



**DEVELOPING INTEGRATED
SOLID WASTE
MANAGEMENT PLAN
TRAINING MANUAL**

***Volume 3:
Targets and Issues of Concern
for ISWM***

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Developing Integrated Solid Waste Management Plan Training Manual

Volume 3

Targets and Issues of Concern for ISWM

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Preface

Rapid increase in volume and types of solid and hazardous waste as a result of continuous economic growth, urbanization and industrialization, is becoming a burgeoning problem for national and local governments to ensure effective and sustainable management of waste. It is estimated that in 2006 the total amount of *municipal solid waste* (MSW) generated globally reached 2.02 billion tones, representing a 7% annual increase since 2003 (Global Waste Management Market Report 2007). It is further estimated that between 2007 and 2011, global generation of municipal waste will rise by 37.3%, equivalent to roughly 8% increase per year. Based on incomplete reports from its participants, The Basel Convention estimated that about 318 and 338 million tons *hazardous and other waste* were generated for 2000 and 2001 respectively. *Healthcare waste* is classified as sub-category of hazardous wastes in many countries. As per WHO estimations the total health-care waste per person per year in most low-income countries, is anywhere from 0.5 kg to 3 kg. There is no estimate about *global industrial wastes generation*. The US EPA estimates that, American industrial facilities generate and dispose off approximately 7.6 billion tons of non-hazardous industrial solid waste each year. The EU estimated that its 25 member states produce 700 million tons of *agricultural waste* annually. **Waste Electrical and Electronic Equipment (WEEE) or E-waste** is also one of the fastest growing waste streams and it equals to 1% of total solid waste on an average in developing countries. It is expected to grow to 2% in 2010.

Although considerable efforts are being made by many Governments and other entities in tackling waste-related problems, there are still major gaps to be filled in this area. The World Bank estimates that in developing countries, it is common for municipalities to spend 20-50 percent of their available budget on solid waste management (open dumping with open burning is the norm), even though 30-60 percent of all the urban solid wastes remain uncollected and less than 50 percent of the population is served. . In low-income countries, collection alone drains up 80-90 percent of municipal solid waste management budget. In mid-income countries, collection costs 50-80 percent of total budget. In high-income countries, collection only accounts for less than 10 percent of the budget, which allows large funds to be allocated to waste treatment facilities. Upfront community participation in these advanced countries reduces the collection cost and facilitates waste recycling and recovery.

Hence, developing countries face 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 utilized to generate revenue to fund waste management. This forms the premise for **Integrated Solid Waste Management (ISWM) system based on 3R (reduce, reuse and recycle) principle**. ISWM system has been pilot tested in a few locations (Wuxi, PR China; Pune, India; Maseru, Lesotho) and has been well received by local authorities. It has been shown that with appropriate segregation and recycling system significant quantity of waste can be diverted from landfills and converted into resource.

Developing and implementing ISWM requires comprehensive data on present and anticipated waste situations, supportive policy frameworks, knowledge and capacity to develop plans/systems, proper use of environmentally sound technologies, and appropriate financial instruments to support implementation.

Many national governments, therefore, have approached UNEP, [as reflected in the decision taken by UNEP Governing Council/Global Ministerial Environment Forum during its 25th Session in February 2009 (UNEP/GC.25/CW/L.3)] to get further support for their national and local efforts in implementation of the Integrated Solid Waste Management (ISWM) programme.

In response to this decision and in line with the Bali Strategic Plan for Capacity Building and Technology Transfer, UNEP has developed a programme on integrated solid waste management. This programme includes support for capacity building and technology transfer for ISWM through a number of actions:

1. Guidelines to develop ISWM Management: The four sets of guidelines on ISWM covering waste characterization and quantification, assessment of current waste management system, target setting and identification of stakeholders' issues of concern for ISWM, and how to develop ISWM Plan.
2. Pilot projects on ISWM and emerging waste streams including E-waste, waste agricultural biomass, waste plastics and so on
3. Regional and sub-regional training for policy makers and experts on ISWM and emerging waste streams
4. Interactive advisory support on ISWM and emerging waste streams

This document is the *third* of the four sets of the guidelines on ISWM. This third step is the building block for ISWM Plan as it focuses on target setting and identification of stakeholders' issues of concern for ISWM to achieve the targets.

This document can also be of interest to other interested parties/organisations that aim at supporting decision-makers. They may be:

- consultants working on urban services, recycling, or waste management;
- representatives or staff of other local stakeholders including community groups, NGOs, and the private sector;
- entrepreneurs wishing to expand or strengthen their solid waste portfolios;
- academicians and scholars in urban environmental management;
- the press, especially when seeking background materials;
- donors interested in supporting future waste management activities;
- local experts interested in using or replicating the results;

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ACRONYMS

AHP	Analytical Hierarchy Process
ASL	Automated Side Loaders
APC	Air Pollution Control
BEI CHP & RS	The bei cellulose hydrolysis process and reactor system
BMT	Biological and Mechanical Treatment
BMW	Bio-Medical Waste
BOT	Build-operate-transfer
C&D	Construction and Demolition
CDM	Clean Development Mechanism
CD-ROM	Compact Disc Read-Only Memory
CIWMB	California Integrated Waste Management Board
C.L	Confidence Level
CO ₂	Carbon Dioxide
CRT	Cathode Ray Tube
CRV	California Redemption Value
CV	Calorific Value
DEPA	Danish Environmental Projection Agency
DKK	Danish Krone
DPSIR	Driving force - Pressure - State - Impact - Response
DTIE	Division of Technology, Industry and Economics
EIA	Environmental Impact Assessment
EMC	Environmental Management Centre
EnRA	Environmental Risk Assessment
EPA	United States Environmental Protection Agency
EPR	Extended Producer Responsibility
ESTs	Environmentally Sound Technologies
E-Waste	Electronic Waste
EWC	European Waste Catalogue
FOB	Free on Board
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GIS	Geographic Information System
GPS	Global Positioning System
HCl	Hydrogen Chloride
HDPE	High Density Polyethylene
HW	Hazardous Waste
IETC	International Environmental Technology Centre
ISWM	Integrated Solid Waste Management
ISWMP	Integrated Solid Waste Management Plan
IT	Information Technology
IWPM	Integrated Waste Management Plan
KPIs	Key Performance Indicators
LPB	Liquid Paper Board
LR	Landfill Rate
LWAC	Landfill Waste Acceptance Criteria
MB	Megabytes

MBT	Mechanical and Biological Treatment
MC	Moisture Content
MCDM	Multi Criteria Decision Making
MEAs	Multilateral Environmental Agreements
MF	Multi Family residence
MRF	Materials Recovery Facility
MSW	Municipal Solid Waste
MSWM	Municipal Solid Waste Management
NGOs	Non-governmental Organizations
NIMBY	Not-in-my-backyard
O&M	Operations and Maintenance
ODS	Ozone Depleting Substances
OECD	Organisation for Economic Co-operation and Development
PAYT	Pay as You Throw
PE	Polyethylene
PET	Polyethylene Terephthalate
PIC	Project Implementation Committee
PMC	Pune Municipal Corporation
PP	Polypropylene
PPE	Personal Protective Equipment
PRC	People's Republic of China
PS	Polystyrene
PS	Private Sector
PSP	Private Sector Participation
PVC	Polyvinyl Chloride
RAM	Random Access Memory
RDF	Refuse Derived Fuel
RPPC	Rigid Plastic Packaging Containers
SAT	Sustainability Assessment of Technologies
SF	Single Family residence
SP	Strategic Planning
SWAP	Solid Waste Analysis Protocol
SWM	Solid Waste Management
SWOT	Strengths, Weaknesses, Opportunities and Threats
3R	Reduce, Reuse and Recycle
UNEP	United Nations Environment Programme
USD	The United States Dollar
WCV	Waste Collection Vehicle
WGF	Waste Generation Factors
WND	Wuxi New District, People's Republic of China
WTE	Waste-to-Energy
WWTP	Wastewater Treatment Plant

Part A: Target Setting

1. Targets for ISWM

1.1. Setting Objectives

The design of integrated solid waste management (ISWM) plan and system is objective dependant. Say, if the overall objective of ISWM is only to stabilize or reduce the amount of wastes being landfilled, then the system can be designed to increase recycling (the material) and recovery through waste incineration. However, if the objectives also have to include air pollution control, then the former design may not suffice the requirement, instead waste reduction and/or recycling the organic content of wastes might demand consideration¹. ISWM often has the following objectives:

- diversion from disposal (landfills);
- increase recycling;
- control the pollution from waste to the environment: e.g. control groundwater pollution by landfill leachate, air emissions from waste incineration, or to reduce littering and dumping;
- increase cost efficiency in waste management;
- waste reduction, e.g., decoupling waste increase from economic growth.

Note: *Goal making process in many cases can be rather political than rational. However, even highly political goal setting needs scientific analysis in order to be attainable.*

1.1.1 Choice of objectives for ISWM needs to take certain factors into account:

1. National, provincial and/or city's overall strategy and plan related to waste management:

Take the example of China: One of the goals, the central government set for its 5 year national development plan for 2005-2010 is to build a circular economy. This overall national strategy has strong implications on waste management, since the government issued a number of policies and economic instruments to encourage recycling and recovery. These policies and instruments might provide incentive or unintended disincentive on various components of future ISWM plan.

Moreover at operational level, China's national plan requires increasing the collection of municipal solid wastes (MSW), with specific rate targets for urban and suburban areas. While setting the objectives and targets for ISWM for a locality in China, the national level ambition on MSW collection should be reflected.

2. Local social and economic development plan:

Solid wastes, especially MSW and some waste streams such as e-wastes and vehicle wastes have close co-relation with economic growth and living standards. Accelerated urbanization and urban sprawl, as witnessed in many developing countries has been continuously pressurising the municipal services including waste management.

3. Local industrial development plan:

The industrial growth rate and the sectoral structure planned for the future have major impacts on future generation and composition of industrial as well as hazardous wastes. The industrial development plan can also influence the potential and feasibility for

¹ In cases with more than one objective, the design of the system will depend on the prioritized objectives.

industrial symbiosis, a more efficient way of utilizing resources and reducing wastes and other pollution.

4. *Relative importance or urgency of each goal*

In reality, the objective of waste management is often a combination of goals, that sometimes a trade-off has to be made amongst the conflicting objectives. A commonly used method is to give a weight to each objective to reflect its relative importance or urgency in order to prioritize. A start with operational and management changes, can bring early result with minimal cost which would further help gather support for those more difficult to implement.

1.2. Setting targets to achieve the objectives

The level or situation, one intends to achieve and which can be influenced or changed by an action or event is called a target. They are typically employed to provide a concrete direction and means for checking the progress of waste management initiatives. Having clear and well-defined targets is also useful for communicating the expectations and priorities of ISWM to relevant stakeholders.

1.2.1 Starting Point – Good Baseline Information

Meaningful targets and a good project design depends on **having adequate information on the scale and nature of the problem**. Information on the current and previous situation can be obtained through waste quantification and characterisation of data of the past and the current waste management situation. If this data and information is unavailable or unreliable, an investigation on wastes and its management needs to be conducted². Only a proper idea of the current situation can help set meaningful targets for the future. The target setting process demonstrated in *section 1.2.3* below, best illustrates how crucial the availability and quality of the baseline information is for any meaningful target setting.

Since these targets also serve as part of the indicators for measuring the effectiveness of the project throughout its implementation, baseline information is also the criteria against which to be able to judge what has been achieved.

1.2.2 Requirements for Good Targets

Targets need to be:

- *Specific*: Specify what must actually *be done* to attain the desired objective, namely, to detail:
 - Inputs: e.g. resources in terms of staff or funding;
 - Processes: e.g. the activities which agency/division or industry will be responsible for;
 - Outputs: e.g. the immediate consequences of these activities;

These detailed targets not only assist project partners be clear about the level of investment and activity needed to achieve the desired result but also helps project managers check whether the projects are on course or not. Setting targets for, and monitoring of inputs as well as outputs, is vital for assessing the cost effectiveness of particular initiatives and understanding why a project may not have achieved its intended results.

² see the IETC Guidelines on ISWM, Part I and II

- *Measurable & Time-scaled:*

Targets immeasurable, either for input or output, cannot be checked if they are met or not, thus becoming meaningless. Targets need milestones or timetable, which will set stages to be reached by given deadlines thus rendering little motivation for timely implementation.

- *Realistic and achievable:*

A feasibility analysis, or at least an estimate by experts, is needed to set realistic targets. Industry standards, benchmarks and a comparison to what other similar cities have achieved in the past can also give some idea of it. Targets are meant to be achieved. Unachievable targets will risk losing the credibility of target setting.

There are many different ways of framing targets. Some options include:

Type	Examples	Pros	Cons
Absolute	Reduce landfill amount to 100 t/d by year X	Reduce actual pollution load to environment	Harder to achieve given economic and population growth
Relative	Reduce percentage of landfill to 40% by year X	Easier to attain under rapid economic growth	Total pollution to environment may still increase
Compare to expected trend	Reduce landfill rate by 20% by year X compared to business-as-usual scenario	More practical under rapid economic growth	Total pollution to environment likely still increase
Related to cost/value for money	Save 50% government fund to incineration by year X	Provide financial incentive and rewards	Environment effectiveness is unclear

1.2.3 Target Setting Process

The target setting process can vary from case to case, depending on waste streams targeted and the type of targets opted for, which in turn depends on the availability and quality of baseline information and projection, the desired level of requirement of the ISWM, and the capacity and resources available for the project.

This section demonstrates how to set up quantitative targets for diversion of MSW from landfill, as this is one of the most common objectives for any waste management improvement. By applying the logic and steps in this approach, other type of targets under different objectives can by default be developed as a by-product (such as recycling target). The methodology used in this process is intentionally kept simple, thus catering for the typical application in developing countries where data and resources are often very limited.

- **Objective:** Reduce municipal solid wastes for landfill in year X
(can be absolute amount of wastes landfilled, which might be harder to achieve than a target on landfilled percentage/rate.)
- **Target:** quantify the landfill amount or rate intended for year Y

- **The general quantification formula:**

Waste generation (G)=Waste landfilled (L)+ incinerated (I) +recycled (R) +dumped (D)

- G: Obtained through wastes investigation. Despite the wastes survey at transfer stations, sampling at household level becomes inevitable as in most developing countries scavengers already pick up recyclables before wastes are collected;
- L: Readily obtained from municipality records (e.g. number of truck-trips per day times the average load of truck);
- I: Readily obtained from invoices with better precision since incineration incurs tipping fee in most countries;
- R: **The most difficult to obtain**, as the municipality in many developing countries usually doesn't have clear information about those private sector primarily responsible for recycling and less so about, the informal sector involved in picking;
- D: Also difficult to estimate directly, but can be obtained once we know the value for G, L, I, and R;

The present landfill rate (LR) can be calculated as: $LR = L \div G$

- **Quantification formula for the year X in future:**

- G_x : Obtained from the projected total waste generation in year X³.
- L_x: Landfilled amount in year X depends on 1) incinerated, 2) recycled amount that can be achieved by ISWM in year X, 3) total generation which might be controlled if waste reduction is emphasized. However, if 4) dumped amount is reduced, thanks to enhanced collection by year X, more wastes will have to be managed by the municipality (including through landfill);
- I_x: Obtained from the capacity of existing incineration plants plus any additional capacity that will become operational in year X;
- D_x: Obtained from the difference between projected waste generation and predicted waste collection. Municipality often has overall collection goal by year X (see Box 1.1), as this is relatively easy to implement and evaluate. The collected amount predicted is thus easily obtained through multiplying projection generation by collection target rate.
- R_x: Compared to I_x and D_x, this again is the most difficult one to predict. As a result, **R_x is decisive in quantifying the numeric value of L_x, and thus the landfill target.**

- **Determine the R_x:**

If recycling has been carried out by a limited number of companies for which the municipality has sufficient information, then it is relatively easy to predict recycling capacity in the future and for the municipality to plan to expand such capacity in order to reduce wastes for landfill. **A feasibility study** is needed to determine the magnitude and (material) type of expansion in recycling capacity, which is crucial for setting the recycling target⁴ and subsequently the landfill target.

³ Major methodologies for waste projection are summarized in Annex 1

⁴ As a by-product of exercise on setting the target for diversion from landfill, recycling rate target is automatically derived too

By a feasibility study or experts' estimate, if once the total amount recycled (R_x) that can be reasonably achieved by year X is worked out, then we can get landfill targets for year X:

Landfill amount target: $L_x = G_x - I_x - R_x - D_x$

Landfill rate target: $LR_x = L_x \div G_x$

If the recycling has been primarily carried out by the private sector that have a large number of small companies with many of them located outside the jurisdiction of a municipality, then it is sometimes beyond the reach of the municipality to get sufficient data and information.

One rough but practical solution of the above situation could be - to assume that the recycling capacity outside the jurisdiction of a municipality remains more or less the same over time till year X in the future; i.e., it can be treated as a constant (thus no need to know the detail). The municipality only **needs to know the recycling capacity within its jurisdiction**, because such capacity can be influenced and relied upon by the municipality in its effort to increase waste recycling and diversion.

This requires the municipality to enhance its monitoring, supervision and management of the recycling activity within its territory even if the same is run by the private sector. Without reasonable public intervention and guidance, the private sector, driven by market forces, only works when there is enough profit. Recyclables with lower market value and higher pre-treatment cost (such as glass and soiled plastics), are often left out putting high pressure on landfill.

The IETC Guidelines on ISWM (Part II) provides guidance on how to conduct investigations on waste management including recycling. The following checklist provides further details on what to look at in such an investigation:

- Number of waste facilities, their ownership structure, management and operation;
- Their size and capacity, actual amount and type of wastes processed, type of technology used, key process parameters;
- Financing: tipping fee charged, revenue from selling recycled products or energy generated, tax break or exemption, subsidies, capital investment, operation and maintenance cost, recycled products and their market;
- Pollution control: waste receiving criteria, control measures for air and water pollution, handling of residues, testing results of emissions etc.

After identifying the present total recycling capacity or actual amount per year within a municipality, **a feasibility study or at least an estimate by a group of experts** is required to predict how much more capacity or amount can be added by year X and for which material. After quantifying the R_x , not only L_x and LR_x can be calculated but also the overall recycling rate by year X can be obtained:

Recycling Rate = total amount recycled (R_x) \div total waste generated (G_x)

Box 1.1: Waste collection at Wuxi New District, P.R. China

As part of Wuxi city, Wuxi New District (WND) has been using the city's landfill and incineration plants for disposing off its MSW. Before the implementation of ISWM project, WND only needed to collect MSW and transport it to the city's landfill and incinerators. Recyclables with good economic value were usually collected by scavengers or bought by recycling companies directly from households and institutions, for which WND has little data or information, though it has fairly good information about the MSW collected each year. The waste investigation undertaken by the ISWM project resulted in total MSW generated in WND presently. This enabled the project team to estimate the current collection rate (MSW collection rate = collected/generated) at about 75%. In the case of WND, the collected amount = landfilled + incinerated.

Under the requirement of the national plan to enhance waste management, a 100% collection rate for urban and suburban area under the jurisdiction of WND is envisaged in future. This means there should be no waste dumping in future at WND.

1.3. Communicate objectives and targets to stakeholders

Achieving the target requires combined efforts of government and industry at all levels. It is therefore imminent to consult them, the objectives and targets (both input and output) together with the rationales behind, before finalising. Objectives and targets that incorporate objectives of different partners can tap on synergy in resources and help in tracking contributions made by different agencies and can also facilitate coherent policies, actions and implementation.

The first stakeholder and public consultation meet during the formulation of the ISWM plan should be held at an ideal venue and time to conduct such consultation on objectives and targets. The questionnaire to stakeholders on both input and output targets may include:

- the opinions of your bureau/division/industry about the feasibility of these targets? Can they be reached in time with reasonable effort?
- If not, why? What are needed to make them achievable?
- When and how can your bureau/division/industry build these targets into your work plan and budget line?
- the potential loop holes in meeting the targets (e.g. ways other than those intended)? If so, how can we check and guard against?

1.4. Example from an ISWM Plan:**1.4.1 The principles for establishment of ISWM project targets:**

- To achieve a harmonious development amongst the economy, society and environment;
- To achieve a consistent development between the city and rural construction;
- To achieve an integrated planning and a reasonable layout;
- Comprehensive programming for the near and distant future targets;
- High level of start point and high technology;
- Realization of minimization, resource recovery and un-harmful disposal;
- Realistic targets based on local/national situation.

1.4.2 Qualitative & Quantitative targets:

	Short-term objectives (2006-2010)	Long-term objectives(2011-2020)
Qualitative targets	<ul style="list-style-type: none"> ➤ Construct an initial ISWM model on solid waste administration; ➤ Construct 1-2 demonstrative living districts with ISWM model; ➤ Construct a complete system for MSW treatment and achieve its minimization, resource recovery and safe disposal; ➤ Construct a complete system for industrial solid waste treatment and achieve the aims of circulation, resource reduction and safe disposal. 	<ul style="list-style-type: none"> ➤ Construct a complete ISWM model on solid waste administration; ➤ Construct a modern system for MSW treatment, in which the urban and rural areas are considered together, the layout is reasonable and the resource is adequately utilized, realizing MSW minimization, resource recovery and safe disposal; ➤ With the aim of ecological industry zone construction, construct the city as an ecological and modernized new city zone with a harmonious development amongst the economy, society and environment.
Quantitative targets	<ul style="list-style-type: none"> ➤ To achieve: collection rate of household solid waste by bag - above 60%; the safe disposal rate - 100%; reduction rate - 10%; resource recovery rate - 80%; ➤ Comprehensive utilization rate of industrial solid waste - above 80%; safe disposal rate of hazardous, medical and radio waste - 100%; 	<ul style="list-style-type: none"> ➤ Complete achievement of airtight treatment and disposal, minimization, resource recovery and safe disposal at MSW disposal site. ➤ To achieve: collection rate of MSW by bag - above 90%; the safe disposal rate - 100%; reduction rate - 50%, and recovery rate - 90%; ➤ Comprehensive utilization rate of industrial solid waste - 85%; safe disposal rate of hazardous, medical and radio waste - 100%

1.5. Review progress at regular intervals

An effective and cost-efficient monitoring and reporting system is essential for measuring the progress in implementing the ISWM plan and achieving the targets. At later stage of ISWM plan, a monitoring and control scheme needs to be set up. A check against the targets will help to highlight where projects need adjustments or where targets needs revision to reflect a changing situation as information and understanding becomes better over time. This proves true for quantitative targets especially, as the level of data, time and capacity required by a full scale feasibility study is usually not available.

The limited control that the government exercises over some waste streams and the increasing role of the private sector in waste services present difficulties for the local authority in setting targets and measuring progress towards these targets. Adequate information about waste is highly dependent on the private sector's willingness to provide the commercially sensitive information to the local authorities⁵.

⁵ Annexure 2 showcases examples of targets on waste management and their review.

Annexure 1**Brief list on commonly used methods for waste projection**

Waste streams	Projection method	Assumptions for projection
MSW	Urban population and GDP are the key factors affecting MSW. Obtain such correlation from past data and extrapolate.	MSW is directly proportional to the population and GDP; no decoupling in future.
	Choose from a range of MSW/capita-day, either from nationally recommended or locally available data, multiply by projected population	MSW generation per capita day remains constant for the projected period
Industrial wastes	Current waste amount/km ² multiply by expanded industrial area in future	Same industrial sector structure; more inclined to high value-added with lower wastes generation
	Output-based approach: obtain average waste in tons/output from sample industries, multiply by total output of the sector to get total waste generated by that sector. Sum up sectoral wastes to get total industrial wastes from an area.	Un sampled industries in the same sector are smaller; have similar waste/output ratio and similar type of wastes to those sampled
Healthcare wastes	Average wastes/bed-day multiply by projected beds	Healthcare wastes generation per bed-day remains constant

Annexure 2

Example of targets on waste management and their review

The New Zealand Waste Strategy - published in March 2002, covers solid, liquid, gaseous and hazardous waste. This strategy has three core goals:

- Lowering the social costs and risks of waste;
- Reducing the damage to the environment from waste generation and disposal;
- Increasing economic benefits by more efficient use of materials.

A multi-sector working group was established to advise the Ministry of Environment and the Government on the development of waste strategy and providing advice on national targets. The working group compiled initial targets and submitted its recommendations to the Government. This advice recognised that the limited information available at the time meant that certain targets were somewhat speculative. The targets were further developed within the Ministry and an "expert" group of local authority and waste management professional officers were asked to review the draft targets.

As scheduled, the progress towards these targets was reviewed in 2003. Part of the targets that are more relevant to developing countries and their review are summarized below:

Introduction

This note contains some explanatory information about the targets in the New Zealand Waste Strategy. It provides a brief interpretation of each target, indicates what action has been taken or is expected and provides the name of the person in the Ministry responsible for monitoring the implementation of the targets.

1. Targets for waste minimisation

1.1 Local authorities will report their progress on waste minimisation and management for their annual report in 2001-2002 and quantitatively on an annual basis from then onwards

Interpretation

This target recognises the importance of local authorities providing for and reporting on the local implementation of the NZ Waste Strategy in their annual plans and reports. The target assumes a start on this reporting in the annual reports for 2001-2002. While reporting should be quantitative (to ensure any progress towards local targets can be measured), the national target recognises that some local authorities may not possess quantitative information in the first instance, hence a qualitative reporting may only possibly be undertaken. It also signals that council budgets need to provide for the gathering of information necessary for quantitative reports in subsequent years.

Action taken

The Ministry reviewed the council's draft annual plans for 2002-2003 and made submissions to some councils encouraging them to make reference in these plans for waste minimisation and management. This information provides a basis for commenting on this subject in the annual report relating to that period. The measures for councils reporting progress on local

implementation of the strategy will be further dealt in the waste management planning project being developed jointly with local government.

Progress towards the implementation of the target 1.1

This target recognises the importance of local authorities providing for and reporting on the local implementation of the NZ Waste Strategy in their annual plans and reports. The target assumed a start on this reporting in the annual reports for 2001-2002 with the inclusion of qualitative information, and councils subsequently including quantitative information. The comments that follow are based on an analysis of annual plans and reports provided to the Ministry by councils.

Issues arising from the implementation of the target 1.1, including barriers to implementation

A delay in releasing the strategy until March 2002 left councils with little time to consider the implications of this target for their 2001-2002 annual reports. The Ministry emphasises that councils had limited time to act on the first part of this target. Most councils, however, included some reference to waste management in their annual reports but did not explicitly comment on the local implementation of the strategy. Councils require suitable systems of measurement if they are to report quantitatively. Many have systems in place, and the revised *Solid Waste Analysis Protocol (SWAP)*, Ministry for the Environment, 2002) provides a standard system for measuring solid waste.

1.2 By December 2010, all regional councils will ensure that at least 25 percent of all existing industrial resource consent holders have in place a recognised waste minimisation and management

Interpretation

The general intent of these targets is clear. Programmes that minimise waste and manage it effectively can avoid or mitigate environmental effects.

Action taken

The Ministry will be considering these targets in the context of its review of waste legislation and institutions. There is a general question about the extent to which the Resource Management Act (under which resource consents are granted) can influence the efficient use of material resources and provide an adequate legislative foundation for waste minimisation policy tools.

Progress towards the implementation of the target 1.2

Several private sector initiatives suggest that this target will be met before 2005. These initiatives include those taken by the New Zealand Business Council for Sustainable Development, Plastics New Zealand and the New Zealand packaging industry. The 'pathfinding' organisations, participating in the development of sustainable development strategies initiated at the Redesigning Resources Conference, held in June 2000, which also included waste minimisation programmes. Extended producer responsibility (EPR) programmes, such as the used oil recovery programme and the take-back programmes for mobile phones sponsored by Telecom and Vodafone, are other business initiatives that will reduce waste.

Issues arising from the implementation of the target 1.2, including barriers to implementation

Though with some limited voluntary approaches, there is considerable opportunity for businesses to voluntarily develop and adopt waste minimisation programmes. EPR programmes relying on a voluntary approach may encourage companies to ‘free ride’⁶. Some companies may avoid participating in the programmes as this would give them a commercial advantage. Hence, those not participating can undermine the programme as a whole because the ‘playing field’ is not of fair level for all the players. These issues have been dealt within some jurisdictions through legislative back-stopping that allows programmes to be regulated if voluntary approaches fail. The Ministry for the Environment is currently working through these issues in considering appropriate policy for the management of used oil and used tyres.

2. Targets for organic wastes

The term ‘organic waste’, in its common definition covers many types of waste including garden waste, kitchen scraps, commercial wastes such as paunch grass and food-processing, and other wastes that may biodegrade in a landfill such as paper/cardboard and untreated wood.

Interpretation

Measurement programmes are likely to involve measuring the quantity (through weighbridge and/or charging records) and composition (using SWAP) of waste disposed to landfill. The percentage diversion rates should be measured in terms of the total disposal and recycling quantities. For example if 25,000 tonnes of garden waste is composted and 5,000 tonnes disposed off to landfill (as measured through SWAP and weigh bridge records), then 83% diversion of garden waste has been achieved. This measure should apply to the total waste stream rather than refer to a specific baseline year.

Beneficial re-use could include (subject to appropriate regulatory approval) composting or mulching for sale, use of composted or mulched organic waste as a partial top soil replacement in landfill final capping/rehabilitation. Commercial organic waste may include food waste from commercial kitchens and food retailing business and waste wood from construction and demolition activities.

Action taken

The Ministry, along with the local government and an industry pilot group, is working on developing an integrated tool kit for collecting, analysing and reporting waste data. The tools developed through this process will assist local authorities to meet target 2.1. The Ministry is developing an organics recovery programme with a focus on developing resources for good practice in composting.

2.1 By December 2003 all territorial local authorities will have instituted a measurement programme to identify existing organic waste quantities and set local targets for diversion and disposal

Progress towards the implementation of the target 2.1

The revision of the *Solid Waste Analysis Protocol* (SWAP) provides a nationally consistent means of measuring the composition of solid waste, including different organic waste streams. This information combined with the data of total waste provides organic waste quantities.

⁶ take advantage of the programme but not pay their share of the costs.

Some local authorities have SWAP survey programmes in place, which, in conjunction with data from the Ministry's SWAP Baseline Programme, provide a useful estimate of waste composition for most areas in New Zealand. This information is available on the Ministry's website. Pilot work by Environment Waikato and the Bay of Plenty Regional Council to develop a waste data network shows promise for regional systems for measuring key indicators. This pilot project focuses on a collaborative approach to data collection and reporting, involving local authorities, recycling operators and the waste management industry. Environment Waikato has established a regional target consistent with this national target. Several local authorities that have recently completed waste management plans have set local targets for the diversion and disposal of organic wastes.

Issues arising from the implementation of the target 2.1, including barriers to implementation

The establishment of effective measurement programmes will take time, and some councils may rely on the pilot work still under way. Setting and measuring local targets require information from commercial as well as municipal sources, and the commercial sensitivity of information can be a barrier to companies sharing this information with councils. One council has indicated that it will not set diversion targets because of the lack of commercial incentive to compost or mulch organic waste. Review Targets in the Waste Strategy.

2.2 By December 2005, 60 percent of garden wastes will be diverted from landfill and beneficially used and by December 2010 the diversion of garden wastes from landfill to beneficial use will have exceeded 95%

Progress towards the implementation of the target 2.2

Many councils provide the opportunity at their landfills or transfer stations for the diversion of garden wastes for composting or mulching. However, green waste going to landfills still forms a significant fraction of total waste (up to 25 percent in some areas). Home owners who have the capacity to compost or mulch green waste can also use garden wastes beneficially. Considerable encouragement has been given to householders' use of garden wastes through public information (including the national Reduce Your Rubbish campaign). Measurement of green waste diverted through home composting is problematic. Two councils that have set garden waste diversion targets since the publication of the NZ Waste Strategy (Queenstown and Rodney) consider that between 50 and 60 percent of this waste stream can be diverted by the end of 2005 providing, a range of policies are put in place. Councils with 'best practice' composting or mulching systems in place are currently diverting around 50 percent of green waste away from landfill disposal.

Issues arising from the implementation of the target 2.2, including barriers to implementation

High levels of garden waste diversion are dependent on a range of complementary policies and conditions, including:

- disposal charges providing an incentive for diversion of garden wastes;
- sufficient markets/uses for the products generated from garden wastes, with these markets prepared to assign an appropriate value to the processed waste material;
- garden waste collection systems that can be readily used by householders;
- garden waste collection systems that avoid mixing inorganic wastes with garden wastes;
- public information and education.

This target will not be achieved without appropriate policies in place and without the presence of beneficial end uses for the products generated from garden wastes. The Ministry for the Environment's Organic Waste Project will help to address these issues. Where electricity is being generated from the burning of landfill gas there is little incentive to divert organic waste because this may detrimentally affect electricity generation. Contamination of compost is a significant issue not only in New Zealand but also internationally. The key current concern affecting the diversion of green waste is the residual herbicide (Clopyralid) remaining in lawn clippings through the composting process. The Ministry is working with the composting industry in New Zealand and the Environmental Risk Management Authority to identify and implement appropriate controls on the sale and use of Clopyralid.

2.3 By December 2007, a clear quantitative understanding of other organic waste streams (such as kitchen waste) will have been achieved through the measurement programme established by December 2003

Progress towards the implementation of the target 2.3

This target relates directly to Target 2.1, which covers the establishment of measurement programmes identifying organic waste quantities and setting local targets for diversion and disposal. Achieving the target requires work to quantify the different elements of organic wastes.

Issues arising from the implementation of the target 2.3, including barriers to implementation

The issues are similar to those discussed in Target 2.1.

2.4 By December 2007, more than 95 percent of sewage sludge currently disposed to landfill will be composted, beneficially used or appropriately treated to minimise the production of methane and leachate

Progress towards the implementation of the target 2.4

Sewage sludge can be stabilised (at which point it is commonly called biosolids) and then composted or spread directly on to land. Volumes of sewage sludge will increase as a consequence of the progressive upgrading of wastewater treatment. Currently, sewage sludge from the Wellington wastewater treatment plant is composted, and sludge from New Plymouth is dried and turned into fertiliser. Kapiti Coast is developing a process similar to the one used at New Plymouth, so is Hutt City Council, but in the Hutt and in other areas the product is currently landfilled. Mangere, by far the largest biosolids producer, is currently investigating options for the use of its material. The Ministry recognises the inherent difficulty in achieving the target date and has initiated a project focusing on organic wastes.

Issues arising from the implementation of the target 2.4, including barriers to implementation

There are several barriers to increasing the beneficial use of biosolids, including:

- the presence of contaminants (eg, heavy metals), which may restrict the use of biosolids as soil conditioner/fertiliser
- objections by Maori, on cultural grounds, to the use of a product based on human waste being added to soil used for growing food
- possible market resistance based on the risk of consumer rejection of products that arise from soils enhanced with biosolids

- the low economic value of biosolids, which means that land filling may be a more cost-effective option for disposal.

Guidelines for the safe use of biosolids have been produced by the New Zealand Water Environment Research Foundation to help address these barriers. Implementing these guidelines relies on the approach and contaminant threshold concentrations being adopted by regional councils throughout New Zealand. There is a possibility that regional councils may not apply the guidelines as intended, and in particular will adopt the more restrictive risk-based contaminant concentrations immediately rather than in 2012, as proposed in the guidelines because they consider that the thresholds may permit an unacceptable level of contamination of the environment.

The Ministry's Sustainable Industries Group is working with biosolids producers and processors to identify and address roadblocks to beneficial use. The target also allows for appropriate treatment to reduce the generation of methane and leachate. The wastewater sector has yet to take up this second option further, and it may be worth pursuing options such as anaerobic digestion combined with sludge drying for some situations.

2.5 By December 2010, the diversion of commercial organic wastes from landfill to beneficial use will have exceeded 95 percent

Progress towards the implementation of the target 2.5

Commercial organic wastes include food scraps from the retail and hospitality sectors, food-processing wastes and industrial-processing waste. In some cases these wastes are being diverted, generally for use as soil amendment with or without composting. Examples include soil incorporation of paunch waste from meat-processing plants and composting of waste treatment sludges from food-processing plants. Since a significant portion of this diversion occurs outside the normal waste management industry, there is very little quantitative data on diversion rates.

Issues arising from the implementation of the target 2.5, including barriers to implementation

The issues for diversion of commercial organic waste are similar to those for garden waste, i.e. potential beneficial use, disposal charges and education of waste producers. In general, commercial organic wastes are more putrescible than garden wastes (they have a higher nitrogen content and higher odour potential during degradation). This means that processing needs to be more closely controlled to minimise odours. The nature of many of these wastes also means that there is a potential for using them as feedstock for biogas generation (anaerobic digestion) prior to processing as a soil amendment/fertiliser. The basis for assessing the 95 percent level of beneficial use needs to be clarified.

3. Targets for special wastes

The term 'special wastes', includes categories of wastes that presents particular problems and also demands specific policies for their management. These include used oil, used tyres, old electronic goods, farm plastics and end-of-life motor vehicles. The sound management of these waste streams will usually require the relevant industry to take some responsibility for the goods beyond the point of sale, and to develop or co-operate in schemes that help reduce and better manage the waste. Extended producer responsibility (EPR) is the term commonly used to describe these schemes.

3.1 *By December 2005, businesses in at least eight different sectors will have introduced extended producer responsibility pilot programmes for the collection and reuse, recycling or treatment and disposal of eight categories of special wastes*

Interpretation

Extended producer responsibility (EPR) puts the onus on businesses to look for and capitalise on opportunities for resource conservation and pollution prevention throughout a product's life including disposal. It is particularly applicable to special "**problem**" wastes (e.g. e-wastes). EPR is a tool for waste minimisation increasingly adopted in many OECD countries. There are examples in New Zealand (Telecom's and Vodafone/Nokia's takeback scheme for cell phones).

Action taken

The Ministry is developing a policy framework to address special waste issues. Initial attention is being given to the recovery of used oil. Used tyres and end of life vehicles are likely to be the next "special" wastes for which specific policies shall be subsequently developed. The Ministry is looking for the cooperation of the business sector in developing the use of EPR.

Progress towards the implementation of the target 3.1

EPR schemes covering used oil, used mobile phones, used white-ware and used electronic equipment have already been initiated by industry. The Ministry is currently working towards the enhancement of the used oil recovery programme and towards an EPR policy for used tyres.

Issues arising from the implementation of the target 3.1, including barriers to implementation

The establishment of EPR schemes involves costs, which some importers and distributors may be reluctant to meet and pass on to the consumers. Such schemes may also require the co-operation of several parties, however, some of them may be unwilling to co-operate. Some may want to 'free ride' on a scheme but not meet their share of costs. Co-operation can be perceived as collusion and may raise anti-competition arguments. There is no legislative back-stop to EPR schemes that would create a level 'playing field' and reduce the risk of such free riders. The Ministry is doing further work on policies that would provide encouragement and support for EPR schemes.

4. Targets for construction and demolition wastes

4.1 *By December 2005 all territorial authorities will have instituted a measurement to identify existing construction and demolition waste quantities and set local targets for diversion from landfills*

Interpretation

There is presently little or no information on the volume and category of waste arising in the area of Construction and Demolition. It is generally recognised that there are big gains to be achieved by diverting this sort of refuse from landfills and that there are significant recycling initiatives possible within this sector. Without knowledge of the quantity being disposed off, it is difficult to reconcile the gains that are available.

Action required

This target is one of the secondary stream of targets in the Strategy, where an achievement in reduction is not expected immediately. The Ministry has initiated a Waste Management Planning project that will provide a base for this work to proceed in the near future. It is likely that a number of sites in some areas are not even recognised as disposal sites, due to the designations under which they were established. It is felt likely, that a waste-licensing scheme might be a suitable vehicle for establishing quantities in this sector, and this may require a national approach.

Progress towards the implementation of the target 4.1

The revision of the *Solid Waste Management Protocol* provides a nationally consistent means of measuring the composition of solid waste disposed to landfill, including waste from C&D activities. This information, combined with total waste quantity data, provides a partial picture of C&D waste disposal. In many areas C&D waste is also disposed off at dedicated C&D landfills and/or cleanfills as appropriate, but there are no co-ordinated systems for measuring the quantity of waste being disposed off at these sites. Pilot work by Environment Waikato and the Bay of Plenty Regional Council to develop a waste data network shows promise for regional systems for measuring key indicators. The Ministry, through the Sustainable Management Fund, is funding a project to consider C&D waste, including measurement/monitoring, and developing and documenting best practice in C&D waste diversion. Some local authorities are including diversion requirements in permits for C&D activities.

Issues arising from the implementation of the target 4.1, including barriers to implementation

No significant barriers have been identified for the achievement of this target.

4.2 *By December 2008, there will be a reduction of construction and demolition wastes to landfill to 50 percent of December 2005 levels measured by weight*

Interpretation

This target recognises that once waste volumes are recognised and quantified in this sector, it will be fairly easy to follow the models for waste reduction that have been established by this time (for example) in the organics area.

Action taken

No action has yet been taken in this area of work.

Progress towards the implementation of the target 4.2

Progress can only be assessed once the 2005 baseline has been determined.

Issues arising from the implementation of the target 4.2, including barriers to implementation

The key issues affecting the diversion of C&D waste include:

- disposal charges, both at landfills and dedicated C&D waste sites
- markets for the diverted material (e.g., recycled aggregate, waste wood, gyp board, plastics)
- site logistics (the practicality of sorting waste materials on-site)
- building design, selection of materials and the deconstruction process.

It is expected that the Sustainable Management Fund C&D waste project will assist in better defining the issues preventing C&D waste reduction and in designing and implementing effective solutions to any barriers identified.

5. Targets for hazardous wastes

5.1 *By December 2005, an integrated and comprehensive national hazardous waste management policy will be in place that covers reduction, transport, treatment and disposal of hazardous wastes to effectively manage risks to people and the environment*

Interpretation

The hazardous waste management policy, currently being developed, will provide formal guidance and direction to hazardous waste operators in best-practice management of hazardous waste. The policy will contain a mix of regulatory tools (e.g. National Environmental Standards) and non-regulatory tools (for example, economic instruments, industry partnerships). There is no clear indication of the best method to implement the policy, but this may be determined through the review of institutions and legislation mentioned above.

Action taken

The 'core' of the policy has largely been developed and trialled in practice - the *Working Definition of Hazardous Waste*. The Definition, along with the *New Zealand Waste List*, provides a consistent method to identify hazardous waste. The classification system of the NZ Waste List will form the basis for an important hazardous waste management control - *record-keeping and tracking*. *Landfill Waste Acceptance Criteria* (LWAC) are also being developed to ensure environmentally-sound and consistent criteria for acceptance of hazardous waste at landfills. Further work over the next two years will determine the other management controls that need to be applied to hazardous waste.

Progress towards the implementation of the target 5.1

Elements of an integrated and comprehensive policy are already in place. These include a national definition of hazardous wastes, an online waste list, guidelines on identification and record keeping, and guidelines on waste acceptance criteria. Other elements of the policy will be developed before the end of 2005.

Measuring progress towards the target

The elements needed for an integrated and comprehensive hazardous wastes policy are well understood. Progress is monitored internally and also by the Parliamentary Commissioner for the Environment.

5.2 *By December 2004, hazardous wastes will be appropriately treated before disposal at licensed facilities and current recovery and recycling rates will be established for a list of priority hazardous wastes*

Interpretation

'Appropriate treatment' will be defined in the development of the national hazardous waste management policy. 'Licensed facilities' will be hazardous waste operators that comply with the policy and local requirements (e.g. resource consents). A possible licensing mechanism is accreditation through industry associations.

Recovery and recycling rates will be determined once *record-keeping systems* have been adopted and are commonly used by hazardous waste operators (including generators of hazardous waste). Partnerships with industry (e.g. EPR and cleaner production initiatives) will contribute to increased recycling and recovery rates. There are currently no established criteria for determining 'priority hazardous wastes'. However, they could be designated based on certain factors (e.g. degree of hazard, availability of options, volume,) at either a national, regional or local level.

Action taken

Development and bedding-in of the afore-mentioned hazardous waste management policy will ensure that these targets are achieved. In the short term, work on appropriate treatment and disposal is progressing (e.g. *Landfill Waste Acceptance Criteria*), *Record-keeping* trials are establishing benchmark data on hazardous waste management (including recycling and recovery), and criteria for determining priority hazardous wastes are being developed. As part of the Sustainable Industry Group, there may be increased scope for developing partnerships with industry to achieve recovery and recycling targets.

Progress towards the implementation of the target 5.2

Guidelines on landfill waste acceptance criteria have been developed, and will form the basis for assessing appropriate treatment. The hazardous waste policy mentioned in the previous target will include further guidance on appropriate treatment and licensing requirements. There has been some work done by regional councils on determining recovery and recycling rates for hazardous wastes (Environment Bay of Plenty and Environment Waikato hazardous waste survey).

Issues arising from the implementation of the target 5.2, including barriers to implementation

The collection of reliable data on recovery and recycling rates is difficult, as there is no standard method for data collection. Defining 'priority' hazardous wastes will depend on regional differences. The regional council work determining recovery and recycling rates for hazardous wastes has shown that voluntary surveys tend to produce "flawed and unreliable data", suggesting that a more mandatory approach may be needed to track priority hazardous wastes. The lack of an appropriate trade-waste by-law recording information on hazardous wastes going to sewer is considered by Environment Waikato to be a key gap in the information framework. Councils wish to know which hazardous wastes are 'priority' hazardous wastes.

5.3 Recovery and recycling rates for priority hazardous wastes will increase 20 percent by 2012

Interpretation

Similar to those discussed in target 5.2

Action taken

Similar to those discussed in target 5.2

Progress towards the implementation of the target 5.3

Systems are not yet in place to allow progress towards this target to be measured. When current recovery and recycling rates have been established, and record-keeping and tracking systems have been adopted by hazardous waste management enterprises, there will be a better information base with which to measure progress. The baseline for measuring progress towards

this target needs to be established by the Ministry. The national collection of waste agrichemicals currently being organised by the Ministry for the Environment in collaboration with regional councils will provide, where practicable, for the recovery and recycling of waste chemicals that are collected. The amount processed largely depends on whether the waste chemicals are reliably labelled, and will only be a small fraction of the total hazardous waste stream.

Issues arising from the implementation of the target 5.3, including barriers to implementation

The need for better systems for hazardous waste measurement has been discussed above. The relatively small scale of hazardous waste generation in New Zealand means that establishing viable recycling and recovery operations is more difficult than in more industrialised countries (e.g., Australia). There is international trade in recyclable and recoverable materials, and this affects the commercial viability of domestic facilities. There are currently no financial incentives for enterprises to establish facilities in New Zealand, other than market pressures. The base value for measuring the 20 percent increase is not clear.

6. Targets for waste disposal

6.1 By December 2003, local authorities will have addressed their funding policy to ensure that full costs recovery can be achieved for all waste treatment and disposal processes

Interpretation

Full cost recovery means charging for disposal in a way that recovers all easily identifiable costs for development, operation and aftercare. For landfills, the Landfill Full Cost Accounting Guide for New Zealand provides a clear guidance on how to identify and quantify these costs.

Action taken

The Ministry has published a series of guidelines relating to good practice in landfill siting, design and operation. In September 2002, the Ministry has completed a review and audit of landfills in New Zealand which indicates the current prospects of the landfill targets being met.

Progress towards the implementation of the target 6.1

The implementation of this target requires councils to account for the full costs of their waste treatment and disposal facilities. The target is backed up by the accounting requirements of the Auditor General and the Local Government Act. Our understanding is that councils will achieve this target by the end of 2003. The Ministry for the Environment has developed a guide that can assist councils to calculate the full costs of landfills. The cost of collection needs to be incorporated into this model to enable councils to comply with this target. The full cost of wastewater collection, after taking into account the depreciation of the sewerage asset and the operational cost of treatment, is available through asset management planning processes and should be available in each council's long-term financial strategy.

Issues arising from the implementation of the target 6.1, including barriers to implementation

There are no known barriers to the implementation of this target.

6.2 *By December 2005, operators of all landfills, cleanfills and wastewater treatment plants will have calculated user charges based on the full costs of providing and operating the facilities and established a programme to phase these charges in over a time frame acceptable to local community*

Interpretation

Similar to those discussed in target 6.1

Action taken

Similar to those discussed in target 6.1

Progress towards the implementation of the target 6.2

There is anecdotal evidence that many landfill operators are using the *Landfill Full Cost Accounting Guide for New Zealand* (Ministry for the Environment, 2002a) to achieve this target. However, no formal survey of uptake of the guideline or calculation of user charges has been undertaken. Based on this limited evidence it is estimated that most, if not all, landfill operators are on track to introduce user charges over a time frame acceptable to the local community. There are some significant remaining issues around charging at rural transfer stations and for domestic rubbish collections. There is also very little comprehensive information available on the charging situation for cleanfills in general. Most cleanfills are privately run and are therefore likely to be recovering the full costs of operation. While the overall costs involved with wastewater are generally known, the marginal capital and operational costs attributed to an additional connection may not be clear. The costs of infrastructure provision and replacement for wastewater are addressed in some detail in the asset management programmes that have been championed by the local government and Audit New Zealand following Local Government Amendment No. 3 Act. Operational costs tend to be based more closely on historical costs and are subject to challenge from time to time, and the costs associated with domestic flow compared to commercial and industrial flows (trade wastes) are similarly unclear.

Issues arising from the implementation of the target 6.2, including barriers to implementation

A major perceived barrier to full-cost charging for solid waste is the risk of illegal dumping. The true nature of this barrier is unclear as there is some evidence that increases in disposal charges have been introduced by some local authorities with little or no increase in illegal dumping. Where the territorial local authority runs landfills, there can be ratepayer resistance to increasing the direct costs of waste disposal. Where landfills are private owner-operated, full costs will generally be recovered, while in areas served by several landfills there are complex interactions between market share and profit per tonne of refuse disposed. There are some significant challenges to be overcome in implementing full-cost charging for wastewater treatment and disposal. These include developing simple and consistent ways of measuring loading and flow, the political implications of 'user pays', and the adequacy of legislative provisions.

Source:

1. Targets' interpretation and actions:
<http://www.mfe.govt.nz/issues/waste/targets/index.html>
2. Review of targets: <http://www.mfe.govt.nz/publications/waste/review-targets-waste-strategy-feb04/review-waste-strategy-targets-feb04.pdf>

Part B: Issues of Concern

1. Identification of Stakeholders

A ‘concern’⁷ is something that causes anxiety and affects you, and will have to be taken into consideration while taking a decision. So ‘Issues of Concern’ are aspects identified by relevant stakeholders for different stages of the waste stream - to be addressed in the Waste Management Plan. It is similar to a ‘wish list’. There are many examples of concerns provided in this document like cultural aspects, fund availability, local expertise or skills etc.

1.1. Stakeholders and their representative organisations

There are six types of stakeholders and they could be represented by their associations (including community organizations and business and industry associations), NGOs, opinion leaders and representatives of the departments or companies. The list of stakeholders and their representative organisations are as hereunder:

I. Waste generators

- Households (for municipal waste) represented by resident associations, NGOs, etc.
- Businesses (for municipal waste) represented by business associations, Chambers of Commerce, etc.
- Hospitals (for health care waste) represented by individual hospital management, etc.
- Industries (industrial waste) represented by Industries Association, Industrial Park Management, etc.
- Wastewater treatment plants represented by their management
- Others, if any?

II. Service providers

- Governments (waste collection departments, landfill site operations, etc.) represented by different departments
- Private companies (waste transporting companies, incinerator managing company, etc.) represented by their associations and opinion leaders
- Community organizations represented by their associations and opinion leaders
- Others, if any

III. Regulators

- Regulatory bodies (Environmental Protection Bureau, etc.)

IV. Government departments:

- Responsible for one or more waste streams such Construction & Sanitation and Environmental Protection Department, etc.

V. Recycling sector (formal and informal)

- Waste pickers represented by associations and NGOs
- Businesses in recycling materials represented by associations, etc.
- Businesses in generating resources (such as compost and biogas) represented by associations, opinion leaders, etc.
- Industries using recycling materials as an input, represented by Federation of Chamber of Commerce, industry associations, etc

(Note: Such associations may not exist and WND may suggest - Who represents them?)

⁷ Concerns are different from constraints, which are beyond our control or the scope of the project.

VI. Community or neighbourhood

The community or neighbourhood are people living in the area where waste is either generated (by individual households, businesses, industries, etc.), or transported, treated and disposed (incineration plants and landfills). These communities are directly affected if the waste is not collected from the neighbourhoods, or the transportation of waste creates noise and congestion in their neighbourhoods, or the secondary containment from waste treatment and disposal affects health and environment. They can be represented by local leaders, community associations and opinion leaders.

1.2. Preparing the list of the stakeholders

In line with the above discussions to identify the stakeholders and their representative organizations and individuals, a list of the stakeholders can be prepared in line with Table 1.1 (for MSW) and Table 1.2 (for industrial waste, which also includes healthcare waste and sludge from wastewater treatment plants).

Table 1.1: List of the Stakeholders for Municipal Solid Waste (MSW)*

Stakeholders & Activities	Waste Generators	Service Providers	Regulators	Government	Actors in Recycling & Resource Generation	Community
Source Segregation						
Collection						
Transportation						
Treatment						
Disposal						
Recycling & Resource Generation						

* Construction waste is not considered at the moment in ISWM Plan as discussed during 2nd PIC Meeting

Domestic waste from industries is also considered as MSW in WND

Table 1.2: List of the Stakeholders for Industrial Waste*

Stakeholders & Activities	Waste Generators	Service Providers	Regulators	Government	Actors in Recycling & Resource Generation	Community
Source Segregation						
Collection						
Transportation						
Treatment						
Disposal						
Recycling & Resource Generation						

* Industrial solid waste includes healthcare waste and sludge from wastewater treatment plants

2. Issues of Concern for the Stakeholders

2.1. Identification of focal areas, stakeholders according to waste streams, and priority issues

One of the first steps to be taken in identifying the issues of concern is (1) to identify the focal areas along a waste stream, (2) relevant stakeholders, and (3) identification and prioritisation of the issues of concern. These can be presented in the form of a matrix, illustrated in Figure 2.1

A. Focal areas for issues of concern

- I. Source segregation
- II. Collection
- III. Transportation
- IV. Treatment
- V. Disposal
- VI. Resource recovery (recyclables, compost, gas, etc.)

B. Distributing stakeholders according to waste streams

- I. Municipal solid waste – residential, commercial and non-processing industrial waste
- II. Industrial waste – Industrial processing waste (including hazardous waste), healthcare waste and sludge from municipal wastewater treatment plants (WWTP)

C. Identification and prioritization of the issues of concern

- I. List out the important issues of concern based on the experience, as shown in section B of this chapter
- II. Involve stakeholders to discuss these issues and suggest additional issues to be included in the list or Table
- III. Based on the discussions, prioritize the issues first with respect to each stakeholder and subsequently with respect to each focal area
- IV. The summarized issues may be presented as shown in *Fig 2.1* and detailed sheets may be attached with the report on the Issues of Concern for the Stakeholders

D. Matrix of issues, stakeholders and components for Integrated Solid Waste Management (ISWM)

As shown in Fig 2.1, after the prioritization of the issues of concern for the stakeholders, a matrix could be developed. This would be helpful to define the priorities of various stakeholders for different components of ISWM, to develop a more realistic ISWM Plan.

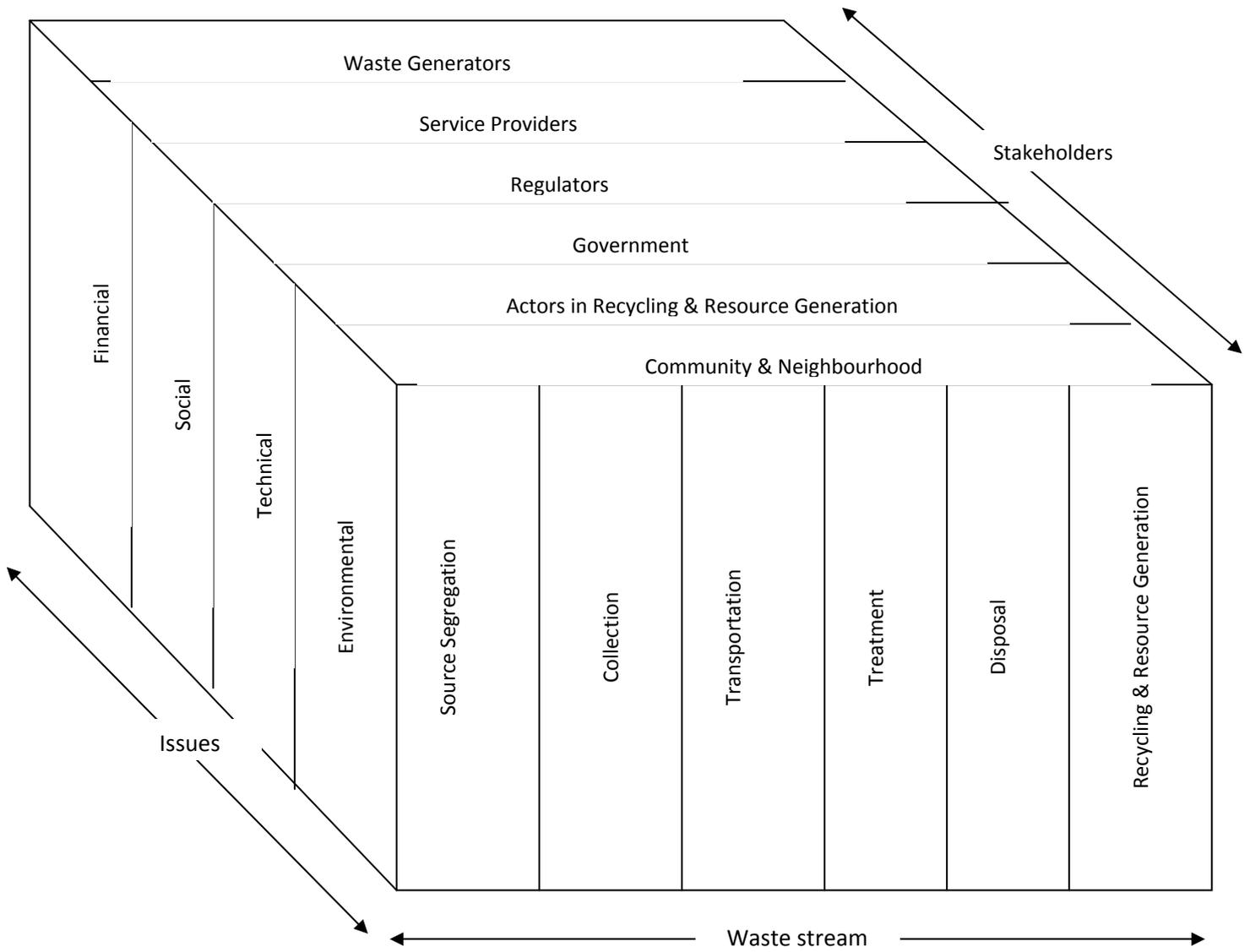


Figure 2.1: Issues, Stakeholders and Components for ISWM

3. Municipal Solid Waste

This chapter focuses on municipal solid wastes, and looks at the following stages: (a) source segregation, (b) collection, (c) transportation, (d) treatment, (e) disposal, and (f) recycling and resource generation.

3.1. Source Segregation

Table 3.1 provides a sample list of Issues of Concern related to Source Segregation. A WND specific list will have to be prepared based on the views of various stakeholders.

Table 3.1: Examples of Issues of Concern for Source Segregation (MSW)

	Waste Generators	Service Providers	Actors in Recycling & Resource Generation
Financial	<ol style="list-style-type: none"> 1. Who would bear the costs for buying bins and bags for source segregation 2. Who would get the benefit of earnings from the sale of source-separated recyclables 3. Current fee system and increase in the fee with respect to affordability 	<ol style="list-style-type: none"> 1. Who would bear the cost of providing extra equipment and service 2. Who should get the benefit from the sale of source-separated recyclables 	<ol style="list-style-type: none"> 1. Will scavengers get benefit from more and clean quantity of recyclables (income and better job safety)
Social	<ol style="list-style-type: none"> 1. Cleaning the recyclables and keeping the garbage for longer duration 2. Awareness raising for segregation of waste and proper primary disposal 	<ol style="list-style-type: none"> 1. Who will be responsible for safety & security of additional facilities 2. Sanitation workers' working environment including health risks 	<ol style="list-style-type: none"> 1. Will any training be required 2. Waste pickers' working environment including health risks
Technical	<ol style="list-style-type: none"> 1. Information about segregation of waste (different types of waste) 2. Availability of different types of waste collection bags 3. The size, shape and location of bins 4. Methods for reuse and recycling waste at source 5. Current problems in the waste collection and one or two possible suggestions for the improvements 	<ol style="list-style-type: none"> 1. Technical adaptability of bins to transfer the garbage in the collection vehicles 2. Training for sanitation workers 3. Knowledge about different type of wastes, especially hazardous waste 4. Segregation and recycling of waste after collection by sanitation workers 	<ol style="list-style-type: none"> 1. How to distinguish between PET and other plastics 2. Cleaning/treatment of the recyclables by waste pickers – availability of space, water, etc. 3. Waste pickers' collection point (bins, community waste disposal points, etc.) for waste pickers
Environmental	<ol style="list-style-type: none"> 1. Odour, leakage and attracting birds, animals and flies 		

1. Expenditures and efforts required:

In some countries, the costs and efforts involved to promote source segregation of recyclable and non-recyclable waste is a debatable issue. This cost includes the type, size and location of the bins, which can be easily unloaded into the waste collection vehicles. There could be various arrangements to meet these costs. For example, in Nonthaburi Municipality of Thailand, under a pilot project, source segregation was promoted and the municipality provided an extra trip to collect and sell the recycling waste. The earnings were equally distributed between the community, for buying the bags and bins, and between the municipal workers as an incentive for them to take an extra trip and to sort and sell the recycling waste. In addition to the costs incurred, the waste generators may be required to clean or wash some of the recycling materials before disposing off in the specific bins or bags.

2. Frequency of collection and time-lag for keeping the garbage:

When the garbage is segregated into various categories, and if the same vehicle cannot collect all the types of separated waste at the same time, then the garbage would be required to be stored for a longer duration. This may create social and environmental nuisance such as odour, leachate, flies, attracting birds and animals.

3. Technical aspects of collection vehicles:

If the source-segregated waste is transferred to vehicles manually, then it may require more efforts in comparison to the transfer of mixed waste. In many countries, the bins and vehicles are designed in such a way that the waste can be transferred without a lot of manual effort. Kerbside collection systems in European countries are based on this idea. However, procurement, operation and maintenance of such a system for a developing country could be costly and there may be lack of technical capacity to carryout maintenance of vehicles.

4. Scavengers and informal sector:

There is also a debate in many places, of whether source-segregation will improve the earnings and safety at work. In some places, the informal sector moves a step further in recycling ladder and instead of collecting recycling waste from the mixed waste, they can start buying the waste from the waste generators and sell to the recycling businesses.

3.2 Collection

Table 3.2 provides a sample list of Issues of Concern related to Collection. A WND specific list will have to be prepared based on the views of various stakeholders.

Table 3.2: Examples of Issues of Concern for Collection (MSW)

	Waste Generators	Service Providers	Actors in Recycling & Resource Generation
Financial	1. Will there be any new collection charges	1. Will there be revised collection charges for the service providers	1. Whether scavengers will gain or lose in the new collection system?
Social	1. Can I allow scavengers to come to my house		
Technical	1. Frequency and timing of collection	1. What should be the collection frequency and timing based on the capacity of the department	
Environmental	1. Odour and flies if the waste has to stay longer at my disposal point	1. Will there be new health and environmental risks if the waste stays longer before it is collected	

1. Concerns about costs, frequency and timing of collection:

Waste generators of MSW (residents and businesses) are usually worried about any new charges to meet the collection costs. In some developing countries, the primary collection is arranged by the residents or businesses through community organizations or the local private sector, while the secondary collection is the responsibility of the local government. On the other hand, the residents and businesses want to get rid of the garbage as soon as possible, therefore, they want to have a higher frequency of waste collection and convenient timing from their point of view. The higher frequency may not be economically viable and there may be conflicting views among stakeholders on the convenient timings.

3.3. Transportation

Table 3.3 provides a sample list of Issues of Concern related to Transportation. A WND specific list will have to be prepared based on the views of various stakeholders.

Table 3.3: Examples of Issues of Concern for Transportation (MSW)

	Service Providers	Community
Financial	1. Cost of transportation equipment	1. Will the community have to bear any additional charges
Social		
Technical	1. Operational aspects 2. Maintenance capacity	
Environmental		1. Noise and congestion

1. Costs for procuring, operating and maintaining transport vehicles and equipment:

Local governments spend most of its budget (allocated for MSW) on transportation. Based on the road infrastructure and distances within the town, and to transfer stations, treatment or disposal sites, a variety of transportation vehicles and equipment may be required. Their O&M as

well as procurement (if not available locally) may require foreign exchange. The service providers may try to cut costs leading to reduced level of service or reduced age of equipment. Cost-cutting measures may lead to retaining of old vehicles and equipment in service, causing an adverse effect, i.e. lower efficiency and higher environmental pollution.

2. Local capacity to operate and maintain the transportation system:

A high-tech transportation system without enough local technical capacity to maintain may be a serious concern for the service provider. In many developing countries, sometimes the equipment is procured under international cooperation that may not be in line with available technical capacities. Hence, either the equipment should be selected in line with the local capacity, or the local capacity should be strengthened in line with the high-tech transportation system.

3. Noise and congestion faced by the community during transportation of MSW:

The timing of transportation system, especially for collection of MSW from residential areas and from congested commercial streets, is very crucial. Transportation may cause congestion, if waste is collected during rush hours. On the contrary, if the waste is collected late night, then the residents may have concerns over the noise created.

3.4. Treatment

Table 3.4 provides a sample list of Issues of Concern related to Treatment. A WND specific list will have to be prepared based on the views of various stakeholders.

Table 3.4: Examples of Issues of Concern for Treatment (MSW)

	Service Providers	Actors in Recycling & Resource Generation	Community
Financial	1. Costs for each treatment option 2. Benefits (e.g. waste to energy) 3. Who should pay the costs	1. Costs and benefits of recycling at treatment plants	1. Will we get a share in the benefit
Social	1. Can treatment facilities provide additional jobs	1. Working conditions at treatment facilities	
Technical	1. Operation & maintenance skills 2. Compliance with the regulations	1. What are the market opportunities	
Environmental	1. Water pollution from treatment facilities	1. Is this regarded as natural environmental damaging	1. Treatment facilities should not be located in my backyard

1. Treatment costs for different options:

The cost (and benefits) of alternative treatment systems could be a major issues for the service providers. Thermal treatment (such as incineration), biological treatment (such as anaerobic digestion), and chemical treatment (such as pyrolysis) may incur different costs while generating different benefits, which could be mainly influenced by the location and technology of the treatment. For example, if thermal treatment technology is efficient and can also convert waste

into energy, then its location determines its ability to sell this energy to meet some of the costs. Similar situation may apply for producing compost and biogas through anaerobic digestion. Market opportunities for recycled products may be another major concern (for e.g., the availability of ready market for compost, bio-gas etc.)

2. *Technical capacity:*

Most of the treatment technologies are usually high-tech requiring good technical capacity for their O&M. Before procuring any new technology, it may be a good idea to assess the local capacity and to plan capacity strengthening for meeting new operational and maintenance needs.

3. *Compliance with the local regulations:*

Treatment technologies could generate secondary contamination and create environmental pollution (air, water, noise, odour, and so on). There could be national and local environmental standards to control this secondary contamination and environmental impacts. Enforcement of strict regulations may be a point of concern for the service providers to install certain types of treatment technologies including incinerators. For example, the Philippines procured two incinerators, but these could not go operational due to Air Quality Standards in that country.

4. *Community concerns for the environmental impacts:*

In contrast to the concerns of service providers on the availability and compliance with stringent regulations, the community may have concerns over the non-availability or non-compliance of environmental standards resulting in secondary contamination and environmental pollution including noise and odour.

5. *Costs and benefits for promoting of recycling activities:*

Recycling businesses may have concerns for certain type of recycling or material recovery activities at the treatment plants due to demand and supply in the market. Treatment options and possibilities for recycling and resource generation may be in line with these concerns.

3.5. Disposal

Table 3.5 provides a sample list of Issues of Concern related to Disposal. A WND specific list will have to be prepared based on the views of various stakeholders.

Table 3.5: Examples of Issues of Concern for Disposal (MSW)

	Service Providers	Actors in Recycling & Resource Generation	Community
Financial	1. Costs of different options		
Social	1. Will there be any public involvement against the facility 2. What is the guarantee of recovering waste over long periods		1. Is the treatment self-viable over long-term
Technical	1. Operation & maintenance skills 2. Compliance with the regulations	1. Scavenging at landfill 2. Technology and capacity for producing energy from landfill gas	1. Is there any risk of accident
Environmental	1. Will there be future stringency in environmental law		1. Environmental impacts on ground water & air pollution, noise, odour, etc.

1. Costs and benefits of different disposal options:

As discussed for the treatment options, there may be different costs and benefits streams for different options, including sanitary landfill, bioreactor, mechanical and biological treatment (MBT) and land reclamation. The cost of land and distance from waste generation or waste transfer places could be a vital parameter, in addition to the costs required for procurement, and to operate and maintain the technology. Some disposal methods may provide higher benefits from speedy generation of landfill gas and compost.

2. Technical capacity:

Technical capacity could be a major concern if the technology is unfamiliar and high-tech.

3. Compliance with the standards:

Stringent standards, for example to protect ground water, could be an issue of concern for service providers.

4. Community concerns for environmental protection:

On the contrary, the communities may want to promote stringent standards and their compliance to avoid any negative environmental impact - therefore, they may have concerns about specific disposal methods.

5. Scavenging at the disposal sites:

There are examples of scavenging activities at disposal sites such as landfills. There could be concerns of safety of scavengers and communities living near landfills, including landslides of garbage mountains or health epidemics.

3.6. Recycling & Resource Generation

Table 3.6 provides a sample list of Issues of Concern related to Recycling & Resource Generation. A WND specific list will have to be prepared based on the views of the various stakeholders.

Table 3.6: Examples of Issues of Concern for Recycling & Resource Generation (MSW)

	Factors in Recycling & Resource Generation
Financial	1. What will be the change in the earnings for individuals and businesses involved in collection and selling of recycling materials 2. Is there a ready market for resources generated from waste (e.g. compost, bio-gas) 3. Where is the information available on new technologies utilizing waste as an input
Social	1. Work safety of individuals involved in the recycling and composting business 2. Acceptability of goods (including compost and gas) produced from waste
Technical	1. Technology and capacity to convert waste into a resource
Environmental	1. Compliance with the environmental standards

1. Earnings for recycling businesses:

A major concern of individuals and businesses involved in the collection and selling of recycling materials could be the effect on their earnings.

2. The cost of converting waste into a resource:

In addition to treatment plants and disposal sites, private companies or community organizations may become involved in collecting and converting waste into a resource - the cost and its market value may be a major concern.

3. Costs for procuring technology and overall costs of production for using waste as an industrial input:

To use waste as an input in an industrial process, immediate costs may be incurred if industries have to make modifications in their current technology. Despite overall positive cost-benefit advantages, if the industries cannot afford the immediate expenditures then it will be difficult for them to use waste as an input.

4. Acceptability of goods produced from waste:

Producers may have concerns about acceptability of goods, including compost and gas, produced either by converting waste into a resource or by using waste as an input in an industrial production process.

5. Technology and the local capacity:

The availability of efficient and safe technology and local capacity for O&M of that technology can also be an issue of concern for local recycling businesses.

6. Compliance with the standards:

Businesses may have concerns about compliance with environmental standards, which might either prevent some of the recycling activities or may make it too costly.

4. Industrial Waste

This section on preparing a list of “Issues of Concern” focuses on industrial wastes that includes industrial processing waste, healthcare waste and sludge from municipal WWTP. The following stages dealt: (a) source segregation, (b) collection, (c) transportation, (d) treatment, (e) disposal, and (f) recycling and resource generation. .

4.1. Source Segregation

Table 4.1 provides a sample list of Issues of Concern related to Source Segregation. A WND specific list will have to be prepared based on the views of various stakeholders.

Table 4.1: Examples of Issues of Concern for Source Segregation (Industrial Waste)

	Waste Generators
Financial	1. Who will pay for the additional cost of segregation 2. The cost for treatment and reuse is very high 3. Is it expensive to treat special waste (hazardous waste, e-waste, etc.)
Social	1. Are there any special provisions to be made for operators
Technical	1. Compliance with the regulations 2. Technology, capacity and practices to store and treat or reuse/recycle the waste within the industry or hospital 3. Information about the type of waste for segregation at source 4. Opinions about the difficulties to manage industrial/hospital waste and one or two suggestions for the improvements
Environmental	1. Any internal regulations, in addition to national and local regulations, regarding handling/managing special wastes at industry/hospital

1. *Clarity of the regulations for source segregation:*

In most industries and healthcare facilities, source segregation of waste is practiced in compliance with the regulations. However, understanding of the various regulations may still be a major concern for industries and healthcare facilities who may want to get a clear picture of the regulations about hazardous and non-hazardous wastes, and about the procedures for compliance.

2. *Technical capacity to store and reuse:*

Industries may face limitations in capacity to acquire proper technology and procedures for the storage of various types of hazardous and non-hazardous waste. Capacity limitations, especially lack of modern technology, may also limit the possibility of reusing and recycling most of the waste within the same industry.

4.2. Collection

Table 4.2 provides a sample list of Issues of Concern related to collection of industrial wastes. A WND specific list will have to be prepared based on the views of various stakeholders.

Table 4.2: Examples of Issues of Concern for Collection (Industrial Waste)

	Waste Generators	Service Providers
Financial		1. Waste generators are currently unwilling to engage service providers for waste collection 2. Are the collection charges, paid by the generators (industries/hospitals) enough to generate profits
Social	1. Service providers do not deploy trained personnel	1. Waste generators are not cooperative to facilitate the work of service providers
Technical	1. Frequency and timing of collection	1. Technology and capacity to collect the source-separated waste from industries 2. Do service providers possess the licence to collect/manage special wastes
Environmental	1. Environmental protection measures by the service providers during collection	1. Meeting the environmental standards while collecting/managing special waste (hazardous, e-waste, etc.)

1. Frequency, timing and capacity of collection system:

Waste generators, such as industries and healthcare facilities, may have their priorities in the frequency and timing of collection of wastes, especially hazardous or volumetric wastes. On the other hand, service providers may lack capacity to handle some special wastes and their concern could be the ways and means to strengthen that capacity as well as to meet the frequency and timing of collection as per their clients’ needs.

2. Environmental protection measures by the service providers:

Waste generators, such as industries and healthcare facilities, may have concerns for service providers over the environmental protections measures, especially when waste is being collected or transferred to collection vehicles.

4.3. Transportation

Table 4.3 provides a sample list of Issues of Concern related to transportation. A WND specific list will have to be prepared based on the views of various stakeholders.

Table 4.3: Examples of Issues of Concern for Transportation (Industrial Waste)

	Service Providers	Waste Generators	Community
Financial	1. Cost of transportation equipment		
Social			
Technical	1. Operational aspects 2. Maintenance capacity	Service providers lack technical capacity and that may result into accidents and mismanagement	
Environmental			1. Noise, congestion and accidents

1. Cost of transportation equipment:

New waste streams may require service providers to procure new transportation equipment, and may have concerns on the initial investments and cost recovery for the new equipment.

2. Operational aspects and maintenance capacity:

Service providers, in addition to financial aspects may also have concerns about the O&M of transportation equipment. They may also have concerns regarding the compliance of regulations for operations such as transportation of hazardous waste.

3. Noise, congestion and accidents:

The community may have serious concerns regarding the transportation of industrial waste, especially if its route passes through residential and commercial areas. The noise, congestion and accidents (involving vehicles carrying hazardous waste) could be a major concern for them.

4.4. Treatment

Table 4.4 provides a sample list of Issues of Concern related to treatment of industrial wastes. A WND specific list will have to be prepared based on the views of various stakeholders.

Table 4.4: Examples of Issues of Concern for Treatment (Industrial Waste)

	Waste Generators	Service Providers	Community
Financial	1. Charges	1. Costs for each treatment option 2. Benefits (e.g. waste to energy)	
Social			
Technical		1. Operation & maintenance skills 2. Compliance with the regulations	
Environmental			1. Environmental impacts

1. Costs and benefits for the service providers:

Treatment options could be costlier for industrial waste and the benefits (such as waste-to-energy) may be fewer in comparison with MSW. Hence, service providers may have concerns about the initial and ongoing investments and cost recovery, while waste generators may be concerned about the charges they have to pay for waste treatment.

2. Operation and maintenance:

The technology needs, especially for hazardous waste treatment, could be more complicated requiring higher technical capacity for O&M of these treatment plants.

3. Compliance with the regulations:

A major concern for treatment plant operators could be that of compliance with regulations. Sometimes they may not be clear about some of the regulations and procedures for compliance.

4. Environmental impacts:

The community may have concerns about environmental impacts from these treatment plants, including incinerators.

4.5. Disposal

Table 4.5 provides a sample list of Issues of Concern related to disposal. A WND specific list will have to be prepared based on the views of various stakeholders.

Table 4.5: Examples of Issues of Concern for Disposal (Industrial Waste)

	Service Providers	Community
Financial	1. Costs for each option	
Social		
Technical	1. Operation & maintenance capacity 2. Compliance with the regulations	
Environmental		1. Environmental impacts on ground water & air pollution, noise, odour, etc.

1. Cost of disposal options:

The cost of various disposal options, especially secured landfill sites, could be very high and the primary concern for service providers would be the initial investment cost and its recovery.

2. Operation and maintenance capacity:

Technical capacities required to operate and maintain disposal sites for industrial waste, especially for hazardous waste, may be a concern for service providers responsible for new streams.

3. Compliance with the regulations:

Regulations for disposal sites for industrial waste could be very stringent, and there may be concerns about their clarity and procedures.

4. Environmental impacts:

The community, especially if they are living near these disposal sites, may have serious concerns about the environmental impacts as well as odour and noise. Their major concern could be the impact on groundwater and local air pollution.

4.6. Recycling and Resource Generation

Table 4.6 provides a sample list of Issues of Concern related to Recycling & Resource Generation. A WND specific list will have to be prepared based on the views of various stakeholders.

Table 4.6: Examples of Issues of Concern for Recycling & Resource Generation (Industrial Waste)

	Factors in Recycling & Resource Generation
Financial	1. What would be the change in the costs and benefits to reuse waste as an input 2. What would be cost for various options to generate resource from waste (e.g. compost and biogas)
Social	1. Acceptability of goods (including compost and gas) produced from waste
Technical	1. Technology and capacity to convert waste into a resource and to use waste as an input
Environmental	1. Secondary contamination form recycling activities and compliance with the regulations

1. Costs and benefits for reusing waste as an input:

There may be a need for modifications in the technology to use waste as an input in industrial production. Waste could either be used as an alternative fuel or be converted into a raw material for producing goods. The costs for these modifications in the technology could be a concern for industries wishing to use waste as an input. The other concern could be the cost and reliability of procuring waste as an input on a regular, sustained basis.

2. Costs involved for resource augmentation by utilizing waste (compost, biogas, etc.):

Companies involved in the business of resource augmentation by utilizing waste may have questions on the costs involved. The total costs may include cost of collecting organic waste, converting it into a resource and supplying it to customers.

3. Acceptability by consumers of goods produced from waste recycling:

There may be some concerns by producers about consumer acceptability of goods produced from waste. Even if the quality of products is as good as the products produced from fresh/virgin materials, customers may not accept these products easily.

4. Secondary contamination from recycling activities:

Secondary contamination and compliance with regulations may be an important concern as this may limit the level of recycling activities within or outside the industry.

About the UNEP Division of Technology, Industry and Economics

The UNEP Division of Technology, Industry and Economics (DTIE) helps governments, local authorities and decision-makers in business and industry to develop and implement policies and practices focusing on sustainable development.

The Division works to promote:

- > sustainable consumption and production,
- > the efficient use of renewable energy,
- > adequate management of chemicals,
- > the integration of environmental costs in development policies.

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

- > **The International Environmental Technology Centre** - IETC (Osaka, Shiga), which implements integrated waste, water and disaster management programmes, focusing in particular on Asia.
- > **Production and Consumption** (Paris), which promotes sustainable consumption and production patterns as a contribution to human development through global markets.
- > **Chemicals** (Geneva), which catalyzes global actions to bring about the sound management of chemicals and the improvement of chemical safety worldwide.
- > **Energy** (Paris), 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.

*UNEP DTIE activities focus on raising awareness,
improving the transfer of knowledge and information,
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This book is the third volume in the series of training manuals on developing Integrated Solid Waste Management (ISWM) plan. This manual aims to build the capacity of practitioners and policy makers for setting up targets for ISWM and identifying stakeholders' issues of concern.

The objective of the manual is to facilitate setting targets expected to be achieved through the ISWM Plan. The manual also provides guidelines for conducting stakeholder consultation to identify their concerns with reference to financial aspects, environmental impacts, technology considerations and cultural aspects.