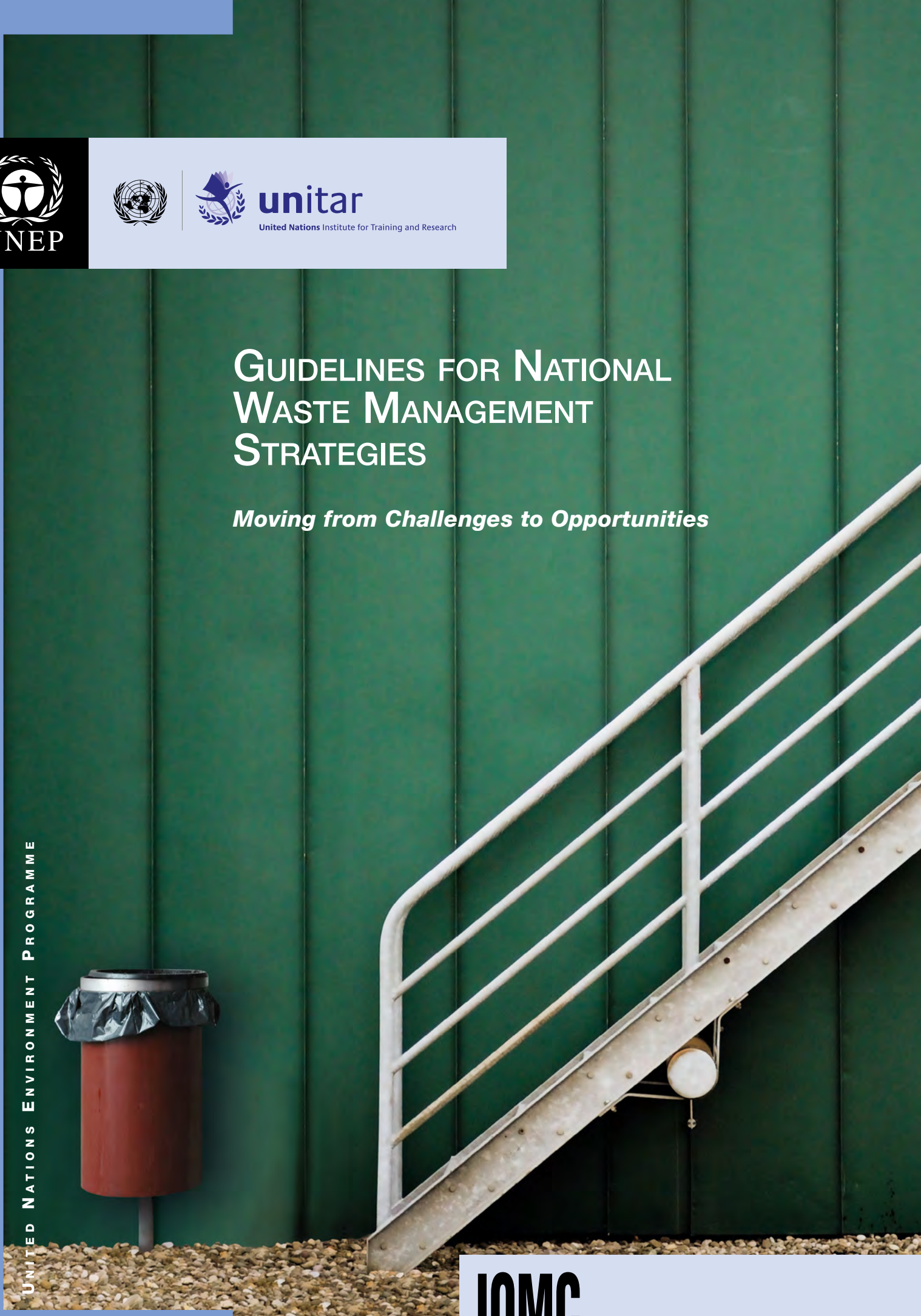
UNEP

unitar
United Nations Institute for Training and Research

Guidelines for National Waste Management Strategies

Moving from Challenges to Opportunities



United Nations Environment Programme

IOMC
INTER-ORGANIZATION PROGRAMME FOR THE SOUND MANAGEMENT OF CHEMICALS
A cooperative agreement among FAO, ILO, UNDP, UNEP, UNIDO, UNITAR, WHO, World Bank and OECD

This publication was developed in the IOMC context. The contents do not necessarily reflect the views or stated policies of individual IOMC Participating Organizations.

The Inter-Organisation Programme for the Sound Management of Chemicals (IOMC) was established in 1995 following recommendations made by the 1992 UN Conference on Environment and Development to strengthen co-operation and increase international co-ordination in the field of chemical safety. The Participating Organisations are FAO, ILO, UNDP, UNEP, UNIDO, UNITAR, WHO, World Bank and OECD. The purpose of the IOMC is to promote co-ordination of the policies and activities pursued by the Participating Organisations, jointly or separately, to achieve the sound management of chemicals in relation to human health and the environment.

Disclaimer

The designations employed and the presentation of the material in this publication do not imply the expression of any opinion whatsoever on the part of the United Nations Environment Programme concerning the legal status of any country, territory, city or area or of its authorities, or concerning delimitation of its frontiers or boundaries. Moreover, the views expressed do not necessarily represent the decision or the stated policy of the United Nations Environment Programme, nor does citing of trade names or commercial processes constitute endorsement.

ISBN: 978-92-807-3333-4

GUIDELINES FOR NATIONAL WASTE MANAGEMENT STRATEGIES:

MOVING FROM CHALLENGES TO OPPORTUNITIES

ACKNOWLEDGEMENTS

Authors and contributors:

Author: Mark Hyman (Consultant, UNEP)
Contributors: Brandon Turner (UNITAR) and Ainhoa Carpintero (UNEP)

Supervision:

Matthew Gubb (UNEP), Jonathan Krueger (UNITAR) and Brandon Turner (UNITAR)

Project coordination:

Ainhoa Carpintero (UNEP)

Editor:

Tess Cieux

Reviewers and contributors:

Africa: Anis Ismail (SWEEP-Net GIZ), Casmir Ogueri (Environ-Waste Nig. Ltd, Nigeria), Desta Mebratu (UNEP), Godfrey Oluka (Directorate of Health and Environment, Kampala Capital City Authority, Uganda), Issaria M Mangalili (Division of Environment, Vice President's Office, Tanzania), James Mulolo (Waste Management Inspectorate, Zambia), Jean Claude Salama (Ministry of Environment and Forests, Madagascar), Joseph Masinde (National Environment Management Authority, Kenya), Joy Jadam (SWEEP-Net GIZ) and Olugbenga Adebola (Richbol Environmental Services, Nigeria)

Asia Pacific: Ali Abdullah Ahmed Al-Dobhani (Environment Protection Authority, Yemen), Ally Adigue (Australian National University, Australia), Amiya Kumar Sahu (National Solid Waste Association, India), Boon-Poh Phee (Penang State Government, Malaysia), Chin Sothun (Ministry of Environment, Cambodia), Chrin Sokha (Ministry of Environment, Cambodia), Cynthia Indriani (Basel Convention Regional Centre), David Haynes (Secretariat of the Pacific Regional Environment Programme, Samoa), D.G.J. Premakumara (Institute for Global Environmental Strategies, Japan), Haruki Agustina (Ministry of Environment, Republic of Indonesia), Joseph Jayavilal Fernando Mirisage (Environment Education and Awareness, Central Environmental Authority, Sri Lanka), Kazunobu Onogawa (Institute for Global Environmental Strategies, Japan), Khanendra D. Bhardwaj (APO), Magnus Bengtsson (Institute for Global Environmental Strategies, Japan), Makoto Fujita (Global Environment Centre Foundation, Japan), Nguyen Trung Thang (Institute of Strategy and Policy on Natural Resources and Environment, Viet Nam), Piyush Ranjan Rout (Local Governance Network, India), Prasad Modak (Environmental Management Centre, India), Rosemary Rayfuse (University of New South Wales, Australia), Shalimar Vitan (Global Alliance for Incinerator Alternatives, Philippines), Shunichi Honda (Ministry of Environment, Japan), Stefanos Fotiou (UNEP), Tanja Koch (UNEP), Thi Phuong Anh Duong (Institute of Strategy and Policy on Natural Resources and Environment, Viet Nam), Veronica Jurica (Department of Sustainability, Environment, Water, Population and Communities, Australia), Vivek S. Agrawal (Centre for Development Communication, India), Yuyun Ismawati (International POPs Elimination Network, Indonesia) and Xiaofei Sun (Basel Convention Coordination Centre)

Europe: Dana Lapesova (Basel Convention Regional Centre), David Wilson (Consultant, UK), Dusan Jurik (Ministry of Environment, Slovak Republic), Faig Sadıgov (Ministry of Economic Development, Republic of Azerbaijan), Heinz Leuenberger (UNIDO), Herman Huisman (Waste Implementation Agency, Netherlands), Ibrahim Shafii (UNEP), Kathryn M. Conway (UNEP), Ljiljana Rodic Wiersma (Wageningen University, Netherlands), Margaret Bates (University Northampton, UK), Martina Otto (UNEP), Matthias Kern (UNEP), Michael Betts (Integrated Skills Limited, UK), Nancy Isarin (Ambiendura, Portugal), Peter Wessman (European Commmission), Rob Visser (Consultant, France), Ruth Zugman Do Coutto (UNEP), Simone Leyers (IMO) and Vincenzo Gente (European Commission)

Latin America and the Caribbean: Alberto Santos Capra (Environmental and Sustainable Development Secretariat, Argentina), Chris Corbin (UNEP), Daniel A. Bonilla R (Ministry of Environment, Ecuador), David Simmons (Simmons & Associates, Trinidad & Tobago), Edison Garraway (EGARR & Associates, Trinidad & Tobago), Jordi Pon (UNEP), José Alejandro Martínez S. (EAN University, Colombia), Leila Devia (Basel Convention Regional Centre), Marcos Alegre (National Cleaner Production Centre, Peru), Martin Medina (Mexico), Mauricio E. Blanco Redondo (Ministry of Environment and Sustainable Development, Colombia), Roberto Azofeifa (Ministry of Agriculture and Livestock, Costa Rica) and Sergio Gasca Alvarez (Secretary of Environment and Natural Resources, Mexico)

North America: Farouk Banna (World Bank), Klaus Tyrkko (UNDP), Maria Nyholm (UNDP), Mark Reiter (Institute of Scrap Recycling Industries, USA), Robert Höft (UNEP) and Stefanie Brackmann (IADB)

Thanks to our IETC and DTIE colleagues, in particular to:

Surya Chandak, Mushtaq Memon, Ryuichi Fukuhara, Carolin Sanz-Noriega, John Peter Oosterhoff, Utako Aoike, Michiko Ota, Mayumi Morita, Tomoko Ishii, Moira O'Brien-Malone and Solange Montillaud-Joyel

Thanks to UNITAR colleagues, in particular to:

Peter J. Peterson and John A. Haines

Cover photo sources:

archfreak/currentbun/photocase.com, composed by Elmar Sander

Design and layout:

Elmar Sander Kommunikationsdesign

CONTENTS

ACKNOWLEDGEMENTS 2

LIST OF ACRONYMS 6

FOREWORD 7

EXECUTIVE SUMMARY 8

PART I: INTRODUCTION – CONTEXT AND OVERVIEW 11

1.1 THE GUIDANCE DOCUMENT 12
TEXT BOX 1.1 SEVEN FACTS ABOUT WASTE 13
FIGURE 1 OVERVIEW OF THE PROCESS FOR DEVELOPING, IMPLEMENTING AND UPDATING A NATIONAL STRATEGY 14

1.2 UNDERLYING CONCEPTS – WASTE STREAMS 15
TEXT BOX 1.2 EXAMPLES OF WASTE SOURCES AND WASTE STREAMS 17

1.3 UNDERLYING CONCEPTS – WASTE MANAGEMENT HIERARCHY 18
FIGURE 2 WASTE MANAGEMENT HIERARCHY 18
FIGURE 3 TWO TRIANGLES ANALYTICAL FRAMEWORK 19

1.4 WHY SHOULD A WASTE MANAGEMENT STRATEGY BE DEVELOPED AT THE NATIONAL LEVEL? 20

PART II: CHALLENGES AND OPPORTUNITIES IN WASTE MANAGEMENT 22

TEXT BOX 2.1 SUCCESSFUL NATIONAL ACTION ON WASTE MANAGEMENT 23

2.1 SUSTAINABLE DEVELOPMENT 24
FIGURE 4 WASTE MANAGEMENT POLICY CONTRIBUTIONS TO SUSTAINABLE DEVELOPMENT 25
TEXT BOX 2.2 HEALTH-CARE WASTE 27
TEXT BOX 2.3 WASTE AND GREENHOUSE GAS (GHG) EMISSIONS 28
TEXT BOX 2.4 CONTRIBUTION OF RECYCLING TO ECONOMIC GROWTH 29
TEXT BOX 2.5 SAVINGS FROM PREVENTION AND BETTER MANAGEMENT OF BUSINESS WASTE 31
TEXT BOX 2.6 PUNE WASTE PICKERS SEIZE THEIR OPPORTUNITY 33
FIGURE 5 SUMMARY OF THE CONTRIBUTIONS OF SOUND WASTE MANAGEMENT 34

2.2 WASTE STREAMS AND THEIR MANAGEMENT 35
TEXT BOX 2.7 CONSTRUCTION AND DEMOLITION WASTE 37
TEXT BOX 2.8 WASTE PREVENTION AND MINIMISATION IN THE MINING AND MINERAL REFINING INDUSTRIES 38
TEXT BOX 2.9 MANAGEMENT OF END-OF-LIFE LAMPS 39
TEXT BOX 2.10 THE NEED FOR BETTER DATA 40

2.3 GOVERNANCE CHALLENGES 40
TEXT BOX 2.11 WASTE MANAGEMENT CRISIS IN NAPLES, ITALY, AND ITS SOLUTION 42

2.4 FUTURE CHALLENGES 44
TEXT BOX 2.12 WASTE MANAGEMENT CHALLENGES FOLLOWING A NATURAL DISASTER 45

PART III: CONSIDERATIONS IN DEVELOPING A NATIONAL WASTE MANAGEMENT STRATEGY 46

3.1 WASTE MANAGEMENT – CONCEPTS AND PRINCIPLES 47
FIGURE 6 GENERAL CONCEPTS RELATED TO SOUND WASTE MANAGEMENT 49
TEXT BOX 3.1 CHEMICAL LEASING 50
FIGURE 7 WASTE MANAGEMENT HIERARCHY 50
TEXT BOX 3.2 INTERNATIONAL EFFORT ON REUSE OF AN MATERIALS RECOVERY FROM COMPUTING EQUIPMENT AND MOBILE PHONES 53

TEXT BOX 3.3 VERMICULTURE AND COMPOSTING OF ORGANIC WASTE IN CHILE 55

3.2 AIMS, OBJECTIVES, GOALS AND TARGETS 55

3.3 WASTE MANAGEMENT – POLICY TOOLS 57
FIGURE 8 POLICY TOOLS 57
TEXT BOX 3.4 GLOBAL VOLUNTARY UNDERTAKINGS ON MARINE DEBRIS 60
FIGURE 9 ELEMENTS TO WASTE MANAGEMENT POLICY 64

3.4 POLICY CHOICES – TIPS AND TRAPS 64

PART IV: NATIONAL WASTE MANAGEMENT STRATEGY: A PARTICIPATIVE PROCESS 66

FIGURE 10 PROCESS FOR DEVELOPING, IMPLEMENTING, MONITORING, REVIEWING AND UPDATING A NATIONAL WASTE MANAGEMENT STRATEGY 68

4.1 DEVELOPING A NATIONAL WASTE MANAGEMENT STRATEGY 70
TEXT BOX 4.1 ZERO WASTE 73
TEXT BOX 4.2 BUILDING A RELIABLE BODY OF DATA AND INFORMATION 82

4.2 IMPLEMENTING A NATIONAL WASTE MANAGEMENT STRATEGY 84

4.3 REVIEWING AND UPDATING A NATIONAL WASTE MANAGEMENT STRATEGY 85
TEXT BOX 4.3 EXAMPLES OF TABLES OF CONTENTS FOR A NATIONAL WASTE MANAGEMENT STRATEGY 87

ANNEX A INTERNATIONAL RECOMMENDATIONS AND MANDATES 88

ANNEX B INTERNATIONAL TEXTS RELATING TO WASTE 90

ANNEX C INTERGOVERNMENTAL AND INTERNATIONAL ORGANISATIONS AND MATERIALS 96

ANNEX D NATIONAL AND REGIONAL WASTE MANAGEMENT STRATEGIES AND RELATED DOCUMENTS AND WEB RESOURCES 99

GLOSSARY 102

ACRONYMS

ADB	Asian Development Bank
AfDB	African Development Bank
CDM	Clean Development Mechanism
COP	Conference of the Parties
CSD	Commission on Sustainable Development
EPR	Extended Producer Responsibility
EU	European Union
EUR	Euros
EBRD	European Bank for Reconstruction and Development
FAO	Food and Agriculture Organization of the United Nations
GAIA	Global Alliance for Incinerator Alternatives
GEF	Global Environment Facility
GHG	Greenhouse Gas
GIZ	Deutsche Gesellschaft fuer Internationale Zusammenarbeit (German Agency for Technical Cooperation). Formerly GTZ
GPA	Global Programme of Action
GPWM	Global Partnership on Waste Management
GVA	Gross Value Added
IAEA	International Atomic Energy Agency
IBRD	International Bank of Reconstruction and Development
IDB	Inter-American Development Bank
IETC	International Environmental Technology Centre
IFC	International Finance Corporation
IGES	Institute for Global Environmental Strategies
ILO	International Labour Organization
IMO	International Maritime Organization
IMPEL	Implementation and Enforcement of Environmental Law
IOMC	Inter-Organization Programme for the Sound Management of Chemicals
IPCC	Intergovernmental Panel on Climate Change
IPEN	International POPs Elimination Network
IPLA	International Partnership for Expanding Waste Management Services for Local Authorities
ISWA	International Solid Waste Association
IWWG	International Waste Working Group
MARPOL	International Convention for the Prevention of Pollution from Ships and its Protocol
MEA	Multilateral Environmental Agreement
MENA	Middle East and North Africa
MPPI	Mobile Phone Partnership Initiative
MSW	Municipal Solid Waste
NAMA	Nationally Appropriate Mitigation Action
NAPA	National Adaptation Program of Action on Climate Change
NGO	Non-Governmental Organization
NIMBY	Not in my Backyard
OCHA	Office for Coordination of Humanitarian Affairs
ODS	Ozone-Depleting Substances
OECD	Organisation for Economic Cooperation and Development
PACE	Partnership on Action for Computing Equipment
PAHO	Pan American Health Organization
PCB	Polychlorinated Biphenyl
PLANRES	Plan Nacional de Gestión Integral de Residuos Sólidos (National Plan for Integrated Waste Management)
PNGIRSU	Proyecto Nacional para la Gestión Integral de los Residuos Sólidos Urbanos (National Strategy for Integrated Management of Urban Solid Waste)
PNIR	Plan Nacional Integral de Residuos (National Strategy for Waste)
POP	Persistent Organic Pollutant
PPP	Public-Private Partnership
PRTR	Pollutant Release and Transfer Register
PVC	Polyvinyl Chloride
ROHS	Restriction of the Use of Certain Hazardous Substances
SAICM	Strategic Approach to International Chemicals Management
SDG	Sustainable Development Goals
SPREP	Secretariat of the Pacific Regional Environment Programme
SWEEP-Net	Solid Waste Exchange of Information and Expertise Network
SWM	Solid Waste Management
UK	United Kingdom
UN	United Nations
UNCRD	United Nations Centre for Regional Development
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNIDO	United Nations Industrial Development Organization
UNITAR	United Nations Institute for Training and Research
USEPA	United States Environmental Protection Agency
WEEE	Waste Electrical and Electronic Equipment
WHA	World Health Assembly
WHO	World Health Organization
WIEGO	Women in Informal Employment: Globalizing and Organizing
3R	Reduce, Reuse and Recycle

FOREWORD

Sally Fegan-Wyles

Achim Steiner

The statistics are stark: 3.5 billion people, or half of the world's population, are without access to waste management services, and open dumping remains the prevalent waste-disposal method in most low- and lower middle-income countries.

More than 1.3 billion tonnes of municipal solid waste were estimated to have been generated in 2012 and 2.2 billion tonnes a year are expected by 2025. Urbanization, industrialization, increasing population and economic development are all contributing to the rise in waste and also to its increasing complexity and hazardousness.

Figures on municipal solid waste collection rates are similarly sobering. In low- and middle-income countries collection coverage can be as low as around 40%, compared to the 98% for high-income countries. Some middle-income countries still dispose of waste at poorly operated landfills.

Poor waste management can lead to some significant environmental and health hazards. For example, leachate from waste can contaminate soil and water, open burning of waste can cause air pollution, and a failure to use recycled materials from waste means an acceleration of the depletion of 'raw' materials. Unfortunately, it is the urban poor – who live and work near waste disposal sites – that are most at risk sometimes suffering acute health impacts.

These striking facts and figures, along with the reality of poor institutional capacity, financial constraints and lack of political will, make waste management among the most significant planning challenges faced by developing and transition-economy countries in the 21st century.

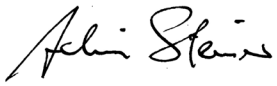
For some governments dealing with the mix of environmental, social and poverty issues presented by both formal and informal waste management is a struggle. Waste-related problems are often handled in a fragmented and uncoordinated manner, mainly focusing on end-of-pipe solutions rather than on prevention measures and integrated approaches.

A greening of the waste management sector – one that shifts the emphasis to the 3Rs (reduce, reuse, recycle) – is essential to achieve the economic, environmental and social objectives of sustainable development. This could generate jobs and contribute to economic growth while addressing environmental issues in a pro-poor and equitable manner.

The *Guidelines for National Waste Management Strategies: Moving from Challenges to Opportunities* – a joint effort of the United Nations Environment Programme and the United Nations Institute for Training and Research – sets a conceptual and methodological framework for national planning that countries may adapt to their particular circumstances.

The new guidelines are an early response to recommendations of the 2012 United Nations Conference on Sustainable Development (Rio+20) which called for the development of comprehensive national waste management strategies. We hope it will inspire and encourage governments and other stakeholders to give improved waste management appropriate priority so that it further supports sustainable development.

Sally Fegan-Wyles
UN Assistant Secretary-General
Acting Head
Executive Director, UNITAR



Achim Steiner
UN Under Secretary-General
and Executive Director of UNEP

EXECUTIVE SUMMARY

In June 2012 the United Nations Conference on Sustainable Development adopted, as part of the main outcome document, "*The Future we Want*", a call for countries to develop and enforce comprehensive national and local waste management policies, strategies, laws, and regulations. This call was a response to the challenges presented by unsustainable production and consumption, including the clear and unavoidable evidence of that unsustainability in the generation of waste. Increasingly, that challenge will come to be faced most acutely in developing countries.

CHALLENGES AND OPPORTUNITIES

The challenges waste poses to governments and communities are many and varied. Globally, the amounts of waste being generated are increasing, especially in developing countries. Much of it is poorly managed, as in cases where waste is not collected, disposal sites are inadequate, or waste is contaminated with hazardous materials. When not properly managed, waste has major impacts on human health, especially for those living near disposal sites; protecting human health is the reason why cities collect municipal solid waste (MSW). Waste also has a range of environmental impacts, on air, water, and land; for example, decay of organic waste contributes 5% of greenhouse gases globally. Waste is a major economic drain, especially on city budgets: frequently 50% of a city's budget is spent on waste management. And the inefficient use of scarce resources reflected in materials discarded and abandoned as waste represents a huge economic and environmental cost borne by society as a whole. Socially, waste has a disproportionate impact on the poor and marginalised in cities, towns and villages. Waste pickers and others earning a meagre income on the fringes of the waste management industry, especially women, are frequently among those who have most difficulty making a viable place for themselves in local economies.

But waste is not only a challenge: it is also a largely untapped opportunity. Proper waste management presents an opportunity not only to avoid the detrimental impacts associated with waste, but also to recover resources, realise environmental, economic and social benefits and take a step on the road to a sustainable future. The benefits ensue when waste is treated as a resource, a resource that can be recovered and put to productive and profitable use. Products can be reused and the materials that make them up can be recovered and converted to other uses or recycled. If waste is separated at source, the uncontaminated organic fraction can be composted or digested anaerobically. Many improvements in waste management deliver benefits simultaneously across a multitude of fronts: requiring less investment, delivering jobs and livelihoods, contributing to economic growth, protecting public health and improving the environment. For example, improving the operation of waste pickers in collecting and recycling useful products and materials can lead to better economic outcomes for the waste pickers themselves; to better quality organic waste that can be composted and used to improve soils; and to less need for investment in landfill facilities, as waste is diverted to more useful paths.

Even more progress can be made if production and consumption processes are re-evaluated, so that all the inefficiencies, losses and adverse impacts associated with generating and managing waste are reduced, or, for certain kinds of products, even eliminated completely.

Improved waste management offers particular benefits to the socially marginalised. The informal sector, which plays a vital role in many developing economies, can be recognised, protected, professionalised and integrated into the waste management system. This sector already makes a significant contribution, which can be built upon to develop a low cost, efficient and remarkably effective grass roots recovery, reuse and recycling system.

Waste management requires governance that takes into account the complexities and inter-relationships both within and outside government. Waste management is a cooperative process requiring the involvement of a wide range of different interests, including: government at national and local levels (and sometimes the regional level

as well); the private sector, which usually plays a major role and makes a major contribution; workers, including the informal sector; the community and its leaders; and others, such as non-governmental organizations (NGOs) and research interests. It is both a challenge and an opportunity for governance to recognize all these varying interests, and reconcile their different perspectives. Governance in the domain of waste management exists within a dynamic policy environment, in which major changes and shifts are frequent.

RATIONALE FOR A NATIONAL WASTE MANAGEMENT STRATEGY

The objective of this guidance document is to improve upon the approach to waste management, which in most developing countries is disorganised, haphazard and under-resourced. This document aims to remedy the problem by establishing a clear rationale for making waste management a national priority, and by providing an organised, logical set of steps to tackle that priority through the creation and implementation of a national strategy. Given the many different interests and aspects of government policy that are affected, this strategy must be carefully coordinated with other national policies and plans.

A successful national strategy can be measured by how well it meets the challenges and delivers the benefits from the opportunities presented by waste management, and in particular the extent to which it realizes these gains on a national scale.

This document provides a conceptual and methodological framework that countries may apply and adapt to their particular circumstances. It outlines a possible process and poses questions that countries may wish to consider as they develop integrated national waste management strategies. Part I of the document is an introduction providing context, an overview and an examination of preliminary issues, including the rationale for a national waste management strategy. Part II explores the challenges and opportunities waste management presents. Part III deals with the major considerations influencing the policy choices involved in a national strategy, while Part IV outlines the process of strategy development, monitoring, and implementation. To support the methodology, the document provides additional information resources in the annexes.

A NATIONAL PRIORITY, A NATIONAL STRATEGY

Most waste management, and in particular the management of MSW, is local, rather than national. But adopting waste management as a national priority presents an opportunity to give the issue political and social visibility, to apply resources that are commensurate with the priority given and to ensure that action is coordinated and that national markets for recovered materials operate effectively.

In responding to the challenges and opportunities of waste management, national governments have a wealth

of material on which to rely. They can refer to fundamental guiding principles such as the waste management hierarchy, the concept of the life-cycle of a product and rethinking waste as a resource. Setting aims, objectives, goals, and targets enables the end result of the policy road and the milestones along it to be defined with clarity. Regulatory, economic, informational and a range of other policy tools are available and have been applied elsewhere. A wide range of information resources and many successful examples are available that can be used to help make good decisions.

STEPS TO A NATIONAL STRATEGY

For each of the significant issues confronting a country, a policy choice must be made. The choices made, and the resulting organized and planned set of actions to implement them, constitute a national strategy. The present guidance document provides a path to identify and make these choices, according to the following planned and measured steps:

Getting started

In order to begin the process, it will be necessary to identify who will take the lead, and gather essential information (through a baseline study) to provide the basis for deciding to develop the strategy. It may also be relevant to undertake other groundwork, such as assembling information on other countries' experience from a similar starting point, or undertaking an estimate of the costs imposed on the country by current waste management practices. All of this groundwork and preparation will provide the basis for a high level decision to proceed with the development of the strategy.

Fundamental elements of the strategy

Fundamentals need to be identified early as they influence all other aspects. These include:

- Establishing the scope of the national strategy
- Identifying an overarching goal and supporting targets
- Estimating expected national benefits
- Identifying initial options for financing and resourcing the process of strategy development, and building capacities for, and during development of the strategy
- Setting a timeline for the development of the strategy
- Identifying linkages to other plans and areas of national policy.

Engagement with all the relevant parties

Waste management is an inherently cooperative activity. A wide variety of groupings and interests need to be engaged, and their energies harnessed. Part of this process will involve setting up relevant consultative and management bodies (e.g. a national waste management coordinating committee or similar structure), establishing coordination and cooperation processes within government and between different levels of government (e.g. national and local governments) and identifying who will lead and manage the development of the strategy. Securing political endorsement at an early stage is a critical step.

Situation and gap analysis

This is a more detailed examination of a country's starting point, focusing on the wider context and identifying relevant national priorities (e.g. related to health or development), the information base for strategy development, the current state of waste management, the available technical infrastructure and its adequacy, the legal and regulatory settings and their adequacy and the available capacities, especially in terms of human resources.

Priority setting

This step requires that waste streams and waste issues such as collection or disposal, that are urgent and/or important, be identified. Other broader issues requiring priority attention, such as, for example, investment or funding needs, should also be identified.

Developing a national strategy

The national strategy is composed of a systematic assembly of policy choices made at a given point in time, within the national context, that builds upon and addresses the fundamental elements and situation and gap analysis, while giving particular emphasis to priority issues. It is critical that the completed national strategy receive high level endorsement and political commitment, and be subject to an appropriate public consultation and information process.

IMPLEMENTATION

Drawing up a national strategy is a demanding task in itself, but is a wasted effort unless the strategy is implemented. This document sets out not only how a strategy should be developed, but also how it can be implemented and monitored, as well as reviewed and updated as needed.

PART I
INTRODUCTION – CONTEXT AND OVERVIEW

1.1 THE GUIDANCE DOCUMENT

1.2 UNDERLYING CONCEPTS – WASTE STREAMS

1.3 UNDERLYING CONCEPTS – WASTE MANAGEMENT HIERARCHY

1.4 WHY SHOULD A WASTE MANAGEMENT STRATEGY BE DEVELOPED AT THE NATIONAL LEVEL?

1.1 THE GUIDANCE DOCUMENT

In June 2012, the UN Conference on Sustainable Development adopted the "*The Future we Want*"[1] as its main outcome document. Paragraph 218 called for the development and enforcement of comprehensive national and local waste management policies, strategies, laws and regulations, with a particular focus on life-cycle approaches and the development and implementation of policies for resource efficiency and environmentally sound waste management. The objective of this guidance document is to help countries respond to that call: to develop and implement national waste management strategies, or, if they already have such strategies, to help them review, revise and update them. Other relevant international recommendations and mandates encouraging integrated approaches to waste management are listed and summarised in Annex A.

It is important to respond to the conclusions of the UN Conference, but it is equally important to recognise and respond to the issues that underlie and led to those conclusions. Waste presents major challenges and equally major opportunities, both of which are especially acute for developing economies. For example, the vast and steadily growing quantities of waste generated by the unsustainable production and consumption of goods is a serious problem which is exacerbated in developing economies. In the present production and consumption process, natural resources are being consumed to the point of exhaustion, generating impacts on a planetary scale, imposing huge – but avoidable – impacts on human health and the environment and creating massive social disruption. Each of these problems is apparent in the generation of waste. Waste also presents a series of direct economic challenges, in particular with regard to the cost of collecting, processing and disposing of waste. Currently in most cities in developing economies, local and national governments are failing to meet these challenges, and there is little chance that the situation will improve under current policies. A single act of indiscriminate dumping of waste can have major impacts on health, well-being and the environment. As an example, dumping of waste in the lagoon of a coral reef can kill off most of the marine life in the lagoon, with devastating consequences for local fisher folk and their families who are dependent upon the reef's resources.

At the same time, sound, coherent waste management provides an opportunity to reap a range of material and other benefits. Waste is not something to be abandoned or discarded, but rather a valuable resource. If addressed through the correct combination of policies, waste management can deliver:

Economic benefits, when efficient practices are introduced into production and consumption, valuable materials are recovered and people find jobs and pursue business opportunities

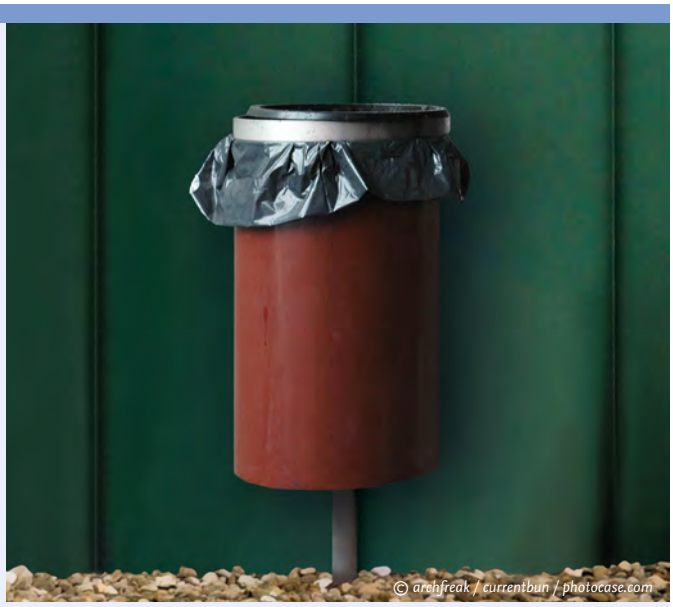
Social benefits, when communities are lifted out of poverty and health problems are solved or lessened

Environmental benefits, when impacts are reduced or eliminated, water and air quality is improved and greenhouse emissions are reduced.

1) http://daccess-dds-ny.un.org/doc/UNDOC/LTD/N12/436/88/PDF/N1243688.pdf?OpenElement

TEXT BOX 1.1

SEVEN FACTS ABOUT WASTE


© archfreak / currentbun / photocase.com

Many of the facts which illustrate the magnitude of the challenges and benefits associated with waste are easily overlooked, perhaps because waste does not capture the imagination of popular media. The following list of seven facts about waste speaks for itself[2]:

1. **Waste generation:** Every year, an estimated 1.3 billion tonnes of solid waste is collected worldwide. This figure is expected to increase to 2.2 billion tonnes by 2025, with almost all of the increase from developing countries.

2. **Greenhouse gases:** Decay of the organic fraction of solid waste contributes about 5% of global greenhouse gases.

3. **Market size:** The global waste market, from collection to recycling, is estimated at US$410 billion a year, not including the sizable informal segment in developing countries.

4. **Resource savings:** Recycling a tonne of aluminium saves 1.3 tonnes of bauxite residues, 15 m^3 of cooling water, 0.86 m^3 of process water and 37 barrels of oil, while preventing the emission of 2 tonnes of carbon dioxide and 11 kg of sulfur dioxide.

5. **Employment:** In 2000 recycling activities in the European Union created 229,286 jobs, which by 2008 had increased to 512,337 – an annual growth rate of 10.57%. The proportion of people employed in waste-related recovery activities in Europe increased from 422 persons per million inhabitants in 2000, to 611 in 2007, an increase of 45%.

6. **Food waste:** Globally, about one-third of food produced for human consumption is lost or wasted, amounting to about 1.3 billion tonnes per year.

7. **Profitability:** One tonne of electrical and electronic waste (e-waste) contains as much gold as 5-15 tonnes of typical gold ore, and amounts of copper, aluminium and rare metals that exceed by many times the levels found in typical ores. Printed circuit boards are "probably the richest ore stream you're ever going to find".

2) Sourced from World Bank (2012). *What a Waste: A Global Review of Solid Waste Management.* Urban Development Series Knowledge Papers. http://web.worldbank.org
UNEP (2011).*The Green Economy Report.* www.unep.org/greeneconomy/greeneconomyreport/tabid/29846/default.aspx;
Gustavsson, J. et al. (2011). *Global Food Losses and Food Waste*, from report prepared for the International Congress: *Save Food!*;
UNEP and UNU (2009). *Recycling – from E-Waste to Resources.* www.unep.org/PDF/PressReleases/E-Waste_publication_screen_FINALVERSION-sml.pdf
Grossman, E. (2006). *High Tech Trash: Digital Devices, Hidden Toxics, and Human Health.* Island Press/Shearwater Books. Washington, p. 217.

Proper waste management has a major contribution to make in shifting the planet towards a sustainable future. Often the immediate action being considered in any city or country will not seem to be on a scale significant enough to make a difference. The most urgent task may well be something which appears to be mundane, like moving from uncontrolled to controlled dumpsites. Nevertheless, any step on the waste management path, no matter how small, is one that contributes to continuous improvement. While the task may never be complete, every step represents progress in the right direction. A country or city that is dealing with the immediate problems of waste management in a determined, informed and progressive way, no matter how ordinary the problems and their solutions, is on the right road to a more sustainable future.

The **problem this guidance document sets out to address** is that **the approach to waste management** in most developing countries is disorganised, haphazard, and under-resourced. This document aims to remedy that problem by providing **a clear rationale for making waste management a national priority, and by outlining an organised, logical set of steps to take action on that priority through the creation and implementation of a national strategy.**

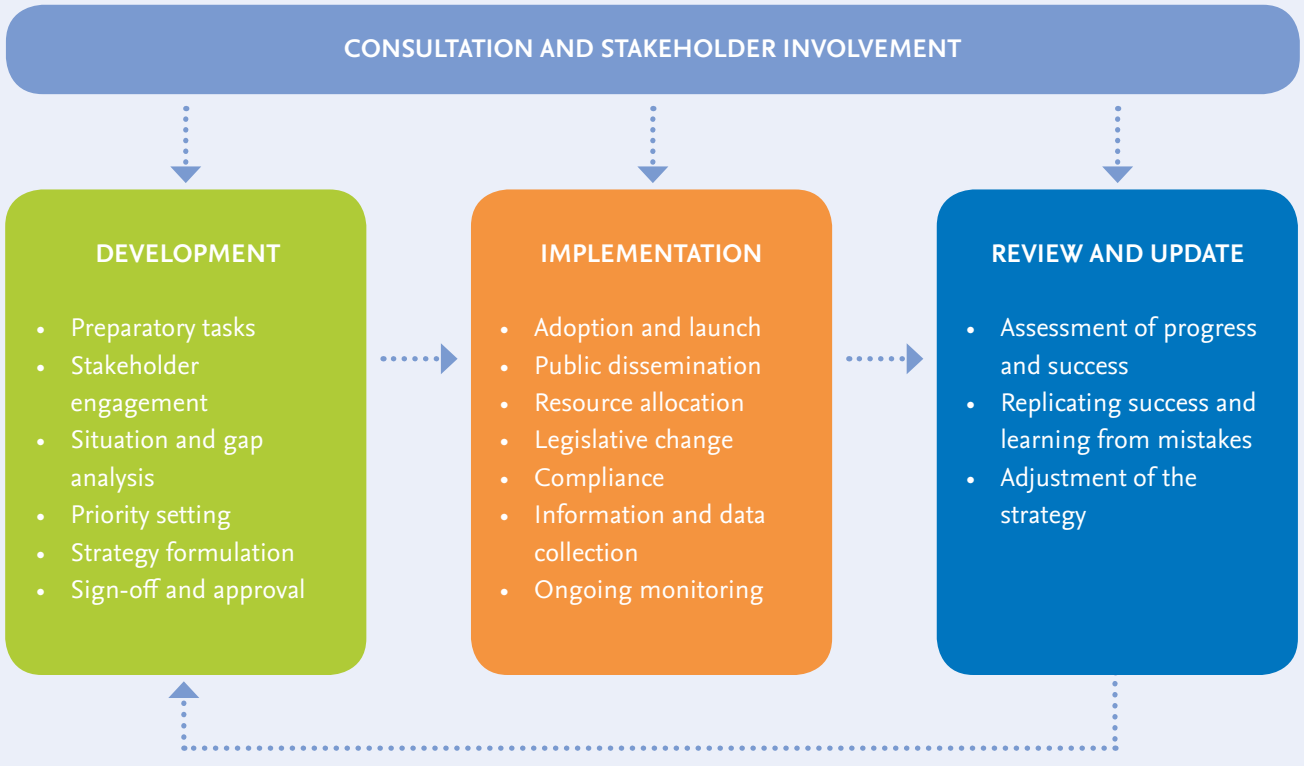
The guidance document is intended for ministers and senior officials in national governments. It provides a conceptual and methodological framework that countries can then apply and adapt to their particular circumstances. In particular, this guidance document outlines a possible process that countries can consider, and poses questions that countries can ask themselves as they develop integrated national waste management strategies. This guidance document is supported by other materials, such as case studies, planning aids and detailed decision guides, designed to help countries apply this methodology.

The guidance document was developed by the International Environmental Technology Centre (IETC) of the United Nations Environment Programme (UNEP) and the United Nations Institute for Training and Research (UNITAR). The document has been the subject of wide consultation with representatives from interested countries and relevant international organisations (all contributors are recognised in the Acknowledgments), who have provided comment on successive drafts. Some of the contributors were able to review the document at a workshop, held at IETC headquarters in Osaka in February 2013. The document will continue to be reviewed regularly to maintain its usefulness and relevance. Further comment is therefore invited by all future readers and practitioners.

Part I of the document serves as an introduction, outlining important underlying concepts and the overall rationale for a national waste management strategy. Part II of the document explores the challenges and opportunities waste management presents to governments and communities. Part III deals with the considerations, material and ideas that would normally be included in developing the content of a strategy. Part IV defines the actions a country can take in order to develop a strategy, as well as to implement, review and update it (see Figure 1 below). **Countries which have already decided to develop a national strategy, and are already familiar with the elements of waste management policy, may wish to focus their attention on Part IV.**

FIGURE 1

OVERVIEW OF THE PROCESS FOR DEVELOPING, IMPLEMENTING AND UPDATING A NATIONAL STRATEGY




By PublicDomainPictures / CCo / via pixabay.com

1.2 UNDERLYING CONCEPTS – WASTE STREAMS

Countries vary in terms of which waste issues are of most importance. Some waste streams are universal, e.g. MSW, construction and demolition waste and automotive waste. Other waste issues will be important to a country because of geography, industrial structure or demographics. This guidance document is not intended to direct countries on how to manage any one particular waste stream or kind of waste. Rather it is intended as a "toolkit" of policy approaches to waste management issues, combined with a suggested approach to strategy development. A strategy is a systematic, coherent and concrete collection of policy choices at a given point in time. This document deals with how those policy choices can be made and assembled into a strategy. It is designed to assist countries to identify the most suitable policy choices, systematically engage stakeholders, set priorities and move to action in a coordinated and coherent way.

Developing a strategy is the first and easiest part of the challenge in most respects. A strategy will remain an empty document if not implemented. A country without a strategy may not be able to tackle its waste problems effectively, but a country with a strategy that is not implemented has expended considerable effort for no purpose. A critical element in successful implementation is resourcing. There is little point in elaborating a strategy unless resources are available for implementation. With implementation comes the need to adjust the strategy to changing circumstances, reviewing it for potential changes or possibly updating it completely, depending on the context. This document, while focused on strategy development, also encompasses implementation, review and updating of the strategy.

Waste is generally managed as identifiable **waste streams** generated from a number of identifiable **sources**. Some sources generate particular waste streams (e.g. building and demolition operations are the main sources of construction and demolition waste). Other waste streams may come from multiple sources (e.g. packaging waste comes from households, public facilities, offices retail operations, etc.). Different waste streams are composed of different materials and therefore have different health and environmental impacts. The quantities to be managed differ from waste stream to waste stream. Consequently, the methods by which various waste streams are collected, recovered, processed, treated or disposed of may vary broadly. Therefore, the policy applied to each waste stream will need to recognize and take into account these differences in order to achieve the relevant policy objective.

Although waste is classified into waste streams for the purposes of management, these distinctions are made largely for practical reasons. In many cases there is an overlap of one stream with another stream, and different locations may use different classifications and names. Waste is usually divided into **hazardous and non-hazardous waste**, as the requirements for handling and treatment of these two categories are very different. For example, special health-care waste[3] requires a different approach from that for general municipal waste, due to its hazardous properties and the risks it poses to workers and to public health in general. For many countries, MSW, originating from sources such as households, shops, small businesses

3) The term "special health care waste" is used in this document, in accordance with the practice of the World Health Organization, to refer to waste resulting from health care and medical sources and containing hazardous components such as infectious material, body parts, and sharps.


Photo courtesy: Brandon Turner


Photo courtesy: Brandon Turner

and public spaces, is the most visible and most important category of waste, at least in the eye of public opinion.

The scope of this guidance document is deliberately broad, so that each country can determine what waste needs to be included in its national strategy. This guidance document uses examples from a variety of waste streams and sources to illustrate the choices and issues countries are likely to confront. The only major category of waste deliberately excluded is radioactive waste. Radioactive waste requires special and dedicated management and would not normally form part of a national waste management strategy. For current purposes "radioactive waste" includes waste derived from applications of nuclear technology or from mining of ores rich in radioactive materials. The International Atomic Energy Agency (IAEA) provides guidance to countries on the management of such waste.[4]

The other major exclusion is conventional pollutants. Waste, which must be managed, discarded, recovered or recycled, is usually distinguished from pollutants released as discharges direct to air, water or sewer. Air and water pollutants are not the subject of this guidance document. The document does cover, however, matter other than solid waste. Waste can take the form of sludge, liquid waste sent to specialised plants for treatment, waste oil, obsolete or discarded chemicals, discarded cylinders of industrial gases, etc. This guidance document adopts a general approach, allowing each country to decide where and on what waste streams to focus.

Other than the very limited exceptions mentioned above, this guidance document includes all waste streams and categories of waste:

- MSW and other kinds of waste
- Industrial and post-consumer waste
- Hazardous and non-hazardous waste
- Waste imported from elsewhere or intended for export.[5]

Different countries will find certain kinds of waste more important than others. This can be reflected in a national strategy by identifying national priorities among waste streams (see Part IV).

As noted above, waste sources and waste streams are not mutually exclusive categories: some waste streams overlap with or are sub-categories of others. Packaging waste, for example, is a sub-category of MSW, and special health care waste is a particular category of hazardous waste. The choice of which waste streams are separately identified and managed is a critical element in policy, and is explained in more detail in Part IV.

Listing the kinds and sources of waste brings into focus the question of what is to be considered waste in the first place, i.e., how waste is to be defined. The question is more complex and difficult than it may first appear, because what is a waste in one context is a raw material or valuable recoverable in another. Different countries have found different solutions to this challenge, and some form of definition will be necessary both for regulatory purposes, and to ensure compliance with relevant international instruments. Definitions of hazardous waste also differ from country to country, and because of the tighter regulatory environment for hazardous waste, a clear definition will be necessary. Generally, hazardous waste is defined as waste that poses a hazard to human health or the environment, exhibiting

4) http://www-ns.iaea.org/home/rtws.asp?s=3&l=25

5) This document has been prepared on the basis that such movements are undertaken in accordance with the Basel Convention and other relevant international agreements.

TEXT BOX 1.2

EXAMPLES OF WASTE SOURCES AND WASTE STREAMS

SOURCES OF WASTE:

- Households
- Offices
- Cafes and restaurants, hotels, food stalls
- Schools, universities, laboratories
- Retail operations (shops, supermarkets, warehouses, etc.)
- Markets
- Public facilities (sports grounds, street sweeping and cleaning)
- Hospitals and other health care facilities
- Mines and mineral processing facilities
- Agriculture and food processing facilities
- Fishing and fish processing facilities
- Forestry operations
- Building sites
- Manufacturing facilities
- Water treatment and sewage treatment facilities
- Land transport facilities (truck depots, bus and train stations and terminals)
- Car yards and car repair shops
- Ships and aircraft (airports, ports, marinas)

WASTE STREAMS:

- Food, kitchen and garden waste
- Automotive waste (oil, tyres, end-of-life vehicles)
- Paper and cardboard
- Agricultural waste
- Textiles
- Mining waste
- Electrical and electronic waste (e-waste)
- Ferrous metals (iron and steel)
- Non-ferrous metals (aluminium, copper, lead)
- Construction and demolition waste
- Special health care waste
- Sewage sludge
- Batteries
- Expired chemicals and pharmaceuticals

one or more physical, chemical or biological hazards (see the discussion on the protection of human health and the environment in Part II). Countries frequently resort to lists of waste, classifying particular kinds of waste (e.g. special health care waste) as hazardous,[6] due to the difficulty of defining hazardous waste in sufficiently precise and comprehensive ways, as well as the need to manage risks of contamination.

Each country embarks upon the challenge of waste management with its own political and institutional structure and its own pattern of public engagement and private sector involvement. These factors will influence how a country goes about developing a strategy on waste management. This guidance document is not intended to be a formula or recipe which can be applied to any set of circumstances, but rather a collection of issues and options from which a strategy, or at least the beginning of one, can be assembled. It is for each country to determine the scope and boundaries of their national waste management strategy. It may be useful, however, for countries to ask themselves if a particular waste stream can be managed according to the waste management approaches typical at this strategic level: waste prevention and minimisation, cleaner production, the waste management hierarchy and environmentally sound management. If so, inclusion of the waste stream in the overall strategic approach is justified.

6) See, for example, the USEPA and EU approaches to defining hazardous waste at http://www.epa.gov/osw/hazard/ and http://eulex.europa.eu/LexUriServ/site/en/oj/2000/l_226/l_22620000906en00030024.pdf respectively.

1.3

UNDERLYING CONCEPTS – WASTE MANAGEMENT HIERARCHY

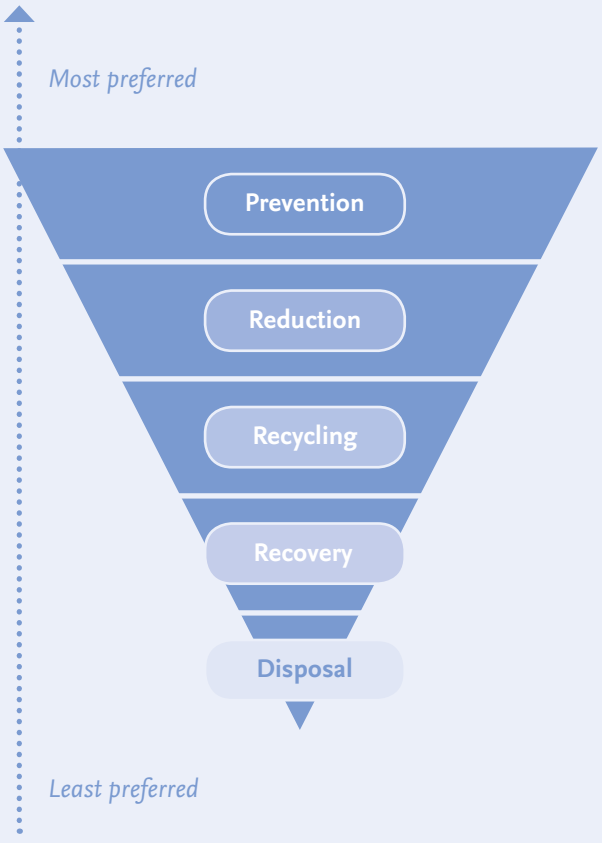
Any discussion of waste management will involve the use of various specialised concepts. The following concepts are the cornerstones of waste management policy across the globe and may be familiar: waste prevention or minimisation, the waste hierarchy, the life-cycle of a product, resource efficiency and environmentally sound management. While all of these concepts are explained in Part III of this document, several are sufficiently central and essential to the understanding of the document to be introduced here.

The **waste management hierarchy**[7] indicates an order of preference for action to reduce and manage waste, and is usually presented diagrammatically (see Figure 2).

The waste hierarchy is presented as an inverted pyramid because the essential thrust of policy is to take action first and foremost on preventing the generation of waste. The next preferred action is to reduce waste generation (e.g. through re-use). Recycling, including composting or anaerobic digestion, is the next preferred action, followed by the downstream steps of materials recovery and waste-to-energy. If energy is recovered from processes such as combustion and pyrolysis, or from landfill, it also belongs at this level of the hierarchy.

The final action is disposal, either in landfills or through incineration without energy recovery. This final step is a last resort for waste which has not been able to be prevented, diverted, or recovered in the preceding steps. Below incineration without energy recovery or properly engineered and managed landfills are the controlled and

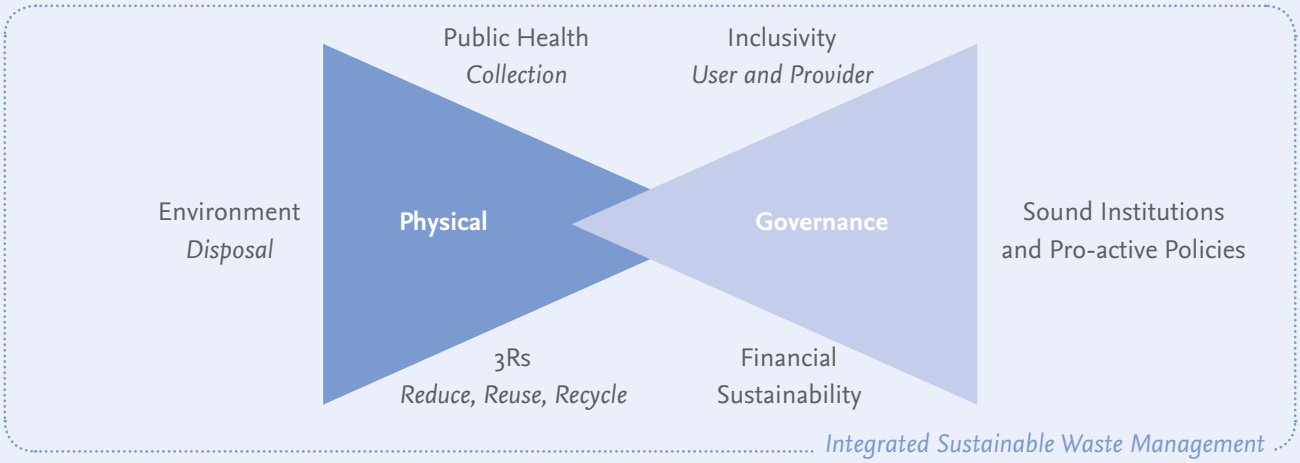
FIGURE 2
WASTE MANAGEMENT HIERARCHY



Source: UNEP (2011). Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication.

7) Different versions of the hierarchy have been adopted by different countries, although they are all broadly similar to that outlined above. The EU, for example, has adopted a hierarchy comprising, in descending order, prevention, preparing for reuse, recycling, other recovery (e.g. energy recovery) and disposal. See the European Commission's Waste framework Directive 2008/98/EC, Article 4, Waste Hierarchy (http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32008L0098:EN:NOT).

FIGURE 3
"TWO TRIANGLES" ANALYTICAL FRAMEWORK



Source: © David Wilson, Costas Velis, Ljiljana Rodic. Concept adapted from: Scheinberg, A., Wilson, D.C. and Rodic, L. (2010) Solid Waste Management in the World's Cities. Earthscan for UN-Habitat.

uncontrolled dumps to which waste is often consigned in low-income countries (and even in some middle-income countries).

Often the waste hierarchy is used in an abbreviated version as a communication tool, referred to as the "**3 Rs**", which identify the choices, in order of preference, as "**reduce, reuse, recycle**".

The hierarchy captures the progression of a material or product through successive stages of waste management, and represents the latter part of the life-cycle for each product. The life-cycle begins with design, then proceeds through manufacture, distribution, use and the various options reflected in the lower stages of the hierarchy (reuse, recovery, recycling and the disposal options). Each stage of the life-cycle offers opportunities for policy intervention: to rethink the need for the product, to redesign it to minimise its waste potential, to modify or extend its use so as to reduce its waste potential and to recover the resources embodied in it. The resources that make up the product are the ultimate driver for better waste management policy. The aim of policy is not to manage waste better or to ensure compliance with waste management regulations, but rather to optimize the use of the world's limited material resources by avoiding the generation of waste and, where waste is nevertheless generated, by treating waste as a resource waiting to be recovered and used. These three principles: **waste hierarchy, life-cycle of products and the concept of waste as a resource, form the underpinnings of the entire document, and should serve as the foundation for any process of strategy development.**

A complementary tool to be used with the waste hierarchy is the "two triangles" analytical framework for solid waste management developed for UN-Habitat[8] (see Figure 3).

While the waste management hierarchy focuses on waste processing (treatment) and disposal options, the UN-Habitat analytical framework also includes waste collection, as the component of solid waste management systems that is directly linked to the protection of public health.

The UN-Habitat framework distinguishes three physical components of solid waste management systems: waste collection services, driven by public health concerns, environmentally sound disposal, driven by environmental concerns and the 3Rs, driven by economic value of resources and resource depletion concerns. In addition, the framework recognises that waste management problems cannot be solved simply by addressing the physical components, dealing with the technical aspects or providing the infrastructure. Therefore, the framework also focuses on three governance aspects, namely: inclusivity, extending to both users and providers of services, financial sustainability and sound institutions and pro-active policies. The ideas underlying the framework align closely with the guidance presented here, and the UN-Habitat document has a wealth of examples and analytical material that could be made available during the process of strategy development. The framework itself can be particularly useful in preparing a country's baseline study (addressed in Part IV).

8) See UN-HABITAT (2010). *Solid Waste Management in the World's Cities.* http://www.unhabitat.org/pmss/listItemDetails.aspx?publicationID=2918

1.4

WHY SHOULD A WASTE MANAGEMENT STRATEGY BE DEVELOPED AT THE NATIONAL LEVEL?

The day to day practice of waste management is mostly a local affair, and a great deal of the innovation that sparks improvements in waste management practices originates in local communities. So why should policy be developed at the national level?

National governments can make a critical contribution by:

- Making waste management a **national priority**, giving it visibility and explicitly defining national interests in waste management, both with respect to the provision of particular services, and as part of broader material resource management
- Ensuring that resources are applied in ways that reflect these national interests and priorities, and especially ensuring that **resources flow to where they are needed** at the local level (since often local government has the responsibilities but not the resources)
- **Recognising and reconciling contradictory and inconsistent policies** at different levels and for different waste streams
- **Ensuring the availability of skills, knowledge, and capacity** to implement waste management programs effectively, especially at the local level
- **Fostering the development of national recycling schemes and markets** for recovered materials (including the provision of subsidies and incentives where appropriate).

Waste management policies usually develop piecemeal, at the local level, and by the time national government takes a strategic interest, there are often already established local practices and solutions. It is vital that national policy be developed in ways that recognise local needs, capacities, capabilities and practices. Imposing outside solutions or simply draining resources from other day-to-day priorities are to be avoided. A national policy should provide national level incentives, goals and targets, national and regional markets and economies of scale, and incorporate the flexibility required for informed and sensitive implementation at the local level.

Effective national strategy development meets several complementary needs:

- It is **strategic**, in that it sets overall directions and adopts high level policy settings, targets and incentives. This information is then available to all the players and provides consistency and coherence to policy.
- It is **integrated**, in the sense that the strategy is comprehensive. As its starting point, it takes the full range of waste in the country, across its entire territory. It considers both the complete life-cycle of the product, from raw materials to products to waste, and the total waste management chain, from collection to disposal.
- It provides a **basis for setting priorities**, i.e. for deciding, within that comprehensive scope, what is most urgent and important, and for allocating resources accordingly.
- The integrated nature of the strategy development process also **allows for interaction** among the environmental, economic and social aspects of waste management, and takes into account all the players involved. It offers an opportunity of revealing and resolving competing interests and agendas.
- It elevates waste management issues to a position of greater **political and public visibility**, reducing the risk of local decisions being captured by particular agendas.
- Strategy development allows the information base for

waste management policy to be built up over time, so that **data collection**, over time, delivers consistent and correct information. Greater data accuracy results in improved policy decisions.

- Since strategy development entails a planned and consistent process to be applied nationally, the policy process becomes more **transparent,** ensuring that all relevant stakeholders and interests have both access to information and the possibility of contributing to decision-making.

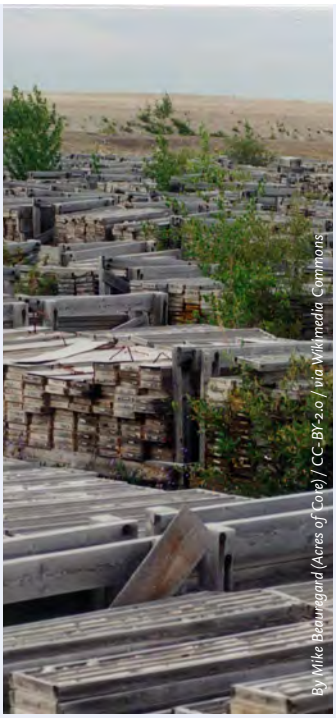
Several critical areas of activity will benefit from national involvement or leadership:

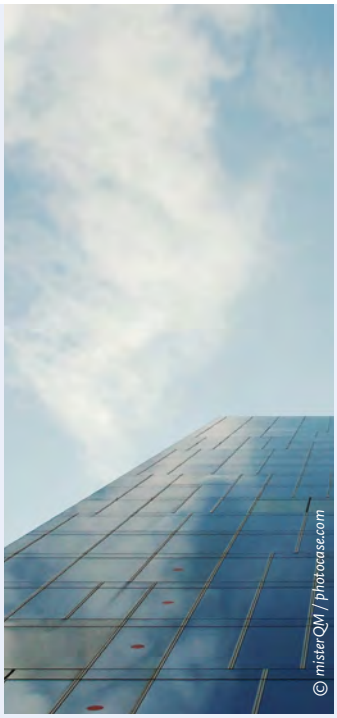
- International obligations are met by action at the national level.
- Some elements of policy require consistency across a country if they are to be effective (e.g. policy and programs relating to industrial waste, or policies aimed at changing consumer attitudes, which may sometimes be introduced through mass media campaigns).
- The application of certain financial, regulatory and other measures implies national involvement. As a prime example, only national governments are likely to be in a position to mobilise or re-allocate large-scale financial resources.
- Recovery and recycling operations for some materials require national markets and economies of scale (while organics and composting, on the other hand, are mostly local in orientation).
- A national approach provides a level playing field for the private sector, with greater certainty and clarity, thus providing a better environment for investment. A national regulatory framework will be especially necessary for public-private partnerships.
- National, regional and local actions together can help raise the profile of waste management as an industry and engage the community in a debate that recognises everyone's potential contribution.
- Improved cooperation and coordination among public entities will yield wider general benefits.

Despite all the advantages of national action, the fact remains that most waste management, and in effect all management of MSW, occurs at the local level. It is therefore vitally important to foster cooperation between levels of government and manage the interface between national and local policy and decision-making. Some elements, such as taxation and other financial mechanisms, structured to change consumer behaviour, or create economies of scale for recovered or recycled materials, are best established at the national level. Other aspects, such as community participation, integration of the informal sector, or organisation of service provision, are best handled locally. In case of the latter, citizen feedback and adaptation to local circumstances are likely to be crucial. Some actions, such as popular education on source separation, may involve both levels of government if coordinated effectively.

In certain instances it may be beneficial for countries to work on a scale broader than national, depending upon the regional and international context. For example, participating on a regional level in certain waste management programs could enable a country to benefit from economies of scale. These issues are covered in Parts II and III.

PART II
CHALLENGES AND OPPORTUNITIES IN WASTE MANAGEMENT





2.1 SUSTAINABLE DEVELOPMENT

2.2 WASTE STREAMS AND THEIR MANAGEMENT

2.3 GOVERNANCE CHALLENGES

2.4 FUTURE CHALLENGES

This chapter examines the challenges of waste management, especially in developing countries, while also exploring the significant opportunities and potential benefits waste management can offer governments, industry, other stakeholders and the community. Waste management in most cities in developing economies and countries with economies in transition involves overburdened waste collection services, and inadequately managed or even uncontrolled dumpsites where waste catches fire and burns. These problems are worsening most rapidly in low-income countries.[9] Problems of governance contribute to and exacerbate these problems.[10] But it does not have to be that way. In recent years the number of successful examples has grown, especially in developing countries, and there are now many success stories, including solutions that do not rely on capital-intensive investment or advanced technologies. Waste management is an ongoing challenge, one in which countries cities and their people can and must do better.

9) See World Bank (2012). *What a Waste: A Global Review of Solid Waste Management*, which estimates global generation of municipal solid waste and projects rates of waste generation out to 2025. Most of the cost burden for the foreshadowed increase in waste generation will fall on developing countries.
10) See, for example, Onibokun, Adepoju G. (ed.), (1999). *Managing the Monster: Urban Waste and Governance in Africa*. Ottawa: International Development Research Centre.

Against a background of increasing global resource scarcity and the challenges of major problems such as climate change, many developing countries struggle with waste management, in the face of weak institutions, chronic under resourcing and additional challenges such as rapid urbanisation. The answer to these challenges lies in rethinking and reorganising waste management on a life-cycle basis, incorporating waste management into the developing "green economy" and focusing on waste as a resource. When these actions are implemented, the waste sector can then begin the transition, which is now occurring throughout the world, from being focused on service delivery, as in the past, to managing resources for the future. The path to the future will encompass a succession of individual, pragmatic and incremental decisions on the ground, which taken as a whole will build momentum to carry this transition forward.

The process of change occurs through the systematic, thoughtful and organized adoption of strategically integrated policies that apply the central principles of waste management: the waste hierarchy, life-cycle thinking and resource efficiency. The focus of this chapter is the crucially important step of developing policy to foresee, diagnose

TEXT BOX 2.1

SUCCESSFUL NATIONAL ACTION ON WASTE MANAGEMENT

A successful example of national action on waste management, Malta's waste strategy[11] is being updated to align more closely with overarching policies of the EU. The overall strategy is supported by action plans and targeted strategies in particular areas, including upgrading waste management infrastructure to compensate for shortages of landfill space, and a specialised plan on the management of PCBs and related wastes. The strategy is noteworthy due to its systematic examination of the particular waste issues confronting Malta, and its broad scope, extending to radioactive waste and waste dumped at sea. The country has shown considerable flexibility in accommodating new challenges such as e-waste.

Another successful national action is the waste management strategy developed by Brazil as part of a Brazil-US Joint Initiative on Urban Sustainability. The Brazilian National Solid Waste Policy,[12] adopted in 2010, extends to domestic, industrial, mining, agroforestry, construction and health waste. Sustainability is the foundation of the strategy, which puts particular emphasis on the implementation of the "polluter pays" principle. Brazil, like many other Latin American countries, also gives special attention to the integration of the informal sector into the waste management system.

11) http://www.mepa.org.mt/waste-policy; see also http://www.mrra.gov.mt/page.aspx?id=123
12) http://www.brasil.gov.br/news/history/2010/08/02/brazil-approves-the-national-policy-on-solid-waste/newsitem_view?set_language=en

2.1 SUSTAINABLE DEVELOPMENT

and manage the risks associated with waste, and enable the reuse and recovery of valuable resources.

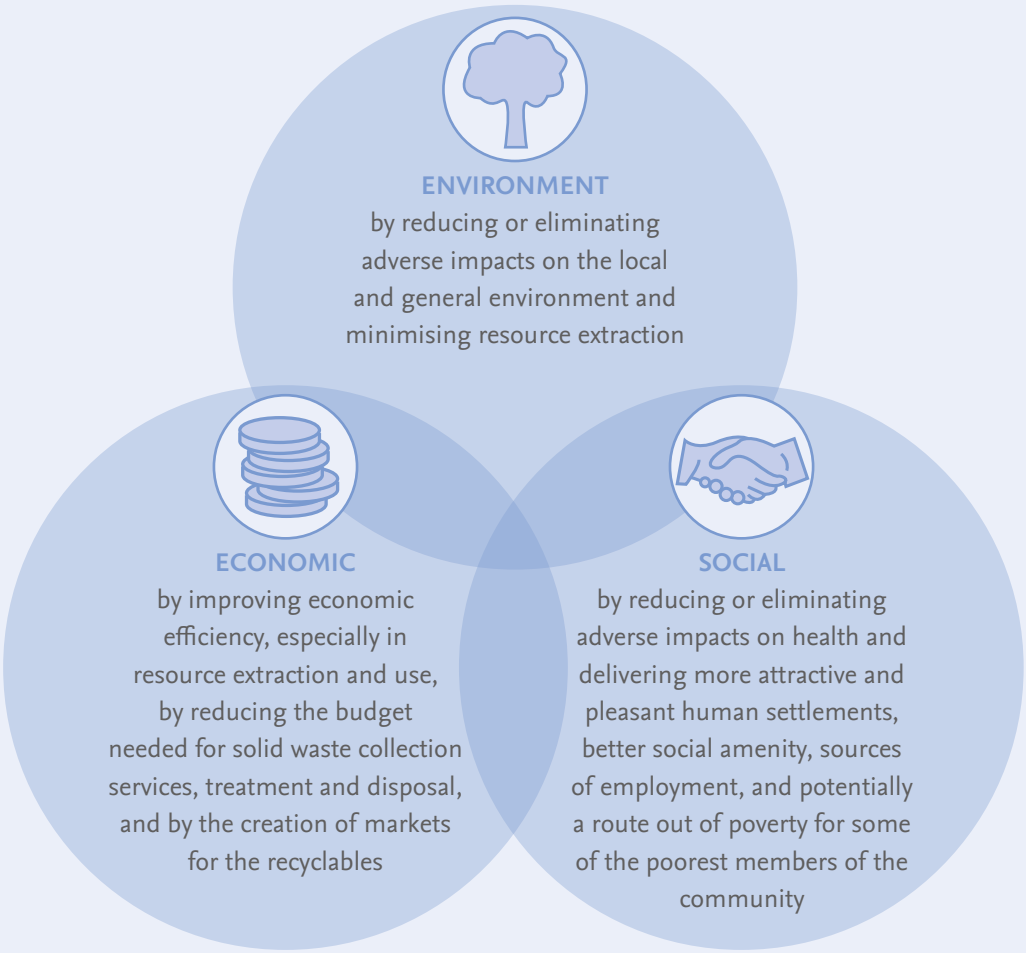
Waste management offers many opportunities for development. When developed and implemented soundly, strategically and in cooperation with other stakeholders, waste management policy delivers many benefits to a wide range of interests. The choices each country makes will be influenced by a range of factors, as considered in Part IV, such as an analysis of the country's current waste management policies and programs, its particular cultural context, its socioeconomic conditions, resources available, etc. Nevertheless, there are many challenges and opportunities which are common to most countries. In the present section, attention is given to sustainability challenges, both in general and in relation to each of the three sustainability dimensions or "pillars": health and environment, economic and social aspects. The benefits and opportunities resulting when these challenges are met by sound waste management policy are also explored. The following section focuses on the challenges and opportunities arising from the need to choose different management approaches and policy depending on the waste stream concerned, with many waste streams needing particular attention and careful analysis. A later section explains the governance challenges and opportunities associated with waste management, in cases where institutions are weak and the needed political and bureaucratic support is absent. A final section considers some of the future challenges facing the sector in the light of developing knowledge and a changing world.

Preventing the generation of waste and managing waste well exemplify the waste management hierarchy and the broader principles and concepts of sustainable development (which are explored further in Part III). Following are some examples illustrating how **sound waste management contributes to sustainability**:

- A well designed and carefully implemented waste management policy contributes to all three "pillars" of sustainable development (environmental, economic and social): by improving economic efficiency, especially in resource extraction and use (e.g. through waste prevention, reuse, recovery or recycling); by reducing the budget needed for solid waste collection services; by reducing or eliminating adverse impacts on health and the local and general environment; by delivering more attractive and pleasant human settlements and social amenity; and by creating sources of employment and potentially a route out of poverty for some of the poorest members of the community.
- Waste management delivers benefits to subsequent generations, by providing them with a more robust economy, a fairer and more inclusive society and a cleaner environment, thereby facilitating intergenerational equity.
- As noted above, sustainable waste management can provide opportunities to the poor, e.g. by enabling waste pickers to earn a sustainable income. Waste management activities are typically performed by the poor, often poor and vulnerable women. These activities can deliver significant economic and social benefits by improving autonomy and recognition for the people concerned. Thus waste management policy also promotes the principle of intra-generational equity.

FIGURE 4

WASTE MANAGEMENT POLICY CONTRIBUTIONS TO SUSTAINABLE DEVELOPMENT



- Policies that are careful, balanced and integrated give effect to other principles of sustainable development, such as the precautionary principle.

In the absence of policies to produce a different result, the rate of waste generation typically increases with economic growth, advances in technology and the appearance of new products incorporating technological advances.[13] Changes in the range of products on the market may lead to increased waste through the use of more disposable products or greater amounts of packaging. The hazardous nature of the waste may increase as product composition changes. A new product may stimulate increased demand simply by its novelty or added features. As waste is generated, the resources that made up the product and its packaging, drawn from a resource base that is inevitably limited (unless reused, recovered, or recycled), are lost. The challenge for waste management is to interrupt and reverse the growth in waste by tackling the waste issue from the beginning of the life cycle, i.e. product design, straight through to production, use and entry into the waste management system. Only then can resource consumption begin the move to a sustainable path.

The choices of each consumer concerning what to buy, wear, consume, use, and discard are very much an individual matter that governments can influence only indirectly. The choice of what products to bring to market is also mostly a matter for producers themselves, within the constraints of regulations such as product safety standards. Nevertheless, the choices made by producers and consumers have a long chain of consequences throughout the life-cycle of the product, and major implications for waste management. Ultimately, **success in waste management requires a fundamental change in patterns of production and consumption**. Governments, especially national governments, and regional and international organisations,

13) See the World Bank (2012). *What a Waste: A Global Review of Solid Waste Management* for projection of the rate of waste generation.

© Sichtfeld / photocase.com


Photo courtesy: Brandon Turner

are in a position to play a key role in developing market frameworks that make it possible for production and consumption to make that change.

Some of the implications for each of the three pillars of sustainability are explored in the following analysis, one aspect at a time. In practice, however, implications do not exist for each pillar in isolation. Waste having chronic health impacts on children living near poorly managed waste management facilities, will also impose economic costs on the local community, and have social implications, since the children whose health is affected are likely to be educationally disadvantaged. As in this illustration, each time a particular aspect of waste carries implications for human health and the environment, for instance, there are also economic and social effects. Therefore these wider ramifications and interactions among and between the pillars should be kept in mind when reading the analysis below.

BETTER HEALTH AND ENVIRONMENT

Waste management policy delivers benefits for human health and the environment. Protecting public health by removing putrescible (organic) wastes from where people live was the initial driver for improved waste management, and is still of primary importance. Children living near waste dumps show significantly increased rates of acute respiratory infections and diarrhoea. Waste collection services are provided first and foremost to address this risk, but at present collect only about 50% of waste in cities in many low-income countries. Other risks derive from hazardous materials, such as:

- Chemical hazards to human health and the environment:
  - Waste pharmaceuticals or pesticides
  - Products containing hazardous substances (such as e-waste, brominated flame retardants, polyvinyl chloride (PVC), polychlorinated biphenyls (PCBs), or light fittings containing heavy metals)
  - Consumer products, such as some cleaning agents, containing hazardous chemicals (including expired consumer products)
  - Materials such as asbestos and persistent organic pollutants (POPs)
- Physical hazards:
  - Corrosive materials such as those found in some batteries or cleaners
  - Flammable materials such as petroleum products or some solvents
- Biological hazards (e.g. infection), such as from sharps, used bandages or medical waste.

These hazards are potentially serious – the risks need careful management. Impacts vary, but it is usually the most vulnerable members of society (e.g. children of the poorest classes) who suffer from diseases and pollution-caused ailments from exposure to waste. The best option is to exclude hazards from products so that hazardous waste is not generated. In cases where this cannot be done, separation and dedicated management are imperative. It is especially important that health-care waste, for example, be managed separately, as once mingled with other waste most health-care waste is indistinguishable, and can potentially contaminate other waste.

TEXT BOX 2.2

HEALTH-CARE WASTE

Most of the waste from health-care facilities is no more dangerous than regular household waste, e.g. packaging waste. Types of health-care[14] waste which do, however, represent a risk to health include:

- Infectious waste, representing 15-25% of total health-care waste, among which are sharps waste (1%) and body part waste (1%)
- Chemical or pharmaceutical waste (3%)
- Radioactive and cytotoxic waste or broken thermometers (less than 1%).

Health-care waste can cause infectious diseases and pollution if not handled properly. Infectious waste, especially sharps such as discarded syringes, poses a risk to anyone who comes into contact with it. Discarded syringes, for example, are sometimes reused.

Despite many efforts over the years, many low- to middle-income countries are not able to properly treat much of their medical waste. When health-care waste is not separated and treated properly, it enters the municipal waste management system where it gets mixed with general municipal waste. This can lead to injury and infection for waste pickers, contamination of other waste fractions, recovery and resale of items such as syringes without sterilisation and pollution of water, including drinking water.

The WHO has developed detailed guidance on managing health-care waste, covering prevention, generation and management.[15] The Basel Convention has also issued technical guidelines in this area.[16]

14) See http://www.healthcarewaste.org
15) http://www.healthcarewaste.org
16) http://www.basel.int/Portals/4/Basel%20Convention/docs/pub/techguid/tech-biomedical.pdf

Sound waste management also prevents adverse environmental impacts in other ways. When materials and products end up as waste, the resources embodied in them cannot be put to productive use. These wasted resources are an opportunity lost:

- If not fed to animals, composted or digested, organic waste represents organic matter lost to soils or a loss of energy.
- If not separately collected and reused or recycled, paper and cardboard consigned to disposal represent a loss of forests and timber.
- If not separately collected and reused or recycled, waste plastics represent a loss of the petroleum or natural gas used to manufacture them.
- If not separately collected and reused or recycled, metal waste (aluminium, steel, zinc, lead, precious, and special metals) represents lost non-renewable resources and lost embodied energy.

These resources, if recovered, can be sold to mills, foundries and other facilities, becoming a source of income and a way of avoiding environmental costs associated with the waste management process and with resource depletion.

Other benefits of well-crafted waste management policy include a wide range of avoided impacts from poorly managed facilities:

- Emissions of air pollutants from incinerators, such as sulfur dioxide, dioxins and furans, nitrous oxide, particulate matter (including nanoparticles) and heavy metals
- Occupational health impacts on waste management workers and waste pickers
- Pollution of surface and groundwater by releases from waste disposal sites, e.g. releases of leachate from landfills or from uncollected waste (which can have both direct and indirect effects, e.g. on fish stocks or biodiversity more generally), including releases of eutrophying and acidifying substances
- Land pollution, creation of contaminated sites, loss of productive arable land and loss of land to abandoned dumpsites
- Toxic air emissions from open dumps and mass burning of waste, or from refuse fires (The emissions from these events can be particularly hazardous because the combustion process is completely uncontrolled, e.g. such fires are often potent sources of dioxins and furans.)
- Emissions of greenhouse gases from disposal sites (carbon dioxide and methane) and combustion facilities (carbon dioxide):
  - Uncontrolled waste disposal is a net emitter of greenhouse gases, whereas waste recovery (reuse,

© Laurin Rinder / fotolia.com

recycling, composting, anaerobic digestion) delivers a net savings of emissions avoided from disposal, and provides substitutes for products manufactured using virgin resources.
    - Similarly, sanitary landfills equipped with gas collection and control systems provide an opportunity to prevent methane emissions.
- Poorly managed controlled disposal sites and open dumps are significant sources of short-lived climate pollutants, of black carbon from incomplete combustion and of tropospheric ozone precursors[17]
- The attraction of insects, rats and other vermin, including disease vectors, to waste facilities, and the provision of breeding opportunities for them, as well as the spread of the diseases they carry
- Floods and drainage and sewerage systems blocked by waste because of inadequate waste collection services
- Impacts on wildlife or on the environment as a whole from waste making its way into the natural environment
- Plastics are of particular concern because of their impacts on biota (e.g. plastics swallowed by terrestrial, aquatic or marine wildlife, or by domestic animals)
- Uncontrolled dumpsites can attract wildlife scavenging on food waste, with consequences both for the wildlife and for nearby human populations
- Impacts on the marine environment as the ultimate repository.

17) See http://www.unep.org/ccac/ShortLivedClimatePollutants.aspx

TEXT BOX 2.3

WASTE AND GREENHOUSE GAS (GHG) EMISSIONS

Reducing, reusing, recovering, and recycling municipal waste are effective and high-impact means of reducing greenhouse gas (GHG) emissions.[18] When discarded materials (waste) are recycled, they provide industry with an alternate source of raw materials. This results in lower demand for virgin materials whose extraction, transport, and processing are a major source of GHG emissions. Recycling thus reduces emissions in virtually all extractive industries: mining, forestry, agriculture and petroleum extraction. The Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) states that "waste minimization, recycling and re-use represent an important and increasing potential for indirect reduction of GHG emissions through the conservation of raw materials, improved energy and resource efficiency and fossil fuel avoidance"[19]. According to UNEP's report on waste and climate change, waste reduction is an important source of emission reductions through improved product design and cleaner production, increasing product durability and maximising the ease of product disassembly (for recycling).[20]Additional energy (and associated emissions) is saved in the manufacturing process itself, as recycled materials generally require less energy to be turned back into products.[21] This is particularly evident in products such as aluminium, where the direct energy required to recycle is 88% less than that required to produce primary aluminium.[22]

Recycling of paper and wood products has a notable double impact. Not only does it reduce the demand for virgin wood fibre, thus reducing emissions from deforestation, but it also preserves forests' ability to continue to act as carbon sinks (removing carbon from the atmosphere).

18) US EPA (2006). *Solid Waste Management and Greenhouse Gases: A Life-Cycle Assessment of Emissions and Sinks*, 3rd Edition.
19) Bogner, J. and Pipatti, R. et al. (2008). *Mitigation of Global Greenhouse Gas Emissions from Waste: Conclusions and Strategies from the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report. Working Group III (Mitigation).* Waste Management & Research, 26 (1), 11-32.
20) UNEP (2010). *Waste and Climate Change: Global Trends and Strategy Framework*,http://www.unep.or.jp/ietc/Publications/spc/Waste&ClimateChange/Waste&ClimateChange.pdf
21) IPCC (2006). *2006 IPCC Guidelines for National Greenhouse Gas Inventories. Waste Generation, Composition, and Management Data.* Ch. 2.
22) Schlesinger, M. (2006). *Aluminum Recycling.* CRC Press.

Effective waste management is also important for delivering improved amenity, especially around waste management facilities:

- For MSW, odour is often an issue. Odour has limited direct impacts but may affect mental health, and in practice influences the location of waste management facilities. It is also a useful metric regarding the existence of other problems. By controlling waste composition and treatment processes, waste managers can improve public acceptance.
- Dealing with unsightliness (e.g. dust, litter, vermin) improves public amenity, especially in the vicinity of waste management facilities.

ECONOMIC OPPORTUNITIES

"Waste" is first of all an economic concept – implicit in the word is the fact that resources are not being used efficiently. There is an economic loss every time resources (assuming they have some other potential use) are utilized in a way that results in being discarded as waste. Raw materials entering a production chain and ending as waste also represent a loss of energy and water. Industrial waste reflects inefficiencies in production processes. If resources can be saved, recovered, or used more efficiently, there is a net economic gain. There are also other potential benefits:

- Land can be put to more productive purposes if not used for open dumping or allocation as landfill.
- Land values will be higher when it is possible to control or avoid the odour and unsightliness associated with poorly managed wastes.
- Recovery of raw materials from waste reduces the need for use of newly extracted materials.
- Waste management provides employment for large numbers of people (both low and high value jobs) and opportunities for enterprise development.
- Energy can be extracted from combustion processes, anaerobic digestion or methane recovery from landfill.
- Composting and anaerobic digestion provide nutrients for agriculture or energy.
- Some industrial wastes can be sold as soil conditioners.
- Greenhouse gas reductions (and lower energy costs) may result from processing choices.

Frequently improvements in waste management are simply good business. Sometimes the benefits are obvious, as in the tourism industry, and sometimes they are apparent only when subject to in-depth analysis.

TEXT BOX 2.4

CONTRIBUTION OF RECYCLING TO ECONOMIC GROWTH

In a report assessing the economic implications of recycling for the European economies, the European Environment Agency found that the recycling sector (dominated by seven groups of materials, namely: glass, paper and cardboard, plastic, iron and steel, copper, aluminium and nickel and precious metals and other metals) made a significant contribution both in terms of value added and to employment.[23]

In 2004, 2008, and 2009, recycling had a turnover of EUR 32.5 billion, EUR 60.3 billion, and EUR 37.2 billion respectively. This represented 1.69%, 2.70%, and 1.94% of gross value added (GVA) of the entire manufacturing, electricity, and waste management industries.

Employment opportunities in recycling included low-skilled work in particular, but also medium- and high-skilled jobs ranging from collection, materials handling, and processing to manufacturing products. Recycling had twice the economic impact of landfilling the same materials, leading the authors to conclude that more and higher paid employment is generated by recycling than by landfilling or incineration.

This data is from a developed economic grouping. Although the best quality data about waste management comes from developed countries, there is no reason to believe that the general result would be different in developing countries.

23) EEA Report (2011). *Earnings, Jobs and Innovation: the Role of Recycling in a Green Economy*. No 8/2011.


© Andrew Dunn / CC-BY-SA 2.0 / via Wikimedia Commons


© Martin Vonka / fotolia.com

Good waste management provides direct economic benefits through improving human health and the environment, including higher productivity, lower medical costs, better environmental quality and the maintenance of ecosystem services. It is the community at large, and often its poorest members, that reap the largest share of these benefits. By proper pricing of raw materials, water, energy and waste management, costs can be shifted away from the poor and the general community to those manufacturing the products or generating the waste. This is more equitable and also more effective, as it provides an incentive to reduce waste generation.

The costs most clearly associated with waste management are the direct costs of the waste management system: the capital costs of the infrastructure and equipment, and the labour costs of those who work in waste management. For cities, waste management is an area of very high direct costs, requiring significant investment.[24] If quantities of waste in general and per capita waste generation in particular continue to increase, it will be a constant challenge to find the investment necessary to keep pace with demand. That challenge becomes more complex as the types of waste change with development and a shift in population from rural to urban areas. Effective waste management policies require resources to be raised (through actions such as setting appropriate prices for raw materials, energy and the use of waste management services), and governments at different levels to cooperate to ensure that resources are indeed allocated where they are most needed.

One of the benefits of good waste management policy is the reconciliation and accommodation of competing economic interests. That these interests can be reconciled demonstrates that they are neither fundamentally nor necessarily in competition. Many of the best strategies for waste reduction, i.e. reuse, recovery, recycling and composting, produce benefits resulting in a quadruple bottom line. These strategies require less capital investment, create more jobs and sustain more livelihoods, protect public health and provide raw material to production processes. Following are examples of the value added of good waste management:

- Various local industries and sectors can benefit from improved waste management, e.g. tourism (as localities become more attractive), or fisheries (as contamination of water bodies is controlled).
- Waste management also presents an opportunity for businesses to develop and grow. This is particularly apparent in the context of the "green economy". In a green economy, growth in income and employment is driven by investments that reduce carbon emissions and pollution, enhance energy and resource efficiency, and prevent the loss of biodiversity and ecosystem services. Resource efficiency in all areas, and especially in the waste management context, is thus a central aspect of a shift to a green economy. For more detail on business opportunities in waste management, see UNEP's work on the "green economy".[25]

24) The costs vary significantly from country to country. The cost of collection and transportation for municipalities in developing countries with a significant amount of territory can be very high, especially in the absence of source separation and local recovery and recycling operations. It may represent in some cases 30% or more of the total municipal budget.

25) See http://www.unep.org/greeneconomy

TEXT BOX 2.5

SAVINGS FROM PREVENTION AND BETTER MANAGEMENT OF BUSINESS WASTE

Studies suggest that better practices in the business community can produce large costs savings from waste prevention.[26] A study of business waste in the United Kingdom (UK), extending to six industry sectors (food and drink manufacturing, retail, hospitality, construction materials and products, construction and demolition and automotive manufacturing), has suggested that significant savings could be available to business from available waste prevention actions, although awareness of the opportunities was often low.

The study that was undertaken concerned a developed country, and took place in the context of both UK and EU legislation and government programs encouraging better waste management practices. The economics of similar programmes in other countries would be affected by many variables including, for example, differences in the pricing of waste management services. Nevertheless, the projected savings in terms of material costs avoided are so great that it is assumed that the conclusions would be valid for a wide range of countries and circumstances.

26) Wilson, D.C. et al. (2012). *Business Waste Prevention: a Review of the Evidence.* Waste Management & Research, 30 (9) Supplement 17-28. http://wmr.sagepub.com/content/30/9_suppl/17.full.pdf+html

Recovering resources from the waste stream is essential for recovering value and avoiding a long tail of waste for disposal, along with the corresponding costs. Moreover, the economic contribution of waste pickers to waste valorisation should not be overlooked. Informal recycling in Jakarta reduces the volume of waste by approximately 30%, thereby saving on collection and disposal costs, and extending the life of landfills. In major Indian cities such as Delhi and Bangalore, waste pickers prevent at least 15% of MSW from ending up in landfills, saving the government around US$13,700 per day in waste collection and disposal costs. Mexican paper mills have strengthened relationships with waste picker associations in order to secure more supply of valuable waste paper. Governments in Argentina, Brazil, and Colombia now support the informal sector, helping it to integrate into wider waste management systems through national programs that provide legal and technical assistance. In some cases, this integration has facilitated the establishment of waste picker organisations, which command greater respect and have the ability to negotiate direct source-collection contracts (or informal agreements) with businesses, industries and neighbourhood associations.

Finding solutions for financing for waste management is an ongoing challenge for many developing and transition countries. In many countries, municipalities have insufficient budgets to carry out basic solid waste management operations, with governments in low-income countries unable to collect even half the waste generated (let alone financing proper processing and disposal). Foreign bilateral aid rarely alleviates this problem as the highest financial burden in waste management in developing countries is collection and operation costs, which

require continuous assistance. Furthermore, the aid that is offered is frequently "tied aid" which can only be spent on companies from the donor country. In practice, this may mean a focus on building expensive disposal facilities rather than improving management by focusing on using local resources and building local capacity. Similarly, some multinational firms, where much of the expertise in waste management is concentrated, may be less interested in low-cost, effective waste management strategies which address local challenges than in expensive, capital-intensive projects which will generate revenue flow. In this context, local governments may be offered incentives to build projects that could prove problematic in the long run.

Solutions to the financing challenge can nevertheless be found. Solutions can be local, national, or international. At the local level, small scale financing options exist, for example, through microfinance or local public-private partnerships. National governments may have an advantage over regional and local governments in accessing loan funding, or may be able to allocate funds from the national budget if waste management is a sufficiently high priority. National governments may also be better placed to raise funds through proper charging and pricing of services or by introducing more sophisticated economic instruments (as explored in Part III). International sources of finance for waste management include the Clean Development Mechanism (CDM) or the POPs-related funding activities of the Global Environment Facility (GEF), where the proposed waste management activities address climate change or POPs respectively.

SOCIAL OPPORTUNITIES AND CHALLENGES

Waste management presents a wealth of opportunities for social reform. Successful waste management policies succeed in elevating waste management to a valuable, worthwhile activity, motivating people to invest their intellect and professional skills, and promoting the inclusion and democratic engagement of the sector's workers, who have in-depth knowledge of the field but are usually marginalised in policy choices.

The involvement of the informal sector in waste management varies considerably from country to country, but is usually significant in developing countries. This situation provides a unique opportunity:

- There is frequently a significant informal workforce engaged in picking and collecting waste, sorting and cleaning it and recovering useful and saleable goods and materials.
- Integrating and professionalising employment for waste pickers, protecting them from exploitation by middlemen, protecting the rights of children, improving the conditions of access and operation and ensuring that waste pickers receive a fair return on their labour are some of the most important measures in waste management policy.
- Waste pickers are often predominantly women, sometimes from socially marginalised groups, or recent internal migrants from rural to urban areas. The fact that the sector attracts these disadvantaged groups underlines the importance of designing better policy to deliver benefits to them.

By Jonathan McIntosh / CC-BY 2.0 / via Wikipedia.org

- Harnessing the labour force can deliver benefits to the waste pickers and other informal workers, enabling them to earn enough to live and take care of their families, as well as to local authorities, as waste management services are typically delivered at lower cost.
- The informal sector is often more important in rural environments, where the problems of raising finance for capital investment in larger scale facilities are even more daunting than in cities.

Informal operations may involve health risks for those in the sector. In general, poor communities living close to waste disposal sites and exposed to health and environmental hazards suffer a disproportionate share of the impacts of unsound waste management. Development of a waste management strategy presents an opportunity to reduce and manage these risks, harness the energy of the informal sector and create a route out of poverty.[27]

Successful waste management policy requires not only that community attitudes change, but that community behaviours change, and that the population engages in and contributes to waste minimisation, for example by reducing consumption, changing consumption patterns and separating waste.

27) Material exists suggesting ways in which the informal collection and recycling sector can be integrated into wider waste management systems. See, for example, Velis, C.A. et al. (2012). *An Analytical Framework and Tool ('InteRa') for Integrating the Informal Recycling Sector in Waste and Resource Management Systems in Developing Countries.* Waste Management & Research, 30 (9) Supplement 43-66. http://wmr.sagepub.com/content/30/9_suppl/43.full.pdf+html

TEXT BOX 2.6

PUNE WASTE PICKERS SEIZE THEIR OPPORTUNITY[28]

Twenty years ago, the waste pickers of Pune, in India, formed a union to protect their rights and organise their work. The waste pickers of Pune are women of low caste, many widowed or deserted. Their work, separating recoverable and reusable materials and goods from the waste stream, involved very significant health risks, with high rates of chronic disease. By organising, they were able to establish themselves as a viable and recognised industry and deliver a range of social, environmental, and financial benefits to the community. Their incomes have risen 150%; a marginalised and downtrodden minority has become integrated into society; the severe health problems afflicting them have greatly diminished; residents pay less for waste management and get a better service; the city saves considerable amounts of money each year; and emissions of methane and energy consumption are lower, while recycling rates are higher.

28) GAIA (2012). *On the Road to Zero Waste – Successes and Lessons from Around the World.* Global Alliance for Incinerator Alternatives, http://www.no-burn.org/downloads/On%20the%20Road%20to%20Zero%20Waste.pdf

FIGURE 5

SUMMARY OF THE CONTRIBUTIONS OF SOUND WASTE MANAGEMENT

SOUND WASTE MANAGEMENT CONTRIBUTES TO:

Achieving a resource-efficient, socially inclusive, and low-carbon economy by tapping into waste as a resource, extending the life-cycle of valuable materials and increasing the use of secondary materials.

BETTER HEALTH AND ENVIRONMENT

- Preventing environmental impacts on air, water, soil, wildlife and the marine environment
- Protecting human health in communities and at waste management facilities
- Minimizing risks associated with hazardous waste
- Improving occupational health
- Reducing greenhouse gas emissions
- Reducing litter and odour
- Avoiding flood risks
- Encouraging resource efficiency, reducing the demand for primary raw materials and the threat of their depletion.

ECONOMIC OPPORTUNITIES

- Increasing business opportunities
- Contributing to GDP
- Providing savings to businesses, especially in resource extraction and use, by waste prevention actions, recovery and/or recycling activities
- Achieving economic savings by improvements in human health and the environment, leading to higher productivity, lower medical costs, better environmental quality and the maintenance of ecosystem services.

SOCIAL OPPORTUNITIES

- Creating employment, including low, medium, and high-skilled jobs
- Integrating and professionalising employment in the informal sector (the route to addressing equity and poverty issues)
- Delivering more attractive and pleasant human settlements and better social amenity
- Encouraging changes in community attitudes and behaviours.

2.2
WASTE STREAMS AND THEIR MANAGEMENT

Whether waste is easy or hard to manage depends in large part on its composition, which in turn depends on how a product was initially designed, what materials and combinations of materials were chosen, what effort has been made to keep components separate or easy to dismantle and how the product was produced. The waste hierarchy emphasises the importance of these upstream choices through the placement of waste reduction as the highest and most important element. Because of poor product design (e.g. incorporation of hazardous components, use of complex material combinations or difficulty of disassembly) or the failure or absence of source separation, wastes in practice are usually heterogeneous. The valuable resources within them need to be separated downstream if their value is to be realised. Late separation, however, is more difficult, dangerous and has a higher cost, highlighting the need to apply the principles reflected in the waste hierarchy, and in particular careful product design and early source separation. If that can be accomplished, waste can become valuable both as an economic resource itself, and as a resource diverted from being useless to usable.

MSW, for example:

- Is generated in large volumes
- Usually contains a high proportion of putrescible (organic) components, such as food, kitchen, and garden waste – (In developing countries, organic waste constitutes 60-70% of MSW, translating to high moisture content and low calorific value.)
- Contains other components such as packaging waste (e.g. glass bottles and jars, plastic bottles, containers and wraps, metal cans, paper and cardboard) and discarded household goods (e.g. cleaning agents, batteries, discarded pharmaceuticals, waste paints and solvents, fluorescent lights, electrical or electronic equipment, even pesticides)
- May have other kinds of waste included, such as healthcare waste (e.g. used syringes, or waste from doctors' surgeries or clinics or home healthcare) or even human waste.

As explored earlier, some of these components are, or may be hazardous to human health and the environment. With the correct infrastructure, policies and decision-making framework, the potential of waste can be realised to deliver benefits:

- In the case of MSW (as an example of a combination of heterogeneous materials), separation at source becomes centrally important to the overall success of a waste management system and the realisation of maximum benefits. The combination of materials can prevent the waste from being optimally managed for maximum value and resource recovery, and maximum benefit to human health and the environment. On the other hand, organic waste, if source separated and uncontaminated by problem components, is very well suited to approaches such as composting (especially in warm climates, where composting is fast and efficient, and can use simple technologies) and anaerobic digestion.
- If it is to be composted successfully, the organic fraction of the waste must be separated (it must not contain materials such as glass or hazardous components such as batteries or pesticides), so that the compost that is derived can be used to improve soils.[29] As a simple technology, based on robust, naturally occurring processes,

29) Some countries have regulated the use of compost as a soil additive (for nutrients or as a soil conditioner), especially to set standards for acceptable levels of common contaminants.

composting requires only limited control and support to be effective. If these steps are taken, organic waste becomes a source of valuable materials such as organic matter, nutrients, and soil conditioners.

- If a composting operation is to make a significant contribution to better waste management, there must be a market for the compost. This may require that activities are undertaken to raise awareness and promote its use.
- Composting is a technology well suited to small scale operations, which makes it especially relevant in rural areas and other places where population densities are lower. In such localities many of the other challenges of waste management become more difficult because of the absence of economies of scale, but composting remains a usable, immediately accessible technology.

Cultural factors, including religious attitudes and practices, may need to be taken into account. Different cultures may have different degrees of aversion to handling waste, especially in higher social classes, which may influence who handles the waste in a household, how or how often the waste is collected and how it is stored and made available for collection. Cultural habits, attitudes, and practices can certainly influence the willingness of populations to separate their waste at source.

It is worth noting that composting, though an effective practice in warm climates, is not the only option. Anaerobic digestion breaks down organic waste in the absence of oxygen to generate methane and carbon dioxide. It is an alternative that can be used to generate a replacement for fossil fuels, to be used for cooking or for power generation.

Source separation also implies the opportunity of separating, collecting, and selling other valuable components from waste. This can include discarded products such as appliances, furniture, and textiles as well as materials such as paper, metal, and glass, all of which can be readily reused or recycled.

By ensuring that certain materials are not found in the waste stream, either because they are no longer part of the product design, or because they are removed at source, the composition of the waste stream can be managed so that:

- Valuable materials are extracted (preferably at the source of waste generation)
- Hazardous and dangerous materials are absent or removed from the waste
- Value from the separated waste is maximised by avoiding cross contamination
- Downstream processing (such as composting, recovery, recycling, or anaerobic digestion) is more efficient and straightforward
- Products diverted or derived from waste have a ready market
- Risks to public health or the environment are reduced or eliminated.

The key message here is that MSW is itself a resource – not one undifferentiated waste stream, but a combination of distinct waste streams which need to be identified and separately managed. Each in turn can be processed into useful derived resources.

Similar considerations apply to waste streams from other sources such as agriculture, construction and demolition and manufacturing. If informed decisions about product design and waste management are made and applied to the circumstances that prevail in the country, waste can be converted into economic value.

TEXT BOX 2.7

CONSTRUCTION AND DEMOLITION WASTE


By Thegreenj / CC BY-SA 3.0 / via Wikipedia.org

Construction and demolition waste provides an example of how material costs can be saved. This type of waste is mostly made up of inert materials: rubble, masonry, concrete, bricks, timber, etc., but the quantities can be very large. According to data from the EU (where waste data is considered comparatively high in quality), construction and demolition waste made up 38.2% of total waste generated in 2006, with mining and quarrying adding an additional 17.8%.[30] If construction and demolition waste is dumped at landfills, the risk to human health and the environment may not be great, but landfill space is more rapidly used and readily reusable resources are lost. Comparatively simple separation processes (e.g. removing steel reinforcing from concrete) can be used to immediately recover valuable materials, and much of the bulk can be allocated to uses such as road base.

30) Data is from EUROSTAT: http://epp.eurostat.ec.europa.eu

Various waste streams present particular challenges and opportunities and may require special management:

- Industrial wastes vary enormously. Some are consistent in composition and therefore more easily recovered, but may require management because they are hazardous, or contaminated with materials that require special management. Others may be heterogeneous in amount and composition, which will affect the economics of reuse, materials recovery, and recycling as well as disposal options.
- Some waste streams are made up of materials not easily separated, or components not easily dismantled, such as e-waste. These can nevertheless be sold or processed as a source of valuable materials if separated and carefully managed.
- Mining industries and mineral refining can generate very large volumes of waste material. Some of this waste may lend itself to reprocessing and recovery. Other waste will need to be managed by landfilling or long-term storage, in some cases, changes in raw materials can reduce waste volumes.
- Some large scale industrial processes generate high-volume waste that can find direct beneficial uses. An example is the use of pulverised fly ash from coal fired power plants, which can be used in road fill and to make light weight bricks for internal walls. It is often made available as a free resource.
- Other extractive industries such as oil well operations, quarrying and sand mining for construction can also generate problems on a large scale. These challenges can be especially difficult for countries where industries are beginning operations for the first time, and where there is a shortage of knowledge and skills to deal with the resulting waste. The problem arises partly because local planning for these industries focuses on enabling them to become established, often ignoring the waste management challenges they will present once operational. The solution lies in including the waste management dimension in the planning process, paying careful attention to matters of scale and the need for special expertise.
- Similar problems can result from the expansion in scale or intensity of certain industries, such as of the industrialization of poultry or other animal husbandry operations.

TEXT BOX 2.8

WASTE PREVENTION AND MINIMIZATION IN THE MINING AND MINERAL REFINING INDUSTRIES[31]

By Mike Beauregard (Acres of Core) / CC-BY-2.0 / via Wikimedia Commons

In the early 1990s, a zinc and lead mining and refining company operated mines in Australia and electrolytic zinc refinery operations in Australia and the Netherlands. The zinc ores contained significant quantities of iron, and the refineries generated an iron-rich waste, jarosite, in very large quantities. This waste also contained heavy metals and other pollutants. In Australia this waste was dumped at sea. In the Netherlands it was stored permanently in engineered landfills, generating a leachate that had to be managed in perpetuity.

Over time, these solutions became unacceptable. The international instrument governing dumping of waste at sea was amended to prohibit dumping of industrial waste, and in the Netherlands, the Government decided that permanent landfilling and leachate management did not constitute a sustainable solution in the long term. Both the Australian and Netherlands Governments brought pressure on the company to change its processes. Australia required the company to cease dumping waste at sea, and the Netherlands required that the company find a solution to avoid landfilling jarosite.

The company identified and implemented two different solutions. In Australia the process was changed so that a different iron-rich intermediate was generated, and this intermediate was used as a feedstock for another of the company's plants, a lead smelter. In the Netherlands, the company switched to a low-iron zinc ore, so that jarosite was no longer generated.

It is important to note that the minor elements in mineral ores do not disappear: they must be recovered and sold into markets or else the process must ensure they are incorporated into manageable waste. The iron in the zinc ore used in the Australian plant ended up as a vitreous slag from the lead smelter. This waste does not leach (unlike jarosite) and can be safely landfilled.

31) See Moors, E.H.M. and Dijkema, G.P.J. (2006). *Embedded Industrial Production Systems: Lessons from Waste Management in Zinc Production. Technological Forecasting and Social Change*. 73, 250-65.
Loan, M. et al. (2006). *Defining the Paragoethite Process for Iron Removal in Zinc Hydrometallurgy. Hydrometallurgy*. 81, 104-129.

Some wastes are difficult to treat because of their chemical composition and properties:

- POPs are by definition persistent chemicals and many are resistant to treatment by simple chemical breakdown, although particular technologies have been developed and applied to some wastes.[32]
- Similar considerations apply to many of the chemicals phased out under the Montreal Protocol on Substances that Deplete the Ozone Layer, as they are also typically halogenated compounds.[33]
- Wastes associated with the phase-out of old polluting industries may require management and/or remediation of contaminated sites, or management of contaminated equipment and materials. As an example, at old chlor-alkali plants, equipment, materials and soil may be contaminated with mercury (and sometimes other pollutants such as dioxins and furans).

32) Guidance on the management and destruction of POPs wastes is available from the Basel Convention. See the list of technical guidelines at http://archive.basel.int/meetings/sbc/workdoc/techdocs.html

33) See http://ozone.unep.org/Assessment_Panels/TEAP/Reports/Other_Task_Force/TEAP02V3b.pdf for a survey of technologies used for destruction of ozone-depleting substances.

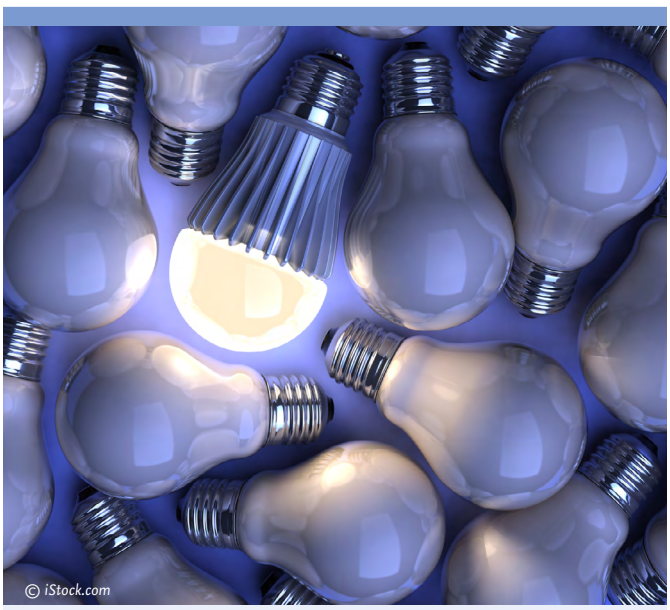

By Marcin Białek / CC-BY-SA-3.0 / via Wikimedia Commons

- Sewage sludge is a high-volume waste that may be contaminated, for example, with heavy metals, depending on sewage treatment methods. Contamination can limit its application in uses such as a soil ameliorant. Management of the sewerage system (e.g. strict criteria for industrial discharges) can help minimise contamination.

Wastes consisting of, containing or contaminated with, the above hazardous materials (and other hazardous materials such as asbestos, arsenic, or cadmium) require special treatment. Policies should minimise the extent of these problems, by avoiding production of goods containing these and other hazardous materials, eliminating or reducing their presence in industrial waste, preventing them from contaminating other wastes and providing for the safe and environmentally sound management of wastes that cannot currently be avoided.

Some waste streams contain elements for which there are currently few or no uses, while they pose a high level of risk to human health and the environment. Examples include arsenic and mercury-containing wastes (mercury wastes include fluorescent lamps, thermometers, and dental amalgam).[34] These types of waste cannot be destroyed, and therefore must be immobilised, permanently encapsulated, or managed in perpetuity – all costly processes which illustrate the importance of changing product composition, industrial processes or the sources of raw materials.

34) The Tenth Meeting of the Conference of the Parties to the Basel Convention in 2011 adopted technical guidelines on mercury wastes; the final version of the guidelines is available at http://www.basel.int/Portals/4/download.aspx?d=UNEP-CHW-GUID-PUB-Mercury.English.pdf. Negotiations for a legally binding separate instrument on mercury were finalised in January 2013, with the Convention, to be named the Minamata Convention on Mercury, open for signature from October 2013. See http://www.unep.org/newscentre/default.aspx?DocumentID=2702&ArticleID=9373


© iStock.com

TEXT BOX 2.9

MANAGEMENT OF SPENT LAMPS

The UNEP/GEF en.lighten initiative "Achieving the Global Transition to Energy Efficient Lighting" Toolkit[35] provides guidance to countries on how to transition to energy efficient lighting. Some efficient lamps contain hazardous materials such as mercury or e-waste. The Toolkit chapter, Safeguarding the Environment and Health, offers direction on international best practices for regulating hazardous substances; the handling of lamps; and collection and recycling best practices. The en.lighten initiative recommends that countries consider the principle of extended producer responsibility and offers technical resources for manufacturers seeking to reduce the use of hazardous materials in their products.

35) www.enlighten-initiative.org/CountrySupport/EfficientLightingToolkit.aspx

An important goal of policy is to improve the quality of the information base. Waste managers everywhere are hampered in their task by the inadequacy of the data and information with which they work. It is inherently difficult to collect data on waste, as it is variable and heterogeneous in composition. Yet good decisions about waste require information and numerical data on which managers can rely. Good policies concentrate considerable efforts to improving the information base.

TEXT BOX 2.10

THE NEED FOR BETTER DATA

In a survey of waste management policies and practices in 20 cities in different parts of the world,[36] done for UN-Habitat, a team of waste management professionals (researchers, consultants, practitioners, advocacy NGOs) from over 30 countries specified some 300 data points for which information was sought. These points were organised under six performance categories, and a benchmark indicator defined for each, focusing on both physical and governance characteristics of the waste management system, as presented in Part I of this Guideline. The team found that very few of the cities included in the study had up-to-date, complete and reliable data on waste and its management. Without proper data, it is difficult to be accountable and transparent, to design sound strategies or to make wise budget decisions.

The team concluded that better data is a priority in efforts to improve waste management. Data is needed on:

Quantities of waste, i.e. how much waste is generated, how much is collected (by formal and informal sectors), how much is treated by each means available, how much is recovered and recycled, how much is disposed of and how much is accounted for. Ideally, quantities of waste would be measured by weight.

Waste composition, which needs to be determined on a consistent basis (i.e. using a robust waste classification system and adequate sampling), and take into account seasonal variation and change over time (e.g. as consumption patterns or production methods change).

Waste-related governance, to provide an insight into user and provider inclusivity, financial sustainability of services, as well as institutional strength and capacities.

36) Wilson, D.C., Rodic L. et al. (2012). *Comparative Analysis of Solid Waste Management in 20 Cities.* Waste Management & Research. 30 (3) 237-254.

2.3 GOVERNANCE CHALLENGES

Improved governance is essential to ensure that governments and other institutions mobilize capacities to address challenges, recognize opportunities and reap the benefits of sound waste management. Many different interests are involved, including:

- Government, at both the national and local level, as well as regional bodies in countries covering a large territory, in addition to the various interests within each level of government
- Private sector, in various different roles
- Communities, and leaders and organisations within them
- Workers in the waste management sector, including the informal sector
- NGOs
- Mass media
- Criminal elements and transnational organised crime (in some cases) operating in the waste sector.

Part III deals with the importance of inclusivity for engaging interest, and Part IV covers how the process of strategy development can succeed in incorporating the energy and capacities of the various interests. Several specific aspects of these interests need to be considered from the perspective of the governance challenges facing governments.

First to consider is the fact that government institutions in this area are often weak and under-resourced. Strengthening institutions and ensuring that resources flow to where they are needed are fundamental elements of a successful policy response. A critical factor is ensuring that the cooperation between national and local governments is articulated so that the respective strengths of each are put to the best use. The command, clout, depth, and resources

of national governments complement the creativity, local knowledge, and agility of local governments.

Secondly, the private sector is a critical player in any successful national strategy on waste management. The private sector comes in many guises – small local operations and individual entrepreneurs; designers, manufacturers, marketers, and distributors of products and services; companies undertaking recycling and associated retail operations; operators of waste management facilities such as landfills; and large multinational companies with access to resources such as capital, skills, and specialised equipment. How to utilise these varying contributions to produce the best outcome for waste management nationally is a critical issue to be resolved in policy development. There are pitfalls as well as opportunities, but the energy and capacities of the private sector cannot be ignored or excluded.

Sometimes a major concern is the risk of illegal dumping of waste by members of the public or "cowboy" operators in the private sector. In some countries there is (at least anecdotally) significant involvement by organised criminal elements and "group crime", locally, nationally, and in transboundary movements. Preventing these criminal and unlawful activities is an added benefit of good waste management policy. Sometimes private sector operators will establish their own private waste management sites, and whether licensed or not, can present an obstacle to the effective delivery of government policy. In other cases (especially developing countries), the use of private firms through public-private partnership (PPP) contracts is difficult due to the limited capacity of governments to manage PPP and the incapacity of governments to fulfil their financial obligations towards the private partner.[37] Waste management provides an excellent field for strengthening local governance in general, and building the capacity of local authorities to deal with the private sector.

A third element is the role of the informal sector, which has been cited previously. Regularising and professionalising this sector is a critical element in the governance aspect of waste management policy.[38] There is also a gender equity issue to this aspect of waste management policy. Since in practice, it is mainly women who make up the sector, improving the lot of the sector means improving the lot of women, who are often excluded from other forms of participation in the economy.

37) See e.g. Awortwi, N. (2004). *Getting the Fundamentals Wrong: Woes of Public-Private Partnerships in Solid Waste Collection in Ghanaian Cities.* Public Administration and Development 24:3, 213-224.

38) For further analysis of the role of the informal sector, see Gunsilius, E. et al. (2011). *Recovering Resources, Creating Opportunities: Integrating the Informal Sector into Solid Waste Management.* Eschborn, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ): Eschborn, Gernany, p. 54. http://www2.gtz.de/dokumente/bib-2011/giz2011-0199en-recycling-informal-sector.pdf; Scheinberg, A. (2012). *Informal Sector Integration and High Performance Recycling: Evidence from 20 cities; Women in Informal Employment Globalizing and Organizing* (WIEGO) p. 33. http://wiego.org/sites/wiego.org/files/publications/files/Scheinberg_WIEGO_WP23.pdf; Scheinberg, A. (2010). *Economic Aspects of the Informal Sector in Solid Waste Management*; GTZ (German Technical Cooperation): Eschborn, Germany. The CWG booklet is at http://www2.gtz.de/dokumente/bib-2011/giz2011-0116en-informal-sector-solid-waste-management.pdf

TEXT BOX 2.11

WASTE MANAGEMENT CRISIS IN NAPLES, ITALY, AND ITS SOLUTION

Since the mid-1990s, Naples and the Campania region in Italy have suffered from dumping of MSW into overfilled landfills. In late 2007, when municipal workers refused to pick up any further material, the waste began to appear on the streets of Naples. After two months the government closed one of two major dumps near the city at the request of the city's residents.

Reports during the summer of 2008 stated that the problem was caused at least in part by the Camorra, a powerful local mafia based in Campania, who had created a lucrative business in the municipal waste disposal business. Heavy metals, industrial waste, and chemicals and household waste were frequently mixed together, dumped near roads and burnt to avoid detection, leading to severe soil and air pollution. A report in the British medical journal The Lancet Oncology in 2004 identified a "triangle of death" east of Naples where toxic waste appeared to be linked to a higher incidence of cancer. Media reports stated that more than 110,000 tons of uncollected rubbish was strewn through Campania's city streets because all the region's landfills were full to capacity. This crisis was the result of a combination of corruption, a climate of impunity and the surprising apathy of civil society.[39]

The Italian Government announced a series of measures to resolve Naples' recurring crisis. The plan included: building three incinerator plants; enlisting the army to remove trash piles; appointing a new trash commissioner to deal with the problem; and assisting cities across the region in implementing recycling plans. When some municipalities and civil society groups objected to the incinerators, civil society groups, academia, and municipalities took up instead a zero waste strategy.

In December 2010, the first Zero Waste Research Centre in Europe was established in Capannori, Italy. In October 2011, the Centre hosted the first International Zero Waste meeting for municipalities with participation by more than 50 Italian municipalities and representatives from the US city of San Francisco, Sweden, Wales, Catalonia and the Basque Country, Spain.[40] By November 2012, 114 Italian municipalities had adopted and begun to implement a Zero Waste Strategy.[41]

39) http://www.iol.co.za/news/world/mafia-at-centre-of-naples-rubbish-mess-1.385229#.UMEIxmBAoug

40) http://www.zerowasteeurope.eu/2011/10/beautiful-politics-is-the-politicians-working-with-the-activists-zero-waste-international-meeting-in-capannori/

41) http://translate.google.com translate?hl=en&sl=it&tl=en&u=http%3A%2F%2Fwww.rifiutizerocapannori.it%2Frifiutizero%2Fcomuni-rifiuti-zero%2F&anno=2

A successful waste management policy requires a sophisticated policy and legislative infrastructure. Necessary elements, which are explored further in Parts III and IV, include:

- Legislation and subsidiary regulations (including legislation in compliance with relevant obligations under international law), along with implementation, compliance, and enforcement actions to ensure their effectiveness
- Clear delineation of responsibilities and mandates among actors (e.g. national and local authorities, producers, importers) and adequate allocation of resources, authority, and power to fulfil these responsibilities (including sub-national or regional cooperation mechanisms)
- Monitoring of progress and gathering and publication of data and information
- Supporting institutions and coordination among them
- Sharing of technologies and best practices, and where appropriate, regional cooperation
- Coordination with other relevant areas of policy, e.g. trade policy
- Supporting frameworks for waste reduction, and for materials recovery and recycling operations (e.g. extended producer responsibility agreements or regulations)
- System of taxes and financial incentives that support the sector, such as providing necessary investments, or avoiding perverse subsidies
- Pilot programs and technical support/exchange initiatives to assist local implementation
- Appropriate regulation and control of private sector behaviour
- Community participation mechanisms
- Education and publicity programs to change public attitudes and behaviour
- Programs to develop and maintain a body of skilled and committed waste management workers, not only in the waste management industry itself but also in government (at all levels) and in those organisations that are major generators of waste
- Mechanisms for review and reform.

An important aspect of policy is to ensure that the weight and balance of policy across the different dimensions is appropriate. Overinvestment in final disposal, for example, may reduce the incentive to reduce waste generation and discourage reuse, recovery, and recycling (depending on other elements of policy, e.g. prices). On the other hand, if there is underinvestment, the level of service to the community will be inadequate. Investment in well-chosen priority waste projects can have major and long-term

beneficial impacts, as the time horizons for major facilities can be very long, i.e. 20-30 years. Well-designed policies can enable the recovery of value from one area of the waste stream to cross-subsidise lower value operations in another area. It is important, therefore, that policy move ahead in a balanced and organised way on several different levels simultaneously.

Every field has its political challenges, and waste is no exception. For example, community opinion often focuses on particular waste streams, even if scientific or economic analysis suggests that priorities should lie elsewhere. On the other hand, choosing a priority that captures public imagination and support can be important to build momentum. Other challenges occur from discontinuities in government and its policy making, as when there is a change in government, or when there is inadequate coordination among different agencies of government. All these issues must be confronted in a highly dynamic policy environment, arising from several sources:

- The range of products reaching the market and patterns of demand and consumption are constantly changing in many sectors. The rise of the mobile phone (which functions in many places as much as a status symbol or fashion accessory as a communication tool), and the rapid cycling of information technology in general, exemplify this trend. New technologies, materials and chemicals are appearing ever more rapidly, usually without considering the potential for waste problems later on. Examples include batteries from hybrid and electric vehicles and new materials such as nano-materials and composites.
- Even when products themselves do not change rapidly, the materials used in their manufacture may change,

requiring in turn that material recovery and recycling operations adapt to a changing environment. An example is the move away from the use of precious metals in electronic goods, which has changed the economics of e-waste recovery and recycling (although valuable materials can still be recovered).

- Changes in the prices of materials may alternatively encourage and threaten recycling. For example, metals prices may rise steeply or alternatively collapse, changing the economics of recovery operations, (although those operations remain environmentally beneficial).
- Waste management technology and waste management best practices themselves lead to new options and opportunities: at times product innovation focuses on improving waste management options (e.g. light weighting of beverage containers).
- Demographic and geographic changes, e.g. the growth in cities, lead to rapid changes in local demand for waste management services, and may also supply labour for waste management operations.
- As economies evolve in some countries, the choices of consumers change and the structure of industry shifts with changes in income and wealth. These factors in turn lead to changes in the volume and composition of waste.

2.4 FUTURE CHALLENGES

The dynamic environment described above creates a series of new challenges and opportunities.

Increasing attention is being paid internationally to the possibility of "tipping points" at which several of the earth's "planetary boundaries" (enabling life as we know it to continue) might be breached, with potentially irreversible results.[42] In developing a national strategy, it may be worth considering how uncontrolled or unmodified waste generation could be pushing the planet towards some of these foreshadowed global tipping points, in areas such as climate change, biodiversity, resource scarcity and chemical pollution.

Waste shines a particular light on issues of resource scarcity and the value chain of materials in society – from extraction, to manufacture, to retail, to use and to end-of-life. Global consumption is on a clearly unsustainable path, and significant resources are passing through the chain of design, material extraction, production, transportation to market, use and disposal. Increased global demand has caused a huge acceleration in total resource consumption over a very short period. This kind of cascading effect is one of the parameters driving widespread interest in decoupling economic growth and resource consumption. In working toward this goal, waste management, in its broadest sense, has a central role to play.

Sometimes an existing waste management challenge can manifest itself differently, or change scope, as a result of technological or other changes. Processing of e-waste has been a known environmental and public health issue for some time, but the global explosion in the use and

42) See for example http://www.stockholmresilience.org/research/researchnews/tippingtowardstheunknown/thenineplanetaryboundaries.4.1fe8f33123572b59ab80007039.html

application of electrical and electronic equipment has transformed the problem. Up until now, policy responses to global e-waste have tended to focus on banning international trade in end-of-life electronics, based on the premise that e-waste was mainly generated in the developed world and then exported to the developing world. Sales of electronics have, however, been growing so rapidly in developing countries that it is relevant to question whether informal recycling in developing countries is in fact being driven by international trade or domestic generation. Projections suggest, for example, that the volume of obsolete personal computers generated in developing regions will exceed that of developed regions by 2016-2018. By 2030, obsolete personal computers from developing regions will reach 400-700 million units, far more than the 200-300 million units from developed regions.

An example of an increasingly problematic but comparatively new waste issue is the waste created by natural disasters, such as earthquakes, tsunamis or cyclones. Such events, if major in scale, can create huge and extremely difficult waste challenges. Making room in waste management policy for unforeseen events of this kind, and appropriate emergency responses may be especially important for those countries with an elevated risk (e.g. those in earthquake or flood zones). Disasters often make existing waste problems worse, by leading to sudden and dramatic increases in the levels of waste generation. Strategies for both disasters and waste management can complement and reinforce one another, if carefully planned, developed, coordinated and implemented.[43]

43) Guidance and examples are available from UNEP-OCHA: see http://www.unocha.org/what-we-do/coordination-tools/environmental-emergencies/resources

TEXT BOX 2.12

WASTE MANAGEMENT CHALLENGES FOLLOWING A NATURAL DISASTER[44]

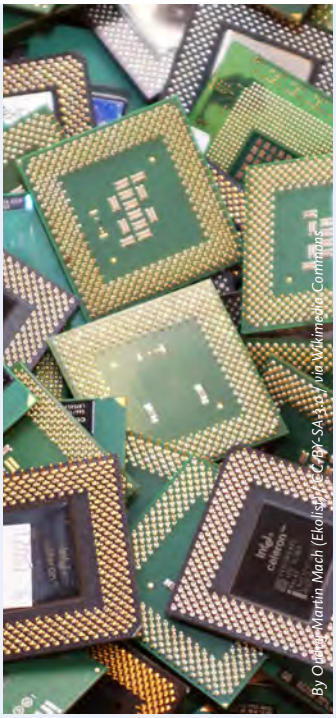
In October 2011, there was a major flood in the Accra region of Ghana. Following the flood, an assessment highlighted the acute challenges to waste management caused by the massive increase in waste generation as residents and authorities cleaned up the mess left behind.

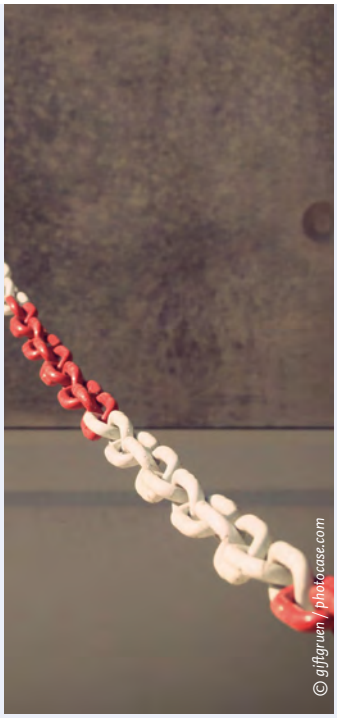
The assessment concluded that both disaster preparedness and response policies and waste management policies needed improvement, and that future floods would bring similar problems unless policy improved in both areas. In some areas, poor waste management had contributed to the flooding, due to the use of stormwater channels for dumping waste. In other areas, the siltation of channels exacerbated the flooding, causing it to become more severe and to generate higher amounts of waste. Additional problems were created by informal industries recovering valuable materials from e-waste in close proximity to receiving water bodies: the unwanted components of e-waste were then dumped into the water.

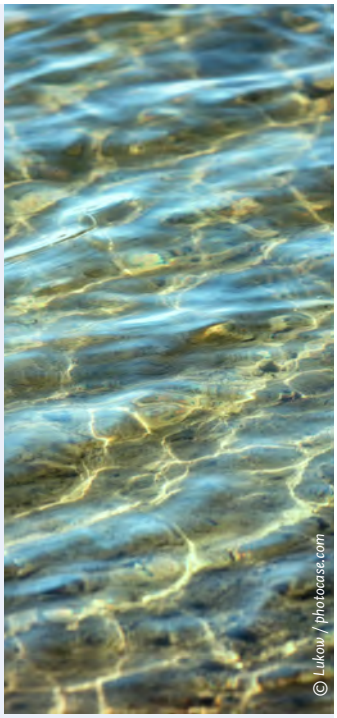
The assessment recommended immediate concrete actions, both to prevent flooding and to improve waste management (e.g. a new landfill). Attention was also given to designing disaster and waste management strategies to improve resilience to flooding over the medium and long-term.

44) http://ochanet.unocha.org/p/Documents/Ghana_Flash%20Flooding_DWM%20Assessment.pdf

PART III
CONSIDERATIONS IN DEVELOPING A NATIONAL WASTE MANAGEMENT STRATEGY







3.1 WASTE MANAGEMENT – CONCEPTS AND PRINCIPLES

3.2 AIMS, OBJECTIVES, GOALS AND TARGETS

3.3 WASTE MANAGEMENT – POLICY TOOLS

3.4 POLICY CHOICES – TIPS AND TRAPS

3.1 WASTE MANAGEMENT – CONCEPTS AND PRINCIPLES

Made up of a number of different elements and drawing on various sources, a waste management strategy:

- Is developed in accordance with principles of sustainable development
- Adopts and applies underpinning waste management policy ideas
- Clearly defines aims, goals, and objectives
- Adopts targets as concrete reflections of those goals and objectives and uses indicators to measure progress
- Applies policy tools to deliver solutions to each priority waste stream or waste management problem.

Waste management policy is composed of a combination of principles, goals, concepts, and selected policy tools. The systematic and coordinated application of policy to a country's waste management challenges, focusing on identified priorities, delivers a national waste management strategy.

The complexity of waste management has led to the development of a number of concepts and policy tools to assist in policy development. These concepts and tools, along with the principles of environmental policy and sustainable development, are utilized and adapted in the development of national strategies. The concepts and principles discussed in this section will inform and guide strategy development, and help to distinguish between available choices. The tools can be used to solve waste management problems in general, and/or applied to particular waste streams.

GENERAL CONCEPTS

Sustainable production and consumption captures the idea that the production and consumption cycle should be reworked to put it on a sustainable basis.[45] The challenge is to go beyond waste itself, and to consider instead the source of waste, i.e. the demand for goods and services and the productive activity that is undertaken to meet that demand. Economic growth and increased consumption are typically accompanied by increased rates of waste generation. If the goals of sustainable development are to be achieved, that link must be broken. The **decoupling** of economic growth and resource consumption is a specific example of sustainable production and consumption in action. This idea is central to the "**green economy**", which is the subject of detailed exploration and elaboration by UNEP.[46]

The tendency of today's progressive waste management thinking is to move away from an analysis focusing on

45) Much international work has been done on the concept of sustainable production and consumption. See, for example, http://www.unep.fr/scp
46) See UNEP (2011). *Green Economy*, available at http://www.unep.org/greeneconomy, and sources cited therein.

waste itself as the relevant policy issue, and to consider the product i.e. the product that hypothetically ends up discarded as waste, from the very beginning of its production. Such **life-cycle approaches** examine a product and its passage through distinct stages of a life-cycle from the very beginning: extraction of raw materials, manufacture, packaging, transport, distribution, sale, use and end-of-life, when it enters into the waste management system and the later phases of the waste hierarchy. Life-cycle assessment includes an inventory of raw materials input, process chemicals, energy and water as well as an inventory of emissions and waste generation, and their respective environmental impacts, during each life-cycle stage. Every stage of the life-cycle offers opportunities for interventions to prevent or reduce waste amounts and/or their level of hazard. The goal of **resource efficiency,** for example, is to rethink the life-cycle of a product from the perspective of the resources that go into each stage, since losing resources as waste is inefficient.[47] Similarly, **eco-efficiency** indicates a focus on delivering the same or increasing levels of goods and services at a reduced material and energy intensity, with a reduced impact on the environment.

A number of related concepts are also relevant:

- **Cleaner production**, defined by UNEP as "*the continuous application of an integrated environmental strategy to processes, products and services to increase efficiency and reduce risks to humans and the environment*", aims at resource efficiency but also explicitly addresses and strives to reduce the use of hazardous substances in products and their production processes, and generation of emissions and wastes. Programs in "green chemistry" support efforts to reduce risks through materials substitution and use of safer chemicals.[48]
- **Ecodesign** is an approach[49] which includes the above considerations of resource efficiency and reduction of risks, in addition to focusing on design features which incorporate: extension of the product use period, design for disassembly, repair or upgrading (thus phasing out components that prevent reuse or recycling) and constructing a product from materials that can serve as inputs to another process.[50]
- In addition to considerations of material and design features, business models are proposed to support the return of valuable materials into production. These business models, such as leasing, are centred on performance rather than ownership. **Chemical leasing** is a familiar term used in cleaner production. Similarly, **product as service** focuses on the service provided by the product to the consumer rather than the ownership of the product. Thus a car is not a product owned by its driver, but the provider of a transport service. The car may be owned by the supplier throughout its life-cycle (taxis and other informal urban transport services are examples of this principle at work). Such

47) That may include rethinking the entire design and asking whether the functions that the product provides to the consumer can be delivered in some other way.

48) See, for example, the Chemicals and Policy Initiative, operated out of the Lowell Center for Sustainable Production (http://www.chemicalspolicy.org/greenchemistry.why.php); see also the Strategic Approach to International Chemicals Management (SAICM) (http://www.saicm.org/index.php?option=com_content&view=article&id=71&Itemid=473), many of whose activities are focused on reducing hazards from use of hazardous chemicals.

49) UNEP/Delft University of Technology (2006). *Design for Sustainability. A Practical Approach for Developing Economies.* http://www.unep.fr/shared/publications/pdf/DTIx0826xPA-D4SapproachEN.pdf; UNEP (undated) *Design for Sustainability (D4S). A Step-by-Step Approach.* Available at: http://www.d4s-sbs.org

50) Such products are popularly referred to as "green products". This term is also often used by manufacturers for marketing purposes, regardless of the degree to which the guiding principles of ecodesign are actually applied to the product in question.

an arrangement benefits both parties: the consumer is assured of the desired service, whereas the supplier remains the owner of the product, e.g. as a source of materials for future products.

While the concepts above define activities in terms of decrease and reduction of *negative* impacts, the **cradle-to-cradle** concept focuses, first and foremost, on defining the intention behind the design of a product in terms of its *positive* impact, i.e. its social, economic and environmental benefits.[51] The cradle-to-cradle concept proposes a complete move away from the linearity of the "cradle-to-grave" model of the life-cycle approach. This approach moves towards a circular concept based on a model taken from the natural world: i.e. residual materials from the metabolism of one organism constitute food for another organism, without the loss of quality that would eventually render them useless. Rather than ultimately ending up as waste, the materials in a product at the end of its use period begin a new life in a new cycle, at the same (or even higher[52]) level of quality, *time and again*. As waste equates to food, cradle-to-cradle thereby eliminates the very *concept* of waste. In order to apply this approach to products and services: materials must have a known, well defined chemical composition; materials must be either biological nutrients (i.e. safe to return into a natural biological cycle) or technological nutrients; and the products must be designed for easy disassembly. Such a cycle calls for new forms of interaction along the supply chain of products, where respect, trust, and partnership play a prominent role.

In order to promote the entire range of innovations required to support transition to a sustainable society, the European Union recently adopted the concept of "**eco-innovation**".[53] This concept refers to any form of innovation resulting in or aimed at significant and demonstrable progress towards the goal of sustainable development, through reducing impacts on the environment, enhancing resilience to environmental pressures or achieving a more efficient and responsible use of natural resources.

These concepts can be applied in a variety of ways in waste management. A facility can be encouraged to adopt cleaner production, or a cleaner production plan can be a requirement for licencing; an industry or a company can be encouraged to make a public commitment to eco-efficiency; or an individual company can choose, perhaps to obtain a market advantage, to redesign its product range or some subset thereto. These ideas are explored in more detail below.

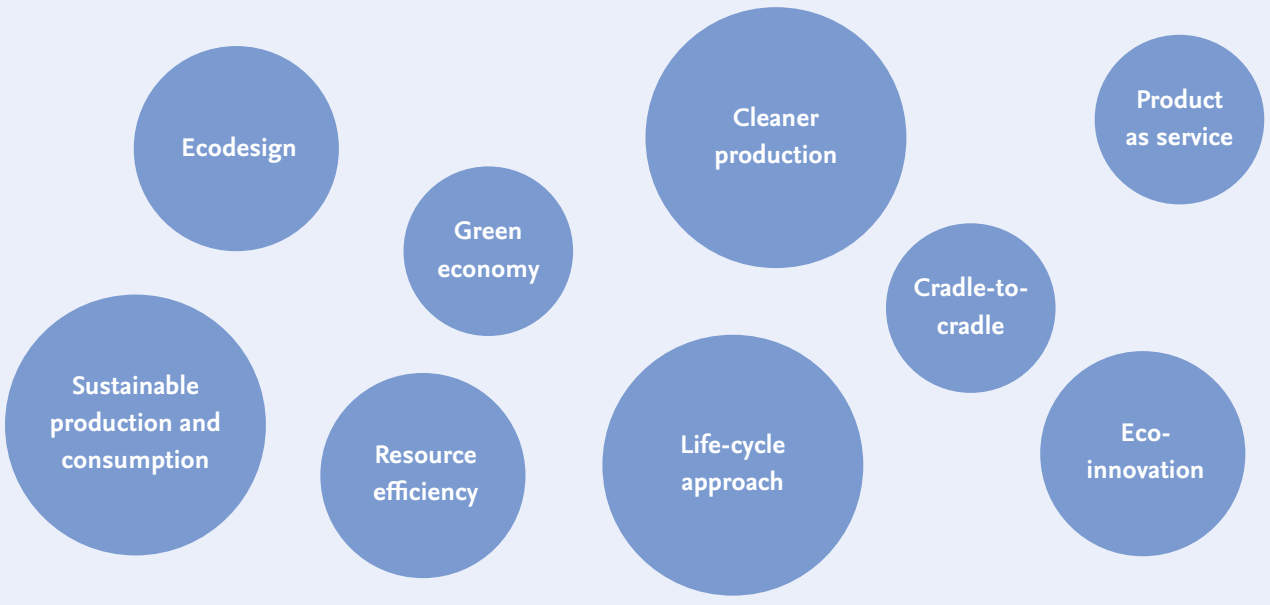
51) Braungart, M., McDonough, W. and Bollinger, A. (2006). *Cradle-to-Cradle Design: Creating Healthy Emissions – a Strategy for Eco-effective Product and System Design.* Journal of Cleaner Production, 15 (13-14), 1337-1348.

52) If material recycling results in a material of higher quality than the original, such processing is called upcycling. An example of upcycling is removal of the remnants of the antimony-containing catalyst from PET in recycling of PET bottles.

53) COM (2011). Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions – *Innovation for a Sustainable Future – The Eco-Innovation Action Plan (Eco-AP).* COM (2011) 899 final

FIGURE 6

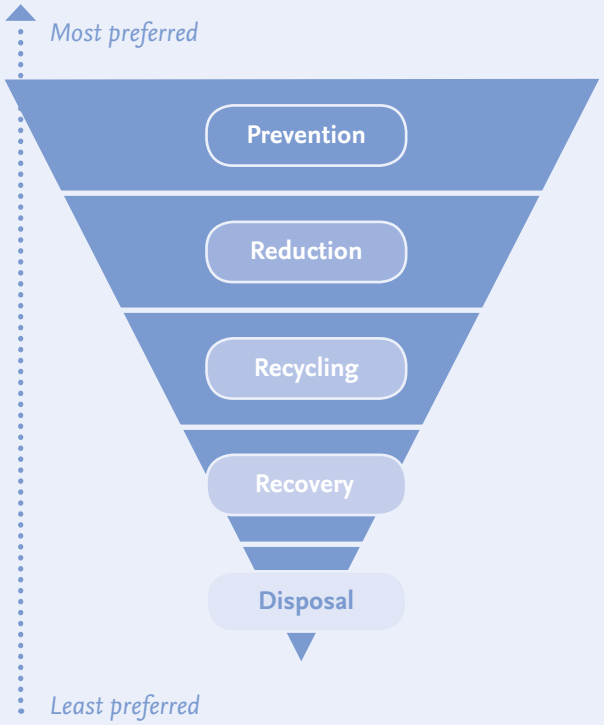
GENERAL CONCEPTS RELATED TO SOUND WASTE MANAGEMENT



THE WASTE MANAGEMENT HIERARCHY

The **waste management hierarchy** was briefly introduced in Part I. The hierarchy diagram is reproduced below for ease of reference.

FIGURE 7
WASTE MANAGEMENT HIERARCHY



Source: UNEP (2011). Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication.

Waste prevention requires that the range, composition and design of products be changed in order to reduce waste through reduced resource demand and/or improved quality, i.e. improved manageability or reduced use of hazardous materials. These changes are at the heart of the waste management challenge and constitute the starting point for sound waste management policy. Improving knowledge and understanding of waste prevention and related concepts is a first step, both within the waste management sector itself and more broadly with regard to the public. Consumers have a role to play, e.g. by refusing to choose or use products that carry waste implications. Recent reports suggest that in developed countries, 30-40% of food is wasted, a huge burden on the waste management system (even with home composting) but easy to improve with better decision-making by consumers and producers.

Source separation, meaning that goods and materials are separated out from the waste stream at source, is paramount for successful re-use, composting, anaerobic digestion, and recycling. Separation at source has two main benefits: it enables the value of re-usable goods and recyclable materials to be recovered efficiently; and the composition is less mixed and therefore less in need of sorting, reducing the problems of dealing with waste downstream, where sorting is more difficult and expensive. Source separation is centrally important to the application of the waste hierarchy. To be effective, source separation requires the active cooperation of the entire population, which in turn requires considerable outreach, engagement and public education. These non-technological and non-infrastructural elements, too often neglected and disregarded as "soft", are nevertheless key to successful waste management.

TEXT BOX 3.1

CHEMICAL LEASING

Chemical leasing is a new business model for the supply of chemical-related services. It is described as "a novel service-based business model that supports sustainable chemicals management and responds to the latest changes in international chemicals policies".[54]

In the normal process for chemical supply, the supplier is motivated to sell as much product as possible, i.e. to maximise the use of chemicals. In chemical leasing, the supplier contracts to provide a service, e.g. volume of water treated, length of pipes cleaned or number of objects painted. The supplier is then motivated to minimise the amount of chemicals used, which results in health, environmental and economic benefits for both sides.

54) http://www.chemicalleasing.com

Re-use can be promoted by changing the design of products to make them easier to re-use. Policy intervention is necessary to divert the materials away from the waste stream and towards avenues for re-use.

Composting and anaerobic digestion of organic waste provide an opportunity for diverting organic waste from landfills and incineration to generate valuable end products (compost and methane for energy production). This is an important opportunity for waste reduction in low-income countries where over half of the waste is organic. One advantage is that composting and anaerobic digestion can be carried out at the household level, the latter in combination with agricultural waste where possible.

Recycling requires that materials be collected, sorted, processed, and converted into useful goods. Sometimes the products of recycling are similar to the products from which they were originally derived, e.g. recovered office paper reprocessed into stationery. At other times the products are very different, e.g. recovered plastic packaging converted into fleece sweaters, or the example of valuable metals, including gold, silver, palladium, copper and tin, being recovered from e-waste and sold to smelters for refining and reuse.

Making producers responsible for their products at the end of the use phase in their life-cycle (extended producer responsibility – EPR) is a major policy instrument by which recycling can be encouraged. If producers take back the products and take responsibility for materials recovery and recycling, the costs to waste management are greatly reduced and the efficiency of recovery can be far higher. Although most EPR programs operate at the national level, there has been pressure to expand them to the global level, which has resulted in the recent establishment of several international programs (see Text Box 3.2).

Materials recovery involves the dismantling and sorting of discarded products to separate out useful materials, and where appropriate to clean them and ready them for reuse (for example, the treatment and dismantling of end-of-life vehicles to obtain tyres, glass, plastics, metals and other reusable or recyclable materials). Many types of industrial waste are sent to specialised treatment facilities, where value can be recovered, e.g. metal-bearing waste may be sent to secondary smelters, and collected steel scrap is the feedstock for electric arc furnaces which produce a large amount of the world's steel products. Similarly, synthetic organic compounds may be sent for solvent recovery and waste oil may be re-refined or used as a bunker fuel. These processes are similar to materials recovery and recycling in theory, but careful attention is needed because of the potential for production of concentrated waste by-products, especially in the context of transboundary movements of hazardous waste (to which the Basel Convention controls apply).

Energy recovery from waste is regarded as preferable to waste disposal without energy recovery. Conventional (oxidative) combustion or incineration with energy recovery is a widely applied technology. More advanced technologies such as pyrolysis and gasification are also used. Technologies such as anaerobic digestion and fermentation, yielding respectively methane and ethanol which can then be used to generate energy, are also sometimes classed as waste-to-energy, although in most systems they are placed higher in the hierarchy.

- Particular attention is needed with regard to waste-to-energy facilities to ensure that emissions (including mercury and other heavy metals, dioxins and furans) are controlled. The task is made easier if the composition of the waste is controlled so that problem contaminants are not present in high concentrations in the waste stream.
- Some industrial processes can use waste as an alternative to fossil fuels, either mixed or in particular forms such as waste tyres. Emission control is also important in this context.

The economics of capital-intensive waste-to-energy options have been called into question, and more advanced technologies such as pyrolysis and gasification may not be efficient for most waste management applications at their current state of development. Due diligence needs to be conducted carefully, and with proper consideration to all options, before large amounts are committed to capital-intensive projects. Large-scale tender processes in particular must be managed with skill and integrity.

Disposal, at the bottom of the hierarchy, is the management option used for the remaining fraction of waste when all forms of diversion, reuse and valorisation are exhausted. It also has the important function of removing unwanted materials from the life-cycle for a final safe and secure storage. Disposal facilities and operations are not all the same: there is a hierarchy of sophistication and reliability of measures applied to protect the environment. At the top of the disposal hierarchy is the landfill, an engineered facility featuring various controls[55] installed to prevent releases of pollutants to soil, water and air. A controlled disposal site (or controlled dumpsite), officially designated for the purpose, is next in the hierarchy. The site is fenced and access is controlled, with some form of control and registration of incoming waste, and basic operations management at the site. An uncontrolled dumpsite is third in the disposal hierarchy, below the level of acceptability but common in low and sometimes middle-income countries. It is important to phase out open-burning dumpsites and convert to controlled disposal facilities, even if they do not meet modern engineering standards. The internationally accepted approach in this regard is progressive rehabilitation to upgrade and phase out uncontrolled dumpsites.

Photo courtesy: Ainhoa Carpintero

COOPERATION AMONG STAKEHOLDERS

Each step in the waste management hierarchy requires engagement with stakeholders. Different steps in the hierarchy may involve different stakeholders:

- Waste prevention requires engagement with the production and commercial sectors to influence design, choice of materials, production and marketing.
- Reuse involves engagement with collectors, dealers, second-hand goods retailers and charitable institutions.
- Recycling involves engaging both formal and informal recycling sectors, including waste pickers, as well as producers and designers in the context of extended producer responsibility initiatives.
- Engagement is also required with the operators of waste management services, including: collection, transport, large-scale composting and anaerobic digestion, landfill and waste-to-energy.
- Close engagement with waste generators, including the general public, as well as others such as office management personnel, is likely to be needed to achieve high levels of source separation.

No waste management policy or strategy can be successful without this close engagement. The investment of time, effort and resources into making policy inclusive of the interests of those involved is always repaid by better participation, fewer problems downstream and better general outcomes.

55) In state-of-the-art landfills, these controls include bottom and top liners consisting of sufficiently thick layers of sufficiently low hydraulic permeability and adequate chemical resistance, a leachate collection and removal system, a landfill gas extraction and utilization system and a drainage system for rainwater.

TEXT BOX 3.2

INTERNATIONAL EFFORT ON REUSE OF AND MATERIALS RECOVERY FROM COMPUTING EQUIPMENT AND MOBILE PHONES

By Ondrej Martin Mach (Ekolist)/ CC-BY-SA-3.0 / via Wikimedia Commons

Waste electrical and electronic equipment, including computing equipment and mobile phones, presents a series of challenges to waste management. The equipment has a short use phase, especially because innovation brings new generations of products to market with ever shorter product cycles, and prices continue to fall. The products are sophisticated, involving a broad range of materials, but are manufactured in ways that make materials separation difficult. Some of the materials involved, such as brominated flame retardants and certain metals, are hazardous. The cost to manufacture new replacement goods is sufficiently low to guarantee a constantly increasing demand. The price of virgin raw materials is low enough to make the processes of materials recovery and recycling challenging economically.

A Mobile Phone Partnership Initiative (MPPI) was launched during the Sixth Meeting of the Conference of the Parties to the Basel Convention in 2002, when 12 manufacturers signed a Declaration entering into partnership with the Basel Convention, in cooperation with other stakeholders, to develop and promote the environmentally sound management of end-of- life mobile phones. Three additional telecom operators signed a Declaration entering into this sustainable partnership in July 2005.[56] A guidance document on the environmentally sound management of used and end-of-life mobile phones was developed, providing information on how to manage used and end-of-life mobile phones from the time they are collected up to and including their refurbishment, material recovery and recycling. A revised and updated guidance document was adopted by the Tenth Meeting of the Conference of the Parties in October 2011 (Decision BC-10/21).

Following the successful work of the MPPI Initiative, the Parties to the Basel Convention established the Partnership on Action for Computing Equipment (PACE) at the Ninth Meeting of the Conference of the Parties, to address related challenges in computing equipment.[57] Reuse, materials recovery and recycling of computing equipment involves extensive international trade in equipment, recovered materials and components in order for economies of scale and low labour costs to enable efficient recovery operations. The hazardous components in computing equipment bring the Basel Convention obligations into play. PACE has been established to explore the testing, refurbishment and repair of used computer equipment as well as environmentally sound materials recovery and recycling, transboundary movements of used electrical and electronic products and e-waste and certification schemes.

Participation in PACE extends to intergovernmental organisations, NGOs, manufacturers, recyclers, refurbishers and academia. The initiative is committed to environmentally sound management of used and discarded computing equipment and its mission statement gives explicit recognition to social responsibility, sustainable development and life-cycle thinking. In 2011, the Tenth Meeting of the Conference of the Parties to the Basel Convention adopted a guidance document on environmentally sound management of used and end-of-life computing equipment (Decision BC-10/20).

56) http://archive.basel.int/industry/mppi.html

57) http://archive.basel.int/industry/compartnership/index.html

GUIDING PRINCIPLES

A number of principles are accepted as guiding national policy on waste management:

- The **proximity principle** states that, wherever possible, waste should be managed close to where it is generated. The **self-sufficiency principle** states that each country (or, potentially, each region or city) should, wherever possible, manage its own waste.[58] These principles do not operate in strict or rigid fashion (although they have particular application in the context of the Basel Convention). They may in some cases be in tension with one another, e.g. the closest facility for dealing with waste (and therefore consistent with the proximity principle) could be across a national border (and therefore inconsistent with the self-sufficiency principle). Similarly, regional cooperation may be the most efficient and environmentally sound way of dealing with waste, with several cities sharing a well-engineered landfill. The principles need to be applied in a flexible manner, with common sense, taking into consideration the constraints of the real world.
- The **polluter pays principle** states that those who cause or generate pollution should bear the cost of it.[59] In the waste management context, the principle means that those who generate waste should bear the cost of managing it so that it does not pose risks to human health and the environment. Increasingly, informed opinion suggests that producers need to take responsibility for products generating high-impact waste throughout their life-cycle (i.e. extended producer responsibility).
- The **precautionary principle** is known as one of the fundamental principles guiding work on the environment and sustainable development. The most common formulation is that of Principle 15 of the Rio Declaration on Environment and Development, adopted at the United Nations Conference on Environment and Development in 1992: "In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation." The principle is often misunderstood or misapplied. On the one hand, it is sometimes singled out as being responsible for allowing gaps in scientific knowledge to be disregarded. Others sometimes interpret it to mean that in the face of uncertainty no proposal should succeed. Neither is accurate: the principle calls for proportion in decision-making. It requires that decisions that may have serious or irreversible effects should be made cautiously and with due regard for the extent of scientific understanding of the problem.
- **Sustainable development** is sometimes defined as: "development that meets the needs of the present without compromising the ability of future generations to meet their own needs"[60]. In the context of waste, the **principle of intergenerational equity** implies that waste should not be managed so as to bequeath legacy problems to subsequent generations. Legacy wastes, as well as contaminated sites and old (hazardous) waste disposal sites, exemplify ways in which future generations could continue to bear the costs, health, environmental and economic, inherited from current poor practices. Waste management policy aims to prevent current problems from being passed on – the current generation must clean up its own mess. Better husbanding of resources, by reuse and recycling, for example, bequeaths resources to future generations for their use.
- **Intragenerational equity** refers to the sharing of resources equitably among people (and internationally, among countries). In the context of waste management, it suggests equitable access to services for all citizens, equitable possibilities for all interested parties to provide services, as well as equitable burden-sharing in terms of location of waste management facilities (the last also referred to as an example of "environmental justice").

58) These two principles derive from Article 4 of the Basel Convention on Control of the Transboundary Movement of Hazardous Wastes and their Disposal.
59) A version of the Principle is incorporated in Principle 16 of the Rio Declaration on Environment and Development.
60) Brundtland Commission (1987). *Our Common Future.*

TEXT BOX 3.3

VERMICULTURE AND COMPOSTING OF ORGANIC WASTE IN CHILE

In a poor part of the Metropolitan Region of Chile, the people of La Pintana have initiated a major project on source separation of their waste, with a focus on the organic fraction of the waste[61]. Organic waste, fruit and vegetable waste and garden waste such as prunings, clippings and weeds, are separately collected and treated by vermiculture (worm farms) and composting. In most developing countries organic waste is a large proportion of MSW (usually well above 50% and sometimes up to 80%), so there is considerable potential for material recovery and valorisation of this material fraction.

Although participation is still only partial, the initiative has been successful in reducing costs, while at the same time abiding by the proximity and self-sufficiency principles: since the vermiculture and composting operations are close to where the waste is collected, the costs of transporting large quantities of waste to more distant landfills are therefore avoided.

61) http://no-burn.org/downloads/On%20the%20Road%20to%20Zero%20Waste.pdf

While all the principles need to be applied flexibly, the issues of proximity and self-sufficiency are especially problematic for hazardous wastes. Particular types of waste often need specialized facilities that many countries may not have within their borders (e.g. e-waste, lead-acid batteries, hazardous chemicals, mineral refining by-products, waste oils). A small island state, for example, may be unlikely to have a secondary lead smelter, but will almost certainly generate used lead acid batteries from motor vehicles. It is preferable to send the batteries to a secondary smelter elsewhere than to waste valuable resources in the batteries and risk the pollution that would result from improper disposal or informal recovery of the lead locally. This example highlights the importance of engaging in cross-border cooperation to take advantage of regional and in some cases global capacity.

3.2 AIM, OBJECTIVES, GOALS AND TARGETS

The **overall aim of waste management policy and national waste management strategies** is encapsulated in the waste management hierarchy: to minimise the generation of waste at source, and to divert materials to re-use, recovery, and recycling in order to minimise the amounts of waste going to waste-to-energy and landfill. Various forms of intervention can address issues in the early stages of the life-cycle, e.g. to prevent the generation of waste and modify demand for the product or what it delivers. The final stage of the life-cycle – waste management – is governed by the concept of **environmentally sound management**, which signifies that waste is to be managed so as to protect human health and the environment against adverse effects.

Waste management serves many different **objectives**:

- Delivering a waste management system that is effective, equitable, robust and sustainable under the prevailing conditions
- Provision of public services (e.g. waste collection, transport, treatment and disposal) suited to the needs of and affordable by local users
- Protection of public and occupational health and the environment
- Contributing to sustainable use of natural resources, e.g. though materials recovery and recycling, soil improvement, energy generation
- Contributing to economic development, including through fostering resource efficient production and developing waste recovery and recycling operations
- Providing employment and enterprise development opportunities
- Deploying technologies appropriate to prevailing conditions


By Johann Jaritz / CC-BY-SA-3.0 / via Wikimedia Commons

- Building the capacities of those forming part of the waste management system
- Encouraging and inviting research and development into technologies and governance approaches for sustainable resource and waste management.

To deal with these objectives, **goals and targets** are adopted to drive waste management policy. These can operate at different levels:

- A country should have an overall goal for waste management. This is the final destination of the strategy over the selected timescale, such as achieving a particular level of reduction in waste generation by a particular date ("zero waste by 2020"[62]).
- Targets, which are steps towards the overall goal, should be chosen for particular waste streams or particular waste management challenges, e.g.: materials recovery targets ("80% of newspapers recovered and recycled by 2015"); waste generation targets ("50% less food wasted by 2020"); system targets ("uncontrolled dumping to be phased out by 2020"). Targets can be set over different timescales (e.g. short, medium, and long term).
- There may be complementary objectives set in other areas, or in other strategies, such as with respect to employment in the sector, since progress in waste management also contributes to broader health, environmental, economic and social objectives.

In common with many other areas of policy, **indicators** can be used to track progress. Indicators might, for example, be used to track parameters for which no numerical targets have been set, but which illustrate progress generally or in particular sectors, in support of or supplementary to a target. Thus, if automotive tyres are a priority waste stream, with a target for reduction of tyres disposed to landfill, supporting indicators might involve: monitoring quantities of tyres sold each year; quantities collected under "take-back" or reuse and recycling schemes; quantities re-treaded or used as industrial fuel (e.g. in cement kilns); as well as quantities disposed to landfill. Similarly, indicators might be used to collect and monitor progress towards improved governance, e.g. the number of local government areas that have met particular targets.

Setting numerical goals and targets and choosing indicators implies that information and numerical data is available or will be gathered to allow progress to be reliably monitored. Many countries may be ill-equipped to gather accurate data and information on waste, and may therefore include waste data and information as areas in which they seek to build capacity in the course of developing a national waste management strategy. In order to be able to measure progress, countries may undertake an initial assessment of the levels of waste generation and the current state of governance and of management options as an assessment of the starting position or baseline in strategy development (as addressed in Part IV).

Reports and information on progress should be made available to all those who are participants in the waste management effort, so that all parties know what is happening and have the information they need to maintain or improve their contribution. Consequently, in order to be effective, information must not only be public but also developed in coordination with local governments and other stakeholders.

Establishing and measuring objectives, goals, and targets, as well as other suggested steps for developing a national waste management strategy, are addressed in further detail in Part IV.

62) The concept of "zero waste" is explored further in Part IV.

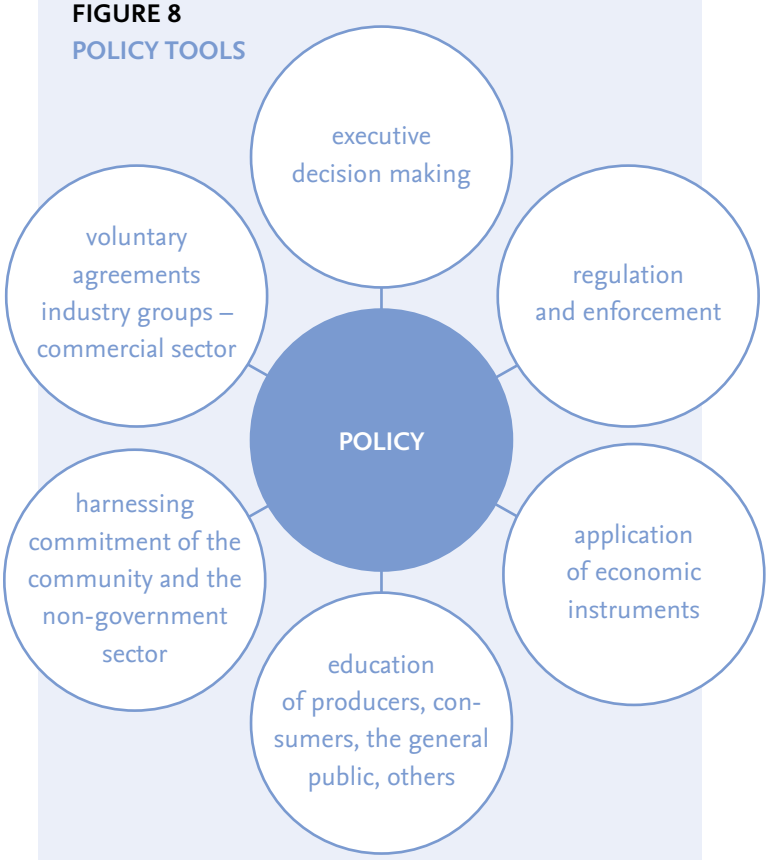
3.3
WASTE MANAGEMENT – POLICY TOOLS

In effect, every form of policy intervention has been and can be applied to waste management. Typically, policy involves: executive decision-making; regulation and enforcement; the application of economic instruments; education of producers, consumers, the general public, and others; voluntary understandings with groups in industry and the commercial sector; the harnessing of the energy and commitment of the community and the non-government sector; collection of information and data; and every possible combination of these approaches. It is the combination of these carefully chosen policies and interventions, including their application to priority aspects of waste management in particular, that constitutes a strategy.

The choices depend on the waste stream in question and the circumstances of the country: its culture(s), its socioeconomic circumstances and structure, and its geography. Thus, for a given waste stream, there may be a combination of a regulatory framework, a pricing tool and a program encouraging participation by producers, consumers, the formal and informal recycling sector and civil society. These parameters would be dependent upon adequate infrastructure, the collection of relevant data and a proper institutional mechanism.

As an illustration of the potential mix of policy tools, a local authority managing MSW might offer incentives (e.g. prizes or other rewards for recycling); penalties for improper disposal or failure to segregate waste at source; limitations on waste collection (e.g. refusing to collect waste not contained within the receptacle provided); and information and education delivered through schools and libraries. The national government might introduce others, e.g. take-back schemes for particular products (e.g. e-waste) to promote recycling; or levies on some products (e.g. automotive tyres) at point of sale to finance waste management.

FIGURE 8
POLICY TOOLS



Despite the huge range of instruments and initiatives that can be, and are, applied, some elements are centrally important to waste management policy, and therefore to the development of a strategy, and are briefly described below.

LEGISLATION AND REGULATION

Underpinning every waste management strategy is a body of legislation and other regulatory action ("legislation" is here understood as the primary statutes governing waste management; "regulation" is the detailed subordinate body of law that sits beneath it). This regulatory framework provides an essential backdrop against which all other forms of policy intervention are set. Legislation and regulation can be used to give effect to any aspect of waste management policy, but almost always provide the following critical elements:

- They set the "bottom line" protections of human health and the environment, e.g. standards for discharges to air and water from waste management facilities, standards for landfill construction and incinerator operations.

- They provide for licensing of facilities that produce, process or dispose of hazardous waste (including ensuring a chain of custody for the waste).
- They give effect to international obligations, especially for transboundary movement of waste (under the Basel Convention and other instruments to which the country may be party).[63]

Regulation may also contribute, provide for, or supplement many other elements in a strategy, including by:

- Setting the parameters for how a particular waste stream is managed (see for example the EU's revised Directive 2012/19/EU on Waste Electrical and Electronic Equipment[64])
- Limiting the way in which a type of product is produced (e.g. the EU's revised Directive 2011/65/EU on the restriction of certain hazardous substances in electrical and electronic equipment[65])
- Establishing the basis for mandatory extended producer responsibility programs (e.g. requiring that producers of particular goods take back the goods at the end of the use phase and take responsibility for any waste implications)
- Providing the basic infrastructure for a waste management system (e.g. by prescribing details of MSW collection systems such as bin sizes, colours, times and frequency of collection, etc.)
- Establishing legal liability for environmental legacy problems, e.g. for contaminated sites or abandoned landfills. Such measures prevent responsibilities that should be private from being transformed into problems for the community at large.
- Giving regulatory effect to or providing a regulatory backstop for other tools: e.g. by providing for the setting of charges; by providing powers to officials to direct that waste audits be undertaken; by mandating the collection and submission of information and data; by requiring particular waste management performance from government agencies themselves, etc.

Regulation (and other forms of government intervention such as guidelines, standards, executive decisions, taxes or specific policies) adopted for other purposes will also have effects on waste management:

- Action on greenhouse emissions will have an effect on management of landfills and incinerators.

Photo courtesy: Ainhoa Carpintero

- Land use policies may determine the availability of land for landfills and other facilities.
- Regulation of products for other purposes may influence their production or sale and therefore their subsequent appearance in the waste stream (e.g. regulation of electrical goods for product safety purposes, or televisions for spectrum management).

The essential companion to regulation is **compliance and enforcement**. Many well designed regulatory systems are ineffective because they are not followed. If waste is dumped, for example, others will see dumping as something they can get away with. The essence of all successful waste management operations lies in the willingness of participants to follow good practices and to possess the discipline to do so consistently. Compliance to discourage departures from the law is therefore a critical element.

In the absence of activities aimed at ensuring compliance and enforcing sanctions against those who do not comply, any regulatory system will fail. Every country needs an independent and powerful **inspectorate or environmental regulator** tasked with ensuring compliance with the legislation and regulations governing the operation of the waste management system.

Establishing that inspectorate and ensuring its proper resourcing is as important as any other element of a functioning waste management system. It is therefore vital to ensure that resources are allocated to compliance. Resources for developing regulatory systems (which might have to be done once or only occasionally) can be easier to find than ongoing resources for compliance, but both are needed for an effective system. This is dealt with further in Part IV.

63) Relevant international treaties and texts relating to waste management are set out in Annex B of this document.
64) http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2012:197:FULL:EN:PDF
65) http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2011:174:0088:0110:en:PDF

Legislative or regulatory actions are not the only forms of government decision-making. Governments are involved in making other types of executive decisions in parallel and complementary to regulatory activity. An example might be deciding what kinds of waste management facilities to build (or which kind should be built) as a matter of policy, quite apart from regulatory approval, which would also need to be obtained. Governments may have to resolve questions of siting, e.g. identifying suitable land for construction of a new landfill, as well as subsequently undertaking regulatory steps such as assessing the environmental impact of the proposed facility, or ensuring it meets construction standards.

Siting decisions, used as an example above, are among the most difficult to make. Such decisions may rest with government, whether national, regional, or local, but frequently involve grappling with competing interests and public opposition (e.g. NIMBY – "not in my backyard") and must be carefully weighed. A decision on the regional level may be better for siting major facilities such as an engineered landfill, to benefit from serving more than one municipal centre, and sharing construction and operating costs.

While no waste management system can operate without a legislative and regulatory base, not every problem can be addressed through regulatory action. Regulation is best for issues that need to be managed on a long-term basis, and are uniform across the country or region. Regulatory action is slow to change, inflexible in the face of varying circumstances, and open to administrative gridlock in the hands of an insufficiently engaged bureaucracy. Regulation is unlikely to be the avenue by which the energy of waste pickers can be engaged, for example. On the other hand it may be important to protect waste pickers' positions by regulatory means, e.g. through occupational health and safety legislation or limiting the rights of competing larger private sector players to seize control of recycling in a particular city.

VOLUNTARY AGREEMENTS

Entering into a voluntary agreement with one or more parties, usually industry or industry associations, to introduce particular measures, is often an attractive policy option for governments. This kind of agreement is particularly effective in certain contexts, e.g. highly visible waste streams with clear associations to particular supplier industries, such as post-consumer packaging waste or mobile phones. A government might agree, for example, with the packaging industry and the manufacturers or importers of packaged goods (and sometimes with other groups, e.g. NGOs) that certain extended producer responsibility options and targets should be adopted by industry for particular packaging materials and packaged goods. If the options were not adopted or the targets not achieved, the implication would be that stronger government action, such as regulation or the introduction of an economic measure, would follow.

Voluntary agreements, often seen as a form of self-regulation, are popular as they are attended by less political agitation and negotiation among those affected. They are flexible, and foster a close dialogue among those involved (usually with wider interests such as consumer groups, NGOs, and the community).

Despite their popularity, voluntary agreements have attracted a great deal of criticism, especially from NGOs. They are criticised as being political rather than policy instruments, in which announcements take the place of action, the agreed actions lack ambition, the process of negotiation lacks transparency, enforcement is lacking and results usually fall short of what was promised. Whether a voluntary agreement is a useful tool in a country's waste management strategy needs to be assessed in the light of the waste stream being targeted and such matters as industry structure, political context and the available alternatives. Many countries will continue to find them attractive, even if sometimes only as a temporary measure pending a more developed and sophisticated policy approach.

TEXT BOX 3.4

GLOBAL VOLUNTARY UNDERTAKINGS ON MARINE DEBRIS

By Vberger (Own work) [Public domain], via Wikimedia Commons

Governments, intergovernmental organisations, industry and scientists have come together in an international voluntary agreement to address the problem of marine debris, with a particular focus on plastics. The UNEP Global Partnership on Marine Litter[66] is a voluntary undertaking, led by UNEP, to combat the problem of marine debris. Its participants include, in addition to UNEP, governments or their agencies (e.g. the US National Oceanic and Atmospheric Administration), the plastics industry (54 organisations from 33 countries) and scientists and policy makers around the globe.

The Partnership is one step in giving effect to the Honolulu Declaration on marine debris.[67]

The plastics industry has launched its own commitment to better management of plastic waste, in its Declaration for Solutions on Marine Litter.[68] It focuses on six major areas of activity: public-private partnerships; better scientific understanding through research; science-based policy and enforcement of existing laws; eco-efficient waste management; recovery of waste plastics for recycling and energy recovery; and better stewardship of plastic resin pellets from supplier to customer.

66) http://www.marinedebrissolutions.com/Global
67) www.5IMDC.org
68) http://www.marinedebrissolutions.com/Declaration

ECONOMIC INSTRUMENTS

Economic instruments are used in waste management to make the system more efficient, and perhaps most importantly, to internalise the costs of waste management, i.e. to build those costs into prices, so that they are borne by those who impose the costs on the overall waste management system. If the costs of waste management can be borne by those who generate waste, a huge burden can be lifted from waste managers and policy makers:

- First of all, economic instruments provide a strong incentive to reduce waste generation and to encourage source separation of waste in order to maximize the opportunity for re-use and recycling for that fraction of waste generated that cannot be avoided.
- Secondly, they render it unnecessary for governments to find the funds to manage waste out of the public budget. In practice, the difficulty of finding funds for waste management nearly always limits what can be done by governments, which makes self-funding approaches all the more attractive.

Economic instruments are also used to address other forms of market failure. **Subsidies** can be applied when important industries, such as recycling industries, face barriers to entry. These subsidies can be direct, but often take other forms such as through organisational assistance, tax holidays and the establishment of industrial recycling parks. Financial incentives can also be offered to promote preferred behaviour, e.g. through lower fees and charges for households that separate waste at source or limit the generation of non-recyclable waste.

"Getting the prices right" i.e. pricing products that have the potential to end up as waste, and pricing waste management services (**fee and user charges**), is centrally important to any successful waste management policy.

Nevertheless, charging for waste management services is not a simple matter. The approach adopted must be adapted to the particular context in each country.
For example:

- Charging for waste collection services is a starting point and may meet with public acceptance, as generators can see the improvement to their environment as waste is removed.
- Charging for the use of waste-to-energy or landfill services raises funds for the operation and development of the services.
  - If imposed transparently, it also encourages those generating the waste to rethink their behaviour, although the public is usually more reluctant to pay for this service.
  - If at all possible, disposal costs should be included in the charging system, for financial sustainability reasons, in order to underpin recovery, recycling and other upstream options.
- Imposing a **tax or levy** on a product at the time of sale can generate funds to be used for reuse, materials recovery, and recycling. This is a particularly useful approach for products which present a problem in the broader waste stream and can be managed through special arrangements, e.g. automotive waste (oil, tyres) or e-waste.
- Charging for services that were previously provided free of charge, e.g. for plastic bags at shops and supermarkets, can encourage changes in behaviour.
- Direct subsidies can encourage the establishment of industries that would otherwise struggle, e.g. providers of alternative low waste products, but need careful introduction and management so as not to result in the long-term dependence of the supported industry.

It is not always necessary to regulate, as many waste management processes have the potential to be profitable, especially if the prices for waste management are accurately imposed on waste generators and all players along the supply chain. In fact, evidence suggests that with proper pricing, the potential savings for business from reduced waste generation are substantial. A great deal can be done through encouragement and changing attitudes. Many companies in the production and commercial sectors have proven willing to change their practices and redesign their products once the potential returns on effort were demonstrated. Cleaner production improvements are often profitable as well as environmentally sound, because they introduce improvements in efficiency. In some cases, products rethought from an ecodesign perspective can be sold at a premium on the market. Reputation and brand recognition can be enhanced by participation in well publicised waste minimisation programs.

Another form of economic intervention is through government procurement of environmentally preferred products ("**green procurement**"). For example, a government can choose to source its purchase of certain items from recycled products or products with lower potential to cause problems as waste, e.g. buying office paper that is recycled or mobile phones that meet a requirement for ease of disassembly.

Sound economic approaches to waste management form one part of the "**green economy**",[69] a concept that seeks to recast traditional economic thinking by giving recognition to the value of resources that traditionally have been either undervalued or not valued whatsoever. The green economy is low carbon, resource efficient and socially inclusive, and aims to invest in actions that reduce carbon emissions and other forms of pollution, optimise resource use and prevent loss of biodiversity and ecosystem services.

Despite their attractiveness as a policy, in practice economic instruments are sometimes difficult to apply and their effectiveness varies considerably:

- Some waste streams are simply not amenable to the application of economic instruments, e.g. it is difficult to charge for waste generated at public or sporting venues.
- Sometimes governments choose to treat waste charges and levies uniquely as revenue raisers, so that the link to waste prevention or reduction is lost.
- One prominent sector may become the focus of attention (e.g. tourism) while the potential of other sectors is ignored, resulting in waste management incentives being delivered piecemeal, or policy applied without the coherence necessary to deliver an enabling environment for waste management.
- For MSW, whether an incentive to minimise waste is created depends on the way the charge is imposed. If, for example, it is based on an average of the waste generated per unit (e.g. per household), there is no real delivery of an incentive to minimise waste.
- Even when the imposition of a charge to lower usage raises funds that can be used for waste management, a very high rate might be needed to discourage waste generation. For certain products it is difficult to influence a reduction in usage. For example, reductions in automotive wastes, e.g. oil, tyres, end-of-life vehicles, would require fewer cars to be bought or fewer kilometres driven.

69) http://www.unep.org/greeneconomy

- If waste charges are set too high, some generators may choose to dispose of waste illegally. There is less willingness to pay for waste management than for other services such as power, water or cell phone services, making it a challenge to collect enough revenue to cover costs.
- Subsidies to industries can lead to their continuing dependence on government support, or distort competition with unsubsidised businesses.
- Incentives, once applied, can be politically difficult to reduce or withdraw, even when the need has receded or higher priorities are competing for limited resources.

Despite these limitations, economic instruments remain a central plank in most waste management strategies. As in other areas, there needs to be an adequate level of skills and capacities to develop and apply these instruments successfully, and with great care:

- Some poor communities will be unable to meet even modest charges for waste management services, and arrangements may need to be made to exempt them from these charges or return them as subsidies.
- Since the possibility of illegal dumping is especially threatening, instruments need to be designed to minimise its occurrence (e.g. a charge at the landfill gate may encourage dumping but a levy on the price of a product will not). In some circumstances compliance activities may need to be increased to discourage dumping.

EDUCATION AND INFLUENCING BEHAVIOURAL CHANGE

Changing the attitudes and practices of many of the stakeholders must become an important component of waste management policy, if ambitious waste management outcomes are to be achieved. Producers need to rethink the range, composition and design of their products and the design and structure of their processes. Shop owners, office staff, the construction and demolition industry and its workers all need to rethink their attitudes towards the generation of waste. Consumers, too, should be encouraged to play a part in waste management, other than simply discarding as waste any goods and materials for which they no longer have a use.

Many changes at the level of the industry, the company or the individual office, site, or facility aimed at reducing waste generation can raise a profit, or at least ensure that the company breaks even financially. Producers and businesses can be encouraged or educated to examine and **adopt changes in product and process design**, as well as in business practices. Improvements can result from a variety of motives:

- Some actions will be justified for purely financial reasons.
- Others will enable the producer to gain a marketing advantage, for example by building brand reputation.
- Others may be undertaken to avoid encouraging regulatory action.
- Others – probably most – may result from a combination of reasons and motives.

Consumers can be urged and educated to make a variety of productive changes such as:

- Reducing their purchases of products that contribute to the waste stream, for example by buying unpackaged or more lightly packaged goods, or greener products in general
- Reusing, recovering or recycling goods, where possible, rather than discarding them
- Composting food wastes at home, where possible
- Separating their waste at source for contribution to recovery and recycling programs
- Keeping hazardous materials out of MSW, in accordance with product or government guidance.

One instrument for heightened consumer awareness is **eco-labelling**, whereby products are required to be labelled with information about their impacts on health and the environment. In the present context, this signifies potential waste impacts, or recycling options at the end of the product's use phase. Another option is providing public education through **citizen advice centres**, to help people play their part in elements of waste management such as source separation.

Ensuring high levels of awareness and building motivation can be especially important at periods of transition. If, for example, major changes in practice are to be introduced, or waste charges are to be levied for the first time, having waste generators aware of the impending change can be vital in securing high levels of compliance.

Certain audiences are particularly susceptible to **educational programs or delivery of targeted information**. Educating children early and building an awareness of the importance of managing waste properly at an individual and family level, and then reinforcing that message throughout the course of schooling, will yield returns over many years and contribute to responsible waste behaviour. For countries with particular industries, special programs may be beneficial. For example, if there is a large tourism industry, especially in ecologically sensitive areas,

information and education aimed at both tourism operators and tourists themselves can be important.

MONITORING, INFORMATION, AND PERFORMANCE ASSESSMENT

Every good policy decision is underpinned by information of various kinds, including:

- Data and information about waste: rates of generation, composition, methods of disposal
- Information about the waste management system, e.g. numbers and types of waste collection vehicles,
- numbers of employees, levels of skills
- Information about waste management policies and programs adopted elsewhere
- Information about impacts of waste or of policy choices
- Information about related matters such as industry structure and operations and consumer choices.

Information exchange and collection is therefore a central part of the process of policy development, choice and implementation.

A good information base allows **progress to be monitored and performance to be assessed** against the goals and targets set in the waste management strategy. It identifies a known starting point, providing the possibility of establishing whether or not anticipated milestones have been reached as time goes on.[70]

As noted earlier, good waste management information is hard to come by. This is one of the most challenging areas of waste management policy: in the absence of reliable information, policy choices are made in the dark.

Information is not only an essential underpinning to good policy, but can sometimes be a policy tool in itself. Pollutant Release and Transfer Registers (PRTRs)[71] are programs that require entities of various kinds, mostly but not exclusively private companies, to report publicly on releases of hazardous chemicals to the environment. Typically, they include a requirement to report on transfers of hazardous wastes off site for treatment or disposal. This reporting process serves several purposes: informing the public of polluting activities; providing information to governments; and imposing a discipline on reporting entities themselves.

These programs rely on the public nature of reported information to influence the behaviour of those reporting. In a similar way, public sustainability reporting by companies, often undertaken on a voluntary basis, normally provides information on a wide range of parameters, including waste generation.

CHOICE OF TECHNOLOGY

Countries will need to choose and apply the **technologies best suited to their circumstances**. Often, developing countries may wish to apply technologies that are low cost and low maintenance, for example handcarts for collecting MSW rather than large dedicated waste collection vehicles (that spend long periods out of service for lack of proper maintenance), and composting of organics rather than incineration of MSW. Research and development to provide new or improve existing solutions, and conscious and careful choices among available options is an essential part of the policy process. Selection of appropriate technologies, use of technology transfer to access the best and most appropriate technologies for the country's purposes and careful deployment of technological solutions are all part of a successful policy approach.

70) In addition to references quoted earlier, other sources of information on data and information in waste management include Wilson D. et al. (2013). *Benchmarking Indicators for Integrated and Sustainable Waste Management (ISWM)*, ISWA World Congress, 7-11 October 2013, Vienna, Austria and World Bank (2001). *Strategic Planning Guide for Municipal Solid Waste Management*. Available at: http://www.worldbank.org/urban/solid_wm/erm/start_up.pdf http://www.worldbank.org/urban/solid_wm/erm/CWG%20folder/Lineam.PDF; and WASTE (undated) *The Waste Key Sheets*. Available at: www.wastekeysheets.net

71) http://www.prtr.net

FIGURE 9
ELEMENTS TO WASTE MANAGEMENT POLICY

LEGISLATION AND REGULATIONS

- Laws and regulations
- Norms, standards and guidelines
- Compliance and enforcement
- Environmental liability

VOLUNTARY AGREEMENTS

- With particular supplier industries
- Introduces particular measures (e.g. certain extended producer responsibility)
- Self-regulated

ECONOMIC INSTRUMENTS

- Taxes and levies
- Fees and user-charges
- Subsidies
- Green public procurement

EDUCATION

- Awareness raising campaigns
- Educational programs
- Advice centres
- Eco-labelling

INFORMATION AND MONITORING

- Information exchange and collection
- Reporting
- Assessment of performance

TECHNOLOGY CHOICE

- Research for new or improved solutions
- Technology transfer
- Selection and choice

3.4
POLICY CHOICES – TIPS AND TRAPS

Governments need to choose their policy options carefully. These choices operate within a wider context, which can exert a direct and important influence on the choices that can be made. For example:

- A country's geographic and even geological structure may be important: factors such as landform, climate, degree of urbanisation and variability across the country in these parameters will influence matters like planning, siting of infrastructure and choice of technology. For example, consider the different choices appropriate for a country made up of coral atolls, compared with one largely consisting of high mountain plateaus or another dominated by sandy deserts.
- Land use planning policies set the context for planning of waste management in cities and towns (e.g. street width and layout, which influence collection choices, temporary waste storage options, as well as siting of landfills, waste transfer stations and other waste management facilities).
- Waste management policy can have a direct impact on or connection with policy in other areas, e.g. on policies in areas such as trade, tax, public health, public finance and environment and transport, among others. Sometimes these impacts will be reinforcing, while at other times they may be in tension.
- A wide perspective should be adopted when thinking through the connections to other areas of policy and the possible drawbacks and benefits. For example, better waste management should be able to contribute to three dominant issues confronting the globe: food, water, and energy:

  - Composting organic waste contributes nutrients and improved soil to food production, and reduced demand for landfill space frees arable land.
  - Reducing waste and managing it better leads to less water pollution, and better soils lead to improved retention of water.
  - Biogas and methane recovery contribute to meeting a country's demand for energy.
- The governance and institutional structure within a country is the foundation for the development of waste management policy, and will influence how it is shaped. Nevertheless, unlike a country's geography, it is amenable to change. The development and implementation of a national strategy aims in part at improving and strengthening the country's governance and institutions as they relate to waste management.
- Some countries will achieve the best outcomes by working together on a cooperative basis, rather than by trying to succeed separately. An illustration would be a geographic grouping of small countries, especially small island states. For such countries, developing large capital intensive facilities might be impossible separately, but possible cooperatively. Similarly, the development of a strategy might be far more manageable if the waste management specialists of several countries pool their expertise.

Waste management policy is like other areas of policy, in that a policy instrument that appears attractive for waste management purposes could turn out to cause problems or produce perverse outcomes. A decision that the government will henceforth only purchase recycled paper may simply encourage paper companies to move recycled content from, say packaging to the office paper that the government buys. A deposit scheme for beverage containers may lead to their disappearance from litter and waste (since they are collected by children, for example), and adversely affect the economics of recycling by waste pickers more generally. Regulations to ban electronic goods from landfills may lead to the dumping of old televisions and computers by the roadside. An ill-designed tax imposed for waste management purposes may simply lead to distortions in the country's taxation system.

There are many more examples. The only solution to avoid these perverse effects is careful consideration of policy choices, consultation with a wide range of stakeholders, development and implementation of policy in close integration both within waste management and with other areas of policy, the avoidance of piecemeal and rushed decision-making and a willingness to change when things go wrong or prove ineffective.

Not all the pitfalls noted above lie in strategy development, i.e. in making policy choices at the beginning of the process. Many of the most difficult challenges occur in the implementation stage. While this is explored in more detail in Part IV, it is worth noting at this point that the need for careful integration and close evaluation of progress is constant, and applies throughout strategy development and implementation. As implementation begins and continues, it is also important to look for ways in which capacities can be built, institutions can learn, political capital and support can be enhanced and action can be adjusted and followed through for greater effectiveness.

PART IV
NATIONAL WASTE MANAGEMENT STRATEGY: A PARTICIPATIVE PROCESS

4.1 DEVELOPING A NATIONAL WASTE MANAGEMENT STRATEGY

4.2 IMPLEMENTING A NATIONAL WASTE MANAGEMENT STRATEGY

4.3 REVIEWING AND UPDATING A NATIONAL WASTE MANAGEMENT STRATEGY

Each country will have its own institutional, legal, and political context for developing a strategy, but the process of developing a successful strategy will have a number of common elements. This section:

- Asks a number of questions that every country will have to answer
- Raises considerations that every country will need to take into account
- Identifies the steps that every country will have to go through,

in the course of developing a strategy.

In answering these questions and resolving the issues that arise, each country will confront a series of policy choices of the kind explored in Part III. A national strategy essentially consists of a systematic application of coherent policy choices applied across the entire range of waste and waste management issues, with particular attention to the issues identified as national priorities.

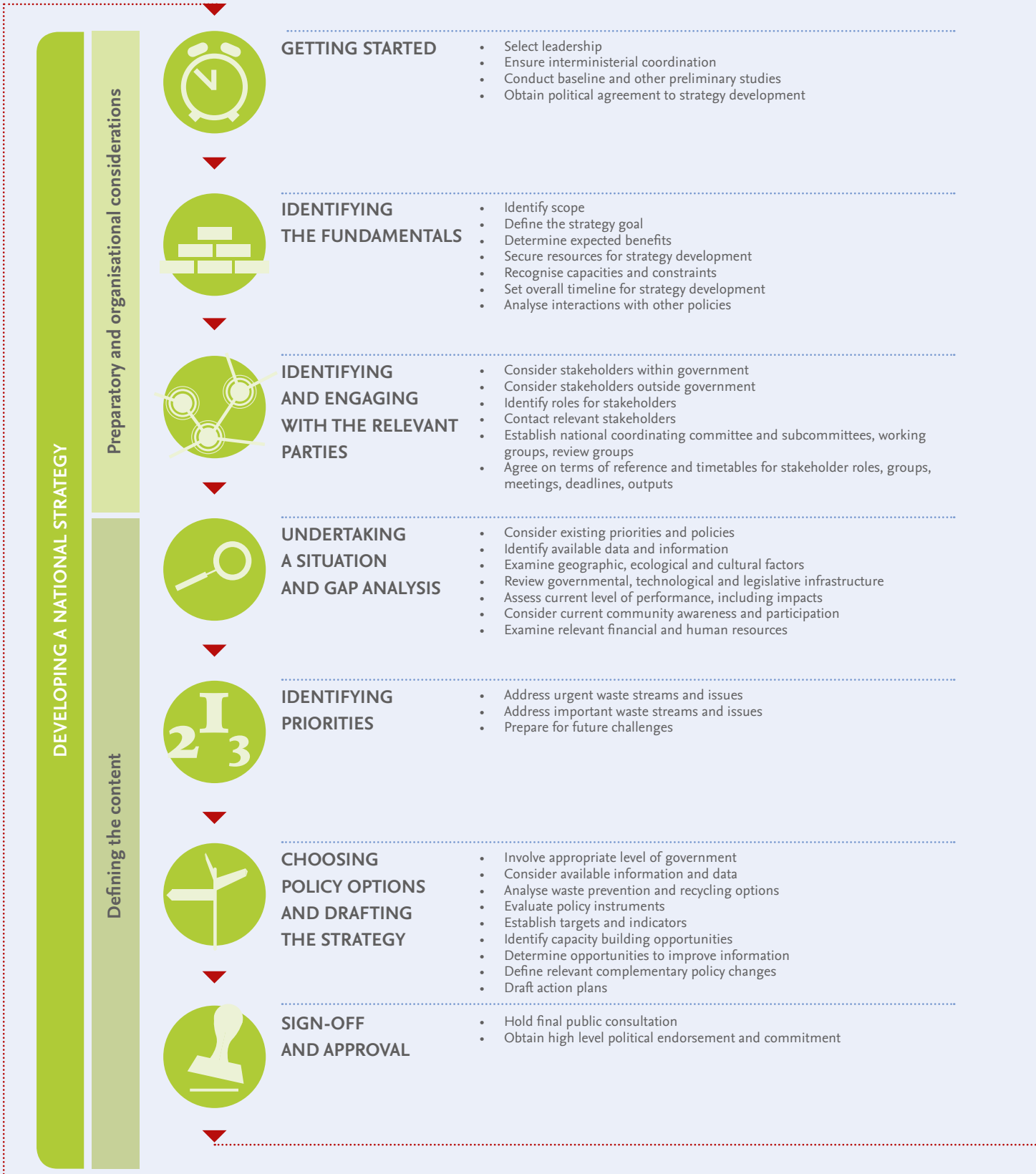
This Part deals first of all with the process of developing a national strategy, and in particular with the participative and inclusive processes needed to ensure widespread ownership and support, without which a strategy is almost certainly doomed to failure. It also deals with the steps that come after the development process, i.e. implementation and review of the strategy once complete.

What the national strategy will look like will depend on a wide variety of factors, as discussed further in this Part. For purely illustrative purposes, a table of contents for two national strategies, drawn up for hypothetical countries facing different waste management challenges and priorities, is included at the end of this section.

The steps and questions outlined in this section take into account the importance of a coherent and integrated approach, and build upon the experience gained and lessons learned through a wide range of efforts to develop sound waste management, as explored in the earlier parts of this guidance document. There is no single set of answers and solutions that will suit every country, but some common elements are identified in the text below. It is not intended that the steps outlined in this section be regarded as fixed or taken as a prescription, but rather that they be applied flexibly in the light of a range of national considerations. Every country will need to assess the suggested steps and answer the questions below in light of their particular circumstances and political and bureaucratic culture.

FIGURE 10

PROCESS FOR DEVELOPING, IMPLEMENTING, MONITORING, REVIEWING AND UPDATING A NATIONAL WASTE MANAGEMENT STRATEGY



IMPLEMENTING A NATIONAL STRATEGY

REVIEWING AND UPDATING A NATIONAL STRATEGY

ADOPTION AND LAUNCH

- Achieve formal adoption
- Launch accompanied by appropriate public relations elements

EXECUTING AND MONTORING

- Raise awareness and communicate the critical parts of the strategy
- Assign responsibilities and tasks
- Mobilise and allocate resources
- Make regulatory changes
- Establish compliance system
- Develop and improve information system
- Institute action to maintain momentum
- Undertake ongoing monitoring
- Recognise mistakes and rethink actions

ASSESSING PROGRESS AND SUCCESS

- Analyse and assess progress against goal and targets
- Undertake regular monitoring and review processes
- Organise independent evaluation

ADJUSTING THE STRATEGY

- Recognise the need for changes to the strategy
- Apply successful approaches to other waste issues or waste streams
- Analyse changes in the external environment
- Update the strategy (partially or entirely, as required)

4.1 DEVELOPING A NATIONAL WASTE MANAGEMENT STRATEGY

Developing a national strategy will require some preliminary action. First, organisational decisions will need to be made to get the process started and some fundamental parameters of the strategy will need to be decided, so that more than a blank sheet of paper is available for the range of interests that will be engaged. The range of interests and groupings will then need to be identified and processes developed for including them in strategy development. A situation and gap analysis will need to be conducted to establish the starting point for developing the strategy. Only then will it be possible to identify national priorities, make policy choices and assemble a strategy.

PREPARATORY AND ORGANIZATIONAL CONSIDERATIONS

The first steps in strategy development involve finding a way to get started. Each country will begin from a different point, but the essentials for every country undertaking the process begin with answering the following "who" and "what" questions:

- Who is best placed to get the process moving?
- What is the starting point or baseline for strategy development?

GETTING STARTED

The entity best positioned to be in charge of the strategy development process is likely to depend on the political and bureaucratic structures of the country. It will be vital, however, to get **political commitment** and unity of purpose nationally. Nothing will happen if there is no political will behind the strategy during its development and subsequently during implementation. It is also critical to put someone in charge of making the strategy happen. This is a standard requirement of successful organisation, and although there may be several disparate interests within government who will have an input, someone or some identifiable group has to be in charge and given the responsibility for driving the process. The selection of the **lead ministry or ministries** is a matter for each country, but whatever organisation takes the lead will need the political power and resources to provide the necessary focus and follow-through. Sometimes one ministry will have a political mandate, and will be the clear choice. In other circumstances it will be better for responsibility to be shared. The choice, however, should be made at the outset, in order to provide clarity and certainty for the remainder of the process.

Some supporting body of officials will also be necessary. This is something that can be revisited as the strategy development process progresses, but some structure such as a project office or identifiable bureaucratic body is likely to be helpful in providing a day-to-day focus for the early stages of work. **Inter-ministerial coordination and cooperation**, i.e. making sure relevant ministries are aligned with and actively supporting the development of the strategy is critical. Inter-ministerial coordination is the necessary complement to the involvement of nongovernmental stakeholders in waste management.

Later in this Part, a situation and gap analysis is suggested to provide a reasonably complete and thorough survey of the starting point for developing a strategy. It may be

useful, however, for countries to undertake a preliminary assessment of their starting position (a **baseline study**) before proceeding too far in the process, in order to be able **to provide basic information about the need for a national strategy**. Other countries may wish to undertake feasibility studies and analytical work to determine whether the capacities of the country will allow development of a national strategy without further assistance, and to scope the analytical parameters governing the development of a strategy. Others may wish to provide a case for a national strategy by conducting an analysis of the costs imposed on the country by current (usually unsustainable) waste management practices. An estimate of such costs can itself be a powerful argument for a national strategy.[72]

These preliminary steps will inevitably touch on the matters considered below: issues with regard to which parties and interests need to be engaged, questions of scope and timing and estimations of the resources needed and available. While this preliminary work may cover some of the ground that is involved in strategy development itself, it is vital that no final decisions of substance are taken before the relevant interests are engaged.

A central element in beginning work towards a waste management strategy in any country is to focus on the question of **what is best done at the national level and what is best done at other levels**. The answer will vary from country to country: a large, federally organised country, for example, may arrive at a solution different from that adopted in a small, centrally organised country. For every country, it is nevertheless vital that national level decisions do not have the effect of cancelling out local initiatives and innovations. The relationship between what is done at the national and local levels must be kept productive and mutually reinforcing.

Many countries will find the experience of other countries of great value in developing a waste management strategy. It may be useful to return to other countries' lessons learnt at various stages in the process of strategy development, and similarly, the experience of each country should be shared with the wider world. The compilation of materials in Annexes C and D can be a useful starting point. In a similar way, local experience should be shared across the country. Successes and failures, the results of pilot projects, and lessons learnt, should be meticulously and systematically collected and shared.

IDENTIFYING THE FUNDAMENTALS

The general dimensions and focus of the strategy are clearly matters to be decided early. It is essential to note, however, the central role of stakeholder involvement in successful strategy development, and to ensure that critical matters are not decided before that involvement is organised. If important matters are decided before stakeholder engagement, there may be a loss both of valuable input and of stakeholder trust and confidence. For that reason, some of the **matters below are best considered as proposals or draft strategy parameters** to be developed early and then refined in the process of strategy development. It may be possible in some instances to present stakeholders with options from which a choice can be made, rather than appearing to have made critical decisions **before the stakeholder engagement process has begun.** The critical questions at this stage are:

- What waste or issues, if any, should be excluded from the scope of the strategy?
- What is the overarching goal or aim of the strategy?
- What national benefits are expected to flow from a national strategy?
- How will the development of the strategy be resourced and financed?
- What are the available capacities and capacity constraints?
- What is the timeline for strategy development?
- How does the strategy relate to other strategies or plans?

Decisions about the **scope** of the waste management strategy should be made early. Some categories of waste may be put to one side, e.g. radioactive waste needs special management and is unlikely to gain from integration into a national strategy. Other than this exception, however, it is better in many respects that the strategy be as comprehensive as possible from the beginning:

- Excluding certain types of waste runs the risk of having them forgotten. It is better to be inclusive and then allocate a lower priority to certain waste streams, with the possibility of rethinking the priorities later (priority setting is dealt with in more detail below).
- Any waste stream, even if of minor significance at present, will probably need to be managed at some stage.
- It is reasonable to focus on the most important items first, especially if the strategy is to be updated frequently.

72) Methodologies for such cost estimates will be available in a supporting document.

A number of waste management issues may be excluded from the scope of the strategy if the waste concerned is managed outside national borders and therefore not suited to inclusion. Most of these issues are subject to particular international regulation. Examples include in particular waste associated with maritime operations:

- Waste arising from the normal operation of ships (e.g. food waste from the galley) is covered by the International Convention for the Prevention of Pollution from Ships and its Protocol (MARPOL).
- The dismantling and recycling of ships is the subject of the Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships 2009 ("the Hong Kong Convention")
- Waste loaded onto a ship for disposal at sea is the subject of the London Convention (1972) and its 1996 Protocol ("the London Convention").

These issues are the province of the International Maritime Organisation (IMO). Once waste has been taken off a ship, however, and once a ship has been dismantled, the resulting waste becomes part of a country's normal waste burden (and for some countries can represent significant quantities compared to waste generated domestically). Such waste streams can be factored into a national waste management strategy like any others.[73] For some countries, e.g. those with ships or boats using internal waters for navigation (dams, inland waterways, lakes and enclosed bays) waste from the operation of a ship is national waste like any other type.

Disposing of waste by dumping it at sea is a separate issue. Such disposal is very tightly controlled for parties to the London Convention. Choosing to manage waste in such a way would not be regarded as a sustainable waste management option for any country other than in the exceptional circumstances provided by the Convention.

Relevant aspects of waste management associated with shipping, therefore (like managing waste taken off ships after they have entered port) should be factored into a national strategy. Similar considerations apply to waste from aircraft. Further considerations relevant to the intersection of international issues and waste management, including the discharge of waste to the marine environment, are presented in Annex B. There are a number of other issues of scope that may need to be considered:

- Discharge of sewage, for example through ocean outfalls, is not normally considered part of waste management. International guidance on sewage disposal is available through the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (GPA).[74] Some kinds of waste from sewage treatment, such as sewage sludge, lend themselves to consideration under a national strategy.
- Other kinds of diversion of waste to sea, for example mine or mineral processing waste pumped out to sea through pipelines as slurry, should be included in a national strategy.
- The assessment or remediation of contaminated sites is not usually regarded as part of waste management. The waste that is generated when remediation is undertaken, however, will need to be managed and would logically be included in a national strategy.

Waste resulting from natural disasters such as earthquakes or cyclones can be a major challenge. For most countries such disasters are rare events, and the waste management aspects are most commonly dealt with as part of disaster preparedness and planning. It may be appropriate, however, especially for countries at high and recurrent risk of particular natural disasters, either to include them in a national strategy, or else deal carefully and explicitly with the interface between strategies relating to waste and disasters.[75] When disasters do occur, the amount of waste generated can be so substantial that the volume overwhelms the normal waste management capabilities of the

73) The Parties to the Basel Convention have given particular attention to the intersection of the interests of the Convention and those of the IMO. See for example Decision VIII/9 of the Basel Convention, at http://archive.basel.int/meetings/cop/cop8/docs/16eREISSUED.pdf#viii09. Note also that the Hong Kong Convention is yet to enter into force; the Basel Convention provisions are relevant to the extent they apply in any given context to the dismantling of a ship.

74) http://www.gpa.unep.org/

75) The Joint Environment Unit of UNEP and the UN Office for Coordination of Humanitarian Affairs (OCHA) has issued Disaster Waste Management Guidelines, available at http://ochanet.unocha.org/p/Documents/DWMG.pdf

country. Every country shares a common **goal** of minimising the amount of waste generated within its borders, but that goal should be given more concrete form:

- The overarching goal should be general, and relate to the country's waste as a whole.
- It should be ambitious.
  - However, the strategy should be realistic, with resource and capacity constraints factored in: an overly ambitious strategy is likely to lead to discouragement.
- The strategy should focus on preventing the generation of waste and phasing out the use of hazardous substances in products, rather than simply on managing what is generated.
  - Waste management is a task that is never completed, and if the strategy puts too much emphasis on managing existing levels of waste, there will never be any time, opportunity, or resources to devote to prevention.
- It should be accompanied by concrete elements such as targets and timetables to provide something to aim for and measure progress against. These targets should be set as various elements of the strategy are developed and more information becomes available, especially in the context of the action plans for priority waste streams and issues (see below). In some countries it may also be necessary for regions and local areas to have their own targets.

TEXT BOX 4.1

ZERO WASTE

© cacciatore.di.sogni / photocase.com

Many countries have identified "zero waste" by a particular date as a national (or sometimes regional or local) target. No country or even city has yet reached that target; but no country or city has ever been satisfied that its waste minimisation efforts have gone far enough. Every success breeds an ambition to do even better. This ambition is the driver of continuous improvement in waste management.

The adoption of zero waste as a national target is a recognition that incremental improvements in rates of waste generation or recycling are not enough in themselves, and that a goal that aims to eliminate waste is needed. A zero waste target is a reflection of the never-ending nature of waste management tasks – a recognition that there will always be a need for improvement, and that once one target has been achieved, others, more demanding and difficult, will still remain to be tackled. Zero waste is a target that can be useful as a reminder of the need to look beyond short-term improvements and focus on radical and long-term change. It needs to be supported by clear, measurable goals or subsidiary targets to provide a metric of progress towards the long-term aim of eliminating waste in its entirety.

It will be important for political and other reasons that the strategy process highlight the likely **benefits of better waste management**: less waste, reduced costs, developed markets for recovered or recycled goods and materials, poverty alleviation, better social amenity, reduced health and environmental impacts and reduced associated costs (as explored in Part II). These benefits need to be presented realistically and with supporting information.

The development of a national strategy is itself an exercise that will require resources both at the national level and elsewhere, within and outside government. Securing **adequate finances and other resources** (e.g. enough staff in the relevant organisations) will ensure that the strategy development does not stall. These resources are different from the implementation resources that will be needed once the strategy is complete.

The **capacities** necessary to undertake a national strategy need to be considered. With limited capacities available (skills, capital) a country may choose initially, to limit the scope, perhaps with the intention of expanding the scope as capacities improve, or as capacities are successively harnessed. A note of caution is warranted here, as the capacities of the country, which are often dispersed at the local level, may not be immediately apparent. The range and depth of available capacities will become more visible once a situation and gap analysis has been conducted (see below).

It is important that the development process for the strategy incorporate a **clear timeline** for its completion and adoption (including any formal steps required. The strategy itself should include a timeline for implementation and review. Many timing elements will be implicit in other elements of the strategy, e.g. it is normal for goals and targets not only to specify what waste reduction outcome is sought but also the date by which it is to be achieved. In practice, the strategy development process may well include planning milestones and checkpoints to provide structure for participants.

It may be useful to establish milestones (e.g. targets representing progress) over the short, medium, and long-term (e.g. 2, 5, and 10-20 years respectively).

At this stage the potential **interactions of the waste management strategy with other policies, plans, and strategies** need to be considered, identified, and listed. As the strategy is developed, these interactions will need to be identified more specifically. Positive interactions are of course to be encouraged, and tensions and conflicts will need to be resolved, particularly with municipalities who will be the most critical implementers of the plan. Thus the lead agency might ask whether the waste management strategy could be linked to or coordinated with:

- A public health plan or policy
- An environmental agenda or action plan
- An energy map (where waste-to-energy options are important)
- A disaster preparedness and response plan
- An urban development planning framework
- Other major plans at the national or, on occasion, regional level
- Existing local/municipal waste management plans.

IDENTIFYING AND ENGAGING WITH THE RELEVANT PARTIES

Waste management is a cooperative endeavour. A successful waste management strategy relies on harnessing the energy and capacities of people and organisations towards a common purpose. Among the first questions to be asked, therefore, in beginning a national waste management strategy, are:

- **Who should be involved?**
- **How can they best provide their input?**

Within each country a great variety of different kinds of organisations and groups play vital roles in developing and implementing a waste management strategy. Each of the players considered below will have more than one role. They will participate as:

- Waste generators
- Contributors to strategy development and implementation
- Elements in the waste management system
- Reviewers and commentators on the contribution of others.

These groups are essential players in a waste management strategy, their multiple roles implying that they need to be engaged at times in more than one capacity.

- **National governments** by definition will have a leading role in developing, coordinating, implementing and reviewing any national waste management strategy. They will have the ultimate say in determining the overall national approach to waste management at the highest level.
  - Government agencies with particular sectoral responsibilities (e.g. environment, industry policy, infrastructure and planning, education, health) will be important for policy coordination, coherency and integration, as well as potentially taking the lead in their sector.

- **Regional and local governments** are the main practitioners of waste management in most countries. They manage and/or undertake MSW management and associated reuse, recovery and recycling initiatives. The way in which regional and local governments relate to each other and to national governments varies from country to country. These relationships are critical to the successful development of a national strategy.
- **The private sector** is a major player in waste management, especially with regard to decisions about products and processes, which can be the determining factor in the amounts and kinds of waste generated. They also play a central role in delivering solutions to waste management problems and challenges, as suppliers of facilities and equipment, and as service providers. The overall economic and industry structure influences which roles the private sector can take, which include the following:
  - Designers of products – Choices about product design are critical in determining waste issues for the remainder of the life-cycle.
  - Producers of goods, whose process choices determine the levels of waste produced and the amount of resources consumed per unit of output
  - Distributors and marketers of goods
  - Service deliverers in sectors where service delivery carries waste consequences, e.g. retail, food, transport operations
  - Users of waste management services
  - Providers of waste management and recycling services
  - Suppliers of waste management equipment, facilities and know-how
  - Partners in public-private partnerships in waste management
  - Industry associations, which may be major players in debates on waste management issues, as may the individual companies that make up their membership. They can also be important as repositories of information and as lobbyists.
- **Service providers in the waste management sector**, including:
  - Materials recovery practitioners, recyclers (formal and informal, private and public), operators of sorting facilities and traders in recovered materials and recycled goods
  - Waste management operators, e.g. the operators of street sweeping, waste collection and waste transport services, landfills and incinerators
  - Industries importing waste as raw material
  - Industries consuming significant amounts of energy (e.g. metals refining, cement, mining), which can use waste or particular waste products as a fuel.
- **Waste management workers** will have a major contribution to make, which can be especially important in many developing countries, where waste pickers and other informal sector workers have a central role.
- **The informal sector** contributes labour to the reuse, sorting, recovery and recycling of useful materials and products found in the waste stream. The sector is especially important in developing countries, although the contribution of the informal sector is not always recognised. Its contribution is neither measured nor documented. The informal sector includes waste pickers and collectors, operators of collection facilities and wholesale vendor operations, small mills and factories using recovered materials, delivery operations and retail of finished recovered, remanufactured and recycled products.
  - In some circumstances, community-based enterprises are sustainable alternative options for solid waste collection and disposal in low-income areas (examples include cities in Kenya, Tanzania and Mali, among many others).
  - In countries where the informal sector is organised into unions or cooperatives, as is commonly the case in many Latin American countries, it is easier to include it in the strategy development process. In countries where this is not the case, additional effort may be needed to ensure its inclusion.
  - As noted in Part II, women frequently play an important if not dominant role in the informal sector, which may in some circumstances facilitate their engagement. At other times, special effort may be required to bring women who are used to being marginalised and ignored into the strategy development process.
- **Waste generators** i.e. members of the community who inevitably, individually or in groups, play a central role in waste management, as:
  - Consumers of goods and services
  - Waste generators, in discarding goods
  - Users of the waste management system, e.g. by recovering materials, by recycling, by sorting materials for collection (or by choosing not to do so)
  - Active players in the waste management system through adopting attitudes to waste and becoming involved in improvements in waste management.
- **Members of the community**, as national citizens, may have rights that the waste management strategy needs to recognise, e.g. they may have rights conferred by law

to use waste management services, to participate in decisions and to be heard on matters where their interests are affected. The community needs to be involved both in the design of the strategy and in the development of local plans. A lengthy initial consultation process in strategy development can pay dividends in the form of a better design and higher participation rates. The community should also be active in monitoring the implementation of the programs in their community. Determining how to engage the community, to obtain their participation in decision-making, is critically important for successful waste management. The challenge arises because communities are made up of large numbers of individuals whose choices may be disparate and uncoordinated. Engagement will depend on the circumstances and culture of each country. In some countries the community will be organised locally, e.g. through heads of villages, or there may be community organisations that can contribute to or coordinate waste management activities, e.g. women's networks. Alternatively, engagement may occur through mass media. Engagement with the community is considered further below.

- **Opinion leaders and decision-makers**, such as political figures at different levels of government, heads of companies, religious leaders and popular figures from mass media can be engaged to influence community attitudes.
- **Non-government organisations** (NGOs) are important sources of support, raising awareness, disseminating information and providing advice, and sometimes may provide relevant organised services, such as cooperatives that serve to reduce waste generation. NGOs are often critical in deciding the political acceptability of waste management policies.
- **Waste experts and academics** (university lecturers and researchers) contribute knowledge and advances in both scientific and social aspects of waste management, e.g. on technologies, on interactions among stakeholders and on decision-making and monitoring tools.
- **Teachers and other educators** play a part in community engagement and changing consumer behaviour, and through the education process supply the human resources necessary to manage, regulate and maintain waste management operations. Sometimes education can contribute through the influence of students, in particular with regard to their families.
- Other sectors can also have a role to play, depending on local circumstances. **Unions,** for example, can sometimes be important players, as can mass media, through the delivery of information or education.

Since within each of those broad groups are various divisions and interests, coordination and communication among them will be important. Particular attention should be paid to interministerial coordination at the national level (with the same coordination likely to be needed at the regional and possibly even local levels). The lead ministry may wish to establish:

- Which ministry is responsible for each major waste stream (e.g. hazardous waste, MSW, hospital and health-related waste, etc.)
- Which ministry or ministries set the relevant health and environmental standards
- Which ministries control the flow of funding (or coordinate priorities for development cooperation)
- Which ministry or ministries should take the lead in educating children and raising public awareness.

Other similar questions may occur as the process proceeds. Obtaining the support and participation of these different groups is essential, not only at the level of national government, but at regional and local levels as well. These groups will not have identical interests and effort may be needed to reconcile competing and disparate perspectives.

In addition to these domestic groups, many **international organisations**, such as UN bodies, industry associations, NGOs, academic bodies and others, have undertaken international work on waste management, and there are numerous examples of successful strategies, assistance and guidance materials, case studies, surveys and analysis. These materials offer a wealth of ideas and templates that can be used in fashioning a national strategy. A compilation of such materials and sources is presented in Annex C.

A productive strategy development process will require all relevant groups to be involved. Among the series of steps to be taken to engage the relevant interests, the most critical are:

- To establish how local interests will be involved. Most waste management activities happen at the local level in towns and cities where managing solid waste is one of the fundamental aspects of having a functioning and liveable city. The process of developing waste management nationally needs both to draw on the knowledge and skills of the people who manage MSW on a daily basis, and to deliver benefits to those people and the work they do. Thus the process needs to combine the advantages of both levels:
  - The hands-on awareness and knowledge of local waste managers
  - The political clout, wider perspective, and greater access to resources of the national level. In some countries, e.g. large countries with regional governments, it may be necessary to have regional governments involved as well.
  - It would be logical to assume that waste prevention, which requires engagement with the producers and the commercial sector, would be better managed through national governments and downstream aspects of waste management better handled by local government. However, it is important to be aware of the risk of fragmentation of policy and loss of cohesion, if these divisions are applied too rigidly and without good communication among the different levels of government.
- To identify relevant interests outside government and get them involved. These interests are likely to include NGOs, private industry, the informal sector (including women) and the underground economy, where appropriate. In most instances there will be more than one type of interest within each of these groups, e.g. one NGO may lobby for environmental policy while another represents community recycling interests. It is for each country to decide how to engage these interests, and to determine which ones are critical to the success of the strategy.

Once the various interests have been identified, an additional question arises: **How should the involvement of all these interests be organised?**

While the answer to this question will depend on the governmental context in each country, the obvious starting point is a **coordinating committee** to bring the critical interests together, e.g. a national waste management coordinating committee. This committee may need to have **sub-committees**, **working groups** and **stakeholder groups** to manage the work.

As the number of interested parties in a program of this size is potentially very large, it is important to decide how all interests can become involved and all contributions be harnessed without the process becoming unwieldy. A coordinating committee, for example, if formed, must be kept to a manageable size (committees usually becoming less effective once they have more than about 12 members). One way forward is to arrange the main committee, sub-committees, stakeholder and other consultative bodies so that all those who have something to contribute can do so at the level at which their input is the most productive.

Since a national waste management strategy is for most countries a complex exercise, it will be beneficial for each consultative or advisory body, including the national coordinating committee, to be given **terms of reference** at the time the body is established. The terms of reference need to be drafted to ensure that each body has a separate set of identified tasks, to avoid overlap, duplication and wasted effort. Attention will also need to be given to the **timetable** according to which groups will meet, the deadlines they may need to meet, the outputs they may be expected to produce and the reporting structure. It may be productive to set up these groups on an as needed basis, and allow them to meet according to a schedule that reflects the contribution that is expected of them. As an example, once priority waste streams are identified a special working group might be needed to deal with them specifically. Alternatively, special **workshops** might be convened to **gather public views**.

No committee should have a permanent mandate. The planning process should include a time horizon for reviewing or dissolving the committee structure. One option would be to keep the main committee (if working well), as well as other key sub-committees where appropriate, to manage the implementation phase, both to supervise implementation and possibly to update the strategy as needed.

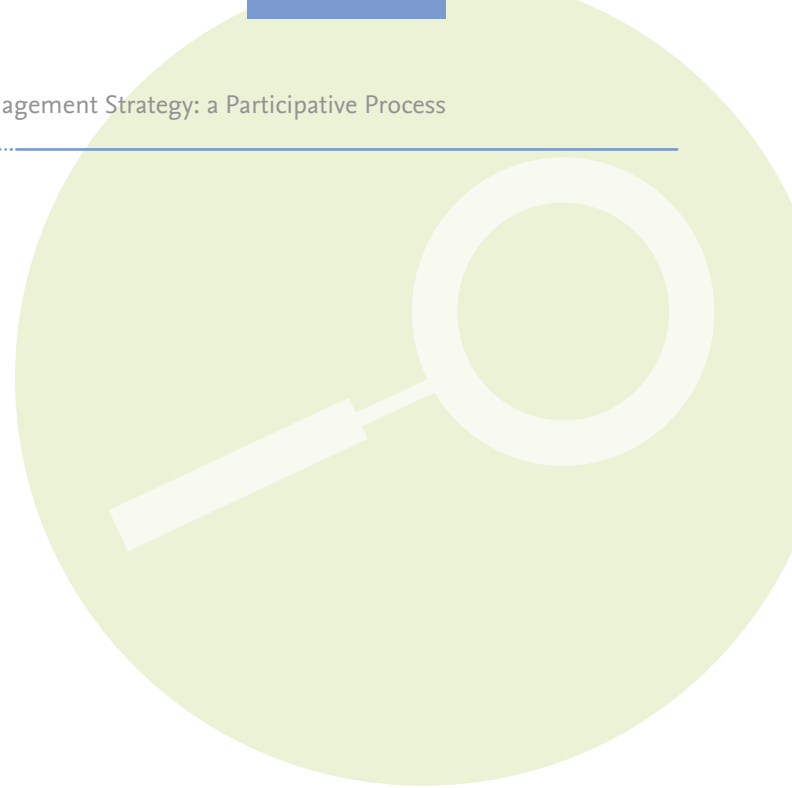
In the process of strategy development and implementation there are many opportunities for people and institutions to learn and to build capacity. One of the most important benefits of the process comes from debating, choosing options and working at making them operational. Institutions, in particular, undergo an educative process that leaves them better equipped to rise to the next waste management challenge, or to tackle a problem in some other field.

DEFINING THE CONTENT

UNDERTAKING A SITUATION AND GAP ANALYSIS

Determining the current status, what is missing, and how well the situation is being managed, is central to developing a useful strategy without going over old ground or leaving out important elements. It may be useful to carry out studies on existing national priorities, e.g. on reducing greenhouse gas emissions, or on determining which waste streams offer the greatest opportunities or have the greatest current impacts. There are a number of critical questions to be answered as part of the analysis:

- **What existing national priorities should inform the strategy?** National priorities in areas like health, employment, poverty or the environment could be important drivers for the strategy, and especially for the process of priority setting.
- **What information and data is currently available or easily gathered**? What are the critical gaps, i.e. known inaccuracies and incomplete data and information? Information and statistical material serve as the starting point for compiling the content of the strategy and deciding what to do next.
- **Are there geographic factors that have to be taken into account?**
  - Does the country have particular features that influence or constrain waste management options? (For example is it a small island state, or does it include small or remote islands?)
  - Are there rural and remote areas where distance or population density are major considerations?
  - How is the population distributed? What is the level of urbanisation?
- **Are there ecological factors that have to be taken into account?** The proximity of sensitive environments (water bodies, wildlife reserves), for example, may act as a constraint on such matters as siting of landfills.
- **Are there particular cultural factors that need to be taken into account?** Cultural practices across the country or in particular regions may lead to increases or decreases in some waste streams, or to differences in practices. Examples could include the potential for major feast days or holidays to generate changes in the amount of waste generated, or an unwillingness of particular groups to handle waste, which might reduce source separation.
- **What are the current policy settings, at the national, regional and city level?**
  - Are all cities the same or similar in the way they go about solid waste management?
- **What technical infrastructure exists at present?**
  For example:
  - Are there incinerators for solid waste? Are they with or without energy recovery? Are there engineered landfills? What level of technology is involved? Are the landfills lined? Is leachate collected? Do the incinerators have pollution control fitted? What happens to the ash?
  - Is solid waste mostly dumped in the open? Is it subject to random and uncontrolled burning?
  - What is the composition and condition of the fleet of waste collection vehicles in different urban centres? What proportion is operational at any given time? Are capital intensive methods used or is collection labour intensive?
- **What is the current legal and regulatory framework?**
  For example:
  - Are the roles and responsibilities of different levels of government and of different players within government well defined? Who is responsible for what? How is that responsibility defined?
  - Is there a comprehensive legal framework?
  - Is there a comprehensive and functioning complaint mechanism?
  - Is the country a party to the major international conventions? Does it have laws in force to give effect to the obligations relating to waste?
  - Is solid waste subject to national laws? Is solid waste regulated through local by-laws?
  - Is hazardous waste generally regulated, and is data collected on the generation and management of such waste?
  - Are non-hazardous waste streams regulated?
- **What is the structure of government below the national level, and what does that signify for the organisation of waste management**?
  - Does the country have a federal system, with provincial or regional governments? Do they have responsibilities in waste management?
  - How is local government organised? Do municipal communities or city governments have the responsibility for day-to-day waste management?
  - How do local government responsibilities relate to those of other levels of government, e.g. how much autonomy do they have?
  - Is there a flow of resources to local government for waste management?
  - Can local government secure the funding or tax revenues they need for waste management tasks?



- **How well is the current waste management system performing?**
  - Is there a high level of compliance with regulation?
  - Is infrastructure robust and mostly operational?
  - Are current policy goals being met?
  - Are there best practice examples in particular locations that can be followed elsewhere?
- **How inclusive of service users and providers is the current waste management system?** Do non-government interests have clear and well-defined roles? How are those roles assigned? If service users and providers have a clear role, do they have access to the resources they need? Do they have the capacities to participate in waste management? Are roles reasonably uniform across the country?
- **What are the current health and environmental impacts (local and global) of waste?** Is data available, and if so, at what level of detail and frequency of collection?
- **What are the economic impacts of waste generation and management?** What are the costs (and benefits) for the national economy? What about the regional and local costs and benefits?
- **What is the level of awareness in the community concerning waste-related issues?**
  - Are there existing post-consumer waste recycling initiatives and schemes?
  - Is there any involvement of criminal activity or an underground economy in waste management?
- **How is waste management currently funded?**
  - Are there cost recovery schemes in operation, through taxes or charges?
  - Are the resources adequate to meet the needs of the sector?
  - Are there other potential sources of finance not being used at present?
- **What are the arrangements for and limitations to transfer of technology and practices?**
- What policy arrangements are in place to promote the uptake of cleaner technologies? How effective are they?
- What are the existing barriers to adoption of cleaner technologies, best environmental techniques[76] and best environmental practices?[77]
- **What is the human resource base for waste management?**
  - What level of skills can the sector call on? Are the technical skills needed for a developed strategy available?
  - Is there an informal sector engaged in waste picking and resource recovery? If so, how big, organised, and effective is the sector? How important is it in the context of national levels of poverty? Does a professionalised and coordinated informal sector have the potential to deliver cost savings to cities and communities?
- **Is there awareness and acceptance of relevant tools, guidelines, and project examples from overseas?** What international models have been influential and successful?

By taking stock of the current state of affairs and the current resource base, broadly considered, the national waste management coordinating committee can identify:

- Those areas in which the country has succeeded or is doing well
- Those areas representing gaps – where policy has been less successful, where waste quantities are growing, or where attention is needed.

This is also the stage at which some assessment needs to be made about what the waste challenges are likely to be in the future. In cases where information about existing problems is incomplete or inadequate, such assessments are clearly difficult, but the question needs to be asked. It is often obvious that particular categories of waste are increasing rapidly, or that the capacity of the country to deal

76) "Best available techniques" refers to those techniques that are the most effective to prevent or (if not practicable) reduce emissions and releases to air, water and land and the impact of such emissions and releases on the environment as a whole, taking into account economic and technical considerations. In this context: "best" signifies most effective in achieving a high general level of protection of the environment as a whole. "Available techniques" are those techniques developed on a scale that allows implementation in a relevant industrial or service sector under economically and technically viable conditions, taking into consideration the costs and benefits. "Techniques" are the technologies used, operational practices, and ways in which installations are designed, built, maintained, operated and decommissioned.
77) "Best environmental practices" refers to the application of the most appropriate combination of environmental control measures and strategies.

with a particular problem is being rapidly eroded. Once the question has been asked, perceptions of the challenges that are due to arrive in the medium or long-term can help shape decisions about priorities. The issues considered in Part II of this document, in particular, could be a starting point for considering possible future waste challenges.

IDENTIFYING PRIORITIES FOR THE STRATEGY

Governments need to determine which of the **waste streams and/or waste issues** relevant to the country are in most need of attention: central to any strategy is determining which areas are more important than others and therefore should get more attention.

- As an example, MSW will be a priority for most countries. For any city, the provision of MSW services is a central factor in keeping the city operating. If most (or even many) cities in a country are failing that test, or coming close to failure; if urbanisation is an ongoing process in the country; or if waste generation rates are increasing; then MSW should become a national priority, thus receiving more attention and probably more resources.
- In another example, a single waste stream may get special priority, e.g. in a small island state that has wastes from the fishing industry and fish processing plants which are polluting local waters. Focusing on finding ways of avoiding generation of the waste or better ways of managing it is facilitated by identifying this particular waste stream as a national priority, and is a logical step in drawing up a national waste management strategy in such a context.
- It may be that an issue that cuts across many waste streams, such as the number of uncontrolled dumpsites or the illegal dumping of waste, is designated as a national priority.
- Most countries will have a number of waste management priorities which need urgent attention in a national strategy, while other waste streams and issues which need to be managed will be given a lower priority, and will not receive the same level of attention or resources.

Priority setting needs to deal both with **what is urgent and what is important**. For example, a waste stream causing immediate problems must get attention and receive priority treatment accordingly. However, other issues may have a longer-term impact, and while less urgent, present clear challenges to policy that will only grow if not addressed. An example might be a waste stream that is currently small but growing rapidly, and has become a problem elsewhere. E-waste, for example, is currently a problem in some countries and is growing rapidly in importance in others. Addressing these waste streams before they assume unmanageable proportions can be done effectively through a national strategy. A strategy can also become a vehicle for encouraging longer-term change through general shifts in attitude. As an example, the strategy could include an extended campaign to encourage people to think more carefully about their behaviour as consumers. A critical requirement of the review process for the strategy is that the choice of priorities be revisited, so that issues and waste streams previously set aside as lower priorities can now be re-examined and given the proper attention.

CHOOSING POLICY OPTIONS AND DRAFTING THE STRATEGY

It is necessary to ask a number of questions for each priority waste stream and issue once identified, taking into account the information already gathered and assembled in the baseline and/or situation and gap analysis, and the principles and policy tools explored in Part III:

- **How is the priority waste stream or issue managed at present?**
- **Is the waste stream or issue best managed at national, regional, or local level?**
- **How adequate is the current approach?**
  What information and data is currently available about the waste stream or issue?
- **How can the level of data and information be improved?**
  - Which organisation is best positioned to gather data and monitor progress?

- **For each priority waste stream, what are the opportunities for:**
  - Waste prevention or minimisation – reduction at source
  - Materials recovery and recycling
  - Improving the data and information about the waste stream.
- **For each priority waste stream:**
  - What options are likely to arise for waste minimisation and materials recovery in the future?
  - What options exist for management of the residual after prevention and recovery options have been exercised?
  - What targets should be adopted for the priority waste stream?
  - What actions are needed to achieve the targets? Who is best placed to take these actions? What policy tools and approaches should be applied to improve the management of the waste stream?
- **For each priority waste issue:**
  - What policy options are available to address the issue?
  - Which of those available is most likely to succeed?
- **What indicators can be used to measure progress?**
- **What needs to be done to gather the skills, capacities, and energies of the relevant interests? What should be done to build awareness and participation?**
- **What policies can be adopted in other areas that will support and complement the strategy (e.g. reducing tariffs on waste management technology and equipment, using industry policy measures to support industries developing such equipment)?**

The emphasis in this process should be on identifying and taking advantage of waste prevention opportunities first, and resorting to steps lower on the hierarchy only when the latter possibilities have been exhausted. Careful attention is needed to ensure that responsibility and resources are placed at the level where action can be most effective, whether it be local, regional, or national.

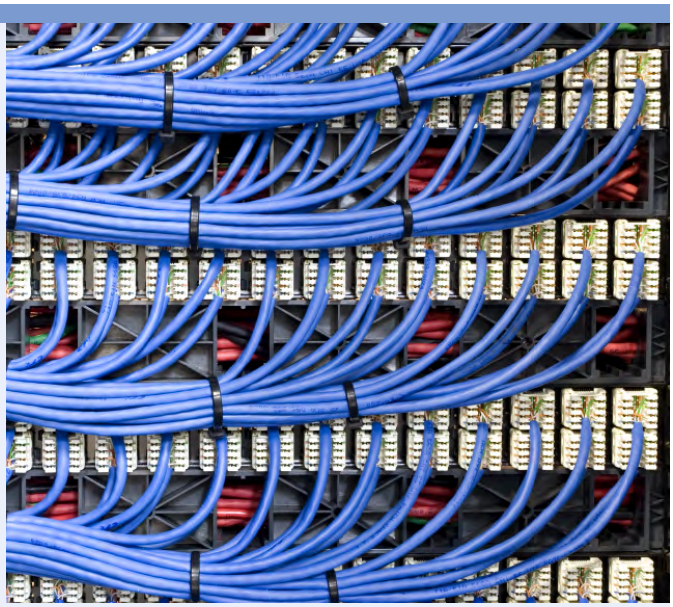
Policy choices about the management of each priority waste stream or issue should be carefully analysed when seeking answers to the above questions (as mentioned previously, the options discussed in Part III may be helpful in this process):

- **What are the implications of the leading options for each waste stream or issue?**
  - Environmental and health benefits
  - Technical considerations (e.g. what additional infrastructure might be needed)
  - Economic perspective (including green economy and "cost of inaction" considerations)
  - Role of government: legislative and other changes, level of government where responsibility should lie.
- **What are the financing options?**
  - Can an economic instrument be applied? Can costs be recovered (e.g. through charging waste generators)?
  - What spending will be required of governments and how can any funds be raised?
  - At what level is the financing challenge best met, e.g. national, regional, or local?
  - Are there suitable options for public/private partnerships? Microfinance?
- **What are the technological choices?**
  - Which technologies are suitable for the composition of the waste to be handled?
  - Which technologies are compatible with current and future recovery and recycling options?
  - Are the favoured technologies affordable (both initially and in operational costs)?
  - Is governance at each level adequate to manage the favoured technologies?
- **What are the implications for other government policy areas? Will other parts of government support the leading policy choices?**

At this stage, leading policy options can be identified for each priority waste stream and issue. In some cases, where the policy choices are not clear or the available data and information too limited, a variety of scenarios might be examined and further feasibility studies and other research might be undertaken. There is also an opportunity at this point of establishing more clearly and persuasively the benefits of strong waste management action, which both contributes to the strategy and to its potential to attract political support.

TEXT BOX 4.2

BUILDING A RELIABLE BODY OF DATA AND INFORMATION



© iStock.com

Reference has been made to the importance of data and information and the challenge involved in its collection. So where should a country with little reliable data begin?

The amount of data and information on waste management can increase in parallel with the development of the waste management system itself: as waste management improves, so should the information base on which future decisions will rely. At first the information collected may be sketchy and limited. A country that is beginning with a largely chaotic and disorganised waste sector should include certain crucial questions for each major settlement as the national government comes to grips with the challenge. These questions would include: How many dumpsites exist? How many are controlled and how many uncontrolled? How many (engineered) landfills and thermal treatment facilities exist?

A next step would be to begin collecting information on how much waste is going to the controlled dumpsites, landfills and other facilities (although probably not the uncontrolled dumpsites as no one would be there to collect data). This could initially include numbers of vehicles (trucks, carts), and eventually some estimates of the volume of each (average volume of a truckload or cartload of waste). This initial data would provide the basis for estimating waste quantities being consigned to waste disposal.

A basic waste composition study could be undertaken, for example, once a year at each controlled dumpsite, landfill or other facility. Continuing these studies over time would contribute data on waste composition, eventually with coverage of changes by region and season.

When a new landfill is constructed, a weighbridge should be considered for inclusion if possible. Even a single weighbridge can begin providing information on the weight rather than the volume of waste, if it is installed at a site where waste composition is reasonably representative of waste across the country.

By a series of incremental steps such as those described above, more accurate data can be built up over time. When a specific intervention is undertaken to manage a particular waste stream (e.g. by regulatory means or through an economic instrument – see Part III), the opportunity of including some means of collecting data should be taken whenever possible.

Once policy choices have been made, an **action plan** should be prepared for each waste stream or issue, with accurate budgets, and the responsibilities for giving it effect clearly identified.[78] The critical question to be asked as each policy choice is made (and also at other critical points in the strategy development process) is: "**How is the proposed action going to contribute to my final goal?**"

Policy tools from these action plans will need to be integrated into existing laws and regulations through appropriate amendments, or new laws and regulations introduced where relevant. The international aspect may also need to be considered, e.g. a particular policy approach may inadvertently create trade barriers, or a "take back" scheme

78) An example of guidance on action plan development is provided by UNITAR at http://www2.unitar.org/cwm/publications/inp.aspx. The guidance uses examples drawn from implementation of the Stockholm Convention but is generic in methodology.

that would be unlikely to succeed nationally may be able to be introduced for several countries of a single region.

In developing the action plan, **targets** should be set for priority waste streams or other priority issues, e.g. targets for moving from uncontrolled to controlled dumpsites or to properly engineered landfills. These targets, which can be used to drive action, create momentum, monitor progress and alert those implementing the strategy to problems. They should be "SMART" targets: specific, measurable, achievable, relevant, and time-bound.

Reference has been made to data and information, and their critical role in measuring progress and informing policy choices. Data is needed to set the baselines for strategy development, and there is little point in setting numerical goals and targets if no data is gathered to enable an informed conclusion on whether a given goal or target has been achieved. Building information and data on waste and waste management requires careful choices and allocation of effort, and as baseline data is important for all measures of progress, data collection needs to start at the initial stage of the strategy development process. To manage each waste stream and to determine if that management is successful, data needs to be gathered on the amounts of waste generated, the sources of the waste and the proportions of the waste stream going to different management options. Data will be at different levels of aggregation for national, regional, and local purposes. Data and information gathered during a baseline study and/or situation and gap analysis, as outlined above, is a starting point for future work.

SIGN-OFF AND APPROVAL

High level endorsement and commitment should be obtained at the appropriate stages, depending upon government processes and the political context. It is for each country to judge how often and when, according to such factors as the political system and context (and even based upon such details as the personalities and preferences of ministers). It may be appropriate to take stock of progress from time to time, in a structured way, depending on the course of events, in order to identify roadblocks and problems and keep the strategy development process on track. Another important step is to draw on the experience of other countries, and in turn share successes (and lessons learnt) with them.

Once the strategy has been developed it should be submitted to a full public consultation process, in which the public at large is made aware of the strategy and is invited to provide comment and feedback. While each country's individual circumstances will determine how this is done, a starting point for making the documents available could be through avenues such as local and village networks, existing community groups, local government, public libraries, mass media and the Internet.

The final step in strategy development is **political sign-off and approval**, which should be obtained after the full public consultation described above is complete. The outcome of the process is a national waste management strategy consisting of:

- An ambitious, overall framework and goal for waste generation and management in the country
- A list of priority waste streams and issues for the country
- An action plan for each waste stream or issue, comprising one or more targets, policy actions on prevention, materials recovery and management
- Accurate cost estimations for each action plan
- Clearly allocated responsibilities for giving effect to the actions identified
- A coordinated plan for building reliable data and information about waste in the country
- Plans for review (including indicators to measure progress) and revision of the strategy on a regular basis and as developments require.

A list of completed national waste management strategies from different countries and other supporting materials is presented in Annex C.

4.2

IMPLEMENTING A NATIONAL WASTE MANAGEMENT STRATEGY

It is at the implementation stage that many of the true obstacles to a successful waste management strategy may become apparent. More strategies and similar grand policy plans fail or fall short of the original intention at the implementation stage than at earlier developmental stages. The adoption of the strategy is an important step along a longer path.

ADOPTION AND LAUNCH

The process of implementation begins with the formal adoption and launch of the strategy. The launch should be accompanied by an appropriate public relations campaign.

EXECUTING AND MONITORING

Following adoption and launch, a number of other steps become important:

- Awareness raising and communication, first among stakeholders in waste management and among concerned sectors in government, followed by the wider community
- Assigning responsibilities and tasks among the players identified in the strategy
- Mobilising resources:
  - Economic instruments, including the charging of fees, introduction of tax incentives and disincentives
  - Investment incentives for the private sector and for public-private partnerships
  - Securing the necessary budget from government
  - Negotiating arrangements with relevant private sector participants
- Identifying and delivering any necessary legislative and regulatory changes
- Implementing action plans for priority waste streams
- Enforcement (in the case of laws or regulations)
- Gathering and recording of reliable information and data, and public dissemination.

The greatest risk in implementation is that after an initial burst of energy and commitment momentum and focus will be lost. Attention needs to be given, therefore, to ways of **maintaining momentum** and to the particular factors in successful implementation processes. Among the relevant aspects to be considered would be:

- Ways of retaining and refreshing political support, which needs to be sustained throughout the process. One example is ensuring that the strategy will deliver some tangible and politically attractive short-term results.
- Including some elements to provide support during implementation, e.g. specific follow-up on priority issues or task forces focused on particular problems or waste streams.
- Considering whether responsibility at the point of implementation needs to be shifted from those who developed the strategy, as implementation often requires a different set of skills.

Critical to successful implementation is **compliance and enforcement**. All the elements that are given effect through legislation and regulation need to be especially supported by firm and clear compliance activity to create the atmosphere of certainty and predictability that is essential to successful implementation. An inspectorate that can visit landfill and other critical waste disposal sites, for example,

4.3

REVIEWING AND UPDATING A NATIONAL WASTE MANAGEMENT STRATEGY

and ensure that they are in conformance with legislated standards, is an essential element in implementation, for which appropriate resources need to be allocated.

One essential element in effective implementation is a continuing focus on progress and on the existence of new obstacles. It is not possibly to simply "set and forget" a strategy. There is a need to **monitor progress** to ensure that the various components of the strategy are being given effect; that the action plans for the priority waste streams and issues are being pursued; that data is being gathered to enable informed decision-making; and that there is visible and measurable progress towards the targets. If the main committee used in developing the strategy is retained, its major task should be to receive and consider reports of progress, identify obstacles, and adjust policies and resource allocations to address failures, shortcomings and new challenges. If the main committee is not retained, a new committee or some alternative structure will need to be established and given this responsibility.

A national strategy requires frequent, or even constant, rethinking as part of the implementation process. Policy for different waste streams needs to be adjusted on a trial and error basis as some policy experiments will succeed and others will fail. In this context, a constant transfer of knowledge between research and innovation and policy makers is important in maintaining an effective waste management strategy. People and institutions learn from their failures, probably more than from their successes. There will be failures in implementation of a national strategy: the challenge is to be willing to **recognise the failures, rethink the actions** and make these failures opportunities for personal and institutional learning across the waste management system.

As noted above, critical challenges in waste management include responding to a dynamic policy environment and gathering sufficient data and information on waste and waste management to allow informed policy decisions. These matters are central to the review and updating of waste management policies, which may need to be undertaken, depending on circumstances, within two to five years after adoption of the strategy.

ASSESSING PROGRESS AND SUCCESS AND ADJUSTING THE STRATEGY

Assessment of the progress and success of the waste management strategy requires that **progress towards the goals and targets for waste management is measured and assessed**. This requires:

- Information and data on each waste stream and on the system as a whole
- A process for evaluation of progress, including the identification of barriers to success and assessment of the success or failure of particular initiatives
- Reporting of the results to governments and to stakeholders.

There is a potential conflict of interest if the body responsible for implementation of the strategy is also responsible for deciding whether progress is adequate: no body can be expected to pass judgment on itself. For that reason, it is desirable that a **formal evaluation** be conducted at arm's length from the implementation process, by a body that is independent from the strategy development and implementation process. This type of monitoring and evaluation

can be set up as a one-off exercise, or established on an ongoing basis (so that occasional reviews are conducted, or some form of continuing oversight), or it can be delegated to a national institution that is suited to the purpose, if such an institution exists.

It is also important to include a process by which elements of the waste management system are kept under more **informal review**, for example by tracking technological change among products or keeping waste management options under continuing scrutiny. The central questions to be asked in the review process are:

- **Have the goal and targets of the strategy been achieved?**
- **If not, why not?**

On the basis of this evaluation process, two kinds of specific markers of the need for change can be identified:

- Waste streams or waste issues where the strategy isn't working and may need revision, for example:
  - If it becomes clear that targets will not be met
  - If a waste stream is not responding, more generally, to the policy options chosen.
- Examples where **changes in the external environment** require a new or revised policy response include:
  - If changes in waste composition, consumer behaviour, or technology require some policy rethinking
  - If availability of labour or finance changes so much that significant change is required
  - If there is an impact from changes in other areas, whether positive (e.g. increases in prices for rare materials make recovery operations more profitable) or negative (e.g. worsening climate change makes policy choices more difficult or limited).

Where there are successes, it may be possible to **apply the successful approach to other waste issues or waste streams**. The priorities originally identified also need to be re-examined. Where there is a sufficient amount of change required, **updating** of the entire strategy may be the best option.

In some cases, policy will need to be reviewed on a wider scale: some issues are international in scope and some materials are traded on global markets. The way this aspect is managed depends in part upon the size of the country and its integration into the global economy.

TEXT BOX 4.3

EXAMPLES OF TABLES OF CONTENTS FOR A NATIONAL WASTE MANAGEMENT STRATEGY

COUNTRY A

- Executive summary
- Introduction and background
- Strategy development – the process
  - Identification of critical stakeholders
  - National waste management council
  - Development process
  - Approval and implementation
- National overview
  - Current status of waste management
  - Existing policy and regulations
- The strategy – critical elements
  - Goals, objectives, and targets
  - Scope and timing
  - Costs and resourcing
  - Relation to other strategies
- Priority waste streams and issues
  - Municipal solid waste
    - Roles of national and local government
    - Role of the informal sector
    - Targets for reduction in waste to landfill
    - Targets for improving landfill construction and management
  - Construction and demolition waste
  - Industrial, commercial and institutional waste
  - Waste electrical and electronic equipment
  - Packaging waste
  - Automotive waste
    - Used lead acid batteries
    - Waste oil
    - End-of-life vehicles
    - Tyres
  - Mining and mineral refining waste
- Other waste streams
- Special circumstances
  - Natural disaster
  - Waste management crisis
- Implementation strategy
  - Short-term, mid-term, long-term activities
  - Budget plan
  - Harnessing the energy of the informal sector and protecting the workers
  - Capacity building measures
  - Public engagement and education
- Monitoring and evaluation mechanism
- Review of the National Strategy
- Annexes
  - Annex 1: Glossary
  - Annex 2: Abbreviations
  - Annex 3: List of stakeholders

COUNTRY B

- Minister's introduction
- Executive summary
- Introduction to the strategy
  - Why do we need a national strategy for waste management?
  - Who was responsible for developing this strategy?
  - How is the national strategy to be put into effect?
- Waste management – where are we now?
  - The state of waste management in B
  - Existing legislation and policy
  - National capacities in critical areas
- Outlining a national waste management strategy
  - Deciding the scope and timing
  - Setting national goals and targets
  - Waste management and other issues
    - Public health
    - Environment including climate change
    - Employment
- Deciding priorities
  - What makes a waste stream or issue important?
  - Priority waste streams and issues for B
- Priority waste streams and action plans
  - Municipal solid waste
  - Construction and demolition waste
  - Agricultural and food processing waste
  - Waste from textile and tanning industries
- Waste governance issues
  - From dumpsite to landfill
  - Waste prevention and recycling
  - Reducing food waste
  - Extended producer responsibility in the textile and tanning industries
- Lower priority waste streams and issues
- Stakeholder attitudes and engagement
  - Education programs
  - Changing consumer attitudes
  - Engagement with producer industries – textiles, tanning, farming, food processing
- Implementation of the strategy
  - Endorsement and release
  - Financial resources
  - Program for legislative amendment
  - Compliance
  - Data gathering, monitoring, evaluation, and review

ANNEX A
INTERNATIONAL RECOMMENDATIONS AND MANDATES

In addition to the most recent endorsement of integrated waste management strategies by the United Nations Conference on Sustainable Development at Rio de Janeiro in June 2012, a number of other international recommendations and mandates similarly encourage national action on waste management Among the most recent and relevant mandates and recommendations are the following:

- The **Bali Declaration** on waste management for human health and livelihood[79] adopted by the Ninth Meeting of the Conference of the Parties to the Basel Convention at Bali, Indonesia in June 2008. The Declaration:
  - Recognized the threat to human health, the environment and sustainable livelihoods from waste not managed in an environmentally sound manner
  - Reaffirmed international commitment to the principles and purposes of the Basel Convention, as well as the need for cooperative approaches that take the Stockholm and Rotterdam Conventions into account
  - Noted the Convention's contribution to sustainable development through waste prevention and minimization, environmentally sound management of waste and management of the transboundary movement of waste
  - Renewed commitment by the Parties to waste prevention and minimization, the control of transboundary movements of hazardous waste and safe and environmentally sound management of waste as a means of addressing the threats to health and to livelihoods from the uncontrolled generation of hazardous and other waste.

79) http://archive.basel.int/meetings/cop/cop9/docs/39e-rep.pdf, Annex B.

- The **Cartagena Declaration on the prevention, minimization and recovery of hazardous waste and other waste**[80] adopted by the Tenth Meeting of the Conference of the Parties to the Basel Convention at Cartagena, Colombia in October 2011. The Declaration:
  - Committed to the promotion and implementation of strategies for preventing and minimizing waste, especially minimizing the generation of waste at source so as to decouple economic growth from the impacts associated with waste
  - Recognised the economic potential and benefits of waste recovery operations, where the generation of waste cannot yet be avoided
  - Recognised the importance to policy and decision-making of information on waste generation and management, and encouraged the collection and reporting of data on waste
  - Encouraged all the sectors involved to cooperate with each other to deliver better outcomes.

- A **strategic framework for the implementation of the Basel Convention for 2012-2021**, adopted by Decision10/2 at the tenth meeting the Conference of the Parties to the Basel Convention. The strategic framework, which forms an Annex to that Decision, includes among its elements:[81]
  - Recognising the waste management hierarchy and, in so doing, encouraging treatment options that deliver the best overall environmental outcome, taking into account life-cycle thinking

80) http://www.basel.int/Portals/4/Basel%20Convention/docs/meetings/cop/cop10/CartagenaDeclaration.pdf
81) http://www.basel.int/Admin/meetdocs/tabid/2311/Default.aspx?meetingId=1&languageId=1

- Using waste management policy tools, such as sustainable use of resources, recognition of waste as a resource, integrated waste management, the life-cycle approach, extended producer responsibility and the polluter pays, precautionary and proximity principles
- Ensuring that every party has national legislation and regulations in place, in addition to enforcement mechanisms, to control transboundary movements of hazardous and other waste and to prevent and combat illegal traffic
- Integrating waste management issues into national sustainable development strategies and plans for sustainable livelihoods.

- **Resolution WHA63.25[82] of the World Health Assembly** at its 63rd meeting, in May 2010. The Resolution:
  - Recognised the potential threat to human health from waste if not properly managed, or disposed of through incineration, in particular health-related waste
  - Supported the implementation of the Bali Declaration
  - Called for strategies to minimise the generation of health-related waste.

- **Decision 25/8 on waste management**[83] adopted by the UNEP Governing Council at its 25th meeting in 2010, which:
  - Supported integrated waste management
  - Encouraged implementation of the Bali Declaration.

- **Part IV of Decision 26/3**[84] adopted by UNEP's Governing Council meeting as the 2011 Global Ministerial Environment Forum, which:
  - Reiterated support for integrated approaches to waste management
  - Encouraged improvements in waste prevention and management, including in the field of e-waste.

Additional mandates and recommendations from decisions under regional agreements, may also be relevant for countries of particular regions. For example:

- **The Libreville Declaration on Health and Environment in Africa, Luanda Commitment** (26 November 2010) identified vector control and management of chemicals (particularly pesticides) and waste as among Africa's top health and environment priorities.
- **The Meeting of the Regional 3R Forum in Asia** in Tokyo in 2009 for the promotion of 3Rs in the Asian Region adopted a goal of mainstreaming the 3Rs in national development agendas and adopted priorities and actions in support of that goal.

There are other international agreements and instruments which, while not specifically focused on waste management, strongly influence waste management policy and contribute to the context in which it is developed. Among these agreements are the **United Nations Framework Convention on Climate Change and the Kyoto Protocol** (including action under these instruments, e.g. Nationally Appropriate Mitigation Action (NAMA) and the National Adaptation Program of Action on Climate Change (NAPA)); the **Convention on Biological Diversity**; and the **United Nations Declaration on the Rights of Indigenous Peoples**.

82) http://apps.who.int/gb/ebwha/pdf_files/WHA63-REC1/WHA63_REC1-P2-en.pdf
83) UNEP/GC.25/17, see http://www.unep.org/gc/gc25/working-docs.asp
84) http://www.unep.org/gc/gc26/docs/Proceedings/K1170817_E-GC26-19_Proceedings.pdf

ANNEX B
INTERNATIONAL TEXTS RELATING TO WASTE

OBLIGATIONS UNDER MULTILATERAL ENVIRONMENT AGREEMENTS

An important question for any country in developing an integrated waste management strategy will always be to consider what is necessary to ensure that the country meets international expectations, including its obligations under international treaties. International norms and obligations arise from several sources and take several forms:

- The principles of sustainable development and environmental policy, which are discussed in Part III of this document and set out in numerous different international texts, encapsulate internationally accepted approaches to policy choices.
- Treaty level instruments such as multilateral environmental agreements (MEAs) typically contain both specific and general obligations (This is explained below in more detail for the Basel Convention and several other international conventions).
- Normative texts adopted by international bodies, such as the UN and its subsidiary bodies, or the UNEP Governing Council, do not have binding force as international law but set out the policy norms and standards which countries are encouraged and expected to meet.

When countries determine their national waste policies, they must meet their binding obligations under international law. The principles and policy norms do not have the same binding force, but countries should only depart from these on an exceptional basis, after careful examination of the options and only where there is a compelling rationale for doing so.

THE BASEL CONVENTION ON TRANSBOUNDARY MOVEMENT OF HAZARDOUS WASTE AND THEIR DISPOSAL

The obvious starting point is the Basel Convention.[85] The Convention deals with hazardous waste but extends to "other waste", namely household waste and the ash from combustion of household waste (all of these together referred to here as "Convention waste"). The Convention contains both general and specific obligations: the specific obligations relate to the transboundary movement of Convention waste, but there are also general obligations, some of which relate to domestic activity.[86]

The main general obligations having a domestic focus, found in Article 4, are:

- Minimise the generation of Convention waste (Article 4.2(a)).
- Ensure that disposal facilities are available for Convention waste (Article 4.2(b)).
- Prevent pollution from facilities for the disposal of Convention waste (Article 4.2(c)).
- Ensure that people who handle and transport Convention waste are authorized to do so (Article 4.7(a)).

85) At 28 August 2012 there were 179 Parties to the Convention.
86) What follows is not intended to be an authoritative exposition of Convention obligations: each country needs to undertake its own analysis in the light of its circumstances and understanding of international law.

There are also general obligations focused on the transboundary movement of Convention waste, including abiding by the principles of the notification and consent regime, namely to:

- Inform other countries of any prohibitions of the import of waste (Article 4.1(a))
- Abide by any such prohibitions imposed by other countries (Article 4.1(b))
- Prevent export of waste to other countries unless they have consented to import (Articles 4.1(c) and 4.2(e))
- Prohibit any transboundary movement if it is suspected that the waste will not be managed in an environmentally sound manner (Articles 4.2(e) and 4.2(g))
- Minimise the transboundary movement of Convention waste (Article 4.2(d))
- Prohibit trade in Convention waste with non-Parties (Article 4.5)
- Require that Convention waste, when subject to transboundary movement, is packed and transported in accordance with international law, and that the movement is tracked (Article 4.7(b) and (c))
- Require that Convention waste subject to transboundary movement is managed in an environmentally sound manner (Article 4.8 and 4.10)
- Ensure that Convention waste is only exported when the country of export lacks the capacity to manage it, or the country of import needs it as raw material or in accordance with other criteria to be agreed by the Parties (Article 4.9).

In addition, Article 6 sets out specific rules relating to the system of notification and consent governing transboundary movement, and Article 7 extends that regime to transit through non-Party states. Other articles cover administrative support for the system (e.g. Article 5 provides for notification of competent authorities and focal points) and impose special requirements governing matters such as reimport of waste (Article 8) and illegal traffic (Article 9). Article 11 allows Parties to enter into new agreements with other countries covering transboundary movements of waste, or to abide by existing agreements, provided in each case the said agreements do not involve lower standards of protection than the Convention itself.

A substantial quantity of supporting material has been developed over the years in working groups under the Convention, providing a valuable resource for countries confronted by waste management problems related to issues covered by Convention waste. Among these guidance tools, the Technical Guidelines on priority waste streams are likely to be of particular value.

A Technical Expert Group under the Convention is currently developing a framework for environmentally sound management of hazardous and other waste, including standards, criteria, guidelines and tools for implementation. Strategies for addressing challenges will be part of the framework and supporting materials.[87]

THE STOCKHOLM CONVENTION ON PERSISTENT ORGANIC POLLUTANTS

The focus of the Stockholm Convention is to reduce or where possible eliminate releases of chemicals listed in the Convention's annexes.[88] Article 6 of the Convention deals with releases from stockpiles or waste. Obligations of the Parties to the Convention[89] can be summarised as follows:

- To identify wastes consisting of, containing or contaminated with listed POPs, and products and articles that contain POPs and will become waste
- To manage these stockpiles and waste ("POPs waste") safely, efficiently and in an environmentally sound manner
- To handle, collect, transport and store POPs waste in an environmentally sound manner
- To dispose of the POPs waste so that their POPs content is destroyed or irreversibly transformed (except where it is not environmentally preferable or where the level of contamination is low)
- To prevent any recovery or reuse of the POPs content
- To allow POPs waste to be transported internationally only in accordance with the rules governing such movements.

These rules apply with some variation to different categories of POPs (e.g. waste contaminated with the unintentionally produced by-products listed in Annex C to the Convention are not subject to all the above obligations), and there are in some cases additional considerations elaborated in the annexes with respect to particular POPs (e.g. Annex A includes detailed provisions governing recycling of articles containing the listed brominated diphenyl ethers[90]).

87) http://www.basel.int/TheConvention/MediaResources/NewsFeatures/TEG2outcomes/tabid/3001/Default.aspx

88) At the time of entry into force, twelve chemicals or groups of chemicals were listed as POPs in the Convention's annexes. Subsequently eleven further chemicals or groups of chemicals were added, and a further four are presently under consideration by the Conference of Parties. Article 25.4 allows Parties to lodge declarations that amendments to annexes (i.e. the addition of new chemicals to the Convention) may only come into force for them upon deposit of a separate instrument of ratification. Several Parties have lodged declarations to that effect. Further, under Article 22.3 Parties may deposit notifications of non-acceptance with respect to new annexes. As a result of these provisions, all Parties to the Convention do not necessarily have the same obligations at any given time with respect to chemicals that have been added to the Convention since its entry into force.

89) There were 179 Parties to the Stockholm Convention as at 30 May 2013.

90) Part IV of Annex A deals with hexabromodiphenyl ether and heptabromodiphenyl ether; Part V deals with tetrabromodiphenyl ether and pentabromodiphenyl ether.

Article 6 also includes an obligation for each Party to use its best efforts to identify sites contaminated with POPs, and, where remediation is undertaken, to ensure that it is environmentally sound.

Article 6.2 requires the Conference of the Parties to work with the Basel Convention on setting destruction levels for POPs waste; identifying appropriate destruction technologies; and setting limit values for POPs contaminants that warrant engaging the waste obligations in the Convention. Technical Guidelines have been issued by the Basel Convention dealing with these matters both in general terms and with respect to particular waste.[91] The Guidelines are currently being revised to include the newly listed POPs.

Other relevant obligations include the preparation and submission of a National Implementation Plan (Article 7) and a National Action Plan on Annex C POPs (Article 5(a)).

OTHER MULTILATERAL ENVIRONMENT AGREEMENTS

Several other MEAs also contain provisions that may impact a country's priorities in the development of a national waste management strategy. Each country should at least make sure that it is not inadvertently failing to meet its obligations to any of these MEAs.

The **Montreal Protocol on Substances that Deplete the Ozone Layer** obliges Parties to control the import, export, and use of the ozone-depleting substances (ODS) listed in the Convention. Articles 4 and 4A control trade with non-Parties and Parties respectively. Trade with non-Parties is essentially prohibited by Article 4, and Article 4A limits exports of ODS that have been phased out, other than those allowed under essential use provisions, to export for destruction. Although the Protocol does not oblige Parties to destroy holdings of ODS, the effect of the provisions on use and trade is that once a particular ODS is phased out stocks need to be destroyed. The Technology and Economic Assessment Panel of the Protocol has provided an expert assessment of destruction technologies to assist Parties, and has approved certain technologies for destruction of particular ODS.[92]

An International Negotiating Committee convened by UNEP has completed work on the **Minamata Convention on Mercury**, with the text to be formally adopted at a specially convened meeting in Kumamoto and Minamata in October 2013. The completed agreement includes a substantial article on storage, wastes and contaminated sites. Other provisions of the Convention may also be relevant to countries as they go about developing national waste management strategies.

OTHER INTERNATIONAL AGREEMENTS

Other international agreements may also have a bearing on a country's waste management policy. Several agreements under the **International Maritime Organisation** (IMO) deal with maritime waste. Although outside the scope of this guidance document, these agreements may nevertheless be relevant as they influence the range of wastes that have to be managed, e.g. waste taken off a ship when it docks after a voyage or the waste that results from recovery operations and recycling on a ship at end-of-life. The relevant agreements are:

- International Convention for the Prevention of Pollution from Ships and its Protocol (MARPOL), which governs (inter alia) the management of wastes arising from the normal operation of ships
- Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships, 2009
- London Convention (1972) and its 1996 Protocol, which deal with the dumping and incineration of waste at sea.

Each country needs to make its own decision as to whether to include maritime waste managed at sea in a national strategy. A country with a large coastline and a significant fishing industry, for example, may well consider that including maritime waste is important because of the contribution that waste from fishing vessels typically makes to the debris washing ashore on beaches and coasts.

Wastes loaded onto a ship for dumping at sea represent a diversion from a country's waste streams. Such actions need careful examination not only from an environmental but also from a policy point of view. The relevant international instruments strictly limit what Parties to those instruments may dump at sea. From a policy perspective the action is contrary to the precautionary principle, and if done on a continuing basis, represents an unsustainable course of action.

91) http://archive.basel.int/meetings/sbc/workdoc/techdocs.html
92) See the Reports of the 22nd and 23rd Meetings of the Parties, in particular Decision XXII/10 and Decision XXIII/12 and its Annex; see also paragraphs 40-47 and paragraphs 193, 196, and 200 and Annex II to the Report of the 22nd Meeting of the Parties, UNEP/OzL.Pro.22/9; and paragraphs 87-89, and 193, 199, and 200 of the Report of the 23rd Meeting of the Parties.

SUB-GLOBAL AND REGIONAL AGREEMENTS

Many countries have entered into **bilateral or multilateral agreements** with other countries on hazardous waste, mainly in order to cooperate regionally in hazardous waste management and provide enhanced regional protections against abuses connected with poorly controlled transboundary movements. For Parties to the Basel Convention, these agreements must meet the requirements of Article 11 of that Convention, i.e. the agreement should not provide a reduced standard of protection. These agreements will need to be taken into account when countries who are Parties to the Basel Convention develop waste management strategies. Several types of agreements can be identified, including:

- Agreements among neighbouring countries or covering a region, e.g. the Bamako, Waigani, US/Mexico, US/Canada and Central American conventions and agreements
- Agreements among countries not geographically linked – The countries of the Organisation for Economic Cooperation and Development have adopted Decision C(2001)107/FINAL dealing with the transboundary movement of hazardous waste among OECD countries.
- Within the European Union a considerable body of regulatory and related action governs many aspects of waste across all members, e.g. WEEE and RoHS. These regulatory actions are not focused on transboundary movements.

Regional agreements in areas other than waste may contain provisions relevant to waste management. There are, for example, ten **regional seas agreements** covering many of the globe's regions (Mediterranean, Kuwait Region, West and Central Africa, South-East Pacific, Red Sea and Gulf of Aden, Wider Caribbean, Eastern Africa, South Pacific, Black Sea, North-East Pacific). Protocols or action plans of Conventions often have solid waste as a priority. One example is the Convention for the Protection and Development of the Marine Environment in the Wider Caribbean Region (the Cartagena Convention), which entered into force in 1986. Article 6 relates to dumping of waste at sea from ships, and other articles, such as Article 7 on land-based pollution, carry implied obligations for waste management on land.

Regional action outside binding agreements also provides guidance and impetus from time to time on particular waste management issues. As an example, the Meeting of the **Regional 3R Forum in Asia** in Tokyo in 2009 promoted the adoption of the "3Rs" in the Asian Region, reaffirming and building on Agenda 21, the Johannesburg Declaration on Sustainable Development (2002) and the Johannesburg Plan of Implementation (2002). The meeting agreed on a number of long-term and short-term priorities:

- Mainstreaming the 3Rs in the national development agenda
- Mobilizing financial resources in cooperation with bilateral and multilateral aid agencies for the implementation of 3R measures and activities
- Developing human resources to address waste management issues
- Facilitating implementation, replication and scaling up of 3R-related pilot and demonstration projects and other good practices
- Collaborating with existing 3R information/research networks at both the national and international levels
- Promoting 3R business feasibility studies
- Conducting international collaborative, advanced policy-relevant scientific research on sound material cycles in Asia
- Capacity building, e.g. through international training programmes focusing on 3Rs for human resource development.

An additional example is the **Regional Seas Programme of UNEP**, which has been developing and implementing Regional Action Plans on Marine Litter, including capacity building for effective management, promoting public awareness and strengthening cooperation among governments, NGOs, and other stakeholders.

INTERNATIONAL POLICY TEXTS

Waste management, aside from transboundary movement issues, is mainly a national rather than international issue. It therefore receives limited international attention from international bodies. However, from time to time, especially but not exclusively in the sustainable development context, policy texts on waste or dealing in part with waste issues are adopted. These are, generally speaking "normative" texts that set policy norms or standards which are non-binding in international law but establish expectations for the policies that countries should adopt. Prominent texts from the past twenty years include:

Agenda 21,[93] adopted by the UN Conference on Environment and Development at Rio de Janeiro in June 1992 – Chapter 20 on environmentally sound management of hazardous wastes and Chapter 21 on environmentally

93) http://www.un.org/esa/dsd/agenda21/index.shtml

sound management of solid wastes are centrally relevant. Chapter 3 on combating poverty, Chapter 4 on consumption patterns and Chapter 7 on sustainable human settlements are also relevant.

The **Johannesburg Plan of Implementation**,[94] adopted by the World Summit on Sustainable Development at Johannesburg in May 2002 – Section III focuses on sustainable production and consumption. Paragraph 16 on cleaner production and eco-efficiency and paragraph 22 on waste management are especially relevant.

Mention was made in Part I of "The Future We Want", the outcome document from the **UN Conference on Sustainable Development**, held in Rio de Janeiro in June 2012. Paragraphs 213-223 deal with chemicals and waste, while paragraphs 215-219 are of particular relevance to waste management. The text endorses:

- Public-private partnerships in waste management
- Adopting a life-cycle approach and policies for resource efficiency and environmentally sound waste management
- Using approaches that recognise the 3Rs, increasing energy from waste and treating waste as a resource
- Preventing unsound management and illegal dumping of hazardous wastes
- Addressing the problems associated with electronic and plastic waste, in particular.

Other parts of the text address related issues such as sustainable consumption and production (paragraphs 224-226); sustainable cities and human settlements (paragraphs 134-137); and poverty eradication (paragraphs 105-107). Chapter III on the green economy (paragraphs 56-74) is also relevant for countries considering waste management policy options.

The Conference reaffirmed sustainable consumption and production as a cornerstone of sustainable development, and adopted the 10-year Framework of Programmes for Sustainable Consumption and Production as a concrete outcome.[95]

The 19th session of the **Commission on Sustainable Development** (CSD 19) focused on sustainable production and consumption.[96] Section C, paragraphs 30-44, deal with waste management, and offer quite detailed guidance, extending to particular waste streams (such as e-waste). Paragraph 38 identifies the central objective of waste management as the adoption of integrated policies that:

- Promote waste prevention and minimisation
- Support environmentally sound and efficient management, focusing on the 3Rs and the recovery of useful materials and energy
- Ensure disposal of residual waste in an environmentally sound manner.

The text supports the adoption of integrated waste management strategies and gives many explanations concerning what such strategies could include.

In the lead-up to CSD19, in the review year (2010 – CSD18), a number of intersessional activities were held focusing on waste management, including: an International Consultative Meeting on Expanding Waste Management Services in Developing Countries,[97] in Tokyo, Japan, in March 2010; and an Intersessional Meeting on Expanding Waste Management Services in Africa, held in Rabat, Morocco, in November 2010.[98] The latter meeting generated the Rabat Declaration on sustainable waste management. Following these two meetings, an Intersessional Conference on Building Partnerships for Moving towards Zero Waste was convened by the UN Centre for Regional Development in Tokyo, Japan, in February 2011.[99]

Hazardous waste may be hazardous for different reasons but many types are hazardous because they contain or are contaminated with hazardous chemicals. The **Strategic Approach to International Chemicals Management** (SAICM), adopted in February 2006 in Dubai, United Arab Emirates, is the central international text on overall chemicals management. Portions of the text deal specifically with hazardous waste issues, as well as other issues relevant to waste management. In the Global Plan of Action:

- Activities 68-73, 161-2, 258-62 and 272-3 concern waste management and minimisation.
- Activities 43-6, 118 and 238-42 cover cleaner production.
- Activities 47-8 and 243 cover contaminated sites and site remediation.
- Activities 119-123 deal with life-cycle issues.
- Several other activities relate to issues that may be relevant in particular situations.

The **Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities** (GPA) represents a common international understanding addressing the major causes of degradation of the marine environment from activities occurring on land. It focuses

94) http://www.un.org/esa/sustdev/documents/WSSD_POI_PD/English/POIToc.htm
95) http://www.unep.org/rio20/portals/24180/Docs/a-conf.216-5_english.pdf
96) http://www.un.org/esa/dsd/csd/csd_pdfs/csd-19/report-CSD19.pdf
97) http://www.uncrd.or.jp/env/spc/index.htm#International_Consultative_Meeting_Expanding_Waste_Management_Services
98) http://uncsd.iisd.org/news/rabat-declaration-adopted-on-sustainable-waste-management/
99) http://www.uncrd.or.jp/env/csd18_19.htm

on nine main sources of impacts on the marine environment, one which is directly waste-related (marine litter), while several others derive in part from waste on land.[100]

Acknowledging that both land based marine litter and litter originating from rivers and seas posed a vast and growing threat to the marine and costal environment, the **5th International Conference on Marine Debris** endorsed the **Honolulu Commitment**,[101] declaring that participants recognise the contribution of resource efficiency, principles of the green economy and integrated waste management as successful responses to the problems presented by marine debris.

While national strategy development draws on international resources, developing robust and effective integrated national waste management strategies can in turn make a contribution to international goals and programs. For example, such strategies contribute to progress towards **Millennium Development Goals**, notably those on poverty and water and sanitation.

One of the main outcomes of the UN Conference on Sustainable Development in 2012 was the agreement by member States to develop a set of **Sustainable Development Goals** (SDGs) that would build upon and complement the Millennium Development Goals. The process for the development of the SDGs has been launched and is envisaged to be finalized by 2015 in order to coincide with the post 2015 development agenda.

100) http://www.gpa.unep.org/gpa-pollutant-source-categories.html
101) http://www.unep.org/pdf/PressReleases/Honolulu_Commitment-FINAL.pdf

SAFEGUARD POLICIES OF THE MULTILATERAL DEVELOPMENT BANKS

All the multilateral development banks – World Bank, Inter-American Development Bank (IDB), Asian Development Bank (ADB), African Development Bank (AfDB) and European Bank for Reconstruction and Development (EBRD) – operate under safeguards designed to prevent and mitigate environmental and social harm in the development process. These safeguards are adopted by the boards of the Banks and are subject to regular reviews.

The World Bank has adopted environmental and social safeguard policies.[102] The International Finance Corporation (IFC) has performance standards that are applied to projects supported by the International Bank of Reconstruction and Development (IBRD)/International Development Agency and owned, constructed or operated by the private sector.[103] The IDB, AfDB, and EBRD have adopted similar safeguard systems.[104]

102) http://web.worldbank.org/WBSITE/EXTERNAL/PROJECTS/EXTPOLICIES/EXTSAFEPOL/0,,menuPK:584441~pagePK:64168427~piPK:64168435~theSitePK:584435,00.html
103) http://siteresources.worldbank.org/PROJECTS/Resources/40940-1244163232994/6180403-1340980612153/BoardApprovalIFC-PerformanceStandardsPPPs.pdf
104) http://www.iadb.org/en/insitutional-reforms/better-environmental-and-social-safeguards,1830.html;
http://www.afdb.org/en/documents/project-operations/environmental-and-social-safeguards-policies-and-procedures/; http://www.bicusa.org/en/Article.10943.aspx

ANNEX C
INTERGOVERNMENTAL AND INTERNATIONAL ORGANISATIONS AND MATERIALS

International organizations have the potential to contribute to the development of national waste management strategies by providing information, examples, ideas, advice, and at times assistance.

UNEP is the leading intergovernmental organisation with a broad interest in waste management. Several areas of UNEP have an interest:

- IETC has been given responsibility within UNEP for taking the lead on broad waste management policy, and for fostering the development of integrated national waste management strategies in particular. Among IETC's major initiatives is the Global Partnership on Waste Management[105] (GPWM).
- Among the MEAs, the Basel and Stockholm Conventions, as noted above, have provisions directly relevant to waste management. These two Conventions now operate an integrated secretariat function as a cluster of Conventions, along with the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade. The combined secretariat has a critical mass of staff and resources, supplying substantial supporting materials in relevant areas.
    - **Regional centres** have been set up under the **Basel and Stockholm Conventions** to assist countries in each region to meet their obligations. These centres can provide assistance, within their respective capabilities, on waste management issues relevant to their parent Convention.
    - Several individual countries have established networks to support and foster implementation, such as Japan, who has led and funded an Asian Network for the Prevention of Illegal Transboundary Movement of Hazardous Waste, with members drawn from East and South-East Asia.
- Other MEAs have capabilities within their area of responsibility, notably the Montreal Protocol Secretariat on the destruction of ODS. Negotiations recently reached completion with respect to the new Minamata Convention on Mercury. Once this Convention has entered into force, the secretariat will have an interest in mercury-containing waste. The Secretariat to the Convention on Biological Diversity has an ongoing interest, especially with regard to the impact of marine debris on biodiversity.
- The SAICM Secretariat has responsibility for facilitating the implementation of SAICM, including those elements relating to waste.

UNITAR is a training arm of the UN System, with a mission to deliver innovative training and conduct research on knowledge systems to develop capacities of beneficiaries in the fields of environment, peace, security and diplomacy and governance. Chemicals and waste are a particular focus within its environmental unit.

UN-Habitat is the UN agency for human settlements, charged with promoting socially and environmentally sustainable towns and cities. One of its major program areas is water sanitation and infrastructure and waste management is one of four focuses within that program. Habitat has focused in particular on MSW, in keeping with its mandate

105) See http://www.unep.org/ietc/OurWork/WasteManagement/tabid/56239/Default.aspx

concerning cities and towns. Its publication *Solid Waste Management in the World's Cities: Water and Sanitation in the World's Cities 2010* provides a comparative examination of solid waste management in 22 cities from different parts of the world.

The **World Bank** has taken a strong interest in urban solid waste management for many years. Extensive materials are available to support countries in areas such as strategic planning[106], cost analysis[107] and community engagement. The World Bank also provides several choices of financial assistance programmes to cities and countries on waste management issues.

The **United Nations Industrial Development Organization** (UNIDO) promotes industrial development in a context of poverty reduction, inclusive globalisation and sustainability. One aspect of sustainability to which it gives particular attention is cleaner production and waste minimisation in industry. Since 1992 UNIDO, in cooperation with UNEP, has established cleaner production centres in 47 developing and transition countries, to act as exemplars and advocates for cleaner production.

Other intergovernmental organisations also have an interest in waste management. The avenue through which many of these interests are likely to be engaged is the **Inter-Organization Program for the Sound Management of Chemicals** (IOMC), a mechanism for initiating, facilitating, and coordinating international action to achieve the 2020 goal of the World Summit on Sustainable Development for sound management of chemicals. The participating organisations of the IOMC are: the Food and Agriculture Organization of the United Nations (FAO), the International Labour Organization (ILO), the United Nations Development Programme (UNDP), UNEP, UNIDO, UNITAR, the World Health Organization (WHO), the World Bank and the Organisation for Economic Cooperation and Development (OECD). Although the IOMC's focus is chemicals, it provides a convenient portal for related activities, such as waste management, to be addressed internationally in a coordinated way. Moreover, it is important to note that the interests of the participating organisations in waste management extend beyond the IOMC's interests in chemical safety. The FAO, for instance, has a general interest in food and agriculture waste, while the WHO focuses on medical and health-related waste.

106) http://www.worldbank.org/urban/solid_wm/erm/start_up.pdf
107) http://documents.worldbank.org/curated/en/2001/02/1096687/cosepre-costs-urban-cleaning-services-users-manual-version-10-windows-98

The **Human Rights Council of the United Nations** appointed a Special Rapporteur on the human rights aspects of toxic and dangerous wastes and products in 1995. That mandate was broadened in 2011 to encompass the complete life-cycle of hazardous products. The Rapporteur has paid attention to a number of particular issues, including medical waste. In July 2011 the Special Rapporteur issued a report[108] on adverse effects of the movement and dumping of toxic and dangerous wastes and products on the enjoyment of human rights.

The **International Maritime Organization** (IMO) is responsible for maritime waste issues, and in particular for the conventions and protocols dealing with waste, as discussed above.

The **regional development banks** take a close interest in urban development, as does the World Bank. Considerable resources are available dealing in particular with solid waste management in cities. Examples include a range of materials developed by the Asian Development Bank and the Inter-American Development Bank as well as a number of ongoing projects.[109]

The **UN regional organisations** offer initiatives and programs in support of waste management including a variety of different priority areas, although in general the emphasis is on urban solid waste management. **Other regional cooperation programs** also operate in the waste management space, e.g. the Secretariat of the Pacific Regional Environment Programme (SPREP).

The **United Nations Centre for Regional Development** (UNCRD) undertakes a number of programs focused on waste, and especially on the "3Rs", working in close partnership with other organisations to deliver these programs.

The **OECD** has worked on waste management for many years and has a wealth of guidance documents, reports and databases specifically in the waste area, which are available at no cost.[110]

108) A/HRC/18/31.
109) See for example http://www.adb.org/publications/toward-sustainable-municipal-organic-waste-management-south-asia; http://www.iadb.org/en/topics/solid-waste/waste,2203.html
110) http://www.oecd.org/env/resourceproductivityandwaste/

Interpol has an Environmental Crime Committee, with a sub-committee dealing in particular with pollution-related crime, the Pollution Crime Working Group. This working group has given priority to countering illegal transboundary movements of hazardous waste.[111]

A number of international **non-governmental organisations** operate in the waste management area. Examples include:

- International Solid Waste Association[112] (ISWA), a global association of national non-governmental organisations, companies, and individuals with a professional interest in solid waste management
- International Waste Working Group[113] (IWWG), an international professional association
- Global Alliance for Incinerator Alternatives[114] (GAIA), which works closely with local communities to establish or support the development of sustainable waste management systems
- Institute for Global Environmental Strategies (IGES), a public interest foundation focused on sustainability in the Asia-Pacific region, with sustainable consumption and production as one of its main areas of activity[115]
- European Union Network for the Implementation and Enforcement of Environmental Law (IMPEL), an international non-profit association of environmental authorities from the European States which takes a strong interest in transfrontier movements of waste
- Basel Action Network,[116] an activist NGO network aimed at preventing the export of hazardous waste to developing countries
- International POPs Elimination Network (IPEN[117]), a global NGO network working in international chemical safety policy and implementation, to address hazards in the life-cycle of POPs, heavy metals, and other chemicals of concern.

Many other **networking initiatives** have been undertaken from time to time under various different headings. Examples include: the International Partnership for Expanding Waste Management Services for Local Authorities[118] (IPLA) under the leadership of the Asian Institute of Technology and the UN Centre for Regional Development (UNCRD); and the Solid Waste Exchange of Information and Expertise Network (SWEEP-Net), a regional network in the Middle East and North Africa (MENA) region dedicated to sharing experiences and expertise in order to improve waste management practices.

111) http://www.interpol.int/Crime-areas/Environmental-crime/Environmental-Crime-Committee/Pollution-Crime-Working-Group
112) http://www.iswa.org
113) http://www.tu-harburg.de/iue/iwwg/welcome.html
114) http://www.no-burn.org
115) http://www.iges.or.jp/en/index.html
116) http://www.ban.org/
117) www.ipen.org
118) http://www.uncrd.or.jp/env/spc/docs/UNCRD_IPLA_CSD19-SideEvent-12May2011-FINAL.pdf

ANNEX D
NATIONAL AND REGIONAL WASTE MANAGEMENT STRATEGIES AND RELATED DOCUMENTS AND WEB RESOURCES

Many countries have adopted waste management strategies, and others have been adopted by regions within countries, or have been developed for larger (supranational) regions. References are given below for some of these strategies, and for studies and overviews intended to assist countries to develop strategies and improve their waste management policies.

Their inclusion is not intended to be a recommendation to follow their example, for a number of reasons:

- Each country has its own circumstances, and the problems identified and solutions found by one country may not be applicable elsewhere.
- All countries find that some parts of their strategies work better than others, and frequent revision and reconsideration is usually needed.
- Whether a strategy is a success is not always apparent from the strategy itself: a strategy that appears sound on paper may turn out to be poorly adapted to the country's circumstances, waste issues or cultural context.
- At any given time, the strategies available to be studied are at different stages of implementation. It is not always apparent whether a strategy will be successful long term or not.

Nevertheless, the following documents and references, while varying in focus, level of detail and completeness, provide a wealth of ideas and varying examples of how waste management issues have been tackled by other countries or regions.

NATIONAL STRATEGIES

Some of the listed strategies were developed with the assistance of development assistance agencies of cooperating countries or multilateral bodies such as development banks. The references given sometimes refer to descriptive material about the strategy or its development rather than to the strategy itself.

Argentina: Proyecto Nacional para la Gestión Integral de los Residuos Sólidos Urbanos (PNGIRSU) (National Strategy for Integrated Management of Urban Solid Waste) http://www.ambiente.gov.ar/?idarticulo=4889

Australia: National Waste Policy http://www.environment.gov.au/wastepolicy/index.html

Belize: Belize Solid Waste Management Project – Policy, Legal and Administrative Framework http://www.doe.gov.bz/documents/EIA/Solid%20Waste/Co2%20SW%20Rev%20EIA%20Policy%20Legal%20and%20Admin%20FW.pdf

Brazil: National Solid Waste Policy http://www.brasil.gov.br/news/history/2010/08/02/brazil-approves-the-national-policy-on-solid-waste/newsitem_view?set_language=en; see also http://www.epa.gov/jius/policy/brazil/brazilian_national_solid_waste_policy.html

Czech Republic: The National Waste Management Plan in the Czech Republic biom.cz/cz/odborne-clanky/the-national-waste-management-plan-in-the-czech-republic-outstanding-opportunities-for-composting-and-mbt

Ethiopia: http://www.entwicklung.at/uploads/media/Ethiopia_Country_Strategy_2008-2012_02.pdf

Finland: National Waste Plan to the Year 2016 http://www.ymparisto.fi/default.asp?node=17719&lan=en

Grenada: National Waste Management Strategy Grenada http://ebookbrowse.com/national-waste-management-strategy-grenada-pdf-d258666295

Hungary: National Waste Management Plan for 2003-2008 http://www.kvvm.hu/szakmai/hulladekgazd/oht_ang.htm

Iraq: National Solid Waste Management Plan for Iraq http://warrr.org/1166/1/203.pdf (an international aid project)

Kazakhstan: National Strategy and Action Plan for Municipal Solid Waste Management http://eeas.europa.eu/delegations/kazakhstan/press_corner/all_news/news/2011/20110328_02_en.htm

Maldives: National Solid Waste Management Policy http://www.mvlaw.gov.mv/pdf/gavaid/minHousing/28.pdf

Malta: A Solid Waste Management Strategy for the Maltese Islands http://www.mrra.gov.mt/page.aspx?id=123; see also http://www.mepa.org.mt/waste-policy

Mexico: Programa Nacional para la Prevención y Gestión Integral de los Residuos 2009-2012 (SEMARNAT) (National Program for Integrated Waste Management) http://www.semarnat.gob.mx/programas/Documents/PNPGIR.pdf; see also http://www.lawyrs.net/files/publications/815-article03.pdf

Morocco: Institutional Development of the Municipal Solid Waste Sector http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/MENAEXT/0,,contentMDK:22873971~menuPK:3949116~pagePK:146736~piPK:226340~theSitePK:256299,00.html

Netherlands: National Waste Management Plan 2009-2021 http://www.bipro.de/waste-events/doc/events2010/NL/National%20WMP%20Netherlands%202009-2021.pdf

New Zealand: New Zealand Waste Strategy http://www.mfe.govt.nz/publications/waste/waste-strategy/

Peru: Plan Nacional de Gestión Integral de Residuos Sólidos (PLANRES) (National Plan for Integrated Waste Management) http://www.redrrss.pe/material/20090128201451.pdf; see also the Strategic Sectoral Plan for Solid Waste Management in Peru. Inter American Development Bank (IADB), 2009

Poland: 2010 National Waste Management Plan http://www.mos.gov.pl/g2/big/2009_06/e97e2a07ce29b48c19f462f83a6bf1a9.pdf

Republic of Korea: Integrated Waste Management Plan http://www.un.org/esa/dsd/dsd_aofw_ni/ni_pdfs/NationalReports/korea/WasteManagement.pdf

Romania: National Waste Management Strategy http://mmediu.ro/file/NationalWasteStrategy.pdf

South Africa: National Waste Management Strategy: http://www.wastepolicy.co.za

South Pacific: National strategies have been prepared for several members of SPREP: Fiji, Federal States of Micronesia, Guan, Kiribati, Nauru, Niue, Palau, Solomon Islands and Vanuatu. There is also a regional strategy for the South Pacific and focused strategies on certain waste-related issues, e.g. asbestos: http://www.sprep.org/Waste-Management-and-Pollution-Control/References/

Spain: Plan Nacional Integral de Residuos de España (PNIR) (National Integrated Waste Plan) http://www.magrama.gob.es/es/calidad-y-evaluacion-ambiental/planes-y-estrategias/Planes-y-Programas.aspx#para0

Swaziland: National Solid Waste Management Strategy for Swaziland: http://www.environment.gov.sz/files/nswms/wis_mainreport.pdf; http://www.environment.gov.sz/files/nswms/statusquo.pdf

Sweden: Strategy for Sustainable Waste Management http://www.naturvardsverket.se/Documents/publikationer/620-1249-5.pdf; see also http://www.naturvardsverket.se/sv/Start/Om-Naturvardsverket/Vara-publikationer/ISBN1/6500/978-91-620-6502-7/

Trinidad and Tobago: Integrated Solid Waste/Resource Management Policy for Trinidad and Tobago http://www.localgov.gov.tt/docs/TT%20MOLG%20SWM%20Policy%20-%20Final%20Draft%20Integrated%20Policy%2014%2011%2011.pdf

UK: Government Review of Waste Policy in England – 2011 Action Plan; Scotland's Zero Waste Plan (regional plans covering England and Scotland) http://www.defra.gov.uk/publications/2011/06/13/pb13542-waste-policy-action-plan/ and http://www.scotland.gov.uk/Publications/2010/06/08092645/0

Uzbekistan: National Waste Management Strategy http://www.undp.uz/en/projects/project.php?id=54 (UNDP project with NZ)

REGIONAL AND CITY-LEVEL STRATEGIES

- Indian plans and strategies for municipal solid waste and health-care waste: www.cpcb.nic.in
- Penang, Malaysia – Solid Waste Management Policy Framework
- Pacific Regional Waste Management Strategy: http://www.sprep.org/attachments/Pacific_RSWMS_2010-2015.pdf. There are also regional strategies for particular wastes, e.g. asbestos and e-waste
- Taiwan: Recycling and Waste Management Plan http://www.taiwan.gov.tw/ct.asp?xItem=27612&ctNode=1927&mp=1001

SUPRANATIONAL MATERIALS

- Collaborative Working Group on Solid Waste Management in Low and Middle-Income Countries: www.cwgnet.net
- EU: guidance document *Preparing a Waste Management Plan – A Methodological Guidance Note* http://ec.europa.eu/environment/waste/plans/index.htm
- A substantial number of other reports and publications relating to waste are available from the European Union. Many can be found on the publications list of the European Environment Agency, at http://www.eea.europa.eu/publications
- IADB, PAHO and AIDIS (2010). *Regional Assessment of Solid Waste Management in Latin America and Caribbean Countries*
- IGES: *3R Strategies for Seven Countries in Asia* http://enviroscope.iges.or.jp/modules/envirolib/upload/2637/attach/national_3r_strategy_development(fullversion).pdf
- SWEEP-Net: *The Solid Waste Management Situation in Mashreq and Maghreb Countries: Update on the Challenges and Opportunities*, http://www.sweep-net.org/?q=node/161
- UNEP: Report on the Green Economy, especially, but not only, the chapter on waste: http://www.unep.org/greeneconomy/greeneconomyreport/tabid/29846/default.aspx

DOCUMENTS IN RELATED AREAS

Many information resources, originating from national and international organisations and academic and NGO sources, have been referenced throughout the guidance document. A multitude of other sources are also available, and a few are listed below:

- Colombia: policy on sustainable production and consumption. Available at: http://www.minambiente.gov.co/documentos/normativa/ambiente/politica/polit_nal_produccion_consumo_sostenible.pdf
- Deutsche Gesellschaft fuer Internationale Zusammenarbeit (GIZ): publications at http://www.giz.de/Themen/en/4991.htm
- European Environment Agency (2011). *Earnings, Jobs and Innovation: the Role of Recycling in a Green Economy*. EEA Report No. 8/2011. Available at: http://www.eea.europa.eu/publications/earnings-jobs-and-innovation-the
- International Solid Waste Association (ISWA): case studies and reports at: http://www.iswa.org/en/76/publications.html.
- Scheinberg, A. (2012). *Informal Sector Integration and High Performance Recycling: Evidence from 20 Cities*, Women in Informal Employment Globalizing and Organizing (WIEGO): 2012, pp. 33. Available at: http://wiego.org/sites/wiego.org/files/publications/files/Scheinberg_WIEGO_WP23.pdf
- UNEP: Information Platform – Global Partnership on Waste Management http://www.unep.org/gpwm/InformationPlatform/tabid/56405/Default.aspx
- UNEP/Delft University of Technology (2006). *Design for Sustainability. A Practical Approach for Developing Economies*. Available at: http://www.unep.fr/shared/publications/pdf/DTIx0826xPA-D4SapproachEN.pdf
- UNEP (2011). *Green Economy – Developing Countries Success Stories*. Available at: http://www.unep.org/pdf/GreenEconomy_SuccessStories.pdf
- UNEP (2012). *Global Outlook on Sustainable Consumption and Production Policies*. Available at: http://www.unep.org/pdf/Global_Outlook_on_SCP_Policies_full_final.pdf
- UNEP (undated) *Design for Sustainability (D4S). A Step-by-Step Approach*. Available at: http://www.d4s-sbs.org
- UN-HABITAT (2011). *Collection of Municipal Solid Waste, Key issues for Decision-makers in Developing Countries*. Available at: http://www.unhabitat.org/pmss/listItemDetails.aspx?publicationID=3231
- UN-HABITAT (2010). *Collection of Municipal Solid Waste in Developing Countries*, 2nd ed. UN-Habitat Nairobi, Kenya. Available at: http://www.unhabitat.org/pmss/listItemDetails.aspx?publicationID=3072
- WASTE: publications http://www.waste.nl/en/products

GLOSSARY

Agenda 21: Agenda 21 is a comprehensive plan of action to be taken globally, nationally and locally by organisations of the United Nations system, governments, and Major Groups in every area in which humans impact on the environment. It was adopted by more than 178 governments at the United Nations Conference on Environment and Development (UNCED) held in Rio de Janeiro, Brazil, in June 1992.[119]

Agricultural waste: Waste produced from the raising of plants and animals for food, including manure, plants stalks, hulls and leaves.[120]

Anaerobic digestion: The biological conversion of processed organic waste to methane and carbon dioxide under anaerobic conditions.[121]

Biogas: Gas, rich in methane, resulting from the fermentation process of biological degradation of organic matter in the absence of oxygen. Biogas can be recovered to produce heat and/or electricity.[122]

Clean Development Mechanism (CDM): Defined in Article 12 of the Kyoto Protocol, the CDM is intended to meet two objectives: (1) to assist parties not included in Annex I in achieving sustainable development and in contributing to the ultimate objective of the convention; and (2) to assist parties included in Annex I in achieving compliance with their quantified emission limitation and reduction commitments. Certified Emission Reduction Units from CDM projects undertaken in Non-Annex I countries that limit or reduce GHG emissions, when certified by operational entities designated by Conference of the Parties/Meeting of the Parties, can be accrued to the investor (government or industry) from parties in Annex B. A share of the proceeds from certified project activities is used to cover administrative expenses as well as to assist developing country parties that are particularly vulnerable to the adverse effects of climate change to meet the costs of adaptation.[123]

Cleaner production: Defined by UNEP as "the continuous application of an integrated environmental strategy to processes, products and services to increase efficiency and reduce risks to humans and the environment". It aims at resource efficiency but also explicitly addresses and strives to reduce the use of hazardous substances in products and their production processes, and generation of emissions and wastes.

Collection: Gathering of waste, including the preliminary sorting and preliminary storage of waste for the purpose of transport to a waste treatment facility.[124]

Commercial solid waste: Wastes generated by commercial establishments including wholesale, retail, or service establishments such as stores, offices, markets, hotels, restaurants and warehouses, etc.[125]

119) UNEP (2010). *ABC of SCP: Clarifying Concepts on Sustainable Consumption and Production*.
120) Tchobanoglous, G., Vigil, S.A. and Theisen, H. (1993). *Integrated Solid Waste Management – Engineering Principles and Management Issues.* McGraw-Hill International Editions.
121) Tchobanoglous, G., Vigil, S.A. and Theisen, H. (1993). *Integrated Solid Waste Management – Engineering Principles and Management Issues.* McGraw-Hill International Editions.
122) Chalmin, P. and Gaillochet, C. (2009). *From Waste to Resource: World Waste Survey*. Economica Ltd.
123) Metz, B., Davidson, O.R., Bosch, P.R., Dave, R., Meyer, L.A., (eds.), (2007). *Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change.* Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.
124) Chalmin, P. and Gaillochet, C. (2009). *From Waste to Resource: World Waste Survey*. Economica Ltd.
125) Adapted from the following: UNEP (2005). *Integrated Waste Management Scoreboard – a Tool to Measure Performance in Municipal Solid Waste Management – Integrated Solid Waste Management – Engineering Principles and Management Issues.* McGraw-Hill International Editions.

Composting: The controlled, biological decomposition of organic solid waste materials under aerobic conditions.[126]

Construction and demolition (C&D) waste: Waste from the process of construction, demolition or repair of houses, commercial buildings, roads, bridges, etc.[127]

Consumer preferences: A consequence of consumer choice, guiding the acquisition of a good or service on the basis of the information available. This may include the preference not to consume at all.[128]

Controlled dumpsite: Dumpsite that has been upgraded to incorporate some of the practices associated with sanitary landfills such as siting with respect to hydrogeological suitability, grading, compaction in some cases, leachate control, partial gas management, regular (not usually daily) cover, access control, basic recordkeeping and controlled scavenging.[129]

Cradle-to-cradle: It focuses, first and foremost, on defining the intention behind the design of a product in terms of its *positive* impact, i.e. its social, economic and environmental benefits. The cradle-to-cradle concept proposes a complete move away from the linearity of the "cradle-to-grave" model of the life-cycle approach. This approach moves towards a circular concept based on a model taken from the natural world: i.e. residual materials from the metabolism of one organism constitute food for another organism, without the loss of quality that would eventually render them useless. Rather than ultimately ending up as waste, the materials in a product at the end of its use period begin a new life in a new cycle, at the same (or even higher) level of quality, *time and again*. As waste equates to food, cradle-to-cradle thereby eliminates the very *concept* of waste. In order to apply this approach to products and services: materials must have a known, well defined chemical composition; materials must be either biological nutrients (i.e. safe to return into a natural biological cycle) or technological nutrients; and the products must be designed for easy disassembly. Such a cycle calls for new forms of interaction along the supply chain of products, where respect, trust, and partnership play a prominent role.

Decoupling economic growth from resource consumption: Decoupling refers to the relationship between (1) economic variables, such as Gross Domestic Product (GDP) or the Human Development Index (HDI), and (2) resource use. *Resource decoupling* refers to reducing the relationship between economic growth and the consumption of land, material, water and energy resources, and the generation of waste.[130]

Design for sustainability/Design strategy: Design for sustainability takes eco-design approaches further and addresses the social dimension of sustainability in the design process. It also encompasses the broader issue of how best to meet needs (functionality) with minimal environmental and social impacts, rather than focusing on improving existing products.[131]

Disposal: The discharge, deposit, dumping, spilling, leaking or placing of any solid waste into or in any land.[132] – The final handling of solid waste, following collection, processing or incineration. Disposal most often means placement of wastes in a dump or a landfill.[133]

Disposal site: A site where solid waste is finally discharged and deposited.[134]

Ecodesign: It is an approach which includes the considerations of resource efficiency and reduction of risks, in addition to focusing on design features which incorporate: extension of the product use period, design for disassembly, repair or upgrading (thus phasing out components that prevent reuse or recycling) and constructing a product from materials that can serve as inputs to another process.

Eco-efficiency: Indicates a focus on delivering the same or increasing levels of goods and services at a reduced material and energy intensity, with a reduced impact on the environment.

Eco-innovation: This concept refers to any form of innovation resulting in or aimed at significant and demonstrable progress towards the goal of sustainable development, through reducing impacts on the environment, enhancing resilience to environmental pressures or achieving a more efficient and responsible use of natural resources.[135]

126) Tchobanoglous, G., Vigil, S.A. and Theisen, H. (1993). *Integrated Solid Waste Management – Engineering Principles and Management Issues.* McGraw-Hill International Editions.
127) UN-HABITAT (2010). *Solid Waste Management in the World's Cities.*
128) UNEP (2010). *ABC of SCP: Clarifying Concepts on Sustainable Consumption and Production.*
129) UNEP (2005). *Solid Waste Management (Volume I). UNEP (2005). Integrated Waste Management Scoreboard – a Tool to Measure Performance in Municipal Solid Waste Management.*
130) Adapted from: UNEP (2010). *ABC of SCP: Clarifying Concepts on Sustainable Consumption and Production.*
131) UNEP (2010). *ABC of SCP: Clarifying Concepts on Sustainable Consumption and Production.*
132) UNEP (2005). *Training Modules - Closing of an Open Dumpsite and Shifting from Open Dumping to Controlled Dumping and to Sanitary Landfilling.*
133) UNEP (2005). *Solid Waste Management* (Volume I).
134) UNEP (2005). *Training Modules – Closing of an Open Dumpsite and Shifting from Open Dumping to Controlled Dumping and to Sanitary Landfilling.*
135) COM (2011) 899 Final – Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions – *Innovation for a Sustainable Future – The Eco-Innovation Action Plan (Eco-AP).*

Eco-labelling: Whereby products are required to be labelled with information about their impacts on health and the environment.

Economic instruments: A monetary incentive or disincentive to act in a manner supportive of policy objectives.[136]

Electronic waste/E-waste/Waste Electrical and Electronic Equipment (WEEE): Generic term encompassing various forms of electrical and electronic equipment that have ceased to be of value and are disposed of. A practical definition of e-waste is "any electrically empowered appliance that fails to satisfy the current owner for its originally intended purpose".[137]

Energy recovery: The process of extracting useful energy from waste, typically from the heat produced by incineration or via methane gas from landfills.[138]

Environmentally sound waste management: Waste management which must go beyond the mere safe disposal or recovery of wastes that are generated and seek to address the root cause of the problem by attempting to change unsustainable patterns of production and consumption. This implies the application of the integrated life cycle management concept, which presents a unique opportunity to reconcile development with environmental protection.[139]

Extended producer responsibility: Making producers responsible for their products at the end of the use phase in their life-cycle.

Food waste: Animal and vegetable waste resulting from the handling, storage, sale, preparation, cooking and serving of waste.[140]

Governance: The way government is understood has changed in response to social, economic and technological changes over recent decades. There is a corresponding shift from government defined strictly by the nation-state to a more inclusive concept of governance, recognizing the contributions of various levels of government (global, international, regional, local) and the roles of the private sector, of non-governmental actors and of civil society.[141]

Green economy: UNEP defines a green economy as one that results in "improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities".[142]

Green waste: Vegetable matter resulting from the tending, maintenance or creation of public or private gardens, and green areas and organic waste generated by professional or municipal horticultural activities.[143]

Hazardous and toxic waste: Substances or objects which are disposed of, intended to be disposed of, or required to be disposed of by the provisions of national law and which possess certain hazardous characteristics, such as (but not limited to) being toxic, explosive, corrosive or reactive. The generation and management of such waste may cause adverse effects on human health and the environment whether by itself or when coming into contact with other waste. Hazardous waste, therefore, requires special handling and must be disposed of in an environmentally sound manner. Generation, management and transboundary movements of hazardous waste should be dealt with according to procedures set out under the Basel Convention (1989). Domestically, additional requirements, restrictions or prohibitions may also exist.[144]

Health-care waste (medical waste): Waste generated by health care activities includes a broad range of materials, from used needles and syringes to soiled dressings, body parts, diagnostic samples, blood, chemicals, pharmaceuticals, medical devices and radioactive materials.[145]

Incineration plant: Any stationary or mobile technical unit and equipment dedicated to the thermal treatment of wastes with or without recovery of the combustion heat generated. This includes the incineration by oxidation of waste as well as other thermal processes such as pyrolysis, gasification or plasma process in so far as the substances resulting from the treatment are subsequently incinerated.[146]

Industrial waste: Solid waste that results from industrial processes and manufacturing.[147]

136) UNEP (2010). ABC of SCP: Clarifying Concepts on Sustainable Consumption and Production.
137) UNEP (2007). *Global Environmental Outlook 4.*
138) UNEP (2005). *Solid Waste Management* (Volume I).
139) Agenda 21 – Chapter 21 - http://sustainabledevelopment.un.org/content/documents/Agenda21.pdf
140) Tchobanoglous, G., Vigil, S.A. and Theisen, H. (1993). *Integrated Solid Waste Management – Engineering Principles and Management Issues.* McGraw-Hill International Editions.
141) Metz, B., Davidson, O.R., Bosch, P.R., Dave, R., Meyer, L.A. (eds.), (2007). *Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change.* Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.
142) UNEP (2010). *Green Economy Developing Countries Success Stories.*
143) Chalmin, P. and Gaillochet, C. (2009). *From Waste to Resource: World Waste Survey.* Economica Ltd.
144) UNEP (2010). ABC of SCP: *Clarifying Concepts on Sustainable Consumption and Production.*
145) WHO – http://www.who.int/topics/medical_waste/en/
146) Chalmin, P. and Gaillochet, C. (2009). *From Waste to Resource: World Waste Survey.* Economica Ltd.
147) UNEP (2005). *Integrated Waste Management Scoreboard - A Tool to Measure Performance in Municipal Solid Waste Management.*

Informal sector: The part of an economy that is characterised by private, usually small-scale, labour-intensive, largely unregulated, and unregistered manufacturing or provision of services.[148]

Integrated solid waste management: Refers to the strategic approach to sustainable management of solid wastes, covering all sources and all aspects, including generation, segregation, transfer, sorting, treatment, recovery and disposal in an integrated manner, with an emphasis on maximising resource efficiency.

Numerous countries are facing uphill challenges to properly manage their waste, with most efforts being made to reduce the final volumes and to generate sufficient funds for waste management. If most of the waste could be diverted for material and resource recovery, then a substantial reduction in final volumes of waste could be achieved and the recovered material and resources could be utilised to generate revenue to fund waste management. This forms the premise for an Integrated Solid Waste Management (ISWM) system based on the 3R (reduce, reuse and recycle) principle.[149]

Landfill: A landfill is a solid waste disposal site where waste is deposited below, at or above ground level. The term is limited to engineered sites with cover materials, controlled placement of waste and management of liquids and gases. It excludes uncontrolled waste disposal.[150]

Leachate: Liquid that has percolated through solid waste or another medium and has extracted, dissolved or suspended materials from it. Because leachate may include potentially harmful materials, leachate collection and treatment are crucial at municipal waste landfills.[151]

Life-cycle approach: Examines a product and its passage through distinct stages of a life-cycle from the very beginning: extraction of raw materials, manufacture, packaging, transport, distribution, sale, use and end-of-life, when it enters into the waste management system and the later phases of the waste hierarchy.

Life-cycle assessment includes an inventory of raw materials input, process chemicals, energy and water as well as an inventory of emissions and waste generation, and their respective environmental impacts, during each life-cycle stage. Every stage of the life-cycle offers opportunities for interventions to prevent or reduce waste amounts and/or their level of hazard.

Life-cycle thinking: Life-cycle thinking expands the traditional focus on the production site and manufacturing processes and incorporates various aspects over a product's entire life-cycle from cradle to cradle (i.e. from the extraction of resources, through the manufacture and use of the product, to the final processing of the disposed product).[152]

Low carbon economies/societies: A low carbon economy is defined as a new economic, technological and social system of production and consumption to conserve energy and reduce greenhouse gas emissions, compared with the traditional economic system, whilst maintaining momentum towards economic and social development.[153]

Material recovery: Utilisation of all or parts of waste as a replacement for a component material.[154]

Multilateral environmental agreements (MEAs): Treaties, conventions, protocols or contracts among several states to jointly agree on activities regarding specified environmental problems.[155]

Municipal solid waste: All solid waste generated in an area except industrial and agricultural wastes. It sometimes includes construction and demolition debris and other special wastes that may enter the municipal waste stream, and generally excludes hazardous wastes, except to the extent that they enter the municipal waste stream. It is sometimes defined to mean all solid wastes that a city authority accepts responsibility for managing in some way.[156]

NIMBY: 'Not in my backyard'. An expression of resident opposition to the siting of a solid waste facility based on the particular location proposed.[157]

Open burning: The practice of setting fire to waste.[158]

Open dumpsite: A disposal area wherein the solid wastes are indiscriminately thrown or disposed of without due planning and consideration and health standards.[159]

148) UNEP (2005). *Solid Waste Management* (Volume I).
149) UNEP (2010). *ABC of SCP: Clarifying Concepts on Sustainable Consumption and Production.*
150) Metz, B., Davidson, O.R., Bosch, P.R., Dave, R., Meyer, L.A. (eds.), (2007). *Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change.* Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.
151) UNEP (2005). *Training Modules - Closing of an Open Dumpsite and Shifting from Open Dumping to Controlled Dumping and to Sanitary Landfilling.*
152) UNEP (2010). *ABC of SCP: Clarifying Concepts on Sustainable Consumption and Production.*
153) UNEP (2010). *ABC of SCP: Clarifying Concepts on Sustainable Consumption and Production.*
154) Chalmin, P. and Gaillochet, C. (2009). *From Waste to Resource: World Waste Survey.* Economica Ltd.
155) UNEP (2007). *Global Environmental Outlook 4.*
156) UNEP (2005). *Solid Waste Management* (Volume I).
157) UNEP (2005). *Solid Waste Management* (Volume I).
158) UNEP (2005). *Integrated Waste Management Scoreboard - a Tool to Measure Performance in Municipal Solid Waste Management.*
159) UNEP (2005). *Training Modules - Closing of an Open Dumpsite and Shifting from Open Dumping to Controlled Dumping and to Sanitary Landfilling.*

Persistent Organic Pollutants (POPs): Chemicals that remain intact in the environment for long periods, become widely distributed geographically, accumulate in the fatty tissue of living organisms and are toxic to people and wildlife. POPs circulate globally and can cause damage wherever they travel.[160]

Policy: Any form of intervention or societal response. This includes not only statements of intent but also other forms of interventions, such as the use of economic instruments, market creation, subsidies, institutional reform, legal reform, decentralization and institutional development. Policy can be seen as a tool for the exercise of governance. When such an intervention is enforced by the state, it is called public policy.[161]

Polluter pays principle: states that those who cause or generate pollution should bear the cost of it.[162] In the waste management context, the principle means that those who generate waste should bear the cost of managing it so that it does not pose risks to human health and the environment.

Post-consumer waste: Waste from consumption activities, e.g. packaging materials, paper, glass, rests from fruits and vegetables, etc.[163]

Precautionary principle: The most common formulation is that of Principle 15 of the Rio Declaration on Environment and Development, adopted at the United Nations Conference on Environment and Development in 1992: "In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation."

Principle of intergenerational equity: In the context of waste, implies that waste should not be managed so as to bequeath legacy problems to subsequent generations.

Principle of intragenerational equity: refers to the sharing of resources equitably among people (and internationally, among countries). In the context of waste management, it suggests equitable access to services for all citizens, equitable possibilities for all interested parties to provide services, as well as equitable burden-sharing in terms of location of waste management facilities.

Proximity principle: States that, wherever possible, waste should be managed close to where it is generated.[164]

Recyclables: Items that can be reprocessed into feedstock for new products. Common examples are paper, glass, aluminium, corrugated cardboard and plastic containers.[165]

Reduce-reuse-recycle (3Rs): The 3R Initiative aims to promote the "3 Rs" (reduce, reuse and recycle) globally so as to build a sound-material-cycle society through the effective use of resources and materials. Agreed upon at the G8 Sea Island Summit in June 2004, it was formally launched at a ministerial meeting in Japan in the spring of 2005. **Reducing** means choosing to use things with care to reduce the amount of waste generated. **Reusing** involves the repeated use of items or parts of items which still have usable aspects. **Recycling** means the use of waste itself as resources. Waste minimisation can be achieved in an efficient way by focusing primarily on the first of the 3Rs, "reduce," followed by "reuse" and then "recycle".[166]

Resource efficiency: The goal of resource efficiency is to rethink the life-cycle of a product from the perspective of the resources that go into each stage, since losing resources as waste is inefficient. That may include rethinking the entire design and asking whether the functions that the product provides to the consumer can be delivered in some other way.

Sanitary landfill: An engineered disposal facility designed, constructed, operated in a manner that minimizes impacts to public health and the environment.[167]
– An engineered method of disposing of solid waste on land, in a manner that meets most of the standard specifications, including sound siting, extensive site preparation, proper leachate and gas management and monitoring, compaction, daily and final cover, complete access control and recordkeeping.[168]

Self-sufficiency principle: States that each country (or, potentially, each region or city) should, wherever possible, manage its own waste.[169]

Sludge: A semisolid residue from air or water treatment processes.[170]

160) UNEP (2007). *Global Environmental Outlook 4.*
161) UNEP (2007). *Global Environmental Outlook 4.*
162) A version of the Principle is incorporated in Principle 16 of the Rio Declaration on Environment and Development.
163) Metz, B., Davidson, O.R., Bosch, P.R., Dave, R., Meyer, L.A. (eds.), (2007). Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.
164) This principle derives from Article 4 of the Basel Convention on Control of the Transboundary Movement of Hazardous Wastes and their Disposal.
165) UNEP (2005). *Solid Waste Management* (Volume I).
166) UNEP (2010). *ABC of SCP: Clarifying Concepts on Sustainable Consumption and Production.*
167) UNEP (2005). *Training Modules – Closing of an Open Dumpsite and Shifting from Open Dumping to Controlled Dumping and to Sanitary Landfilling.*
168) UNEP (2005). *Solid Waste Management* (Volume I).
169) This principle derives from Article 4 of the Basel Convention on Control of the Transboundary Movement of Hazardous Wastes and their Disposal.
170) UNEP (2005). *Training Modules – Closing of an Open Dumpsite and Shifting from Open Dumping to Controlled Dumping and to Sanitary Landfilling.*

Solid waste: Any of a wide variety of solid materials, as well as some liquids in containers, which are discarded or rejected as being spent, useless, worthless or in excess.[171] Solid wastes, as defined in Agenda 21, include all domestic refuse and non-hazardous wastes such as commercial and institutional wastes, street sweepings and construction debris. In some countries, the solid waste management system also handles human wastes such as night-soil, ashes from incinerators, septic tank sludge and sludge from sewage treatment plants. If these wastes manifest hazardous characteristics they should be treated as hazardous wastes.[172]

Source separation: Setting aside of compostable and recyclable materials from the waste stream before they are collected with other municipal solid waste, to facilitate reuse, recycling, and composting.[173]

Stakeholder: A person or an organisation that has a legitimate interest in a project or entity, or would be affected by a particular action or policy.[174]

Sustainable development: Sometimes defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs".[175]

Technology: The practical application of knowledge to achieve particular tasks that employs both technical artefacts (hardware, equipment) and (social) information ('software', know-how for production and use of artefacts).[176]

Technology transfer: The flow of knowledge, techniques, experience, and innovation among different stakeholders through assistance, investment, licensing, trade or training. It comprises the process of learning to understand, utilise, and replicate the technology, including the capacity to choose it, adapt it to local conditions and integrate it with indigenous technologies.[177]

Tipping point: The tipping point is the critical point in an evolving situation that leads to a new and irreversible development.[178]

Upcycling: If material recycling results in a material of higher quality than the original, such processing is called upcycling.

Valorization: The entire process of extracting, storing, collecting, or processing materials from the waste stream in order to extract and divert value and direct the material to a value-added stream.[179]

Vermiculture: A relatively cool, aerobic composting process that uses worms and microorganisms.[180] **Vermicomposting** – The process whereby worms feed on slowly decomposing materials in a controlled environment to produce a nutrient-rich soil amendment.[181]

Voluntary agreement: An agreement between a government authority and one or more private parties to achieve environmental objectives or to improve environmental performance beyond compliance to regulated obligations. Not all voluntary agreements are truly voluntary; some include rewards and/or penalties associated with joining or achieving commitments.[182]

Waste: "Substances or objects which are disposed of or are intended to be disposed of or are required to be disposed of by the provisions of national law".[183]

Waste collection: The act of picking up wastes at homes, businesses, commercial and industrial plants and other locations; loading them into a collection vehicle (usually enclosed); and hauling them to a facility for further processing or transfer or to a disposal site.[184]

Waste management: Collection, transport, recovery and disposal of waste including the supervision of such operations and the aftercare of disposal sites, including actions taken as a dealer or broker.[185]

Waste management hierarchy: The hierarchy indicates an order of preference for action to reduce and manage waste. The waste hierarchy is presented as a pyramid that specifies that preventing the generation of waste is the preferred action, followed by reduction (e.g. through re-use), recycling, recovery and as the least preferred action, disposal. Different versions of the hierarchy have been adopted by different countries.

171) Tchobanoglous, G., Vigil, S.A. and Theisen, H. (1993). *Integrated Solid Waste Management – Engineering Principles and Management Issues.* McGraw-Hill International Editions.
172) Agenda 21 – Chapter 21 – http://sustainabledevelopment.un.org/content/documents/Agenda21.pdf
173) UNEP (2005). *Solid Waste Management* (Volume I).
174) Metz, B., Davidson, O.R., Bosch, P.R., Dave, R., Meyer, L.A. (eds.), (2007). *Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change.* Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.
175) Brundtland Commission (1987). *Our Common Future.*
176) Metz, B., Davidson, O.R., Bosch, P.R., Dave, R., Meyer, L.A. (eds.), (2007). *Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change.* Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA
177) UNEP (2010). *ABC of SCP: Clarifying Concepts on Sustainable Consumption and Production*
178) UNEP (2007). *Global Environmental Outlook 4.*
179) UN-HABITAT (2010). *Solid Waste Management in the World's Cities.*
180) UNEP (2005). *Solid Waste Management* (Volume I).
181) UNEP (2005). *Integrated Waste Management Scoreboard – a Tool to Measure Performance in Municipal Solid Waste Management.*
182) Metz, B., Davidson, O.R., Bosch, P.R., Dave, R., Meyer, L.A. (eds.), (2007). *Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change.* Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.
183) Basel Convention on the Control of Transboundary Movements of Hazardous Waste.
184) Tchobanoglous, G., Vigil, S.A. and Theisen, H. (1993). *Integrated Solid Waste Management – Engineering Principles and Management Issues.* McGraw-Hill International Editions.
185) Chalmin, P. and Gaillochet, C. (2009). *From Waste to Resource: World Waste Survey.* Economica Ltd.

Waste picker: Person or family who salvages recyclable materials from streets, public places or disposal sites.[186]

Waste prevention: Programs, strategies and activities that prevent materials from entering the waste stream.[187]

Waste sources: Agricultural, residential, commercial and industrial facilities, open areas and treatment plants where solid waste are generated.[188]

Waste stream: The total flow of waste from a community, region or facility.[189]

Waste-to-energy (WTE) plant: A facility that uses solid waste materials (processed or raw) to produce energy. WTE plants include incinerators that produce steam for district heating or industrial use, or that generate electricity; they also include facilities that convert landfill gas to electricity.[190]

WEEE: See e-waste.

186) UN-HABITAT (2010). *Solid Waste Management in the World's Cities.*
187) UNEP (2005). *Integrated Waste Management Scoreboard - a Tool to Measure Performance in Municipal Solid Waste Management.*
188) Tchobanoglous, G., Vigil, S.A. and Theisen, H. (1993). *Integrated Solid Waste Management – Engineering Principles and Management Issues.* McGraw-Hill International Editions.
189) UNEP (2005). *Solid Waste Management* (Volume I).
190) UNEP (2005). *Solid Waste Management* (Volume I).

About the UNEP Division of Technology, Industry and Economics

Set up in 1975, three years after UNEP was created, the Division of Technology, Industry and Economics (DTIE) provides solutions to policy-makers and helps change the business environment by offering platforms for dialogue and co-operation, innovative policy options, pilot projects and creative market mechanisms.

DTIE plays a leading role in three of the six UNEP strategic priorities: **climate change, harmful substances and hazardous waste, resource efficiency**.

DTIE is also actively contributing to the **Green Economy Initiative** launched by UNEP in 2008. This aims to shift national and world economies on to a new path, in which jobs and output growth are driven by increased investment in green sectors, and by a switch of consumers' preferences towards environmentally friendly goods and services.

Moreover, DTIE is responsible for **fulfilling UNEP's mandate as an implementing agency for the Montreal Protocol Multilateral Fund** and plays an executing role for a number of UNEP projects financed by the Global Environment Facility.

The Office of the Director, located in Paris, coordinates activities through:

- **The International Environmental Technology Centre** – IETC (Osaka), promotes the collection and dissemination of knowledge on Environmentally Sound Technologies with a focus on waste management. The broad objective is to enhance the understanding of converting waste into a resource and thus reduce impacts on human health and the environment (land, water and air).
- **Sustainable Consumption and Production** (Paris), which promotes sustainable consumption and production patterns as a contribution to human development through global markets.
- **Chemicals** (Geneva), which catalyses global actions to bring about the sound management of chemicals and the improvement of chemical safety worldwide.
- **Energy** (Paris and Nairobi), which fosters energy and transport policies for sustainable development and encourages investment in renewable energy and energy efficiency.
- **OzonAction** (Paris), which supports the phase-out of ozone depleting substances in developing countries and countries with economies in transition to ensure implementation of the Montreal Protocol.
- **Economics and Trade** (Geneva), which helps countries to integrate environmental considerations into economic and trade policies, and works with the finance sector to incorporate sustainable development policies. This branch is also charged with producing green economy reports.

DTIE works with many partners (other UN agencies and programmes, international organizations, governments, non-governmental organizations, business, industry, the media and the public) to raise awareness, improve the transfer of knowledge and information, foster technological cooperation and implement international conventions and agreements.

For more information,
www.unep.org/dtie

The Guidelines for National Waste Management Strategies: Moving from Challenges to Opportunities – a joint effort of the United Nations Environment Programme and the United Nations Institute for Training and Research – provides a conceptual and methodological framework for national planning that countries may adapt to their particular circumstances. It also establishes a clear rationale for making waste management a national priority.

This document outlines a possible process and poses questions that countries may wish to consider as they develop integrated national waste management strategies. It outlines the reasons for a national waste management strategy and explores the challenges and opportunities waste management presents to governments and communities. It also deals with concepts and principles related to waste management and takes account of major considerations influencing policy choices involved in the process of strategy development, monitoring, and implementation. Finally, this document defines the actions a country can take in order to develop a strategy, then to implement, review and update it.

These guidelines are an early response to recommendations of Rio+20, which called for the development of comprehensive national waste management strategies.

www.unep.org

United Nations Environment Programme
P.O. Box 30552 Nairobi, Kenya
Tel.: ++254-(0)20-762 1234
Fax: ++254-(0)20-762 3927
Email: uneppub@unep.org

UNEP

For more information, contact:

UNEP DTIE
International Environmental Technology Centre
2-110 Ryokuchi Koen,
Tsurumi-ku, Osaka
538-0036, Japan
Tel : +81 6 6915 4581
Fax : +81 6 6915 0304
E-mail: ietc@unep.org
Web: www.unep.org/ietc

United Nations Institute for Training and Research
Chemicals and Waste Management Programme
Palais des Nations
CH-1211 Geneve 10,
Switzerland
Tel: +41 22 917 8400
Fax: +41 22 917 8047
E-mail: cwm@unitar.org
Web: www.unitar.org/cwm

ISBN: 978-92-807-3333-4
DTI/1661/JA