THE SUSTAINABILITY OF ALLIANCES BETWEEN STAKEHOLDERS IN WASTE MANAGEMENT

-using the concept of integrated Sustainable Waste Management-

Working paper for UWEP/CWG, 30 May 2000 - Draft

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Abstract
This paper presents the concept of Integrated Sustainable Waste Management (ISWM)[1] in the context of assessing the sustainability of waste management alliances. ISWM differs from conventional approaches towards waste management by seeking stakeholder participation, by including waste prevention and resource recovery explicitly, by encouraging the analysis of interactions with other urban systems and by promoting an integration of different habitat scales (city, neighbourhood, household). ISWM can be used as a policy tool and as an assessment/analysis tool. In this paper the emphasis is on its use as an assessment / analysis tool. It is argued that ISWM can be used as an assessment / analysis tool for all aspects of the project cycle, especially for design / formulation, for monitoring and evaluation of a waste management project. Assessment of the sustainability of waste management means looking at waste management from three different angles: the perspective of stakeholders, waste system elements and sustainability aspects. The focus of this paper **is** on the perspective of stakeholders in waste management and the contribution to sustainability of the alliances between stakeholders. It is concluded that the assessment process is not easy, but can provide valuable information about alliances and provide a basis for comparison. Needs for future research to further develop the concept of ISWM as a tool for assessing the sustainability of waste management are indicated.

1. Introduction

Rapid population growth and uncontrolled industrial development are seriously degrading the urban environment in many countries in the South. One of the most serious environmental consequences of the process of urbanisation is the ever-growing

[1] The concept of ISWNI has been developed by WASTE, Advisers on Urban Environment and Development, and has first been presented in 1995 during the UMP Workshop on Municipal Solid Waste Management in Ittingen, Switzerland. The concept presented is not a final product; it builds continuously on new insights and experiences

amount of solid and liquid wastes generated by cities in the South (UNCHS, 1994). Often a discrepancy exists between the growing population and the increasing - demand for sanitation an solid waste collection services on one hand and the capacity of the local government to provide these services on the other hand.

In many cities in the South solid waste collection is inadequate and poor, leaving waste uncollected in streets, dumped in vacant lands, drains and surface water, and burnt in the open air. Inadequate sanitation is also quite common in low-income urban and rural areas in the South, posing threats to public health.. Both solid waste management and sanitation are costly services, partly due to inefficiencies and a focus on large-scale solutions. The legitimate question arises how we can deal with solid and liquid wastes in an efficient, effective and sustainable manner.

The concept of Integrated Sustainable Waste Management (ISWM) is an approach to reach better, more sustainable solutions to solid waste problems, especially in cities in the South. In this paper the ISWM concept will be explained and its use as an assessment tool. ISWM is not a goal in itself nor is it d blueprint. In the context of the Urban Waste Expertise Programme (UWEP)[22] the ISWM concept has been used for the design of pilot project settings, for monitoring of activities in these pilot project settings and as a guideline for the preparation of case studies on the pilot project settings.

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2. The Concept of Integrated Sustainable Waste Management

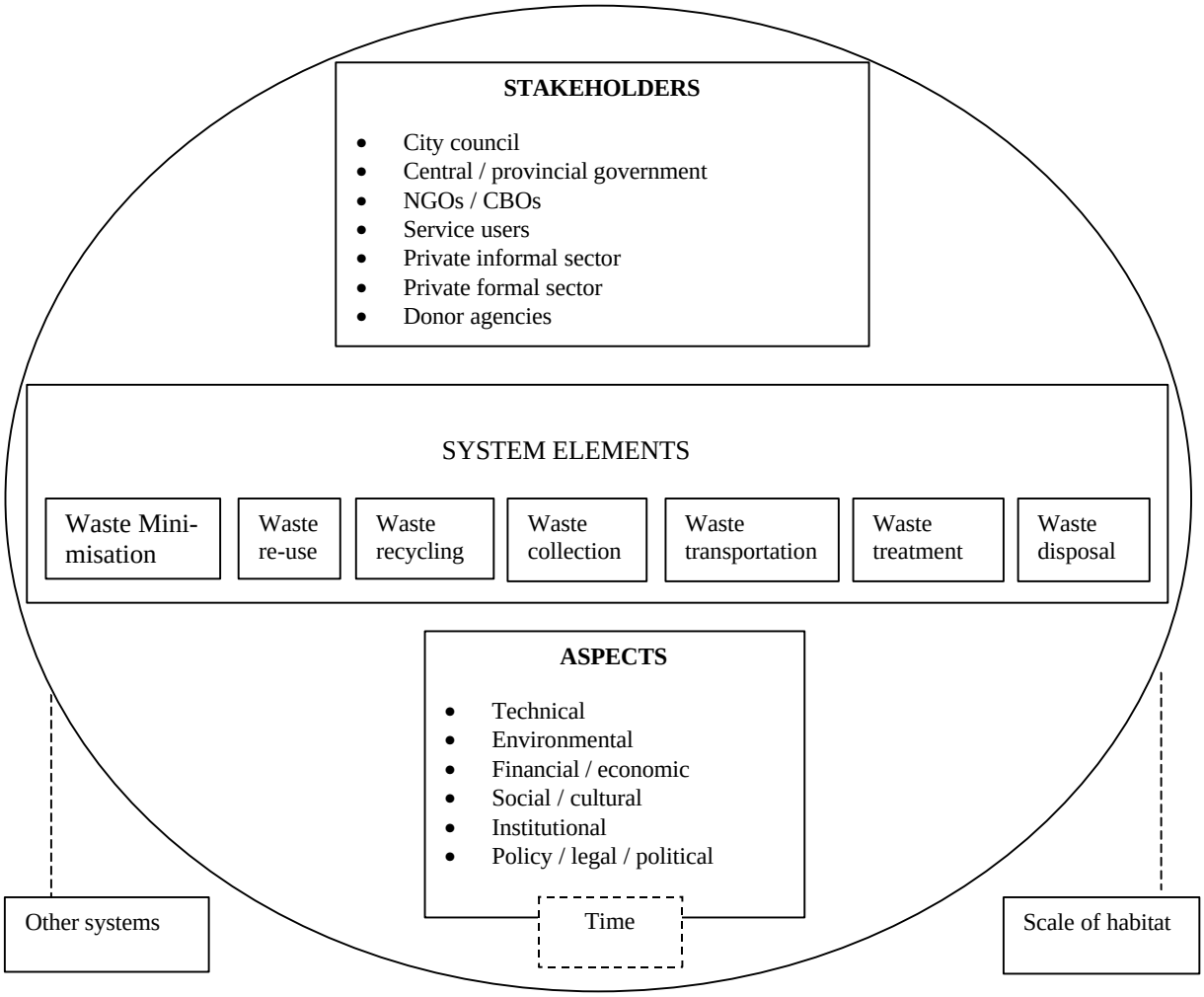
Integrated Sustainaable Waste Management refers to a waste management system that best suits the society, economy and environment in a given location, a city in most cases. The concept of ISWM not only takes technical or financial-economic sustainability into account as in conventionally done, but it also includes socio-cultural, environmental, institutional and political aspects that influence overall sustainability of waste management. ISWM also stands for a strategic and long-term approach. Waste management is seen in the ISWM approach as an equity and public health issue, which means that everybody has a right to a regular waste collection and proper sanitation.

2.1 Dimensions of ISWM

The ISWM concept consists of three dimension of sustainability, which need to be integrated:

- Stakeholders
- System elements
- Aspects

These three dimensions are worked out in more detail in Figure 1 below



2.2'What does 'sustainable' mean?-

In the context of ISWM 'sustainable' can be described as:

- appropriate to the local conditions from a technical, environmental, social, economic, financial, institutional, and political perspective, and;
- capable to maintain itself over time without exhausting the resources it needs

As was shown in Figure I sustainability can be looked at from at least six angles, from a technical, environmental, social, economic, financial, institutional, and policy/political perspective. It is advisable to consider these aspects, whenever a waste management system is being planned, analyzed, monitored, etc.

The factor 'time' is included as a separate aspect in Figure 1, because it is important for the sustainability of waste management. It is an aspect that should not be forgotten, as development and planning are long term issues, which need time. Foreign donor agencies and local decision-makers do not always realise that and take adhoc decisions or propose short-term, visible projects. In countries with local and national elections a change of decision-maker every four, five years may turn previous policies upside down and may thwart attempts to arrive at sustainable, long term solutions.

2.3 What does integrated mean?

'Integrated' refers to the integration of:

- different aspects of sustainability (technical, environmental/public health, financial, etc.)
- different collection and treatment options at different habitat scales, i.e. household, neighbourhood and city level (operational interaction)
- different stakeholders, governmental or non-governmental, formal or informal, profit- or non-profit oriented (co-operation, linkages, alliances, economic and social interaction)
- the waste management system and other urban systems (such as drainage, energy, urban agriculture, etc.)

Sustainable and integrated are closely inter-related. For.example, using different collection and treatment options, at different habitat scales, can form the basis of a system that is adapted to local (physical, social, economic, etc.) conditions. The four types of integration will be developed further hereafter.

2.3.1 Integration of different aspects

The ISWM concept distinguishes six aspects, which draw on the extensive experience of waste management experts of WASTE and other organisations with solid and liquid waste management systems all over the world (Bartone, 2000, Wilson, 2000, UVVEP publications). More and more the idea is gaining ground that including social, institutional, political and environmental concerns pays off in the long run in the form of greater sustainability of waste management systems. In the past many projects have failed due to an overemphasis on technical aspects alone (Coad, 2000). Nowadays the tendency is to look at the financial economic aspects and to stress on the benefits of including the private sector in solid waste management. However, this

approach risks being one-sided. For example the spontaneous grassroots level privatisation processes that take place in many countries in the South are usually overlooked. These processes consist of small-scale and micro-enterprises and community-based organisations undertaking waste management tasks that the government does not carry out satisfactorily, does not carry out at all (for example waste collection in low-income areas) or that are traditionally outside the purview of the government (like recycling and recovery) (Moreno *et al.,*, 1999). This spontaneous grassroots level privatisation processes are sometimes called 'social privatisation', in contrast with conventional privatisation, because many of these entrepreneurs work out of a social concern and not merely out of a profit motive (Moreno *et aL,* 1999). ISWM calls for mixed privatisation options, combining conventional and 'social' privatisation, adapted to the local circumstances. A recent evaluation of solid waste management projects funded by the World Bank confirms that the most successful projects are those that adopt an integrated approach and incorporate different aspects to improve their waste management system (Bartone, 2000).

2.3.2 Integration of habitat scales

Various collection, disposal and recovery options and their integration at different habitat scales are shown in Table 1.

Table 1 Options for Integrated Sustainable Waste Management systems

Habitat scale	**Collection and disposal system**	**Resource recovery system**
Household level	Storage at source	Prevention Separation at source Reuse at source
Neighbourhood level	Primary collection Temporary storage	Primary collection Sorting and pre-treatment Reuse Recycling Composting
City level	Secondary collection Transfer storage Tertiary collection Final disposal and treatment	Sorting and pre-treatment Secondary collection Reuse Recycling Composting

Table I shows all possible combinations of collection, disposal and resource recovery options, but the actual table or chart depends on the local situation.

Waste management runs across different levels: household, neighbourhood, city, region, and country. The tendency is to look at the waste management system at the city scale and to stipulate that the system and technology used should be standardised and the same all over the,city. Possible appropriate solutions at the neighbourhood level are commonly overlooked. As a consequence low-income areas are marginalised in the search for 'modem', standardised waste collection systems and receive no or minimal waste collection, while with appropriate equipment and adapted financial arrangements these areas could receive a proper service too (Wilson, 2000).

However, this requires a neighbourhood-on'ented and decentralised approach, looking at requirements and conditions of local neighbourhoods and communities. Any ISWM system should therefore distinguish between different habitat scales and integrate them as much as possible at the city level.

2.3.3 Integration of different stakeholder groups

To achieve sustainability in waste management it is important to look at the roles, interests and power structures prevalent in waste management. Experience in several countries has shown that co-operation and co-ordination between the different stakeholder groups like a city council, a provincial government, service users, NGOS, CBOS, the private sector (formal and informal), and donor agencies, will ultimately lead to increased sustainability of a waste management system, such as changes in behaviour and sharing of financial responsibilities. On the other hand, ignoring certain activities or groups (for example the informal sector that recovers and recycles a substantial amount of waste in most countries in the South) will result in decreased sustainability of the system, for example in the form of negative public health effects or increased unemployment.

2.3.4 Integration with other urban systems

Integrating waste management with other urban systems such as drainage, urban agriculture, tree nurseries, urban greenery, energy, etc. can also enhance sustainability. For instance compost made from urban organic waste and applied in urban agriculture, public parks etc. can lead to a closed-cycle system within the city, thereby reducing import of raw materials and goods from outside and concurrent burdens on the environment from transportation, manufacturing of chemical fertilisers, etc. If solid waste is properly collected in income-income areas, residents will not so easily throw it in drains anymore, thus improving the drainage system in a city. It is necessary to optimise the positive effects of integration and minimise the negative effects of non-integration.

2.4 Principles of ISWM

The aspects of ISWM have been further developed into a number of principles, which can serve as guidelines or goals to achieve an integrated sustainable waste management system[3]. Some technical, environmental, financial-economic, socio-cultural, institutional and policy/legal/political principles of ISWM are described below. These are not blueprint principles that should be applied in all cases. They need to be selected and /or newly developed according to the local context. Besides it needs to be kept in mind, both the concept of ISWM and its principles are still under development.

Table 2 Principles of Integrated Sustainable Waste Management

[3] The priniples of ISWM have been developed by WASTE, based on project experience and studies conducted by different authors inside and outside WASTE (lardinois & van de Klundert, 1995, Hemelaar & Maksum, 1996, Moreno *et al.*, 1999, Coffey, 1996, Schuebeler *et al.*, 1996, van Beukering *et al.*, 1999, Anschutz & v.d.Klundert, 1999).

Technical Principles	Technologies: ♦ Select technology based on the local availability of spare parts ♦ Select preferably technology that is local manufactured and close to indigenous knowledge and practices ♦ Select durable technology, of good quality, that has a long expected life time Systems ♦ Adapt systems adpated to the physical environment, topography and other physical requirements of the location ♦ Establish efficient systems, ensure optimum utilisation of equipment ♦ Establish preventive maintenance procedures

Environmental principles	♦ Minimise negative impact on soil, air and water ♦ Minimise the generation of waste by adapting the organization of production processes, using ' clean technologies', etc ♦ Maximise re-use and recycling and avoid loss of raw materials, energy and nutrients ♦ Dispose of remaining waste in a controlled manner, not exceeding the absorption capacity of local sinks ♦ Treat waste and recover resources as close to the source as possible

Financial – economic principles	♦ Analyse and plan ISWM financing at the system level: do not isolate different specific operations; since the costs of management may be incurred in one area while the benefits may be counted in another. ♦ Base financial and economic decisions on full knowledge, complete information and transparency in decision making. ♦ Qunatify system costs and benefits fully and in consultation with stakeholders: these should include positive and negative externalities; negative effects of improper or incomplete system performance; etc ♦ Analyse the units of cost and revenue differently per waste element. Use cost per household as the basic unit of collection cost; cost per km as the basic unit for street sweeping; cost per ton as the basic unit for composting or processing; and cost per cubic meter and per ton both as the basic unit for disposal ♦ Set fees fairly, transparently, and in a consultative processes: (1) analyse costs and benefits fully; (2) don't ask system users to pay more than they can for a waste disposal system; (3) don't force service providers to operate at a loss of subsidise the system.

	♦ Make deliberate and transparent decisions, in participatory consultation with stakeholders, about cross-subsidies and transfer payments ♦ Identify all beneficiaries and spread responsibility for system financing and operations between them ♦ Match the capital to labour ratio to the needs and characteristics of the municipality or community, and define productivity of capital and labour in relation to the local context. THEN within this locally defined view of productivity, maximize system efficiency ♦ Privatise or reorganize any of the waste elements only after a full cost analysis has been performed.

Socio-cultural principles	Users: ♦ Service provided to all strata of the population regardless of ethnic, cultural, religious or social background, maximising coverage ♦ Service is adapted to user demands and priorities ♦ Users are able to participate in decision-making on the level, quality and price of the services and on changes in services ♦ Minimise risks to public health Operators: ♦ Use management models which are acceptable to people involved ♦ Lead to safe and healthy working conditions ♦ Maximize employment generated

Institutional / Organizational principles	Human resource development: ♦ Build capacities of operators and managers ♦ Base incentives, recruitment and promotion on merit and performance Organizational development: ♦ Clearly divide responsibilities ♦ Representative, functional organizations ♦ Create an enabling environment for waste service provision by private sector (competitive bidding, etc.,) ♦ Support participation of micro- and small-scale enterprises and community organizations in waste management ('social privatisation') ♦ Provide mechanisms for accountability and complaints ♦ Provide mechanisms to involve all stakeholders in planning and implementation, specially weaker and underprivileged groups, and to increase their influence on decision – making Institutional development: ♦ Decentralise urban services, giving sufficient regulatory and financial autonomy to local governements to improve waste management sustainably (authority to set fees, keep revenues, etc.,) ♦ Make professionalism a leading principle in service provision ♦ Encourage inter-sectoral co-operation and integration of waste management with other urban systems

Policy / Legal / Political principles	Legal framework: ♦ Support the involvement of non-governmental actors and the private sector ♦ Support decentalisation of tasks, authority and finance ♦ Create favourable conditions for public participation and ensures freedom of speech and association ♦ Create rules and regulations that are transparent and unambiguous ♦ Enable impartial enforcement of rules and regulations Policy and political framework: ♦ Enable decision-making at the lowest level of authority, usually the municipality, regarding financial matters and selection of technologies ♦ Give waste management a high priority both in policies and budgets ♦ Plan waste management in a strategic way

	♦ Integrate waste management planning with planning of other urban systems ♦ Recognise that waste management is an environmental health issue, that necessitates equity in service provision ♦ Recognise the role of non-governmental actors and the private sector in waste management and support them ♦ Recognize the role of the informal private waste collection and recycling sector and support it ♦ Foster accountability of decision-makers to ensure efficient use of public funds ♦ Support the 'waste management hierarchy', giving preference to waste prevention, source separation, re-use and recycling, above mere collection and disposal

2.5 Use of ISWM as a planning and assessment tool

The ISWM concept can serve two main purposes. It can be the basis for:

- **An analysis or assessment** of existing waste management systems
- **A guide for policy and decision-makers** for selection of appropriate technologies and in developing sustainable waste management systems.

Likewise, the ISWM principles mentioned in Table 2 can be developed into **indicators of sustainability** in the context of an assessment, or they can serve as the starting point for **policy measures** to be taken (teh means to reach ISWM goals).

ISWM as a policy and planning tool has been developed before in a previous paper by the same authors (Anschutz & van de Klundert, 1999). In this paper an attempt will be made to develop the ISWM concept for the purpose of analysis and assessment.

3. Assessment of the sustainability of waste management

After this 'introduction of the ISWM concept we will elaborate here on the application of ISWM as an assessment tool.

Assessment of the sustainability of waste management should take into account the three dimensions of the ISWM concept: **stakeholders, system elements** and **aspects** (see Figure 1). The stakeholders and their alliances (city council, NGOS, etc.) as well as the system elements (waste collection, separation at source, etc.) can be the object of an assessment, while the aspects (technical, environmental, etc.) are the different @ glasses', the spectacles, one can put on to look at the stakeholders and SWM system elements. The six aspects are thus a crosscutting dimension. In the case of development projects the ISWM concept can be ,used as an analysis and assessment tool for all stages of the project cycle: design/formulation, selection/appraisal, monitoring and evaluation.

In this paper the ISVVTM concept is used for the assessment of alliances of stakeholders, i.e. their contribution to the sustainability of waste management. In a future paper the use of ISWM for the assessment of waste management system elements will be worked out. This paper is therefore only the beginning of the development of the ISWM concept into an assessment tool.

3.1 **Sustainability of alliances between stakeholders in waste management**

In this paper the assessment of the alliances between stakeholders from an ISWM perspective will be shown as an example of sustainability assessment[44].

The stakeholders active in waste management are manifold and include local authorities, provincial and national governments, formal private waste collection companies (large-scale enterprises and registered small-scale enterprises), business associations, compost and bio-gas facility operators, farmers, latrine emptying service providers, waste-pickers, informal waste collectors and buyers, materials dealers, recyclers, service users (residents, commercial establishments, etc.), NGOS, CBOS, religious institutions, universities, banks, etc. These stakeholders usually have different interests (economic, political influence, social status, etc.) and play different roles.

Alliances between different actors in waste management can be defined as 'established relationships between two or more different actors resulting in a mutual benefit (without assuming equality in the bargaining power), having activities within waste management as the means and main objective' (Grafakos & Baud, 1999). This linkage may be as close as strong co-operation (based on a written agreement or contract) or as loose as a simple supportive relation (verbal understanding). An alliance is thus more than a relationship' ; the relationship should lead to a mutual benefit and it should be an established relationship.

It may be clear from the above that alliances between stakeholders in waste management vary; they can have a different content (financial, management, advice, etc.) and they differ in strength (weak or strong, fixed or loose).

Some examples of alliances between two or more stakeholders in waste management are:

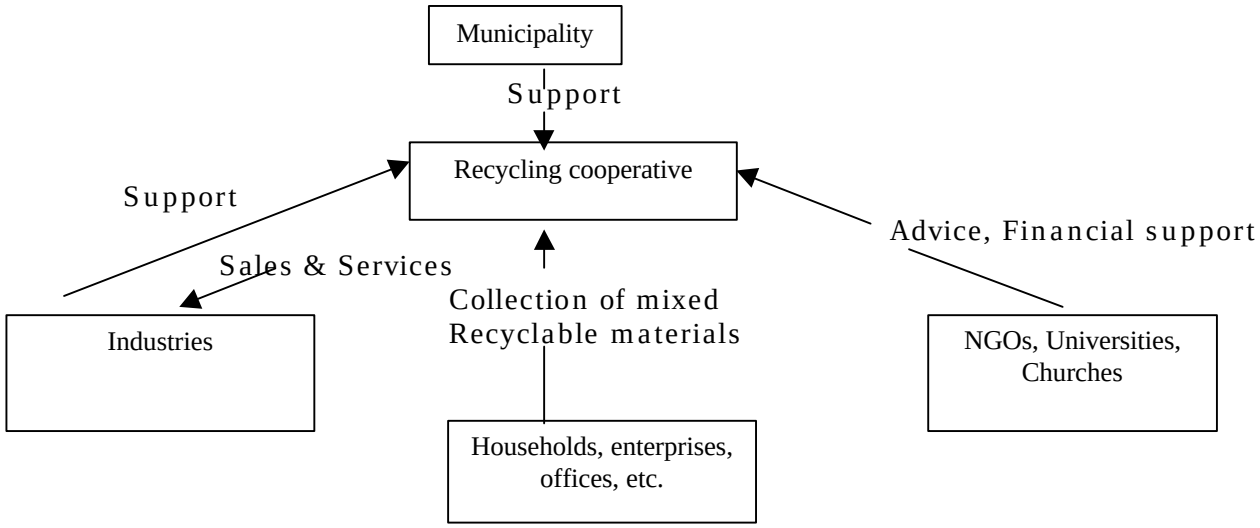
- A municipality that issues a license for waste collection to a private company
- ·A recyclers' co-operative that collects waste materials separated at source from shops and offices and sells it to dealers and wholesalers
- A large private company that sponsors a community recycling centre and receives publicity in return on the uniforms, collection handcarts and promotion material
- A community-based Organisation that monitors a private waste collection enterprise, thereby improving neighbourhood cleanliness and increasing its prestige
- A latrine emptying entrepreneur that collects liquid waste from households against a fee and delivers it at a municipal wastewater treatment plant

[4] The assessment has been conducted for the alliances between stakeholders in solid waste management in four cities: Chennai/Madras (India), Manila (Philippines), Lima (Peru), and Manizales (Colombia). The material of four case studies of the UWEP Programme (Track 09 - Linkages) has been used to test the usefulness of the indicators and the analytical model. WATSE collaborated for this research with the University of Amsterdam

- A council of municipalities that charges gate fees to municipalities for the use of a common landfill
- A bank that gives a loan to a private company to construct a composting facility

An example from Colombia of a combination of alliances between stakeholders is given in Figure 2.

Figure 2 Stakeholders and their alliances in recovery and sales of recyclable materials in Manizales, Bogota, Colombia



An assessment of the sustainability of these alliances stakeholders is considered useful, because it shows the different contributions to the sustainability of waste management. Besides the assessment leads to:

- An identification of problems and progress, dangers and opportunities of the different alliances
- An evaluation of the impact of alliances
- A comparison between different alliances in the same local context, and between the same alliances in different countries
- Recommendations for improvement of existing alliances
- Basis for new alliances

3.2 Steps in the process of sustainability assessment

The following steps were taken to assess the contribution to sustainability of alliances betweeen stakeholders in waste management:

Step1 Identify stakeholders and their alliances
Step2 Define one or more sustainability goals
Step3 Agree on criteria for selection of indicators to measure sustainability
Step4 Develop a number of indicators for each sustainability goal

Step5 Apply indicators to the alliances between stakeholders in the case studies

Step1 Identify stakeholders and their alliances

The stakeholders, their alliances, relations, interests and mutual benefits need to be identified first.

Step 2 Define sustainability goals

Then sustainability goals need to be defined as they are the point of departure for the assessment of alliances. We need to formulate what is the ideal situation we are striving for. This can only be defined in a local situation using local information, together with local stakeholders and counterparts that have an interest in the improvement of waste management. The sustainability goal(s) will be the basis of the indicators we formulate in the assessment later on.

Sustainability goals refer back directly to the ISWM principles and aspects mentioned before(see Table2). They can be similar to of ISWM principles or combinations of different principles, e.g, social and economic.

Some examples of sustainability goals, combining different ISWM aspects, are given in Table 3.

Table 3 Examples of sustainability goals

Environmental sustainability goals: 1) The production of waste should be minimised, through a change in the organization of production processes, the use of 'clean technologies', etc. 2) Re-use and recycling should be maximized (both through open-loop and closed loop recycling) 3) The remaining waste should be disposed of in a controlled fashion, in order not to exceed the absorption capacity of local sinks
Social and economic goal: 1) Employment in SWM should be safe and healthy and provide a sustainable basis for a livelihood
Political and social goals: 1) Legitimacy (official recognition and social acceptance) of SWM activities 2) SWM activities should strive for effectiveness in terms of a clean and healthy urban environment for all
Financial and social goal: 1) The system should be affordable for the users and financially viable for local authorities involved (and private enterprises where relevant)
Institutional goal: 1) More efficient co-ordination within the sector of solid waste management

Step 3 Agree on criteria for sustainability indicators

After describing the sustainability goals that alliances can contribute to, we explore here in which way the goals can be measured. The selection of indicators is thus the subject of this paragraph.

What is an indicator? An indicator can be defined as 'a variable whose purpose is to assess the value of (and measure change in) a phenomenon or process' (Kessler, 1998, in Grafakos & Baud, 1999). An indicator is something that points to an issue or condition. Its purpose is to show how well a system is working. Sustainability indicators provide us with knowledge and information about the present situation that we can use as basis for the achievement of the sustainability objectives. Indicators can be either qualitative or quantitative.

Criteria that can be used to select appropriate indicators are:

- **Relevance** with regard to Agenda 21 and the concept of sustainable development
- **Validity:** really related to what they are supposed to indicate or measure
- **Reliability:** indicators should convincingly demonstrate that objectives are being met
- **Easy to understand**: clear in content, even for people that are not experts on the issue
- Providing a **clear overview**
- **Sensitivity** over time and to change in the situation being observed
- **Availability** of data and time sequences
- **Ability** to acquire data
- International **compatibility**
- **Adaptable** to the coatext of developing countries

Other criteria can be developed according to the local context.

Step 4 Define sustainability indicators

For each sustainability goals indicators should be selected for the assessment. These indicators can be based on international literature on waste management or on local studies. They can also be determined using partic' atory methods and involvin different stakeholders. These indicators should be screened using criteria like the ones mentioned under Step 3.

In the assessment of the contribution to sustainability of the alliances between stakeholders **in** SWM in the four cities 64 indicators and 8 sustainability goals were used, which means an average of 8 indicators for each sustainability goal (Grafakos & Baud, 1999).

Sustainability indicators can be defined at four different levels of assessment. These levels can be applied to other service sectors too. If an assessment only includes looking at performance (e.g. rate of recovery: how much waste is recycled by each alliance), this is not sufficient to get a full picture of an alliance in waste management.

It is also not satisfactory to look only at the official policy and legislation with regard to recycling and recovery.

It is recommended therefore that indicators be formulated at four levels: a policy/regulatory, organizational, operational and performance level. These four assessment levels are explained below in detail.

Policy/regulatory level: What policies exist? Which issues are included in policies and how? How does the regulatory framework related to the SWM stakeholders and activities look like?
Organisational level: What institutional structures support this policy? Who carries out the policy? What type of alliances exists between stakeholders?
Operational level: How is the policy implemented? What happens in practice?
Performance level: What is the outcome of the policy? How well' 'does it function?

Indicators can be defined at all four levels. The first three levels (policy/regulatory, organizational and operational) lead in general to more descriptive indicators, while the last, performance, is usually related to more analytical indicators.

Below one example will be given of a sustainability goal and its indicators. The sustainability goal *'Re-use and recycling should be maximised'* is taken. Indicators at policy/regulatory, organisational, operational and performance level were formulated and screened according to the criteria mentioned in Step 3. Two criteria at the performance level ('Usable/recyclable materials entering landfills' and' % of companies participating in recycling schemes') were removed after screening, because the required data were not readily available, difficult to collect and not as clear as the selected performance indicator. Table 4 outlines the indicators that were finally selected.

Table 4 Example of a sustainability goal and its indicators

Environmental sustainability goal: Re-use and recycling should be maximized	
Indicators used	Definition of indicator
*** Policy / regulatory level**	
Related legislation? (+/-)	Indicates if there is any legislation referring to separation or recycling of waste (positive or negative)
Incentives and (or) barriers?(+/-)	Indicates if there are any constraints and (or) incentives from the policy or regulatory framework for the introduction of recycling practices
*Organisational level	
Length of trading chains(short / long)	Indicates the length of the trading chain and the number of the actors in the recycling trade chain.
Existence of junk shops? (y/n)	Shows if there are any shops for recyclable materials, which contribute to the recycling trade as intermediary and which have linkages with the actors of the alliance
*Operational level	

Separation at source? (y/n)	Indicates if there is any separation of waste at source (consumption level), which is incorporated in the recycling process.
Trade in waste materials? (y/n)	Indicates if there is any trade of recyclable materials that the actors are dealing with
*Performance level	
% (or volume) of waste stream that is recycled, recovered or re-used	Indicates the proportion(% or volume) of the produced waste that is recycled, recovered or re-used. This indicator can be sub-divided according to the nature of the recycled material (metal, paper, glass etc.,)

Source: Grafakos & Baud, 1999

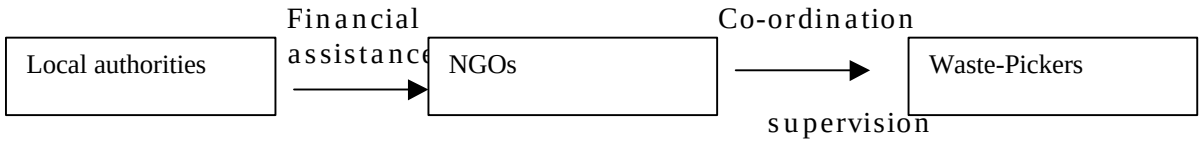
Step 5 Apply indicators to cases

Application of the indicators to the cases started with the development of an overview of existing and non-existing alliances in the four cities. Then the indicators were applied to each existing alliance of stakeholders in each city. Finally the contributions to the sustainability of solid waste management by the different alliances were summarised for each city. Table 5 gives an example of this summary for the case study of Chennai / Madras, India. The sustainability goals used are mentioned in full in Table 3.

Three alliances are found in Chennai/Madras:

1. Local authorities – NGOs-Wastepickers
2. CBOs-wastepickers
3. Traders in waste – dealers – recycling enterprises

The first alliance will be worked out here as an example



Madras Municipal Corporation, which is responsible for the co-ordination and organization of municipal SWM in Madras/Chennai, decided to introduce a new scheme: the 'Clean and Green Madras City Project'. The main idea of the project was to help the street children to be rehabilitated, socialised and accepted by the society through valuable work in cleaning and maintenance of streets. The Madras Corporation stated a pilot project in four areas with four NGOs. These NGOs were given funds to support and supervise young waste-pickers. The MMC provided them with all necessary items like uniforms, equipment and financial assistance. About 250 boys and three supervisors were hired under the scheme.

Table 5 Assessment of the sustainability of alliances between stakeholders in Chennai /Madras, India

Environmental sustainability goals

Alliances	1. Minimisation of waste				2.. Re-use / recycle				3. Disposal			
	P/R.	Or.	Op.	P.	P/R.	Or.	Op.	P.	P/R.	Or.	Op.	P.
L.a. – NGOs – waste pickers	X	X	X	X	0	-	+	-	X	-	X	X
CBOs – waste pickers	X	X	X	X	X	-	+	-	X	-	X	X
Traders in waste – Dealers-Recycling enterprises	X	X	X	X	X	X	+	+	X	-	X	X

Social / Financial / Political / Institutional sustainability goals

Alliances	4. Working Conditions				4. Legitimacy		5. Clean urban environment				6. Financial viability / affordability				7. Co-ordination			
	P/R.	Or.	Op.	P.	P/R.	P.	P/R.	Or	Op.	P.	P/R.	Or.	Op.	P.	P/R.	Or.	Op.	P.
L.a. – NGOs – waste pickers	+	+	+?	+	+		-	-	-	+?	0	-	-	-	+	+	-	+
CBOs – waste pickers	-	-	-	-	X	-	-	-	X	+?	+0	-	-	+	X	X	-	X
Traders in waste – Dealers-Recycling enterprises	X	X	X	+0	X	-	-	-	-	-	+	+	+	+0	X	X	-	-

Symbols: Source: Grafakos & Baud, 1999

L.a.=Local authorities, LSE=Large Scale Enterprises, SSE=Small Scale Enterrprises, NGOs= Non Governmental Organizations, CBOs=Community Based Organizations, P/R: Policy/Regulatory level, Op.: Operational level, P.: Performance level

+ = contribution to the goal	- = not sufficient information	0 = neutral contribution
x = no contribution to the goal	? = some indicators not used because of lack of data	

Summaries like the one in Table 5were used to analyse the strengths and weaknesses of the different alliances in each city. For example the alliance between local authorities, NGOs and waste-pickers in Chennai/Madras scored well on the institutional sustainability goal *More efficient co-ordination within the sector ofsolid waste management'(8. Co-ordination)* (see Table 5), because the new relations between stakeholders (local government, NGOs and waste-pickers) that had emerged out of the project. It also scored very well on the socio - economic *goal 'Employment in SWM should be safe and healthy and provide a sustainable basis for a livelihood'(4. Working conditions)* (see Table 5) as the waste-pickers were provided a sustainable livelihood by the NGO, who gave them a regular job and the MMC who provided them with uniforms and equipment.

The same was done for all alliances in all cities. Conclusions were drawn per city and per sustainability goal. Finally a comparison was made between the four cities.

3.3 Discussion of the assessment approach used

The study implemented by WASTE and the University of Amsterdam gives an interesting view of one type of sustainability assessment; the assessment of alliances between stakeholders. Some useful aspects are:

1. The process of defining sustainability goals to setting criteria and determining indicators
2. The selection criteria used to choose sustainability indicators
3- The use of four assessment levels (policy/legal, organisational, operational, performance)
4. The assessment allowed for a descriptive comparison of the partnerships, the goals of different alliances, and their performance. It also gives an impression of strengths, weaknesses, opportunities and threats (a so-called SWOT analysis) of the alliances, which could be the basis for improvement of the alliances.

However, the assessment also has some constraints:

1. Regarding the sustainability goals:
   Only some ISWM principles were used as 'sustainability goals' for the assessment. Especially the technical and some social and economic ones were missing.
   The process for defining sustainability goals could be more adapted to the local situation. Instead of using (only) scientific literature, one could determine sustainability goals in a participatory way, by including stakeholders, beneficiaries, counterparts **in** the process, or one could use the project overall objective as a sustainability goal
2. Regarding the choice of indicators:

- The process of developing indicators again could be more adapted to the local situation. As for the
- sustainability goals, a participatory approach could be used. They should be tested in the local context and adapted, when necessary.
- Determining the most suitable indicators was not an easy job. It appeared that most indicators in the literature referred to the performance level. Especially social indicators and the ones related to 'legitimacy' were lacking in the literature.
- The lack of reliable information hampered the use of certain indicators.

- Qualitative research units, like a ranking in low/medium/high, cannot be converted into + and -. The same holds for percentages and ratios. How should one compare the performance on these indicators with each other?

3. Regarding the selection of alliances and stakeholders included in the assessment:

- Donors or external support agencies were not included in the alliances between stakeholders in SWM **in** this research, but they are part of the ISWM framework and should be included in an ISWM assessment. Other stakeholders can be included too, based on the local context.

4. Regarding the overall outcome:

- It appeared to be difficult to define appropriate indicators that assess the contributions to sustainability of alliances. The indicators used seemed to be more appropriate to assess the whole waste management system (i.e. the activities) than to assess the alliances involved in this system. It is, for example, doubtful whether the existing policy/regulatory context for recycling is the same as the contribution of an alliance (in this case recycling companies-dealers in waste materials-waste pickers) to the sustainability of solid waste management. That would mean that the whole policy/regulatory framework for recycling would be a result of this alliance, while it probably is the other way around; the policy framework influences the alliance. The indicators should be limited to those that one reasonably can assume that the stakeholders (and their alliances) can influence them.
- The assessment of the alliances resulted 'in an enormous amount of text and figures, which is difficult to oversee. A solution to @is problem could be to select only the most important alliances for each sustainability goal. Improving the layout, using tables, matrices, and possibly a computer programme, could also make a difference.

Nevertheless, the study remains one of the first attempts to conduct an integrated assessment of sustainability in waste management.

4. Conclusion and Future Challenges

In this paper the concept of ISWM has been explained, including its principles and possible application as an assessment tool. Also a method for assessing the contribution to sustainability of waste management by alliances between stakeholders has been presented as an example. Not all aspects of ISWM have been taken into account for this assessment. However, the way it is conducted can be helpful in further developing of the ISWM concept as an assessment tool.

As mentioned before, the concept of ISWM consists of three main components:

1. Stakeholders (participants in waste management process)
2. System elements (stages in the waste management process)
3. Aspects (technical, environmental, etc.)

The first two components can be the point of departure of an assessment, using a combination of aspects of the ISWM concept as 'sustainability goals'. The aspects are a crosscutting dimension. They are used in the formulation of sustainability goals and indicators.

The following issues need to be addressed to further develop the ISWM concept into an assessment tool: 1 . Adaptation and elaboration of the assessment of the alliances between stakeholders in waste
management to include more ISWM principles and more appropriate indicators

2. Development of ISWM as a tool for the assessment of waste management systems and system elements, based on the ISWM concept

3 . Weighing of indicators

How to compare the different indicators? How to 'weigh' one indicator against the other? Are some aspects (technical, socioeconomic, etc.) more important than others? Are some indicators 'necessary' and others just 'sufficient' conditions for ISWM? If so, how to include these differences in the assessment?

4. Differences in units of measurement

The units of measurement of the indicators vary. Indicators are quantitative and qualitative, and measured as 'yes'/'no' categories, rankings, absolute figures, percentages, etc. In social statistics language this means that they are divided over four different measurement scales: nominal, ordinal, interval and ratio. The differences between these measurement scales are explained in Annex 1. How can these different units of measurement be integrated into one model? Can they be added up?

The research for this publication received financing from the Netherlands Ministry for Development Co-operation
(DGIS).
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