recovery rate for MSW will reach between 32% and 35% in 2005 (Franklin Associates 1999).

Table A.5.1: Recovery of materials from MSW, USA, 1997

Material	Recovery level	
	<i>Total amount recovered (million tonnes)</i>	<i>Recovery as a % of generation</i>
Paper & paperboard	35	42%
Yard trimmings	11	41%
Metals	7	39%
Glass	3	24%
Rubber & leather	1	12%
Plastics	1	5%
Wood	1	5%
Food	1	3%
Other materials	1	20%
TOTAL	61	28%

Source: Franklin Associates 1999, p.10.

Table A.5.2: Recovery of products from MSW, USA, 1997

Product	Recovery level	
	Total amount recovered (million tonnes)	Recovery as a % of generation
Containers & packaging	28	39%
Steel	2	61%
Paper & paperboard	21	54%
Aluminium	1	49%
Glass	3	28%
Plastics	1	9%
Wood	0.5	8%
<i>Non-durable goods</i>	15	25%
Paper & paperboard	14	31%
Textiles	1	16%
<i>Durable goods</i>	6	17%
Non-ferrous metals (e.g. lead-acid batteries)	1	65%
Ferrous metals	3	31%
Leather & rubber (e.g. tyres)	1	13%
Textiles	0.5	7%
Plastics	0.5	4%
Other	1	76%
<i>Other waste</i>	12	23%
Food waste	1	3%
Yard trimmings	12	41%
TOTAL	61	28%

Source : Franklin Associates 1999, pp.10-11.

Note: Some figures to not add due to rounding.

5.1.3 Generation and treatment of non-hazardous, non-municipal waste

The non-hazardous, non-municipal waste stream includes construction and demolition waste, industrial waste and end-of-life vehicles. Approximately one quarter to one third of the total waste stream in the USA is comprised of construction and demolition (C and D) debris. In 1996, an estimated 136 million tonnes of building-related C and D waste was generated from the construction, demolition and renovation of residential and non-residential buildings. This figure does not include waste from road, bridge and land clearing, which represents a major proportion of the C and D waste stream. It is estimated that 20% to 30% of building-related construction and demolition waste is recycled. The most frequently recovered and recycled materials are concrete, asphalt, metals and wood, with approximately 85% of C and D steel being recycled. There are

also opportunities to recover bricks and gypsum. (Franklin Associates 1998); (US EPA 2000).

Levels of industrial waste generation are also high. Each year, manufacturing facilities in the USA generate 7.6 billion tonnes of non-hazardous industrial waste. It has not been possible to obtain information on how much of this waste is recycled. In addition, every year, approximately 10 million vehicles are scrapped in the USA. About 75% of the material, by weight, is recycled.

5.2 General policy on waste

The main federal government body involved in waste management is the United States Environment Protection Agency (USEPA), in particular the Office of Solid Waste. The activities of the USEPA are guided by the Resource Conservation and Recovery Act 1976, which requires the USEPA to:

- Provide technical and financial assistance to state and local governments for the development of solid waste management plans that promote the recovery of solid waste;
- Encourage the promulgation of guidelines for solid waste collection, transport, separation, recovery, and disposal;
- Establish a co-operative effort among the federal, state and local governments and private enterprise, in order to recover valuable materials and energy from solid waste (Title 42, Chapter 82, Section 6902).

Thus, the USEPA is not directly involved in collecting and treating waste, as this is left up to local governments and private enterprise. The USEPA provides assistance to these organisations through guidelines, voluntary programmes and partnerships, and information resources. The USEPA has also set various non-statutory goals relating to waste management. These goals include:

- To reduce waste generation to 712 kilograms per person per year;
- To increase the MSW recycling rate to 35% by 2005;
- To empower state, local and tribal governments to better manage solid waste;
- To provide leadership in source reduction and recycling;
- To build public and private partnerships to facilitate waste reduction and recycling;
- To ensure the environmental soundness of source reduction, recycling, combustion and disposal. (US EPA 1998)

The USEPA's approach is very much "one that stresses collaboration and partnership over command and control. Mandates may be necessary in some circumstances, but voluntary approaches will be the preferred route where possible". (Lindsay 1998) The USEPA suggests that voluntary programmes can encourage the private sector to become more involved in waste prevention and recycling if they highlight the business

benefits of recycling. The USEPA also purports that voluntary programmes are more cost effective than mandatory approaches, as they let business find the best way to achieve the desired results. Voluntary initiatives also reduce private sector information and transaction costs. (Lindsay 1998) As a result, the majority of national level initiatives described below are “market-based instruments” or “co-regulatory and voluntary instruments”. Most of the regulatory measures are state level initiatives. A number of significant private sector initiatives are also covered.

5.3 *Regulatory measures*

There are over 500 state recycling laws in the USA, with between 50 and 120 new laws and 1 200 new bills enacted each year. (Raymond Communications 2000) It is not possible to cover all of these laws in this document. Only those that are considered most relevant for South African policy-makers have been selected for discussion.

5.3.1 *Landfill bans*

All but two states in the USA have banned whole tyres from landfill. (Warner Bulletin 1997) More than half of the states have banned the landfilling of yard trimmings, and many have also banned white goods, electrical scrap and batteries. (NRC 2000) The purpose of these bans is to promote the “appropriate” disposal of these products; this includes the removal and treatment of hazardous substances, and the reuse and recycling of materials. The state landfill bans have been found to be particularly successful in reducing amount of yard trimmings going to landfill. (Franklin Associates 1999) They also complement efforts in “extended product responsibility” for batteries and electrical and electronic goods.

5.3.1.1 *Waste separation laws*

At least 22 states and numerous local governments have enacted mandatory recycling laws. These laws require households and commercial establishments to separate newspapers and beverage and food containers from the rest of their waste, for separate collection and recycling (OECD 1992). While these laws are difficult to enforce, they do promote public awareness about waste separation and recycling.

5.3.1.2 *Recycled materials laws*

At least thirteen states have passed legislation requiring mandatory recycled content levels in newsprint; eleven states have voluntary agreements. Minimum recycled content laws have also been passed in three states for telephone books.

California and Oregon also have “rates-and-dates” laws. These laws require plastic packaging sold in-state to contain a set amount of recycled content, be re-usable a certain number of times, or have the plastic recycled at a fixed level within the state. For example, Oregon requires that rigid plastic containers contain 25% recycled content, be made of plastic that is being recycled in the state at a rate of 25%, or be a package that is used five times or more for a similar use. (Salzman 2000)

Supporters of these recycled materials laws claim that they have helped to reduce paper and packaging waste and increase recycling rates. (OECD 1996) However, opponents

of the packaging laws, such as the Industry Council for Packaging and the Environment (INCPEN Undated), claim that these laws:

- Compromise food safety;
- Are impractical: they are difficult to measure, impossible to police and can restrict the range of market opportunities for recycled materials, which might be better used for non-packaging purposes.
- Do not necessarily have environmental benefits because the increased weight of material required to achieve the same strength can outweigh the benefits of using recycled material.

5.4 Market based instruments

5.4.1 “Pay-As-You-Throw” programmes

The USEPA encourages communities to adopt a “Pay-As-You-Throw” approach, where residents are charged for the collection of MSW based on the amount they throw away. This creates an economic incentive to reduce and recycle waste. Generally, residents are charged according to waste volume, although a few communities charge according to weight. In 1996, the unit price ranged from US\$0.02 to US\$0.10 per gallon, and US\$20 to US\$60 per tonne ((Miranda and Aldy 1996), p.27). Each community’s programme operates differently, but some of the more common approaches are:

- For communities with kerbside waste collection, residents pay a different monthly fee, depending on whether they use 32, 64 or 96 gallon waste bins. Additional waste is disposed of in special bags that can be purchased at local stores. To encourage recycling, recycling services are free, or are charged at a flat rate. Some communities also offer low-income rate assistance, and some fine residents for non-compliance with the waste collection system (Canterbury 1997); (Miranda and Aldy 1996).
- For communities where residents are required to take waste to a transfer station, residents pay based on the weight or volume of non-recyclable waste. Recyclable waste can usually be delivered to the transfer station free of charge (Canterbury 1997).

To date, over 4000 communities (serving 20 million individuals) have implemented PAYT (Miranda 1999). While every community does not experience success with PAYT, the majority do. On average, the reduction in landfilled waste is 15% to 30%, with some communities reporting reductions of up to 120%. Reductions in landfilled waste are usually due to a decrease in waste generation, increased recycling rates and/or “undesirable diversion” like illegal dumping. It is important to note however that some commentators claim that there is no conclusive evidence to demonstrate source reduction behaviour as a result of PAYT. (Miranda and Aldy 1996)

Most communities adopting PAYT have achieved recycling rates of at least 50%, with some communities’ recycling rates increasing by 500%. (Canterbury 1997);

(Canterbury 1999); (Horton 1999); (Miranda and Aldy 1996). The average increase in recycling rates is eight to 11%. (Greczyn 1996). However, some commentators report that some communities have also experienced an increase in the amount of waste dumped on the street, in private commercial bins, or at charitable organisations as a result of PAYT. An increase in such “undesirable diversion” does not occur in all communities. It is more common in communities where it was a problem before PAYT was implemented. (Bauer, Scott et al. 1996)

Differences in success with PAYT are often related to whether communities offer education, kerbside recycling, yard waste collection and bulky item pickup services. Communities with more complementary programmes like these generally experience greater success. The enforcement of illegal dumping laws is also important, as is the presence of a market for recycled materials. PAYT has been found to be more successful in communities where the cost of waste disposal and the size of waste bins force residents to reduce waste. (Horton 1999); (Greczyn 1996); (Miranda and Aldy 1996)

PAYT has proven to be popular in the USA because it allows households to control how much they pay for waste services. It also provides local authorities with revenue to cover all waste management costs, including the costs of complementary recycling and composting programmes (Canterbury 1997). One of the greatest challenges of PAYT is to determine the appropriate price structure and price level, so that costs are covered, waste reduction and recycling are encouraged, and residents are not tempted to illegally dump waste. Some communities also have concerns about the increased uncertainty of revenue. This can be overcome by charging residents a small flat fee and a variable fee based on how much waste they discard. This ensures a certain level of revenue stability while still offering residents the incentive to decrease waste. (Horton 1999)

5.4.2 Procurement Guidelines

In 1998, Executive Order (EO) 13101 “Greening the Government Through Waste Prevention, Recycling and Federal Acquisition” was signed by the president. EO 13101 was developed under the Resource Conservation and Recovery Act 1976 and it supersedes a similar EO signed in 1993. The purpose of EO 13101 is to strengthen the government’s commitment to buying recycled content products and hence help create a stronger market for recycled products. The government accounts for 20 percent of the USA’s gross domestic product, and therefore has a great influence on the marketplace.

EO 13101 applies to all federal, state and local government agencies and their contractors. Under the EO, agencies are required to revise their procurement guidelines to remove barriers to the procurement of products containing recycled material; this includes “excessively stringent” performance standards. However, the guidelines do not have to be followed if doing so would result in unreasonable cost, inadequate competition, unreasonable delays, or inability to meet performance standards. In addition, the guidelines do not apply if an agency does not purchase more than US\$10,000 a year of that particular item. (US EPA 2000)

Under EO13101, the USEPA has issued more specific “Comprehensive Procurement Guidelines” that designate products for which government agencies must develop

affirmative procurement programmes. (US EPA 1997) Examples of products covered by these guidelines are listed in Table A.5.3. This list of items covered by the guidelines is reviewed on an annual basis. The USEPA has also issued “Recovered Materials Advisory Notices”, which recommend recycled content levels for products listed in the Comprehensive Procurement Guidelines.

Table A.5.3: Examples of products covered by the USEPA’s procurement guidelines

<i>Paper & paper products</i>	<i>Vehicular products</i>	<i>Construction products</i>	<i>Transportation products</i>
Sanitary tissue Newsprint Paperboard & packaging products Printing & writing paper	Engine coolants Lubricating oils Tyres	Fibreboard Paperboard Carpet products Floor tiles Patio blocks Cement/concrete Building insulation	Traffic cones Traffic barricades Delineators Parking stops
<i>Park & recreation products</i>	<i>Landscaping products</i>	<i>Office products</i>	<i>Miscellaneous products</i>
Playground surfaces Playground equipment Running tracks Park furniture Fencing	Mulch Compost Hoses Garden edging Timbers & posts	Waste containers Toner cartridges Printer ribbons Folders & binders Plastic desktop accessories Envelopes	Awards & plaques Signage Mats Strapping & stretch wrap

Source: (US EPA 1997), (US EPA 1998)

EO 13101 and the Comprehensive Procurement Guidelines are not enforced. However, the Office of the Federal Environmental Executive does attempt to monitor compliance. Since the introduction of the first EO in 1994, the federal government has more than quadrupled its purchases of recycled content paper. It has increased purchases of other recycled content materials by more than 50% (USEPA 2000a; Office of the Federal Environmental Executive 2000).

5.4.3 Deposit-refund systems

Ten states have introduced mandatory deposit-refund systems (“bottle bills”) for beverages. The systems are generally applied to glass, metal and plastic containers that are used for carbonated soft drinks and beer, and in some cases wine and spirits. The deposit is equal to approximately USD 0.01 to USD 0.05, and is usually imposed on beverage manufacturers rather than packaging manufacturers. In some cases, a lower deposit is applied to “standard” containers, to encourage use of these containers. In nine states, retailers are responsible for taking back containers from customers; in California, returned containers are handled by recycling centres or through kerbside collections.

Retailers must pay refunds for containers of the same brand and type that they offer for sale, and they must ensure that the collected containers are recycled. As compensation, retailers are paid a fee to cover the costs of handling returned containers. In some cases, retailers must pay back to the State deposits that have not been reclaimed ((OECD 1993), p.31).

The deposit-refund systems have increased the return rates of beverage containers to between 70% and 98%. Virtually all containers that are collected are recycled, with recycling rates being highest for aluminium cans. (Robinson 1996); (OECD 1993), (McMahon 1992). At first, there was a marked increase in the use of reusable bottles, but this trend has not continued. The effects on employment have also been positive. Gains in jobs in the beverage industry (in distribution and retailing) outweigh the jobs lost in the packaging industry (OECD 1993).

According to the OECD (OECD 1993), when compared to kerb side recycling systems, the deposit-refund systems have increased return rates and the quality of returned materials. The deposit-refund systems have also facilitated the development of recycling technologies and generated funds with which to build and upgrade recycling infrastructure. (McMahon 1992)

There are, however, arguments against deposit-refund systems. Opponents of the “bottle bills” claim that they unfairly discriminate against the types of packaging covered by the bills. They claim that the laws are too expensive to administer and impose unrealistic paperwork requirements. In many states, there has also been consternation over the use of revenue from the deposit-refund systems for funding improvements in the management of non-beverage waste materials. In addition, in states like California, the deposit-refund systems have produced such high recovery rates that profits have declined and the financial structure of the system is not very stable. (McMahon 1992)

5.4.4 National Battery Take-Back Initiative

The Rechargeable Battery Recycling Corporation (RBRC) is a non-profit public service company that manages the collection and recycling of small, dry-cell, rechargeable nickel-cadmium batteries. The RBRC has established a battery take-back initiative in the USA and Canada, in response to the classification of nickel-cadmium batteries as hazardous waste and a number of state mandates that require battery manufacturers to collect used nickel-cadmium batteries. The RBRC is now pushing for federal legislation to make the programme uniform in all states. (Scarlett 1998)

Currently over 22 000 retail stores and many industrial, commercial and institutional/governmental facilities voluntarily participate as RBRC collection centres. Over 250 battery manufacturers (representing 75% of the world’s producers) fund the RBRC by paying a voluntary license fee in return for the right to display the RBRC symbol on their packaging. The licence fee is usually collected from retailers to avoid the payment of fees on products that are not sold within the USA and Canada ((Guyer and Bagby 1998), pp.65-70). It is estimated that approximately 18% of used batteries are collected. (Garcia and Aleksandra Kielkiewicz-Young 1998)

5.4.5 Green Seal Eco-label

Green Seal is an independent, non-profit organisation that was established in 1990. Green Seal issues a third party eco-label to products that “cause less harm to the environment than similar products”. Products are assessed according to specified criteria, which include potential for reuse and recycling, and recycled materials content. (Green Seal 2000) (US EPA 1998). Green Seal builds consumer awareness through public education campaigns using television, trade publications and the environmental press.

To date, more than 300 products in 27 product categories have been awarded the Green Seal. This is “reasonable for a young program, but relatively small compared to the overall American market. The environmental benefit to date can therefore only be limited” ((OECD 1997); p.62). The limited success of Green Seal is thought to be due to industry reluctance to engage in third party eco-labelling and public confusion over the proliferation of environmental labels. Nevertheless, participating manufacturers have reported an increase in market share after certification, particularly for recycled paper products.

In addition to the eco-labelling programme, Green Seal has established an “Environmental Partners Program”. Businesses, government agencies and other organisations can join the programme by committing to buying environmentally preferable products and services as part of their procurement policies. Green Seal provides member organisations with information on environmentally preferable products. As of August 1997, over 160 organisations were actively participating in the programme ((US EPA 1998); p. B-155).

5.5 Co-regulatory and voluntary instruments

5.5.1 WasteWise

WasteWise is a free, voluntary USEPA programme. Participating organisations commit to achievements in:

- Waste prevention;
- Recycling collection; and
- Buying or manufacturing recycled products.

The USEPA provides technical assistance to companies that join the WasteWise programme, and highlights “success stories” in USEPA publications. Participating companies are able to use the WasteWise logo in their advertising so that they will be recognised as being “environmentally aware” (US EPA 1997).

It appears that the WasteWise programme has been relatively successful in raising awareness about environmental issues and encouraging businesses to reduce and recycle waste, although the actual level of improvement is difficult to establish. The programme began in 1994, and there are now over 500 companies actively participating. In 1998, WasteWise partners purchased more than 450,000 tonnes of recycled products, such as copier paper, paper towels and toilet paper. Manufacturers

diverted 158,000 tonnes of waste from landfill through materials reuse and recycling, and companies collected more than 7.2 tonnes of materials for recycling. (US EPA 2000)

5.5.2 Jobs Through Recycling

“Jobs Through Recycling” (JTR) is a multi-million dollar grants programme that has been developed by the USEPA to:

- Assist in the creation of markets for recycled materials;
- Stimulate economic development through recycling; and
- Stimulate job growth in the recycling industry. (US EPA 1998)

Through the JTR programme, a number of states and tribes have established “Recycling and Reuse Business Assistance Centres”. These centres provide technical, financial, business and marketing assistance to recycling enterprises. The JTR programme has enabled a number of recycling-based businesses to employ “Recycling Economic Development Advocates”, who are specialists providing business, technical and financial advice. JTR funds have also been used to fund specific demonstration projects in order to develop markets for recovered materials, test product specifications, and foster new and innovative recycling programmes. Also, the JTR’s “Investment Forums” bring recycling entrepreneurs seeking capital in contact with investors and economic development officials. (US EPA 1997); (US EPA 1997)

Since launching the JTR programme in 1994, the EPA has awarded more than US\$7.2 million in grant funding to 36 states, five tribes and three multi-state organisations. A review of four programmes initiated through JTR shows that an investment of US\$1 million in grants has helped businesses create more than 1700 jobs and \$290 million in capital investment. (US EPA 1997) Examples of specific projects that have been funded through the JTR programme include:

- The creation of Recycling Economic Development Advocate positions in various states. Each of these advocates have been able to facilitate the creation of between 120 and 4,200 jobs.
- The establishment of annual investment forums that have resulted in financial backing for a number of recycling firms, creating over 60 new jobs.
- The establishment of a materials exchange to strengthen recycling markets for poultry litter and wood waste. So far 15 jobs have been created, and it is expected that another 40 jobs will follow in the future.
- Investment in local and regional recycling infrastructure, to date creating 70 new jobs with at least another 500 jobs expected in the future.
- The establishment of a programme to promote state agency recycling and purchasing of recycled content products. This programme has led to the creation of almost 100 new jobs.

- Providing advice to paper, wood and plastics recyclers, to help them improve their operations and expand their markets. This has led to the creation of over 60 new jobs.
- The establishment of a consumer electronics appliance de-manufacturing programme that now employs over 60 people.
- Conducting a pilot project into the reuse of yard trimmings for mining land reclamation. This project has resulted in the creation of 170 new jobs. (USEPA 1999b).

Literature on the JTR programme does not give any indication of the skill level of the jobs created through the programme. However, it is likely that many of the jobs are manual jobs for relatively unskilled workers.

JTR grants are awarded by the USEPA on an annual basis through a competitive process. The USEPA will consider grant requests of up to US\$200,000. First time applicants must have funding from other sources for at least 25% of the JTR funding sought. (US EPA 1997)

5.5.3 Extended Product Responsibility

The USA has no federal mandates relating to extended producer responsibility. However, the USEPA supports the principle of “shared product responsibility” where all stakeholders play a role in reducing the environmental impact of products. The USEPA has developed voluntary stakeholder projects in various cities, to assist companies, retailers, customers, waste handlers, research institutions and government agencies to advance the understanding and implementation of EPR principles ((US EPA 2000); (Lindsay 1998)).

In addition, take-back programmes have been established by individual businesses, such as Nike, Dell Computer, Hewlett Packard, Xerox, transport packaging companies, disposable cameras and clothing. These have usually been motivated by economic and “image” factors. (Scarlett 1998)

5.6 Information and education

The USEPA collects, analyses and distributes a large amount of information relating to waste management. For example, its web site provides access to a comprehensive list of information on:

- Various US EPA waste management programmes and policies;
- Statistics related to waste;
- Ideas on how individuals, communities, businesses and others can reduce, reuse and recycle waste;
- A comprehensive list of waste-related contacts.

To assist in the collection of information about waste generation and recycling rates, the US EPA has also developed a standard methodology for state and local governments.

This includes the provision of worksheets, survey forms as well as detailed examples of how to collect and analyse information relating to recycling. The purpose is to:

- Ensure fair comparison of recycling rates among states and local governments;
- Provide useful information for planning and decision making;
- Provide accurate, up-to-date numbers for market development and monitoring purposes. (US EPA 2000)

The USEPA also runs public education campaigns. One example is its “Buy Recycled” programme that is intended to instil a “buy recycled ethic” in consumers. It is hoped that this will strengthen the infrastructure for recycling by stimulating consumer demand for recovered materials and recycled products. The “Buy Recycled” programme includes public advertisements, as well as training programmes for state and local governments to help them develop local programmes. (US EPA 2000)

5.6.1 Partnerships

A large number of partnerships have been formed to promote recycling in the USA by raising public awareness and supporting recycling ventures. Table A5.5 presents a selection of these partnerships.

Table A.5.5: Partnerships to promote recycling in the USA

Partnership	Partners	Purpose
<i>National Recycling Coalition</i>	Representatives of the recycling industry.	Aims to promote recycling. It provides technical information, education, training, outreach and advocacy services to its members (NRC 2000). With the support of the USEPA, it has also developed various “initiatives”, such as the Electronics Recycling Initiative. As part of this initiative, five electronic product recovery pilot programmes have been conducted, funded by the USEPA (USEPA 1999).
<i>National Waste Prevention Coalition</i>	People in the solid waste management field who work for local government, state government, non-profit organisations, universities, consultancies and other organisations.	The goals of the NWPC are to prevent waste and promote reuse. The NWPC runs publicity campaigns and acts as an information clearinghouse (NWPC 2000).

Partnership	Partners	Purpose
<i>Northwest Waste Prevention Coalition</i>	Informal organisation of people in the solid waste management field in the Pacific Northwest.	The coalition targets particular issues (for example, it is currently looking at lawn waste) and then compiles information on related projects that are being undertaken by organisations in the region. The purpose is to create a resource for organisations that are interested in establishing projects, and to generate regional and national publicity for waste reduction and recycling (NWWPC 2000).
<i>Chicago Board of Trade Recycling Partnership</i>	New York State Office of Recycling Market Development, National Recycling Coalition, Clean Washington Center, USEPA and Chicago Board of Trade.	Provides a formal recovered materials market exchange. The market helps to remove uncertainties over the price and availability of recovered materials. It also helps standardise the quality of recycled materials (USEPA 1997a).
<i>Vehicle Recycling Development Center</i>	Three American automotive manufacturers, who collaborate with the Automotive Recyclers Association, American Plastics Council and Institute for Scrap Recycling Industries (Scarlett 1998).	Conducts research and development activities to facilitate the reuse and recycling of materials from used vehicles (“News from America” 1997).
<i>Business and Industry Recycling Venture</i>	Greater Seattle Chamber of Commerce and Seattle Public Utilities.	Promotes waste reduction and recycling on the basis of saving money. To do this, the BIRV has produced 17 case studies of local businesses that show how companies have saved money by recycling (Seattle Chamber of Commerce 2000).

5.7 Evaluation of recycling initiatives

The success of individual recycling initiatives in the USA are discussed in the previous sections. Together, the initiatives have undoubtedly contributed to continued public interest in recycling, an increase in recycling rates, the development of recycling infrastructure, and the expansion of markets for recycled products. However, it is apparent that more will be required in the future if recycling rates are to exceed current levels; public interest is declining and local governments are concerned that they will not be able to sustain recycling programmes if markets for recycled products do not improve ((Cotsworth 1999); (UNEP 1999), p.307).

Since there is no urgent environmental crisis creating political pressure for federal action on waste management, it is likely that the approach to recycling will continue to be based on market based instruments and voluntary partnerships. The sustainability of this approach hinges on cost-effectiveness. Cost-effectiveness can be influenced by regulation, such as liability laws, sales taxes on non-returnable packaging and tax exemptions. The enforcement of laws, such as landfill bans, will also affect the implementation of voluntary take-back and recycling initiatives. (Cotsworth 1999)

6. INDIA

6.1 *Levels of waste generation and recycling*

The analysis of solid waste management in India is severely hampered by a lack of reliable data. Details of waste generation, composition and disposal are generally unknown, even to government authorities ((van Beukering, Sehker et al. 1999), p.9; (Jain and Pant 1994) p.1). This should be kept in mind when reading the following information.

6.1.1 Industrial waste

In major cities, industrial and commercial waste accounts for up to 80% of total waste arisings by weight ((van Beukering, Sehker et al. 1999), p.9). Industrial waste often contains large quantities of fly ash, blast furnace slag, phospho-gypsum, lime sludge and red mud. (UNCSD 1997)

6.1.2 Rural areas

Almost three quarters of India's population lives in rural areas. Annual solid waste generation in these areas is estimated at approximately 15 million tonnes. Almost all of this waste is utilised, usually for fuel, animal feed or farm manure. Hence, rural solid waste is not considered to be a particular problem. (Jain and Pant 1994)

6.1.3 Urban areas

Solid waste management in India's urban areas is becoming increasingly challenging as industrialisation and urban population growth continue. During the mid 1970s, annual solid waste generation in India's main cities and towns was approximately 70 kilograms per person. Today, it is approximately 125 kilograms per person per year, or a total of 19 million tonnes. (Indian Ministry of Environment and Forests 1999) With a national population growth rate of 2% (and almost 4% in urban areas) it is expected that waste generation will continue to increase in the future. (van Beukering, Sehker et al. 1999) (It should be noted that estimates of urban solid waste arisings vary. For example, it has been estimated that annual solid waste generation in urban areas is 30 million tonnes (van Beukering, Sehker et al. 1999) and 12 million tonnes (D'Souza 1998)).

Between 30 and 75% of India's municipal waste is organic. (Jain and Pant 1994), (D'Souza 1998). More detailed information on the composition of urban waste streams is not available on a national level, although there is some information about individual cities. For example, Table A.6.1 indicates the composition of waste in Bangalore, a city with five million people.

Table A.6.1: Composition of waste in Bangalore

Waste fraction	% of total waste stream
Organic material & other biodegradable waste	42%
Paper & cardboard	17%
Rubber	10%
Plastics	7%
Glass	3%
Metal	2%
Hospital waste	2%
Miscellaneous	18%

Source: (van Beukering, Sehker et al. 1999) p.9.

In India, the disposal of urban waste is the responsibility of local authorities, who often spend up to half of their annual budget on waste management ((van Beukering, Sehker et al. 1999) p.8). An extensive informal waste management sector operates in parallel with the established municipal systems, dealing with up to 20% of total waste stream. (Chaturvedi 1999) About a quarter of urban waste, particularly from poorer areas, is simply not collected. This waste decays on streets and within slums, creating health and environmental hazards. (D'Souza 1998)

Most inorganic, recyclable waste is dealt with through the informal waste management sector. This includes bottles, plastics, metals, waste paper, batteries, rubber, and cutting oil. (Jain and Pant 1994); (Kumra 2000). The majority of recyclable waste is sold directly by households and commercial establishments to waste merchants. Scavengers extract any waste that reaches garbage bins, transfer stations or landfill sites. The waste is then sold to dealers who are responsible for separation, sorting, grading and resale to reprocessing units. A significant portion of inorganic waste like clothes, glass bottles and metal tins are usually reused before they are recycled.

Thus, although waste is not always dealt with in regulated systems, levels of recycling and reuse are very high (see for example Figure A.6.1). In some urban areas, reuse and recycling rates for inorganic waste are as high as 90%. (Chapman 2000). The informal waste management sector also provides income for the urban poor and cheap input materials for manufacturing operations, thereby encouraging the process of industrialisation. However, the quality of reused and recycled materials is often inferior, affecting the efficiency of manufacturing processes and the quality of manufactured products. It is debatable whether this sort of industrialisation is good for the “development” of the country. (Sharma, Beukering et al. 1999)

The disposal of organic waste is more problematic. In the absence of stringent laws, most waste that is not reused or recycled is collected and dumped in landfills. There is no separation of waste, so organic waste, abattoir waste, construction debris, medical waste, industrial waste and other toxic and hazardous waste. (D'Souza 1998)

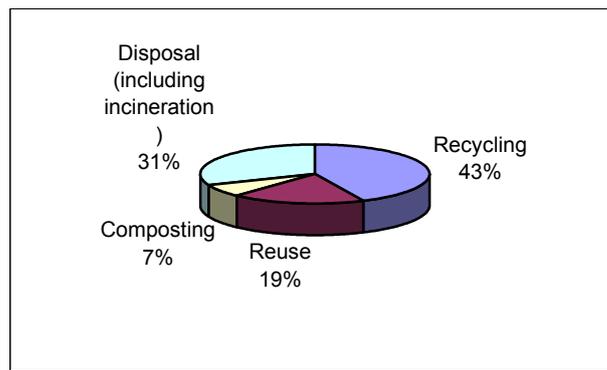


Figure A.6.1: Waste treatment in Bangalore – Source: (van Beukering, Sehker et al. 1999)

6.2 General Policy on Waste

While the level of waste reuse and recycling in India is not a particular problem, the quality of recycling technologies and recycled products is certainly an issue of concern. Recycling technologies tend to be crude, and there is little regulation of the secondary product market. As a result, recycling facilities are seen to be “dirty”, and the quality of recycled products is often poor. For this reason, the Indian government’s recycling initiatives have tended to focus on quality issues in an attempt to ensure that recycling processes and recycled products are safe to humans and the environment. This said, it should be noted that government intervention in both the formal and informal waste management industries is minimal. In the past, issues of poverty, population growth and unemployment have sidelined the issue of waste management. (D’Souza 1998). In addition, government intervention is generally not welcomed by industry, as it is considered that stricter quality and health and safety guidelines may in fact hinder recycling. (Kumra 2000)

The following sections provide a summary of some of the key initiatives that have been introduced by the Indian government in recent years.

6.3 Regulatory Measures

6.3.1 Municipal Solid Wastes (Management and Handling) Rules, 1999

The Municipal Solid Wastes (Management and Handling) Rules 1999 give municipal authorities the responsibility of collecting, storing, transporting, processing and disposing of municipal solid wastes. The rules promote reuse and recycling by requiring authorities to, amongst other things:

- Organise programmes to raise awareness about waste segregation and recycling;
- Ensure that biodegradable waste is composted, anaerobically digested or otherwise biologically processed; and
- Ensure that all recoverable materials are reused or recycled.

6.3.2 Ban on plastic bags

In India, the collection and disposal of plastic bags is a growing problem. The use of plastic bags has increased significantly in recent years, and thin, non-reusable bags are often dumped on the streets rather than collected for recycling or disposal. The problem is most severe in low-income areas where waste collection services are inadequate: in these areas not even informal waste scavengers are interested in collecting non-reusable plastic bags, as they have very little commercial value. In an attempt to ease the problem, the Indian government has been considering a ban on the production of plastic bags of less than 80-gauge thickness (Unnithan 1998). Although such a ban has been discussed for a number of years, nothing has yet emerged at the national level. There are, however, bans on thin plastic bags in specific regions, such as “sensitive” areas, as areas of natural beauty, and popular tourist destinations (Kumra, personal communication 2000).

6.3.3 Recycled Plastics Manufacture and Usage Rules, 1999

As previously mentioned, the quality of recycled products is often inferior. Concern has been raised about the health implications of using recycled goods, particularly plastic containers, for food preparation and storage. In response to these concerns, the government has produced rules related to the use of recycled plastics. The rules state that:

- No vendor may use recycled plastic bags or containers for storing, carrying, dispensing or packaging food stuffs;
- Recycled plastic bags and containers must be clearly marked as such;
- Plastic recycling, and the manufacture of recycled plastic bags and containers, must be in accordance with the Indian Standard IS 14534:1998 “The Guidelines for Recycling of Plastics”. These standards specify health, safety and quality measures that must be implemented during recycling operations.

6.4 Market based instruments

6.4.1 Subsidies

During the 1990s, government and semi-government bodies have provided several economic incentives for private companies to become involved in waste recycling and composting by providing:

- Highly subsidised land;
- Free supplies of waste;
- 100% depreciation on machinery; and
- Grants and loans.

6.4.2 Tax exemptions

To encourage the reuse and recycling of industrial waste, the government applies an excise duty exemption to the production of building materials using fly ash or phosphogypsum. A custom duty exemption is also applied to imports of equipment and machinery for the conversion of industrial wastes for useful purposes.

6.4.3 Littering fines

In some cities, including Chandigarh and Surat, individuals can be fined up to 500 rupees (US\$11) for littering. Higher fines apply to industry. The purpose of the fines is to discourage illegal waste dumping, to increase waste collection rates, and to raise revenue. The imposition of fines varies from place to place, depending on the resources available to municipal authorities (Gupta and Kansal 1998, p.4).

6.4.4 Deposit-refund systems

According to the United Nations Commission on Sustainable Development (UNCSD1999, p.6), deposit-refund practices are quite widespread in the consumer industry in India. However, other literature on waste management in India fails to mention the existence of any such schemes. This issue may require further investigation.

6.5 Co-regulatory and voluntary instruments

6.5.1 Ecomark

The Indian Government launched the Ecomark ecolabelling scheme in 1991, to increase consumer awareness of environmental issues. The Ministry of Environment and Forests, with the technical advice of the Central Pollution Control Board, manages the programme. The Ecomark label is issued to products that meet specified environmental criteria, one of which is that the product must be “recycled, recyclable, made from recycled products or bio-degradable, where comparable products are not”. In addition, “the material used for product packaging shall be recyclable, reusable or biodegradable”. (Indian Ministry of Environment and Forests 1999) By promoting recycled and recyclable products in this way, the government hopes to increase public interest in recycling and increase the size of the currently limited market for recycled products (van Beukering, Sehker et al. 1999).

To date, no products bear the Ecomark symbol, even though two products have been licensed to use the symbol. This is seen to be due to a lack of consumer and industry interest in the environmental performance of products. (Ghosh 2000) It may also be due to the costs involved in applying for the Ecomark, which may not outweigh the market benefits, as well as the numerous regulatory requirements that must be met ((US EPA 1998), pp.B-60-61).

6.5.2 Partnerships

Van Beukering ((van Beukering, Sehker et al. 1999), p.8) reports that a number of other initiatives have been introduced by municipalities and non-governmental organisations (NGOs) in recent years. These initiatives include:

- The formation of community-based organisations, to encourage public participation in the collection, segregation and disposal of waste;
- The building of public/private partnerships;
- Applying technological innovations to improve waste recovery. These innovations relate to waste treatment methods such as composting, bio-gasification, fuel pelletisation, refuse-derived fuel and incineration. There are also projects to improve the recovery of materials from production processes, such as metals recovery from electroplating(Kumra 2000).

Some of these initiatives have been in the form of internationally funded pilot projects, conducted in co-operation with the World Bank, United Nations Development Programme and Asian Development Bank, or through bilateral agreements (UNCSD 1997). Others are funded through “matching grants” that are offered to research and development institutions by the Indian Government’s Technology Development Board. This Board is responsible for facilitating the development of new technologies, and the assimilation and adaptation of imported technologies. (UNCSD 1999)

6.5.3 Information collection

There have been a number of attempts to collect more comprehensive data on waste generation, composition and treatment. In 1992, the Ministry of Environment and Forests issued a notification for every industry to audit the environmental impact of its operations, including its waste. (UNEP 1999) Five years later, the Ministry initiated a scheme to survey solid waste generation and treatment in major cities and towns. (UNCSD 1997) An Indian Government Environmental Information System Network has also been established to help manage the collection, collation, storage, analysis, exchange and dissemination of environmental information. While these projects are the first step towards developing more reliable and comprehensive data, information at all levels is still generally scattered and disorganised, if it is available at all. (van Beukering, Sehker et al. 1999)

6.6 Evaluation of recycling initiatives

The success of recycling initiatives in India is difficult to establish for a number of reasons, including:

- The absence of reliable baseline data, let alone time series data;
- The absence of stated objectives by which to judge the initiatives;
- The fact that a lot of waste is treated through the informal sector, and is therefore not affected by many of the initiatives described above; and

- The fact that many of the initiatives, such as the regulatory measures, have been implemented only very recently.

Nevertheless, literature on recycling in India suggests that the effectiveness of government initiatives has been hampered by a lack of public awareness about waste management, and a lack of financial and other resources ((UNCSD 1997), p.6 and (UNCSD 1997), p.2; (van Beukering, Sehker et al. 1999); (Chaturvedi 1999), p.4). The strength of the informal waste management sector also makes government intervention in the recycling industry both difficult and, according to some, undesirable. Some commentators purport for example that “The present trade network (or informal waste management sector) forms a solid foundation for the improvement of the (WASTE) recovery rate. Replacement of this informal network with a western collection system may have devastating effects.” (Sharma, Beukering et al. 1999) They suggest that informal recovery reduces costs for the government, provides income for the poor, and promotes the reuse and recycling of materials where it is economically feasible.

To maximise success from an environment, social and economic point of view, it has is suggested argued that future recycling initiatives in India need to:

- Recognise and build on existing informal recycling networks, such as by creating registered “rag pickers enterprises” that are able to bid for municipal waste collection contracts and negotiate with other actors as a private body.
- Raise consumer awareness of the importance of waste separation and recycling.
- Provide monetary incentives for households and business to reduce waste generation and to separate waste.
- Allocate sufficient space for the composting of organic waste, provide incentives for citizens to compost waste, and facilitate the reuse of composted waste.
- Focus on regular and proper monitoring of disposal activities.
- Encourage technology transfer, to improve the efficiency and safety of recycling.

7. KENYA

Since the 1980s, Kenya has experienced a rapid increase in rural-urban migration. Today, around a third of the population lives in urban areas ((Marcoux 1998);(Habitat 1998)). Urbanisation has created problems for service providers, who are not able to keep up with the rapid population growth. As a result, many basic services such as sewage and waste disposal are grossly inadequate. This causes serious health and environmental problems in many urban areas ((UNEP 1999), pp.65-66).

7.1 *Levels of waste generation and recycling*

7.1.1 **Solid waste generation**

It has not been possible to obtain national level figures on waste generation, nor has it been possible to obtain information about waste in rural areas. This section therefore focuses on Nairobi, Kenya's largest urban centre, which is generally acknowledged as having the most serious waste management problems.

Nairobi has a population of around 2.3 million. The residents of Nairobi generate approximately 336,000 tonnes of waste each year, equivalent to 145 kilograms per person. It is estimated that half of all solid waste is organic material (see [Figure A.7.1](#)). Toxic materials, like batteries, make up about 0.2% of the waste ((Gathuru 1994); (Ishani and Lamba 1998), p.4; (Peters 1998), p.8). One material that is becoming increasingly more common in waste is low-density polyethylene (LDPE) plastic bags that have come into popular use in the last five to 10 years ((Peters 1998), p.15).

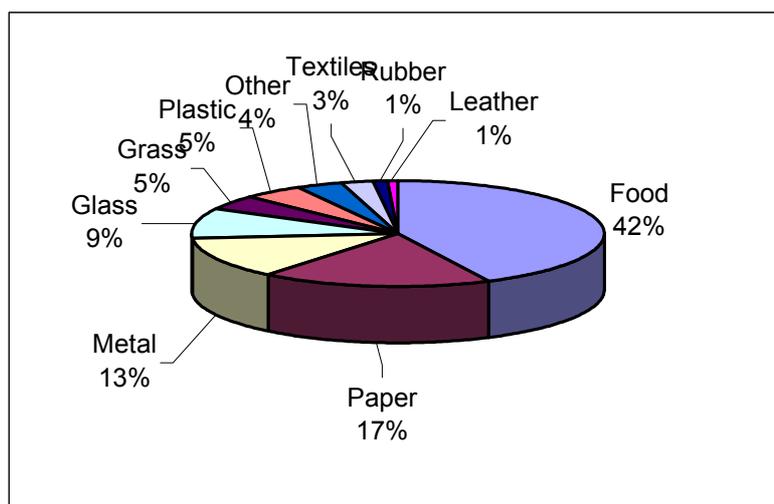


Figure A.7.1: The composition of Nairobi's solid waste (Source: JICA Study on Solid Waste Management in Nairobi City, 1997 quoted in (Mokua 2000))

7.1.2 Responsibility for waste treatment

The Kenyan *Public Health Act* and *Local Government Act* empower local government authorities to collect waste from residential and commercial areas. Local authorities are funded by the central government, but the funding is usually insufficient for adequate service provision. For example, the Nairobi City Council (NCC) is able to collect less than half of the waste that is generated. Waste collection rates are particularly low in the informal settlements that house up to 70% of Kenya's urban population. Informal settlements are considered by local authorities to be "illegal" and therefore outside their area of responsibility. The geographic isolation of informal settlements also hinders waste collection ((Ishani and Lamba 1998, p.4); (Gathuru 1994), p.1; (Habitat 1998), p.1; (Peters 1998), p.4).

Private waste collection companies have recently emerged to supplement local authority efforts, encouraged by the Kenyan Government's Structural Adjustment Programme and privatisation policies (Habitat 1998). Private services are largely confined to industries, institutions, commercial establishments, and middle- to high-income residents who can afford to pay to have their waste collected. These services rarely extend to lower income areas and informal settlements (Wambui 1996). In response to the inability of the public and private sectors to provide adequate services in lower income areas, community based organisations (CBOs) have also become involved in waste management. (Peters 1998)

7.1.3 Waste treatment

The waste that is collected by local authorities and private companies is dumped in uninhabited areas. A small amount of inorganic waste is recycled, generally in large-scale industrial plants. The remainder of the waste is: (Peters 1998); (Gathuru 1994)

- Incinerated on site by residents;
- Left to decompose;
- Used as animal feed;
- Picked by street children in search of food; or
- Recovered by scavengers who sell it to recyclers or industry, usually through middlemen. The most popular scavenged items are paper, scrap metal and bottles.

7.2 General policy on waste

The Kenyan Government's environmental management policy states that it is committed to developing comprehensive waste management policies, strengthening institutional capacities, and planning and implementing national awareness programmes. However, little has actually been done to achieve these goals. Nor is adequate consideration given to waste management during spatial planning and development (Gathuru 1994). Despite the lack of governmental leadership, CBOs and NGOs have been quite active in promoting waste collection, reuse and recycling. These organisations' activities are funded by donor agencies, including the United Nations

Environment Programme, the World Bank Micro Projects Intervention Programme, various Scandinavian countries and the Dutch Government (Peters 1998); Nakuru Local Agenda 21 officials, personal communication, 24 February 2000). They generally focus on increasing levels of waste collection (for health and sanitation reasons) and generating employment for Kenya's urban poor. Urban growth has led to an increase in poverty, and it is estimated that almost half of Kenya's population lives below the poverty line. Although there is a lack of formal employment opportunities, the fast growing informal waste management sector offers an alternative for the urban poor. (Ishani and Lamba 1998); (Peters 1998)

Some of the major waste-related projects conducted in recent years are described below.

7.3 Co-regulatory and voluntary instruments

7.3.1 Mathare Youth Sports Association

In 1987, the Mathare Youth Sports Association (MYSA) began combining sports activities with community self-help. Once a week, local youth clean up in low-income settlements in Mathare, Nairobi. They do this in lieu of sports fees that they cannot afford. The NCC provides personnel and equipment to assist in the clean-ups, and Scandinavian donor agencies provide the salary for a co-ordinator and money for equipment (Ishani and Lamba 1998). The MYSA project has increased levels of waste collection in Mathare. However, recycling rates have not significantly increased, due to a lack of infrastructure and a limited market for recycled materials. The MYSA has also encountered health risks and injuries to youths, and difficulties in involving females and older youths in the clean-ups. (Peters 1998)

7.3.2 Machuma Schools

In the early 1980s, a church group established "Machuma Schools" for street children in Nairobi slums. Approximately 300 children attend the schools, which are now donor funded. Every day, the school children attend classes for half the day, and then collect scrap metal, bones, paper and plastic for the remainder. The material that is collected is sold, with the children keeping the profits. (Gathuru 1994)

7.3.3 Rescue Centres

The Unduga Society of Kenya is a Kenyan NGO that has developed "rescue centres" for street children, where they can get access to medical care, food and counselling. The centres have also have waste recycling groups, where children collect paper, bottles and other scrap from the International School of Kenya. The waste that is collected is sold, with the money going to the children. (Gathuru 1994)

7.3.4 Composting groups

Various community groups have been established in urban areas to collect and dispose of waste. For example, women in Nairobi have formed groups to collect and compost

organic waste, for sale to farmers and middle- to high-income residents. Composting is supported by a number of NGOs, including: (Ishani and Lamba 1998)

- The Uvumbuzi Club, which transports and markets compost; and
- The Foundation for Sustainable Africa, which trains composting groups and assists in packaging and marketing the compost wherever possible.

Composting has been found to improve health, improve drainage, reduce odours from waste, and promote urban agriculture. However, it has not yet managed to generate substantial profits due to marketing and transportation constraints. There are also a number of barriers to composting, including land availability, the unclear legal status of urban agriculture and health concerns. (Peters 1998)

7.3.5 Clean-up Nairobi Campaign

In 1992, Nairobi residents formed a coalition for the “Clean up Nairobi” campaign. The campaign attempted to increase public awareness about waste reduction and composting. Members of the coalition also worked with the community to collect and compost waste. Originally the NCC provided equipment for the campaign, but has since withdrawn support. This led to the collapse of the project.

7.3.6 “Green Towns”

The Green Towns project was an initiative of the Kenyan Ministry of Local Government, the Ministry of Lands and Settlements, the Government Training Institute in Mombasa, and the Agricultural University of Wageningen in the Netherlands. The purpose of Green Towns was to integrate environmental concerns into local authority planning and decision-making. Projects were established in 11 towns. An evaluation of the project in three of the towns found that:

- Physical conditions had improved;
- The health of residents had improved; and
- There was a greater environmental awareness among residents and decision makers.

Unfortunately, the project ended due to a lack of adequate funding.(Wambui 1996)

7.3.7 Recycling technology development

In recent years, pilot projects funded by donor agencies have been developed to find ways of recycling plastic, paper and candle wax. (Gathuru 1994)

7.3.8 Local Agenda 21 Programmes

With the assistance of international aid agencies, local Agenda 21 programmes have been established in a number of cities, including Nakuru and Thika. Within these programmes, there have been efforts to train and sensitise community based waste

management groups (Nakuru Local Agenda 21 officials, personal communication, 24 February 2000).

7.3.9 Waste Recycling in Nairobi, Kenya, 1990-1995

WASTE and a team of consultants from developing countries conducted a project to assess the potential for recycling organic wastes, plastics, rubber, tin cans, motor oil, cooking oil, broken glass, photo chemicals, household batteries, bones and horns. The focus of the research was on how recycling could be a source of income for people in the low-income areas of Nairobi.

7.4 Evaluation of recycling initiatives

It has been found that the success of waste management projects in Kenya depends largely on motivational factors that encourage people to participate. (Ishani and Lamba 1998) However, even where projects have successfully increased rates of waste collection, they have not necessarily increased recycling and composting rates (Wambui 1996). Even despite the proliferation of informal waste picking that occurs both within and outside the boundaries of these projects, the majority of inorganic waste is not reused and recycled.

In addition, all of the initiatives described above are fairly small scale and therefore have limited impact; they have done little to improve the overall condition of cities, or the adequacy of waste management services. Replicating the projects requires government support, but this does not seem possible as the government itself has many constraints and little political will to lend support (Ishani and Lamba 1998). Privatisation is often put forward as a solution, but it has not proven to have necessarily helped improve the level of service provision. This may be because both central and local government authorities are ambivalent about the sharing or surrendering service provision with private companies, despite their own inability to provide adequate services.

NGOs and CBOs have been more active than the government in promoting improved waste management. Their projects have helped to generate income for the urban poor, reduce health and environmental hazards, and increase awareness about solid waste management (Nakuru Local Agenda 21 officials, personal communication, 24 February 2000). While local NGOs and CBOs are willing to provide assistance in setting up groups and training people, a lack of financial and human resources restrict their work. (Ishani and Lamba 1998)

Improving the waste management situation in Kenya requires overcoming a number of significant obstacles. Some of these obstacles and suggested solutions are presented in Table A.7.1.

Table A.7.1: Improving waste management in Kenya

Based on (Gathuru 1994); (Ishani and Lamba 1998); (Habitat 1998); (Peters 1998) (Nakuru Local Agenda 21 officials, personal communication, 24 February 2000)

Obstacle	Suggested solution
Difficulty in providing services to unplanned settlements	Provide financial and technical support to self-help initiatives, and NGO and CBO projects that focus on improving waste management in informal settlements. Develop systems to ensure an integrated approach to land use planning, development and waste management
Lack of public awareness and education about waste issues.	Information dissemination and creation of awareness about the link between waste and environmental and health issues.
Very limited market for recycled products and materials.	Improve rural-urban linkages, to increase the size of the market, particularly for compost.
Governmental constraints, including: <ul style="list-style-type: none"> • A lack of political will to improve the efficiency of urban services; • A lack of financial, technical and physical resources in central government and local government authorities; • A lack of leadership by the central government and a lack of decision making authority at both central and local government levels 	Create a regional network of city planners, private sector organisations, NGOs, CBOs, and recycling industry representatives, to share best practice initiatives and create a more powerful lobby for waste management and recycling. Decentralise activities and redefine roles in the public sector to empower local government. Privatised activities where feasible, with mechanisms to ensure that privatisation does not exclude or impose undue burden upon the poor. Local authorities should regulate, co-ordinate and advise NGOs and CBOs. They should only be involved in service provision when it is not possible for the private or community sector to do so.
Lack of support for NGOs and CBOs.	Government recognition of and support for self-help initiatives, partnerships, NGOs, CBOs and other associations.
Lack of recycling infrastructure.	Develop and implement locally adapted recycling technologies. Develop the formal sector to improve facilities for the recycling of inorganic waste. Formal sector development must go hand in hand with informal activities, to ensure that where possible, the jobs created go to the urban poor.
Lack of information about waste management.	Develop indicators to measure the impact and rate of success of waste management initiatives.
Poor conditions for waste pickers and self-help groups.	Improve employment conditions for waste handlers, as well as access to support services. This should preferably be done in a way that does not “formalise” the sector and alienate those people who rely on it for their livelihood. It would be more preferable to establish “co-operatives”.

8. BOTSWANA

Although Botswana has one of the fastest growing economies, little attention has been given to the management of waste. Due to a lack of disposal facilities and little public awareness about the negative impact of unmanaged waste, dumping has been common. Botswana has 175 recorded dumping sites scattered around the country, of which only a few are considered to be landfill sites (Simon, 1999). In 1993, the governments of the Federal Republic of Germany and the Republic of Botswana entered into an agreement to establish a waste management project in Botswana. The overall goal of the project was to reduce environmental pollution by addressing inappropriate waste management practices.

8.1 Levels of Waste Generation and Recycling

In Botswana there is limited information on the quantities of solid waste generated. The estimated figures indicate that about 325 000 tonnes of solid waste, excluding mining waste, is disposed of at landfill sites each year (Kgathi, 1999). About 46 000 lead acid batteries are either disposed of at landfill sites, stored or dumped indiscriminately. Motor vehicle scrap production is estimated to be 20 000 tonnes per year.

The composition of the waste stream in the urban areas and rural areas was established during the development of the Waste Management Strategy in 1997 and the estimated tonnes recycled (Table A.8.1).

Table A.8.1: Composition of waste in different areas and mass recycled

Waste	Urban Areas (% by mass)	Rural Areas (% by mass)	Recovered (T/a)
Paper/cardboard	9.5	14	6 000 (22%)
Plastic	7.1	10.6	570 (5%)
Glass	6.8	24.5	N/A
Cans and other metals	5.8	21.1	3 400 (58%)

(Source JPD Phatshwe Personal Communication 2000)

One of the major difficulties in estimating the amount of solid waste is that most rural areas do not have a collection service. The collection service in most major villages is erratic and poorly co-ordinated. Increasing attention is being given to the reduction of solid waste by adopting strategies of waste minimisation, reuse and recycling. However, to date there is no policy on the reuse of waste materials, a practice which is still in the early stages of development. Waste streams that are currently recycled include beverage cans, bottles and cartons and paper.

8.1.1 Glass

Glass bottles are imported from South Africa for use in the packaging of soft drinks and beer manufactured by Kgalagadi Breweries. The brewery has been packaging mainly in

cans, as these are more suited to the rough terrain over which they have to be transported to the end user. In 1982, beverage returnable bottles accounted for 13% of the soft drink packaging and the rest was in non-returnable cans and plastic bottles (Kgathi, 1999). As the condition of the roads and the scarcity of water in Gaborone have improved, an increasing number of returnable bottles are being used. It is currently estimated (April 1999) that returnable bottles account for 20% of the total packaging of soft drinks and 15% of the total packaging of beer.

8.1.2 Beverage Cans

The recycling of beverage cans in Botswana is promoted by Collect-a-Can. Cash is paid for cans delivered to the Gaborone Depot, collected by Collect-a-Can agents from source or delivered to a Collect-a-Can depot in South Africa. Cans are usually collected at urban centres by those people of a lower socio-economic status, including the unemployed. Entrepreneurs are also located in the main centres who travel around with a baler and collect cans from the outlying areas. Those who collect at a landfill site are usually charged a fee by the Council, for example P50 for 20 to 30 tonnes of scrap collected from the Gaborone landfill in 1997 (Kgathi, 1999). Some landfills have stopped this form of informal scavenging.

Collect-a-Can state that 52% of the cans are currently being recycled, which are returned to South Africa for re-processing. Cans are collected and returned to the depot on the empty delivery trucks (Collect-a-Can, 2000). Approximately 80% of the cans collected are from schools located within a 100 km radius of Gaborone who participate in competitions. This however is sometimes problematic and has been perceived to be a health risk due to the heap of cans that are not collected timeously.

8.1.3 Paper

Waste paper is collected in Botswana by Waste Paper Recovery and sold to Swazi Paper Meal in Swaziland. Waste Paper Recovery was established in 1983 to address the litter problem and collects paper from Gaborone and Francistown (Kgathi, 1999). It is estimated that 22% of the total amount of paper and cardboard generated is recovered for recycling. (JDP Phatshwe Personnel Communication 2000)

8.1.4 Oil Containing Wastes

Botswana had oil sales of 5.6 million litres per annum in 1996. (NCSA 1996) Disposal is uncoordinated and ranges from storage for re-refining in South Africa to illegal dumping. A study undertaken in 1996 identified that the oil available for recovery is reported to be 37% of the sales, which could be increased to 50% in the short-term. The study concluded that should the volume of collected used oil increase to the projected 6 million litres by the year 2005, local processing of the oil could become viable. In the short to medium-term, the most practical disposal technology was identified to be the use of used oil as a substitute fuel in selected large industrial processes. The establishment of a scheme to raise funds, manage and promote environmentally friendly collection, transport and reclamation of oil has been proposed.

8.2 General Policy on Waste and Recycling

Botswana developed a waste management strategy in 1998, which takes into account all waste management issues and concerns regarding the protection of people, animals and the environment. The strategy embodies the following principles, whose basic premise is to minimise environmental pollution:

- Principle of prevention;
- Polluter pays principle;
- Principle of co-operation.

In addition to the above principles, the strategy has adopted the internationally accepted Waste Management Hierarchy of Reduction, Reuse and Recycling. The main objectives of the strategy are to minimise and reduce waste in industry, commerce and households and maximise environmentally sound waste reuse and recycling, as well as the promotion of environmentally sound waste collection, treatment and disposal.

Based on the waste management strategy, a Waste Management Act was developed and Promulgated in September 1998. This Act was promulgated to provide the legal framework to strengthen, implement and support the strategy. The Act provided for the establishment of an independent Department of Sanitation and Waste Management, the registration and licensing of waste carriers and the registration and licensing of waste disposal sites. With regard to waste recycling the Act states that a local authority must prepare a waste recycling plan as part of its local waste management plan, a waste recycling plan with respect to controlled waste in its area. The recycling plan is to include information on the type and quantity of waste that could be recycled; the implication of recycling on the authority; technical, organisational and financial incentives the local authority will provide to encourage recycling; estimated costs or savings; possibility of returning waste materials to the manufacturer. Consecutive recycling plans must include an evaluation on the previous recycling plan.

8.3 Specific Policy Instruments to Promote Recycling

In order to develop a policy framework that will lead to better solid waste management, Botswana has looked at the introduction of a combination of regulatory, economic and environmental education instruments.

8.3.1 Regulatory Measures

There are a number of regulations for solid waste collection and disposal, which are embodied in the Waste Management Act of 1988. The Act states that local authorities should make provision for solid waste recycling with the relevant bodies in the private sector but does not impose regulations with regard to waste minimisation and recycling, such as setting targets on recycling, or banning the packaging of beverages in certain types of containers.

8.3.2 Environmental Education

Environmental education is still at an early stage of development although a number of programmes are emerging from non-governmental organisations. The initiatives include the promotion of the use of reusable cloth bags as opposed to plastic bags, and the raising of awareness about environmental problems through panel discussions.

8.3.3 Economic Instruments

Property rates are payable by all plot holders in urban areas, which are calculated according to the value of the property and has no relationship to the amount of waste collected and disposed of. There is therefore no incentive to reduce the amount of waste generated.

8.4 *Evaluation of recycling initiatives*

The practice of selling waste at landfills should be discouraged as it may hinder the development of recycling. It has suggested that recycling be subsidised in view of the reduced external costs associated with waste disposal and recommends recycling credits for those who recycle waste.

9. NAMIBIA

The University of Namibia has been commissioned to compile a report on the waste management situation in Namibia. It was found that past planning was inadequate, the legislation and regulations are outdated and fragmented. Recycling is very limited due to the small population and the distance to transport the material back to South Africa for recycling. A number of small initiatives are currently ongoing that are undertaken by the private sector and NGOs. Paper is recovered from a landfill site in Windhoek and transported to South Africa or Swaziland, glass is recovered from Coca Cola and the breweries, and a 76% can recovery rate is achieved by Collect-a-Can. Information of the quantity of material recycled is not available.

APPENDIX B

Recycling in the NWMS (Strategy Formulation Phase)

During the Strategy Formulation Phase of the NWMS, the following issues pertaining to recycling were raised as part of the consultative process. (These issues were included in the Discussion Document on Non-hazardous Waste Management)

Recommended Options

The Recommended Options included the following elements:

- A research and development program to assist in the selection of sectors or generators that generate abundant, marketable recyclable materials, in the first instance. This program would almost certainly focus on certain industries, trade and commerce, and certain residential areas. Pre-consumer recycling, source separation, composting and research into other appropriate methods of recycling would also be promoted.
- Government commitment and carefully researched legislation that will promote the viability of recycling, both on the general and specific levels.
- To further promote the economic viability of recycling, the provision of economic or regulatory incentives, and short to medium term subsidies in cases of projects that are expected to become self-sustaining.
- In order to extend recycling in time, there must also be provision to extend the strategy progressively as legislation, subsidies and recognition make it more feasible and more economically viable.
- A program for recycling, research and development projects aimed at the selection of sectors, materials and methods

The selection of recyclable materials and sectors must be based on sound research and a clear understanding of the principles and issues involved. Historically, many mistakes have been made in this area in South Africa because of a lack of understanding. The data requirements for the development of the recycling components of the strategy must be forthcoming from the proposed Waste Information Systems (WIS).

Specific information must be obtained on waste quantity and composition. The focus must be on identifying the waste components most suited for recycling and the sectors from which to best recover them, e.g. clean paper from offices, cardboard and plastics from trade, organic waste from food industry and paper, glass and metal from households.

Research is also required and would include:

- Research into the required quality and the percentage of these materials in the waste stream. This should determine what that is actually recyclable through limited field testing and through pilot-projects in the different sectors i.e. industry, commerce and household.
- Research into what constitutes sustainable methods of large scale recycling, e.g. composting plants or materials recovery facility (MRFs) (a facility where only recyclable materials, separated at source, are sorted and recovered).
- Evaluation of existing experience from small scale recycling projects (e.g. garden centre drop offs, recycling centres and buy-back centres in Eastern Gauteng, Keep South Africa Beautiful, Cape Town).
- Research and pilot projects in order to determine which residential areas should be covered by recycling schemes, collection systems or composting systems for recyclable materials and organic waste in the future.
- Research and pilot projects in order to determine which sectors and which materials to start with in commerce and industry.

If the above pilot projects prove successful, development could take place such as the establishment of recycling centres in order to create jobs through labour-intensive recycling schemes and the prevention of salvaging on landfills.

Government commitment and legislation

The government and all concerned must accept that there will be cost implications if recycling is going to form a major part of the National Waste Management Strategy. The government must publicise its unambiguous support for the ethic and concept of waste recycling and its commitment to making recycling in South Africa more economically viable. It must therefore commit itself to promulgating appropriate legislation and implementing some or all of the economic incentive and subsidy measures set out in the following section. Since legislation such as deposit legislation and taxes on packaging, will be highly controversial and have far reaching affects, this legislation must be carefully researched. The government must then implement its commitment by properly researching, formulating and promulgating the appropriate legislation required to put the selected measures in place to promote recycling.

Incentives and subsidies

Since large-scale resource recovery of non hazardous waste will seldom be sustainable from the income derived from the sale of the recovered materials, economic and regulatory incentives and government subsidies will be required if recycling is to succeed. There is a large range of such incentives and subsidies, which are set out below in a logical order, for consideration and further expansion.

Incentives must be put in place to promote the use of recycled, instead of virgin raw materials:

- Transport rebates for recycled material, e.g., it must be cheaper to transport a ton of scrap metal to the steel mill than a ton of iron ore;
- Enforced recycled content, e.g., as cars manufactured in South Africa are required by law to have a certain local content, they should also have a certain recycled content, (such recycled content should be reflected on the product label);
- Tax incentives, which could include rebates for percentage of recycled content or taxation on the use of virgin materials.

Incentives must also be put in place to promote the purchase of products that include recycled materials and thus ensure a stable market:

- Use of products comprising recycled material, e.g. paper, by all the government departments;
- Prescribed use of products comprising recycled material, e.g. paper, by all consultants and contractors working on government contracts;
- General promotion of the concept that the use of products comprising recycled material is the right thing to do.

Make recycling more attractive than disposal by making disposal more expensive in the following ways:

- Enforcing the landfill permit system, thereby improving the standards of landfilling, as well as increasing the costs of disposal, which are then passed onto the disposer;
- Introducing a tax on waste going to landfills, or alternatively:
 - Providing a disposal rebate at the landfill for authorities, organisations and institutions that have resource recovery and recycling programs in place;
 - Penalising or taxing those that dispose of excessively large volumes of waste;
- Recycling could be made more attractive than disposal by introducing a deposit system on certain waste, e.g. beverage containers.

Progressive extension

Since at present the only significant recycling taking place in the country is that which is currently economically viable, there is plenty of scope for future expansion. Such expansion will have to be progressive. The strategy must therefore make provision to extend progressively as legislation, subsidies and recognition make it more feasible and more economically viable to recycle. Aspects of the strategy must therefore be phased. This is addressed in terms of targets and time frames in each of the sections on implications. Once the necessary research has been conducted, legislation and targets can be introduced.

Costs

The cost of the program on research and development of recycling comprising in respect of waste analyses, pilot projects, recycling methods, and evaluation of existing experience is estimated at R 8 million. This also includes small labour intensive projects with low overheads, set up to exploit the richest waste streams and provide employment, which are probably the most feasible recycling projects in the short term. The fact that they do not already exist (other than on the landfills), however, indicates that they are not economically viable and require an economic incentive or subsidy to make them viable. To determine what is involved in this regard, however, will require research and 5-10 pilot project with different schemes in different residential areas.

Research is required in order to develop economic and regulatory incentives in legislation. Although the terms of reference for these functions are not yet defined, the cost is estimated at R 5 million.

Where recovery at source from households is implemented, the waste collection systems will have to be changed. Since income derived from the sale of recovered materials seldom covers all costs, particularly in the short term, subsidies are usually required if such projects are to be initiated. The amounts involved will vary from project to project, suffice to note that capital costs on a significant number of projects will run into millions of Rands, whereas operating costs would be comparable to regular collection of waste.

The construction of any major recycling facility, whether it is an MRF, a composting plant, or other, will require capital, particularly if it is mechanically oriented. Since income derived from the sale of the recovered materials will seldom cover interest and redemption on capital costs, subsidies are usually required if such projects are to work. The capital amounts involved depend on the size and complexity of the facility, but may range between R 5 and R 15 million.

Environmental Implications

The environmental implications of the recommended option include a number of positives if the recycling projects work and are properly controlled:

- Savings on virgin raw materials and energy;
- Reductions in landfilling and hence the need for landfills, and any associated adverse environmental impacts;
- Reduction in illegal dumping;
- Increase in compost for soil enrichment;
- More disposable income earned by some, which could be used to improve their own private environments and quality of life.

The potential negative environmental impact of recycling is that unless “housekeeping” is strictly controlled at recycling facilities, litter and hoarding, and hence aesthetics become a problem.

Identified Legislative Implications

In order to make recycling more viable in South Africa, certain incentives would have to be legislated. These are elaborated on in Section 4.3.4 and could include, but would not necessarily be limited to, the following:

- Incentives which would promote the use of recycled raw materials, for example:
 - Transport rebates for recycled material;
 - Targets for recycled content of certain products;
 - Enforced recycled content, indicated on labels;
 - Tax rebates for percentage of recycled content;
- Incentives which would promote the purchase and market of products that include recycled materials, for example:
 - Use of products comprising recycled material by all government departments;
 - Prescribed use of such products by all consultants and contractors working on government contracts;
- Deposit return systems;
- Tax on waste going to landfills.
- To legislate for some of the above measures would require careful research, to confirm that they are indeed desirable, followed by the formulation and promulgation of appropriate legislation.

APPENDIX C

DEAT Waste Campaign Projects

PROJECT LIST

PROJECT NAME	LOCATION	IMPLEMATING AGENT	PROJECT OUTPUTS	JOBS TO BE CREATED
Moutse Waste Management project	Mpumalanga	Moteti Multi purpose community centre	<ul style="list-style-type: none"> ▪ Collection of waste for recycling ▪ Job creation ▪ Production of art and craft from waste for selling 	33
Langa waste management project	Western Cape	Tsoga Environmental Resource Centre	<ul style="list-style-type: none"> ▪ Development of park ▪ Development of a nursery ▪ Schools programme on waste management ▪ Clean and green the community through waste collection for recycling and tree planting 	55
Integrated waste management project	KZN	Uthungulu Regional Council	<ul style="list-style-type: none"> ▪ Construction of a landfill site ▪ Development of 3 transfer stations ▪ Craft programme – production of crafts from recycled material, to be linked to LSDI/Dept of Welfare/KZN Economise Council Craft Programme ▪ Establishment of a Waste Buy Back Centre and waste sorting facilities ▪ Establishment of vegetable and fruit gardens along with development of composting facilities. 	85

PROJECT NAME	LOCATION	IMPLEMATING AGENT	PROJECT OUTPUTS	JOBS TO BE CREATED
Dirisanang Waste Management Project	Kimberly	Dirisanang Waste management Project	<ul style="list-style-type: none"> ▪ Development local entrepreneurs in waste collection and recycling ▪ Environmentally aware and active citizens ▪ Job creation ▪ Construction of landfill site ▪ Create 6 food gardens in 9 wards 	
Ilthabolole Clean and Green Project	Mafikeng	Ilthabolole Community	<ul style="list-style-type: none"> ▪ Collecting recyclable waste to produce artefacts and crafts ▪ Marketing of products ▪ Development of BUY –Back centre ▪ Construction of vegetable gardens ▪ Establishment of creation parks ▪ Empowerment and skills development 	42
Duncan Village Community Development Trust Waste Management and Recycling Project	East London	Duncan Village Community Development Trust	<ul style="list-style-type: none"> ▪ Community awareness ▪ Household sorting and collection of cans ▪ Selling of recycling companies ▪ Job creation ▪ Elevating health status of community ▪ Maximise the employment of women and youth 	65

PROJECT NAME	LOCATION	IMPLEMATING AGENT	PROJECT OUTPUTS	JOBS TO BE CREATED
The Beautification of Mamelodi	Gauteng	Tswelopele Development Initiative	<ul style="list-style-type: none"> ▪ The Beautification, cleaning development of the Moretele river area into a park ▪ Prevention of dumping in areas around the parks ▪ Community owned waste management programme ▪ Setting up recycling centres at shopping centres ▪ Trained and capacitated scavengers turned into waste collectors ▪ Training for young people in gardens management ▪ Minimization of waste and hazardous rubbish dumps ▪ Maximize job creation 	34
Ikageng Basadi Clean and Green Project	Gauteng	Ikageng Basadi	<ul style="list-style-type: none"> ▪ Establishment of a buy back centre ▪ Establishment of a craft centre selling products from recycled projects ▪ Creation of a recreation park ▪ Establishment of fresh produce market ▪ Maximum job creation 	41

PROJECT NAME	LOCATION	IMPLEMATING AGENT	PROJECT OUTPUTS	JOBS TO BE CREATED
Makgoba Enviromental Club Waste Management Project	Northen Province	Makgoba Environmental Club	<ul style="list-style-type: none"> ▪ Self employment of people through facilities to be provided by the project ▪ Development of an improved ▪ Nutritional base for the community through creation of food gardens ▪ Recycling of waste ▪ Positive change in environmental attitudes within the community ▪ Job creation ▪ Production of artefacts from waste 	55
Stream Rehabilitation Project		Garankuwa YMCA	<ul style="list-style-type: none"> ▪ Development of park around the stream ▪ Job creation ▪ Creating environmental awareness within communities 	56
Sethokga Hostel Waste Management Project (Tembisa)	Gauteng	Khayalami Metropolitan Council	<ul style="list-style-type: none"> ▪ Cleaner environment through and sale of recycles ▪ Producing artifacts out of recyclables ▪ Well constructed and operating food gardens ▪ Developed clean green recreation spaces within the hostel premises ▪ Job creation 	139

PROJECT NAME	LOCATION	IMPLEMATING AGENT	PROJECT OUTPUTS	JOBS TO BE CREATED
Mdutjana Waste Management Project	Mpumalanga	Mdutjana TLC	<ul style="list-style-type: none"> ▪ Developed local entrepreneurs in waste collection and recycling ▪ Environmentally ware and active citizens ▪ Job creation ▪ Construction of a landfill site ▪ Create six parks ▪ Create six food gardens in nine wards 	60
Greater Pretoria Mamelodi Council	Gauteng	Greater Pretoria Mmelodi Council	<ul style="list-style-type: none"> ▪ The implementation of waste management project ▪ In three Metropolitan areas- Mamelodi Soshanguve Centurian and Atteridgeville 	60
Phomolong	North West Province	Phomolong Community	<ul style="list-style-type: none"> ▪ Collecting recyclable waste to produce artefacts crafts ▪ Marketing of products ▪ Development of Buy- Back centre ▪ Construction of vegetable gardens ▪ Establishment of creation parks ▪ Empowerment and skills development ▪ Approximately 50% of budget will go towards job creation 	52