Article:
Wilson, DC, Rodic, L, Cowing, MJ et al. (7 more authors) (2015) 'Wasteaware' Benchmark Indicators for Integrated Sustainable Waste Management in Cities. Waste Management, 35. 329 - 342. ISSN 0956-053X

https://doi.org/10.1016/j.wasman.2014.10.006

Supporting Information

For paper published in Waste Management – doi: 10.1016/j.wasman.2014.10.006

'Wasteaware' Benchmark Indicators for Integrated Sustainable Waste Management in Cities

David C Wilson*[,1], Ljiljana Rodic[2], Michael J Cowing[3], Costas A Velis[4], Andrew D Whiteman[5], Anne Scheinberg[6], Recaredo Vilches[1], Darragh Masterson[1], Joachim Stretz[7] and Barbara Oelz[8]

[1] Civil and Environmental Engineering Department, Imperial College London, United Kingdom
[2] Education and Competence Studies, Wageningen University and Research Centre, The Netherlands
[3] Independent Consultant, St Lucia
[4] School of Civil Engineering, University of Leeds, UK
[5] RWA Group, Sofia, Bulgaria
[6] WASTE, Gouda, The Netherlands
[7] Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (GIZ), Cairo, Egypt
[8] GIZ, Eschborn, Germany

* Corresponding author: David C Wilson. E-mail: waste@davidcwilson.com. Telephone: +44 118 946 1117. Address: Department of Civil & Environmental Engineering, Imperial College London, Skempton Building, South Kensington Campus, London SW7 2AZ, UK.

This Supporting Information contains the detailed

User Manual for the Wasteaware ISWM Benchmark Indicators

as needed for correct application of the methodology presented in the paper

User Manual for the Wasteaware ISWM Benchmark Indicators

Introduction

The Wasteaware ISWM (integrated sustainable waste management) benchmark indicators are a tool to assess the performance of the municipal solid waste management and recycling system in a city, municipality or group of municipalities (here collectively referred to as 'a city') in a standardised manner. The primary purposes are: to allow a city to judge its own performance regarding delivery of solid waste management services; to provide information for decision-making on priorities for the limited funds available for service improvements, by identifying both local strengths that can be built on and weak points to be addressed; and to monitor changes over time. In addition, using a standardised indicator set allows benchmarking against the performance of similar cities, within a country or in different countries, on a consistent basis. The Wasteaware indicators have been designed specifically to be applicable to cities in all countries, irrespective of income level.

The main paper published in Waste Management provides the background and presents the Wasteaware ISWM benchmark indicators. This User Manual is a reference document that provides step-by-step guidance on how to complete the indicator set, a process which is then facilitated by an automated excel Indicator Form.

Any indicator set depends critically on the quality of the data inputs. The aim here is to use existing data, not to carry our primary survey work. As in other cases where quality of a (public) service is measured, we rely heavily on the subjective professional judgment of the user or assessor in each city. The user will ideally be a local solid waste management professional who is familiar with the local situation, covering both the formal solid waste and (where applicable) informal recycling parts of the overall system. Where such a user is found, then our experience is that filling in the user form is not so onerous - it can take anywhere between a few hours and a few days. We have also successfully used graduate students to prepare profiles; this can work well, where the student has some level of local familiarity and good supervision, both locally and academically; ideally such a student case study requires six weeks in the field.

The detailed pages of the User Manual contain guidance on how to complete each individual indicator and criterion. This information is provided to ensure that the indicators are applied consistently, irrespective of user or location. It is for this reason that the justification column is provided in the User Form: this should be filled out as completely as possible when compiling information and filling out the user form. In addition, relevant interview dates and transcripts, formulae and calculations used should be attached. Such traceability is essential for the transparency of the assessment process, so that anyone reading the assessment report can immediately know where the information came from and how it was scored; this also makes it possible to audit the indicators and ensure that they are applied consistently across cities.

The guidance notes column advises the user on obtaining the right information and on how to present it and assess it; it was created, modified and updated from previous tester's feedback and comments, resulting in a quite lengthy, but also a rich and informative User Manual that not only reflects the complexity of evaluating solid waste management in a city, but also undertakes to streamline, guide and facilitate such an evaluation.

It is important to note that this User Manual is a flexible tool for the user, which is designed to be consulted throughout the assessment process: for example prior to a meeting with a stakeholder (as a reference guide on 'what to ask'); during a visit to a treatment or final disposal facility (to compare with technical specifications); or at the end of the process (to organise, check for completeness and analyse the information gathered).

The 'Wasteaware' ISWM benchmark indicators have now reached a level of maturity where they can be made available for widespread use. We would not claim that the current ISWM indicators are either 'final' or 'perfect' - there will always be a strong element of judgment involved and 'improvements' will always be possible.

So please do submit your completed indicator set along with the User Feedback Form to the corresponding author, so that your experience can feed into the next review.

Example summary table: Wasteaware ISWM benchmark indicators

Note: In the excel version of the Indicator Form, this summary table is filled in automatically

Background information on the city							
City		**HYPOTHETICAL EXAMPLE CITY**					
Country		India					
B1	Country income category	World Bank income category		Gross National Income (GNI) per capita			
		Lower-middle income		$1050/ capita			
B2	Population	Total population of the city		1,000,000			
B3	Waste generation	Total municipal solid waste generation (tonnes/year)		350,000 tonnes/year			
Dates when indicators applied: A- this time; B - previous				A - 2012; B- 2008			
No	**Category**	**Data/ Benchmark Indicator**		**Results**	**Code**		**Progress**
Key Waste-related data		**Data**			-	-	-
W1	Waste per capita	MSW per capita	kg per year	300	-	-	✓
			kg per day	0.822	-	-	✓
W2	Waste composition:	Summary composition of MSW for 3 key fractions – all as % wt. of total waste generated			-	-	-
W2.1	Organic	Organics (food and green wastes)		60%	-	-	-
W2.2	Paper	Paper		10%	-	-	-
W2.3	Plastics	Plastics		12%	-	-	-
W2.4	Metals	Metals		2%	-	-	-
Physical Components		**Benchmark Indicator**			-	-	-
1	Public health – Waste collection	1.1 Waste collection coverage		95% (MEDIUM/HIGH)			✓
		1.2 Waste captured by the system		95% (MEDIUM/HIGH)			✓
1C		Quality of waste collection service		MEDIUM/HIGH (70%)			✗
2	Environmental control – waste treatment and disposal	Controlled treatment and disposal		90% MEDIUM/HIGH			=
2E		Quality of environmental protection of waste treatment and disposal		MEDIUM (55%)			✓
3	Resource Value – 3Rs: Reduce, Reuse, Recycle	Recycling rate		25% (MEDIUM)			✗
3R		Quality of 3Rs – Reduce, reuse, recycle - provision		LOW/MEDIUM (35%)			=
Governance Factors		**Benchmark Indicator**			-	-	-
4U	Inclusivity	User inclusivity		LOW/MEDIUM (30%)			✓
4P		Provider inclusivity		LOW (20%)			=
5F	Financial sustainability	Financial sustainability		MEDIUM (45%)			✗
6N	Sound institutions, proactive policies	Adequacy of national solid waste management framework		MEDIUM/HIGH (70%)			✓
6L		Local institutional coherence		LOW/MEDIUM (40%)			✗

Key for colour coding:

- Low: Red
- Low/Medium: Red/Orange
- Medium: Orange
- Medium/High: Orange/Green
- High: Green

Key for abbreviations:

- B- Background information
- W – Waste Information
- 1 C– Public Health.
- 2 E– Environmental Control
- 3 R– Resource Mgmt.
- 4U- User inclusivity
- 4P – Provider inclusivity
- 5F – Financial sustainability
- 6N – National Framework
- 6L – Local institutions.

F: User Feedback Form

After completing the indicator set for your city, please provide the feedback on your experience with the indicator set as a tool.

No.	Question	Guidance notes
1	Overall, are the indicators easy to use?	Please select one of the following options: 5 – very easy; 4 – easy; 3 – not easy, not difficult; 4 – difficult; 5 – very difficult. Also please provide as much supporting information and explanation as possible
2	Overall, are the instructions easy to follow?	Please select one of the following options: 5 – very easy; 4 – easy; 3 – not easy, not difficult; 4 – difficult; 5 – very difficult. Also please provide as much supporting information and explanation as possible
3	How much time did it take you to collect the data and other information you required for this indicator form?	
4	How much time did it require for you to complete the indicator form?	
5 5.1 5.2 5.3 5.4	Your specific comments on individual indicators or criteria:	Please indicate to which indicator/criterion your comment applies (add more rows as required)
6	Your suggestions on improving the indicator set, to make it more insightful and/or useful?	
7	Does the process of developing the indicators help you in gaining an insight to the local situation?	Please select one of the following options: 5 – yes, very much so; 4 – yes, quite; 3 – yes, somewhat; 2 – not really; 1 – not at all Also please provide as much supporting information and explanation as possible

Part A: Supporting information

C: City and user information

No.	Information requested	Guidance notes
C.1	City	Please provide background information on the city, its administrative structures and its relationship to its wider region. It is essential to specify to which administrative unit the waste data pertain. In order to understand all that follows, the reader must understand exactly which definition of this particular city is being used. To take the example of 'Buenos Aires' in Argentina, the metropolitan area is made up of four concentric 'arcs' (bounded on one side by the sea): the central zone is the City of Buenos Aires (CABA), which has the status of a Province; the next zone comprises 20 municipalities in the Province of Buenos Aires, which together are known as Gran Buenos Aires; a further four municipalities are included in the Metropolitan Area of Buenos Aires (AMBA); while five more also form part of the wider Conurbation of Buenos Aires served by the inter-municipal waste disposal agency CEAMSE. There are thus four main definitions of 'Buenos Aires' - with populations varying from 2.9 million for the autonomous city itself (CABA) to 14.3 for the wider conurbation.
C.2	Country	Please provide information on the relation of the city to any regional governments as well as the national government. This is important both for very large countries, where the regions (States, Provinces) may have a large degree of autonomy; and for very small countries, e.g. small island developing countries (SIDS), where the city and national governments may be highly inter-connected.
C.3	Name of the person filling in the indicator forms	Please provide information on the person or team who have collected the data and carried out the assessments to derive the indicators, including brief information on your knowledge and experience both of solid waste management and on the city. Please provide e-mail contact details.
C.4	Sources of information	Please provide an overview of the principal sources of information used. Please list and provide full references and web-links if available for major written sources, plus a listing of names and positions for stakeholders consulted.
C.5	Date when indicator form completed	This is the date when you completed the indicator form.
C.6	Date to which the indicators apply	Ideally, if the assessment is being carried out in say 2014, and the latest official data is available for the last full year, 2013, then this date would be 2013. If the most important sources vary in date, it is important to list them here and provide their relevant dates, as well as a full description of steps you have taken to reconcile the information if there is a discrepancy in dates between sources. Many of the criteria used to derive the indicators are based on observations 'on the ground', which should be as recent as possible – this is particularly important if there has been a recent major change in the local SWM system, such as the opening of a new treatment or disposal facility. The supporting data, on population, waste quantity and composition, will often come from a census or a strategy report, which can be a number of years old, so some extrapolation to update these data to match the date of the observations will be required.
C.7	Previous application of the indicators	Has the Wasteaware ISWM benchmark indicator set previously been applied to this city?
C.8	Date when indicators applied previously	If so, what was the date to which those indicators applied?

B: Background information

No	Category	Indicator	Guidance notes
B1	GNI/capita	Gross national income (GNI) per capita for the country in USD	The World Bank data on Gross National Income per capita, calculated according to the 'Atlas method', is used here. The year used for the GNI/capita data should match the base year used for deriving the indicators (see item C.6). Country data using the 'Atlas Method' of calculation can be found at: http://databank.worldbank.org/data/views/reports/tableview.aspx?isshared=true The World Bank classification of countries on the basis of their Gross National Income per capita, into low, lower-middle, upper-middle and high income, is used here. The year used for the income class should match the base year used for deriving the indicators. Income classification can be found at: http://data.worldbank.org/about/country-classifications. Please provide the World Bank data for the country, even though there may be data available for the city, as methodologies for calculation can vary widely.
B2	Population	Total population of the city	The best estimate of the total population for the base year specified in C.6. Please report the latest official census data and year; plus any unofficial estimates; and details of how any extrapolation has been made to the base year. As general guidance, any informal or unofficial settlements should be included in the estimate used. Please relate the population to the boundaries or definition of the city as explained in C.1; this is particularly important where there are several alternative definitions.
B3	Waste generation	Total municipal solid waste (MSW) generation (tonnes per year)	The best estimate of total MSW generation and the local definition of MSW. Collect data from different sources, compare and contrast recent available data and estimates; and provide justification of the estimate used. When official data is scarce, please obtain the best estimate by extrapolating data from interviews with as many solid waste management stakeholders as possible and, when applicable, observing waste trucks during their rounds. The definition of MSW used in this document is the one from the UN-Habitat[1]: 'wastes generated by households, and wastes of a similar nature generated by commercial and industrial premises, by institutions such as schools, hospitals, care homes and prisons, and from public spaces such as streets, markets, slaughter houses, public toilets, bus stops, parks, and gardens' It is important that you annotate your figures with the local/national definition(s) of MSW and provide the definition of MSW used – such definitions do vary a lot between countries, and understanding such differences is vital to ensure that the indicator sets for different cities are comparable. What is the source of the available estimates? How and when were the estimates made; how reliable are they; is the waste weighed? If measurement is made at the point of disposal, how is this extrapolated back to the quantity generated? Is allowance made for seasonal variations? If time series data are available for different years, please provide this as an attachment. If there is no directly measured data available, and an estimate has had to be made from published estimates of waste per capita (perhaps at the national level), then please document this very clearly with your sources of information

[1] - http://www.waste.nl/sites/waste.nl/files/product/files/swm_in_world_cities_2010.pdf. (page 6).

W: Waste-related data

No	Category	Indicator	Guidance notes
W1	Waste per capita	MSW per capita [expressed both in kg per year and kg per day]	Please provide official or published figures and state the source of data. Where there are several sources of information, including published data for waste per capita and the calculations based on B2 and B3 above, please compare the figures and justify your selected estimate. If official or published figures are not available, provide the calculated value. Please document any estimates and the assumptions made.
W2	Waste composition:	Summary composition of MSW as generated. Data points used for 4 key fractions – all as % wt. of total waste generated	Please provide full sets of whatever data are available on MSW composition as generated, with accompanying details. When were the measurements made? How regularly is composition measured? Are seasonal variations taken into account? How reliable is the data? If time series data are available, please provide this as an attachment. The point of measurement is important to note as well: Do data reflect waste *composition 'as generated'* (prior to any recycling), or *'as collected, treated or disposed'?* In other words, where in the system is the measurement made? If at the disposal site, is correction made for materials removed earlier for recycling? Please justify the choice of particular data set that you use for defining the six selected benchmark indicators below. The first four are key material fractions representative of the composition as a whole; the last two are important in assessing waste handling and treatment options, if data are available.
W2.1	Organic	Organics (food and green wastes)	The 'organic' fraction is defined primarily as kitchen and food waste from households and restaurants; market wastes; green, garden or yard waste, including wood from pruning trees in public parks and/or along roads; and similar. It excludes paper, cardboard, textiles, leather, and wood from packaging or furniture. Please note whether some organic waste is likely to have been reported as part of another fraction – e.g. if MSW is routinely mixed with sand or soil during collection (so that the 'fine fraction' is likely to include a portion of the organics), and/or if the 'other' fraction is high.
W2.2	Paper	Paper	The paper fraction includes cardboard, but excludes laminated materials such as drink cartons.
W2.3	Plastics	Plastics	The plastic fraction includes mostly packaging wastes, such as PET,PVC, polypropylene, high and low density polyethylene (HDPE/LDPE) and polystyrene.
W2.4	Metals	Metals	The metal fraction includes ferrous (iron and steel) and non-ferrous (e.g. aluminium, copper, lead, zinc, tin) metals and alloys.
W2.5	Solid waste density	Solid waste density	Please provide existing data if available, or provide estimates if actual measurements are not available. Please include detailed supporting explanations of where and how the measurements were made. This is important information for the planning of both waste collection and subsequent waste handling - but data availability is often poor, so you may need to put some effort into obtaining a 'best estimate'.
W2.6	Moisture content	Moisture content	Please provide existing data if available, or provide estimates if actual measurements are not available. Please include detailed supporting explanations of where and how the measurements were made.. This is important information for the planning of waste treatment in particular- but data availability is often poor, so you may need to put some effort into obtaining a 'best estimate'.

Part B: Benchmark Indicators for Physical Components

Benchmark Indicators 1 & 1C – Public Health (Waste Collection)

No	Short name	Description	Guidance notes
Indicators 1.1 and 1.2 aim to provide a quantitative measure of the waste collection component. 1.1 is intended to provide a measure of access to waste collection, while indicator 1.2 aims to provide an indication of the actual usage (effectiveness) of the collection and street sweeping system.			
1.1	Waste Collection Coverage	Percentage of households in the city that receive a reliable waste collection service	Waste collection coverage represents the access that the population of a city have to a waste collection service, including both formal municipal and informal sector services. A 'collection service' may be 'door to door' or by deposit into a community container. 'Collection' includes collection for recycling as well as for treatment and disposal (so includes e.g. collection of recyclables by itinerant waste buyers). 'Reliable' means regular - frequency will depend on local conditions and on any pre-separation of the waste. For example, both mixed waste and organic waste are often collected daily in tropical climates for public health reasons, and generally at least weekly; source-separated dry recyclables may be collected less frequently. Conversion of quantitative collection coverage to 'traffic lights' colours: Low red 0 – 49% Low/Medium red/orange 50 – 69% Medium orange 70 – 89% Medium/High orange/green 90 – 98% High green 99 - 100%
1.2	Waste Captured by the solid waste management and recycling system	Percentage of waste generated that is actually handled completely by the waste management and recycling system, thus the waste that is not lost through illegal burning, burying or dumping in unofficial areas.	Waste captured by the system represents all the waste materials shown on a Materials Flow Diagram (MFD) that are delivered to an official treatment/disposal facility or to a recycling factory. This includes street sweepings, wastes collected, and waste materials collected for and delivered to recycling; including both formal municipal and informal sector services. Accordingly, waste capture does not include collected waste materials that are then dumped at an illegal ('wild') dumpsite location. Conversion of quantitative waste captured by the system to 'traffic lights' colours: Low red 0 – 49% Low/Medium red/orange 50 – 69% Medium orange 70 – 89% Medium/High orange/green 90 – 98% High green 99 - 100%
1C	Quality of waste collection and street cleaning service	Qualitative indicator to assess the quality of the waste collection/ street cleaning service	This is a composite indicator made up by marking the criteria 1C.1 – 1C.6 below. *The first three criteria focus on 'primary collection', the* first step of getting waste from communities into the solid waste management system, and on the inter-related service of street cleaning. Criterion 1C.4 focuses on the next step, getting the waste to (perhaps more distant) final treatment or disposal facilities. The last two criteria, 1C.5 and 1C.6, examine respectively the appropriateness of service planning and monitoring, and health and safety of collection workers. Each criterion is assigned a score as indicated in their own guidance note. All the individual scores are then summed to provide an overall %, which is reported here alongside a qualitative assessment as per the categories on page 2: LOW; LOW/MEDIUM; MEDIUM; MEDIUM/HIGH; HIGH.

No	Short name	Description	Guidance notes
1C.1	Appearance of waste collection points	Presence of accumulated waste around collection points/containers	Focuses on locations from which waste is collected. Such an assessment should be made not just immediately after a scheduled collection; even if the collection point is cleaned during collection service, if waste is already accumulating in an unsightly manner one or two hours later (or one or two days later if collection is only weekly), then that should be reflected in a lower score. a. Very high incidence of littering 0 is scored b. High incidence 5 c. Medium incidence 10 d. Low incidence 15 e. Very low incidence 20
1C.2	Effectiveness of street cleaning	Presence of litter and of overflowing litter bins.	Focuses on the city centre, along main roads and in popular places where people gather. Scoring as for 1C.1
1C.3	Effectiveness of collection in low income districts	Presence of accumulated waste/ illegal dumps/ open burning.	Focuses on evidence of illegal dumping and open burning, occurring in and around lower income districts (usually due to a lack of regular collection). Includes incidence of dumping into watercourses and drains. Scoring as for 1C.1
1C.4	Efficiency and effectiveness of waste transport	Appropriate public health and environmental controls of waste transport.	While the previous criteria focus primarily on 'primary collection', getting waste from communities into the formal solid waste management system, this criterion focuses on the next step, getting the waste to (perhaps more distant) final treatment or disposal facilities. Sometimes the two steps are quite distinct, with a clear centralised collection point or local transfer station that marks the boundary between primary and 'secondary 'collection; in other cases, initial collection may be in larger vehicles which can travel some distance, either to the final destination or to a larger centralized transfer station. This criterion applies in either case, focusing on both the longer distance transport and on any transfer station. A high compliant transport operation will use 'contained' vehicles, with precautions in place to prevent both windblown litter and any liquor from the waste contaminating the roads; the vehicles will be well maintained; and the vehicles will be capable of mechanical discharge, to reduce turnaround time and to avoid multiple manual handling of the waste Where a transfer station forms part of the overall transport operation, some of the guidance on assessment provided under criteria 2E.1-2E.3 can also be applied here. The assessment score should be reduced if there is accumulation of waste that exceeds the transfer station's capacity. Wastes need to be transported to the treatment/final disposal site with an appropriate frequency to prevent this. a. No compliance 0 is scored b. Low compliance 5 c. Medium Compliance 10 d. Medium/High compliance 15 e. High compliance 20
1C.5	Appropriateness of service planning and monitoring	Appropriate service implementation, management and supervision in place	(a) Where the private sector are involved in collection: is there documentary evidence of appropriate contracts in place; detailed specifications of service; monitoring procedure and tools; and evidence for regular supervision on the ground. OR (b) Where public sector provides collection: is there documentary evidence of appropriate service planning, specifications of service, service delivery, and monitoring procedure and tools. Scoring as for 1C.4
1C.6	Health and safety of collection workers	Use of appropriate personal protection equipment & supporting procedures	Applies to both/either public & private operators. The reference requirements are regular health-checks/ inoculations/ boots/ gloves/ overalls /high visibility vests. Scoring as for 1C.4.

Benchmark Indicators 2 & 2E – Environment (Waste Treatment and Disposal)

This set of criteria focuses on the environmental impacts of waste treatment and disposal. Note that organics recycling is included under indicator 3 below, so that the assessment of biological treatment here focuses on environmental aspects, process control and energy efficiency of the treatment, rather than the quantity or quality of the organic product for recycling.

No	Short name	Description	Guidance notes
2	Controlled treatment or disposal	Percentage of the total municipal solid waste destined for treatment or disposal in either a state-of-the-art, engineered facility or a 'controlled' treatment or disposal site.	The 'numerator' in this calculation is the total waste that is dealt with in a 'controlled' facility. The 'denominator' is the total solid waste destined for treatment or disposal - that is the total waste generated less waste recycled or reused. Waste being accepted at a facility 'counts' towards this quantitative indicator if the facility has reached at least an intermediate level of control. The level of control for a particular facility can be assessed using the qualitative criteria 2E.1 – 2E.3 below: in general, a score of at least 10 on each criterion is the threshold required to be considered as 'controlled'. To use land disposal as an example, and referring to the World Bank categorisation for the stepwise improvement of sites, both uncontrolled and semi-controlled sites would fall below the threshold, while controlled, engineered and full sanitary landfills would all be counted towards this 'controlled' indicator. Conversion of quantitative controlled treatment or disposal rate to 'traffic lights' colours: Low red 0 – 49% Low/Medium red/orange 50 – 74% Medium orange 75 – 84% Medium/High orange/green 85 – 94% High green 95 – 100%
2E	Degree of environmental protection in waste treatment and disposal.	Indicator to assess the *'quality' of waste* treatment and disposal	This is a composite indicator made up by marking the criteria 2E.1-2E.6 below. The first three criteria focus in turn on different aspects of environmental protection at a treatment / disposal facility: 2E.1 looks at waste reception and general site management; 2E.2 at the specific waste treatment and disposal processes and the operating procedures for their proper use; and 2E.3 focuses on environmental controls. Criterion 2E.4 assesses efficiency of energy generation and use. The last two criteria focus on technical competence (2E.5) and on occupational health and safety (2E.6). Each criterion is assigned a score as indicated in their own guidance note. All the individual scores are then summed to provide an overall %, which is reported here alongside a qualitative assessment as per the categories on page 2: LOW; LOW/MEDIUM; MEDIUM; MEDIUM/HIGH; HIGH.
	The guidance notes below provide advice on how to score particular types of treatment and disposal facility. However, it is neither practicable nor desirable to provide comprehensive guidance here. There is a large variety of treatment and disposal options available, so there needs to be a degree of flexibility in the assessment - the assessor needs to apply the principles outlined below using their best professional judgment. Also, a number of different treatment and disposal options will be used in parallel in many cities. In principle, each should be assessed separately, and a weighted average derived using the percentage of MSW being treated/ disposed at each (not forgetting any wastes that are escaping the formal waste management system and being dumped or burned illegally); in practice, the assessor will generally be able to make an informed judgment without going to that level of detail. As always, it is important to provide full documentation of the information available and the judgments made, to allow independent verification of the scoring and to ensure that the indicators are comparable across cities.		

No	Short name	Description	Guidance notes
2E.1	Degree of control over waste reception and general site management	Degree of control over waste reception and handling at each site. This criterion should be applied to all treatment and disposal sites, whatever the specific process being used.	Factors affecting the assessment include: • Vehicular access to the site (high level of control: hard surfaced access roads of adequate width and load-bearing capacity, kept clean and free of mud) • Traffic management (high level of control: any queues for site access kept short in time and contained within the site; little impact of traffic on neighbours). • Site security (high level of control: site fenced; no unauthorised site access; gates locked when site closed). • Waste reception and record keeping (high level of control: reception office; staffed during all opening hours; all vehicles logged and loads checked; weighbridge installed and all weights logged). Note that the procedures for monitoring the records thus collected are assessed under 2E.3. • Waste unloading (high level of control: waste directed to a designated area; unloading supervised by site staff). • Control over nuisance (high level of control: successful control of windblown litter, flies, vermin, birds and of 'mud' leaving the site on vehicle tyres) • Control of fires (high level of control: no routine burning of wastes; no 'wild' fires; active fire prevention and emergency response systems in place in case of accidental fire) a. No control 0 is scored b. Low level of control 5 c. Medium level of control 10 d. Medium/High level of control 15 e. High level of control 20
2E.2	Degree of control over waste treatment and disposal	Degree of control over both the waste treatment or disposal process in use at each site and over any potential emissions. This criterion covers both the presence of the necessary technologies, and the operating procedures for their proper use.	The nature of controls required will depend on both the process employed and on the potential emissions. As an example, the table below provides guidance on how the general principles can be applied to land disposal and thermal treatment (using the specific example of mass-burn incineration). For biological treatment, the detail will vary with the type of process (e.g. windrow composting, in-vessel composting, anaerobic digestion). However, in all cases a 'high level' of control would imply a high degree of control over: the incoming waste (to avoid hazardous waste or contrary materials); processing temperature to ensure pathogen destruction; retention time in the process; mixing in the process (including turning of windrows); atmospheric emissions including odours and bioaerosols; and leachate collection and treatment Similar principles can be applied to other facilities, including mechanical-biological treatment (MBT) plants, advanced thermal treatment and new technologies for valorisation of organic waste in developing countries. In each case, the user may use the following scoring tables as a 'best judgment' guideline for scoring. Where a fuel is being made from waste to be burnt elsewhere, then the assessment should include the process and emission controls at the user facilities.

	Level of control	Score	Land disposal	Thermal treatment
a.	None	0	Uncontrolled dumping - no controls	Uncontrolled burning lacking most 'control' functions
b.	Low (Semi-controlled facility)	5	Site staffed; waste placed in designated area; some site equipment	Site staffed; some containment and management of combustion process; basic operating procedures to control nuisance

c.	Medium (Controlled facility)	10	Waste compacted using site equipment; waste covered (at least irregularly)	Emission controls to capture particulates; trained staff follow set operating procedures; equipment properly maintained; ash properly managed.
d.	Medium/ high (Engineered facility)	15	Engineered landfill site: uses daily cover material; some level of leachate containment and treatment; collection of landfill gas	High levels of engineering and process control over residence time, turbulence and temperature; emission controls to capture acid gases and capture dioxins; active management of flyash.
e.	High (State-of-the-art facility)	20	Fully functional sanitary landfill site: properly sited and designed; leachate containment (naturally consolidated clay on the site or constructed liner); leachate & gas collection; gas flaring and/or utilization; final cover; post-closure plan	Built to and operating in compliance with international best practice including eg. EU or other similarly stringent stack and GHG emission criteria. Flyash managed as a hazardous waste using best appropriate technology.

No	Short name	Description	Guidance notes
2E.3	Degree of monitoring and verification of environmental controls	Includes the existence and regular implementation of: robust environmental permitting/ licensing procedures; regular record keeping, monitoring and verification carried out by the facility itself; AND monitoring, inspection and verification by an independent regulatory body (cf criterion 6N.5)	The environmental monitoring programme and process control record keeping required will be specific to the type of facility. • All sites must comply with the federal/local environmental legislation, have conducted an Environmental Impact Assessment (EIA) where necessary, have obtained the most recent permit/license and kept it up-to-date. Permitting processes should be supportive of initiatives that improve environmental performance of the system. A lower score should be assigned if permitting processes for improved facilities have been unduly long and complex, while existing facilities continued to operate with much lower levels of (or no) environmental control. • For all sites it should include incoming waste volumes, weights and categories; at least occasional monitoring of waste composition and relevant properties; control of 'nuisance' (including windblown litter, flies, vermin, birds and 'mud' leaving the site on vehicle tyres); and control of odour, site fires, and emission of potential greenhouse gases (particularly methane and nitrous oxides, as well as carbon dioxide). • For all land disposal: ground and surface water. • For engineered and sanitary landfills: leachate and landfill gas management. • For thermal treatment: moisture content and calorific value of incoming wastes; temperature, residence time, emissions to air (including those of nitrogen oxides (NO), sulphur dioxide (SO_2), hydrogen chloride (HCl), heavy metals and dioxins), effluent treatment and disposal, and the quantities and management methods of both flyash and bottom ash. • For biological treatment: input waste controls (to protect both the process and the product quality); process control (temperature, residence time, mixing); product quality control; emissions controls; and greenhouse gas controls (particularly methane and nitrous oxides). a. No compliance 0 is scored b. Low compliance 5 c. Medium Compliance 10 d. Medium/High compliance 15 e. High compliance 20

No	Short name	Description	Guidance notes
2E.4	Efficiency of energy generation and use (Optional criterion used for energy recovery facilities only)	Assesses the energy efficiency of those facilities for which a major purpose is (or could be) energy recovery.	Some waste treatment facilities justify themselves at least in part on the basis of energy generation - displacing fossil fuels and saving greenhouse gases. Such energy recovery is assessed here under the 'environmental' indicator, rather than under 'resource value – reduce, reuse, recycle', as energy recovery sits in the waste hierarchy below reduction, reuse and recycling, but immediately above disposal. This is an 'optional' criterion, and should only be assessed if thermal treatment and/or energy recovery is a substantial part of the overall mix of technologies used for waste treatment and disposal. It should always be used where there is a thermal treatment facility accepting municipal solid waste (including mass burn incineration, advanced thermal treatment (e.g. gasification or pyrolysis) or production of a refuse-derived or secondary recovered fuel (RDF or SRF) for combustion elsewhere (e.g. in an industrial plant - in such case the assessment should be applied to the combined process of fuel production + use). This criterion should be used to assess landfill sites with landfill gas control or anaerobic digestion only where energy efficiency is at least medium/high and it may increase the overall scoring – otherwise, e.g. a landfill with active landfill gas control but no energy recovery could be marked down compared to one with no landfill gas control at all. In accord with the waste hierarchy, measures to promote the efficiency of energy recovery should not, in general, divert materials than can easily be recycled. As an example of the assessment, reference is made to a conventional mass-burn thermal treatment plant: • No compliance: either no energy recovery installed, OR support fuel often needed to support combustion. — 0 is scored • Low: some thermal energy generation, used mainly for internal process purposes. — 5 • Medium: good levels of energy generation and with a regular surplus for export, either as electricity generation for export to grid with no external sale or use of the waste heat from combustion; or as medium efficiency use of thermal energy on a seasonal basis. — 10 • Medium/high: Medium efficiency combined heat and power (CHP); or medium efficiency use of thermal energy on a year-round basis (steady user available in the vicinity) or co-incineration in a cement kiln. — 15 • High: High efficiency combined heat and power, with the heat being used all year round; or high efficiency use of heat all year round (steady user available in the vicinity) or co-incineration in a cement kiln. — 20

No	Short name	Description	Guidance notes
2E.5	Degree of technical competence in the planning, management and operation of treatment and disposal	An assessment of the level of technical competence at three points in the system: (i) the authority responsible for service provision; (ii) the management of the treatment and disposal facilities; and (iii) the frontline operational staff	Assessment at point (i), the authority responsible for service provision. This should include the training and technical competence of the senior management and team responsible for ensuring that treatment and disposal sites are provided and operated in line with the authorities objectives; and also EITHER: (a) where the private sector operate treatment and disposal – documentary evidence of appropriate contracts in place; detailed specifications of service; contractual monitoring procedures and tools; OR (b) where the public sector provides treatment and disposal – documentary evidence of appropriate service planning, delivery, liaison and feedback. Assessment at points (ii) and (iii) depends on both the levels of staffing and on the academic and technical training and practical experience of both the management and frontline operational staff. A 'high' rating would require some form of certification of technical competence for ALL management and operational staff.. Scoring as for 2E.3
2E.6	Occupational health and safety	Use of appropriate personal protection equipment & supporting procedures	Applies to both/either public/private operators. The reference requirements for all facilities include: safe operating procedures in place and enforced; regular health-checks/ inoculations; boots/ gloves/ overalls /high visibility vests. For thermal treatment, additional safety equipment should be provided and used as appropriate, including heat protection and respiratory protection equipment meeting appropriate specifications. Scoring as for 2E.3

Benchmark Indicators 3 & 3R – Resource Value – 3Rs – Reduce, reuse, recycle

No	Short name	Description	Guidance notes
3	Recycling rate	Percentage of total municipal solid waste generated that is recycled	Includes both materials recycling and organics valorisation / recycling (composting, animal feed, anaerobic digestion). The definition of recycling used in this document comes from the UN-Habitat book: '[the term] represents a collection of public and private, formal and informal activities that result in diverting materials from disposal and recovering them in order to return them to productive use'[1]. The recycling rate should include the contribution from the 'informal' recycling sector (IRS – see Note 1 at the end of Provider inclusivity 4P indicator for a definition) as well as formal recycling as part of the solid waste management system. Please indicate in your notes the methods used to estimate the informal sector contribution to the whole. The total quantity collected for recycling should be adjusted downwards to allow for any materials that are subsequently rejected and sent for treatment or disposal. Recycling is higher up the waste hierarchy, so energy recovery from e.g. thermal treatment is here dealt with under treatment and disposal (benchmark indicator 2). However, materials recycling from treatment plants, including e.g. paper or plastics recycling at MBT plants or metals recovery from incinerator bottom ash, is 'counted' here when calculating the recycling rate. Conversion of quantitative recycling rate to 'traffic lights' colours: Low red 0 - 9% Low/Medium red/orange 10 - 24% Medium orange 25 - 44% Medium/High orange/green 45- 64% High green >65%
3R	Quality of 3Rs – Reduce, reuse, recycle – provision	Indicator to assess the *'quality' of* 3Rs provision	This is a composite indicator made up by marking the criteria 3R.1-3R.6 below. The first two criteria focus on the quality of recycling, for dry recyclables (3R.1) and for organics (3R.2). Criterion 3R.3 *assesses the policy and practical focus on the 'top of the hierarchy':* for a higher waste generating city, this means reduction and reuse, whereas for lower waste generating cities, it is primarily diversion to recycling. Cr*iterion 3R.4 Irecognises the role of the 'community sector' in high*-income countries and of the informal recycling sector in middle- and low- income countries. The last two criteria focus on the environmental protection (3R.5) and health and safety (3R Each criterion is assigned a score as indicated in their own guidance note. All the individual scores are then summed to provide an overall %, which is reported here alongside a qualitative assessment as per the categories on page 2: LOW; LOW/MEDIUM; MEDIUM; MEDIUM/HIGH; HIGH.
3R.1	Source separation of 'dry recyclables'	Percentage of the total quantity of materials collected for recycling that are collected as clean, source separated materials	The focus here is on the relative % of clean, source- separated materials that are recycled, as opposed to materials that are sorted out from 'mixed' wastes – where there will inevitably be much higher levels of contamination. In high-income countries, the materials separated at source and either separately collected, or brought by the waste generator to a recycling centre. In low- and middle- income countries, the materials collected by 'itinerant waste buyers' and direct delivery to 'recycling shops'. The following questions should be addressed when scoring: What percentage of the total materials collected for recycling is being separated at source? And to what standard is this separation?

No	Short name	Description	Guidance notes
			a. 0-1% clean source-separated materials- all recycling from mixed wastes — 0 is scored b. 1 – 25 % clean source-separated materials- majority from mixed wastes — 5 c. 26 – 65 % clean source-separated materials — 10 d. 65 – 95 % clean source-separated materials — 15 e. 96-100% clean source-separated materials — 20
3R.2	Quality of recycled organic materials.	A qualitative assessment of the likely quality of the recycled organic product (i.e. animal feed, compost, and the organic product [digestate] from anaerobic digestion)	This criterion focuses on e.g. on separation of food wastes from other components of MSW at the household or commercial level; of green wastes; and also of 'wet' wastes from 'dry recyclables'. The following questions should be addressed when scoring: How much is being separated at source? And to what standard is this separation? The acceptability of the product in local markets is also a relevant criterion when assigning the appropriate score. a. Little or no separation or quality control. — 0 is scored. b. Some separation to reduce contamination. — 5 c. Organic materials thoroughly separated from other mixed wastes in a treatment facility. — 10 d. All input material separated at source. e. All input material separated at source and product meets a formal quality standard. — 15 / 20
3R.3	Focus on the top levels of the waste hierarchy	An assessment of the degree of both policy and practical focus on promoting reduction and reuse in 'higher waste generating cities'; and on the '3Rs' – reduction, reuse, recycling – in 'lower waste generating cities'.	The threshold for a 'higher waste generating' city is set at 365 kg/person/ year (1 kg/ person/day). For higher waste generating cities, it is assumed that attention has already been paid to promoting recycling; so this criterion focuses on assessing the degree of policy focus and practical efforts or institutional support to: prevention of wastes; organized reuse of second-hand products and materials; and extension of useful life through improved design and/or organized repair and refurbishment. For lower waste generating cities, assesses primarily the degree of policy and practical focus on diverting waste from treatment and disposal to recycling. Are there any official targets for recycling? If so, how high they are? Is recycling by the IRS included in the measurement of the targets? a. No focus — 0 is scored b. Low focus — 5 c. Medium focus — 10 d. Medium/High focus — 15 e. High level of focus — 20
3R.4	Integration of the community and/or informal recycling sector (IRS) with the formal solid waste management system	An assessment of how far and how successfully efforts have been made to include the IRS (in low and middle-income countries) and the community reuse and recycling sector (in higher income countries) into the formal solid waste management system.	This criterion focuses on the degree of integration the informal/community sector with the formal solid waste and resource management system(s). It is considered important as criterion here, particularly since in many developing countries the IRS is one of the main, if not the only, sectors that recycle municipal solid waste. Integration initiatives can be categorized into 4 groups. One focuses on organization and capacity building of the (IRS or Community) sector. The other three focus on the interfaces of the sector with formal solid waste management; with secondary material markets; and with society as a whole[2]. Example interventions include access to source separated waste; incentives schemes which bring in the community; adding value to the separated waste and organics; and access to working capital. The related criterion 4P.3 has a narrower focus, on promoting recognition and acknowledgement of the informal and community sectors as legitimate stakeholders and service providers within the overall solid waste management system. Scoring as for 3R.3

3R.5	Environmental protection in recycling	Environmental impacts of the recycling chain.	Focuses on the environmental impacts of all the steps involved during recycling, from collection, through separation and sale, to local pre-processing of the separated materials. In developed countries, one would expect the separate collection of source-separated recyclables to be relatively 'clean'; so the main focus is likely to be on any centralised facilities, e.g. 'bring' centres where the public can deliver materials for recycling (or disposal); and sorting plants for mixed recyclables (often called Material Recovery Facilities (MRFs)). For these, some of the guidance on assessment provided under criteria 2E.1-2E.3 can also be applied here. In a developing country where recycling is predominantly carried out by the informal sector, the assessment needs to focus on all the steps from initial collection and separation through to local dealers and recycling shops carrying out cleaning and pre-processing. A high compliant operation will be carrying out recycling in an environmentally sound, organised and structured manner; separation points will be kept clean and tidy; any rejects will be delivered into the formal waste management system (not dumped or burned); and precautions will be taken to manage operations at, and control emissions from, dealers' shops and pre-processing plants. For any identifiable 'facilities', some of the guidance on assessment provided under criteria 2E.1-2E.3 can also be applied here. This criterion also covers collection of Waste of Electric and Electronic Equipment (WEEE) that is locally generated. Note that the actual environmental impact of centralized composting and AD processes is considered under indicator 2E. a. No compliance 0 is scored b. Low compliance 5 c. Medium Compliance 10 d. Medium/High compliance 15 e. High compliance 20
3R.6	Occupational health and safety	Use of appropriate personal protection equipment & supporting procedures	Applies to both/either public/private/IRS individuals, establishments and operators: a) Are the equipment and infrastructure fit for purpose, ergonomic and safe? b) Do the employees and IRS have appropriate clothing and equipment (e.g. boots/ gloves/ overalls /high visibility vests) and do they receive regular health-checks/inoculations? Scoring as for 3R.5

[1] - http://www.waste.nl/sites/waste.nl/files/product/files/swm_in_world_cities_2010.pdf. (page 116).

[2] - http://wmr.sagepub.com/content/30/9_suppl/43.short. The tables provide example interventions under each of the four groups of interactions (IRS and the solid waste management sector; IRS and the materials and value chain; IRS and the society as a whole; and organization and empowerment of the IRS).

Part C: Benchmark Indicators for Governance Aspects

Benchmark Indicators for Inclusivity: (i) 4U – User inclusivity

No	Short name	Description	Guidance notes
4U	User inclusivity	Represents the degree to which all users, or potential users, of the solid waste services (i.e. households, business and other waste generators) have access to services, and are involved in and influence how those services are planned and inplemented	This is a composite indicator made up by marking the criteria 4U.1-4U.6 below. Criterion 4U.1 assesses the extent to which all citizens, irrespective of their income level, receive a good service. The next three criteria focus on assessing the degree to which users, or potential users, of the solid waste services are involved in the planning, policy formation, implementation and evaluation of those services. The last two criteria address complementary aspects of public awareness and education: 4U.5 assesses the level of activity and 4U.6, its effectiveness in achieving the desired behaviour change. Each criterion is assigned a score as indicated in their own guidance note. All the individual scores are then summed to provide an overall %, which is reported here alongside a qualitative assessment as per the categories on page 2: LOW; LOW/MEDIUM; MEDIUM; MEDIUM/HIGH; HIGH.
4U.1	Equity of service provision	Extent to which all citizens (users and potential users), irrespective of income level, receive a good solid waste management (SWM) service- i.e. a service which they can afford, which meets their expressed needs, and which protects public health and environmental quality.	This criterion addresses equity issues – do all citizens, irrespective of income, receive a good service which protects public health and environmental quality? Are low-income neighbourhoods, including 'informal' settlements, well served? Different modes of delivering solid waste management services may work better in different parts of a city; so what constitutes a 'good' service may vary between areas within the same city. A door-to-door primary collection service provided by the informal sector or micro enterprises using hand or bicycle carts in a high-density informal settlement might score highly, while the provision of regularly emptied containers around the periphery of such a settlement, within say 100m of each resident, might warrant a medium score. a. No compliance 0 is scored b. Low compliance 5 c. Medium Compliance 10 d. Medium/High compliance 15 e. High compliance 20
4U.2	The right to be heard	Do authorities have a legal obligation to consult with and involve citizens in decisions that directly affect them?	Is there a right to participation in planning and decision-making? The existence and level of implementation of laws, bylaws and other legal instruments at national and/or local level that require consultation and participation with stakeholders outside the Governmental structures. Scoring as for 4U.1
4U.3	Level of public involvement	Evidence of actual public involvement at appropriate stages of the solid waste management decision-making, planning and implementation process.	Do the relevant stakeholders actually participate in: • Public involvement through appropriate representation (women, youth, religious leaders, unions etc) at key stages of the solid waste management planning and implementation process? • Solid waste management committees/task forces/ 'platforms' established and meeting regularly? • Procedures for public engagement in facility siting? Scoring as for 4U.1
4U.4	Public feedback mechanisms	Existence and use of public feedback mechanisms on solid waste management services.	Are there accessible and well-known feedback mechanisms? These could use drop-in, telephone, post and/or internet communication to facilitate widespread accessibility. A basic mechanism would provide for feedback on operations - an excellent system here should be assigned score of '15'. The score should be raised by one increment if feedback mechanisms also cater well for opinions about choices or decisions made. Scoring as for 4U.1
4U.5	Public education & Awareness	Implementation of comprehensive, culturally appropriate public education, and/or awareness raising programmes	This criterion rates the current and recent level of activity of public education and awareness programmes. This includes the use of printed-press, TV, radio, community meetings, schools programmes. Factors to consider in assigning the score include an assessment of the organisations running such campaigns, which may include the municipality, the service provider, or active NGOs or universities. One question to ask: Is there an explicit budget line and/or a department/staff position in charge of creating and updating environmental/awareness campaigns? Scoring as for 4U.1

4U.6	Effectiveness in achieving behavior change	Change in the habits and behaviours of both the public and businesses regarding their waste management/ handling practices	Criterion 4U.5 assesses the current and recent level of activity of public awareness and education programmes, while this one rates the effectiveness of past campaigns in achieving the desired behavioural changes of citizens and businesses regarding their waste handling practices over the last decade or two. Particular behaviours of interest may include: using garbage bins or collection containers instead of dumping wastes in the streets; segregation at source for recycling instead of presenting mixed wastes for collection; waste prevention instead of throwing away; presence of a collective environmental 'waste aware' consciousness within the community Scoring as for 4U.1

Benchmark Indicators for Inclusivity: (ii) 4P – Provider inclusivity

No	Short name	Description	Guidance notes
4P	Provider inclusivity	Degree of provider inclusivity Represents the degree to which service providers from both municipal and non-municipal (including the formal private, community *or 'informal'[1] sectors*) are included in the planning and implementation of solid waste and recycling services and activities	Either the public or the private sector can provide high quality solid waste management services given the right framework conditions. Service delivery by the public, formal private, *community or 'informal'[1] sectors* can all be appropriate, with each *'operator* model*' likely to be more suitable in particular 'niches'* and according to the local circumstances[2]. This is a composite indicator made up by marking the criteria 4P.1-4P.5 below. Criterion 4P.1 assesses the presence of legal instruments which enable both the public and private sectors to get involved in providing stable waste management services. Criteria 4P.2 and 4P.3 focus in turn on representation of the private sector and acknowledgement of the role of the informal/community sectors respectively. Criterion 4P.4 looks at the *'*balance*'* between public and private sector interests, so that neither party is unduly advantaged over the other; while 4P.5 assesses the actual bid process. Each criterion is assigned a score as indicated in their own guidance note. All the individual scores are then summed to provide an overall %, which is reported here alongside a qualitative assessment as per the categories on page 2: LOW; LOW/MEDIUM; MEDIUM; MEDIUM/HIGH; HIGH.
4P.1	Legal framework	Degree to which laws and/or other legal instruments are in place and implemented at national or local level which enables both the public and private sectors to deliver solid waste management services on a stable basis.	The legal framework should cover public sector provision of services, public-private partnership (PPP), private sector participation (PSP), and community based organisation (CBO) and/or organised 'informal' sector participation. Is the inclusion and participation of both the public and the private sectors clearly enunciated in the current national or local legislation (this would imply a high score)? Or is either of these expressly forbidden (this would imply a low score)? Are there clear regulations and guidance for service contracts? Are there any restrictions regarding their duration or annulment within the law? This criterion applies regardless of whether PSP, or public service provision, is actually implemented in a municipality. a. No compliance 0 is scored b. Low compliance 5 c. Medium Compliance 10 d. Medium/High compliance 15 e. High compliance 20
4P.2	Representation of the private sector	Organisations or structures in place to ensure the representation of the private waste sector and facilitate their active participation within solid waste management planning forums, task forces, committees and/or steering-groups	The private waste sector includes the formal private, community-based and/or organised 'informal' sectors. Scoring as for 4P.1

No	Short name	Description	Guidance notes
4P.3	Role of the 'informal' and community sector	Evidence of acknowledgement and recognition of the role of the organised 'informal' and community sectors within or alongside the formal solid waste management system	The reality in many developing country cities is that the informal sector is providing services for waste collection, recycling and reuse. This criterion is assessing how far this reality is being recognised by the city authorities. In high-income countries, the criterion focuses on community-based organisations, who often have an important role in providing e.g. reuse and recycling services. Note also the broader criterion 3R.4, which focuses on the wider integration of the informal and community sectors within the overall solid waste and resource management system. Scoring as for 4P.1
4P.4	The balance of public vs. private sector interests in delivering services	Degree to which appropriate checks and balances are in place locally, so that waste services are being delivered by either the public or private sector, in a manner that is mutually beneficial and does not substantially disadvantage either party.	A high score here is likely to indicate that public and private sector service providers are combined in a robust, reliable SWM system in such a way so as to combine the strengths of each sector for the maximum benefit to the community. Concretely, contracts are well balanced between the interests of the parties; set clear objectives; are of sufficient duration to allow the necessary investments in required infrastructure and equipment; incentives and penalties are in place to ensure that performance measures are met, and to protect the interests of both parties; the client is assured that service provision can be maintained even if the contractor goes out of business; and sufficient flexibility is maintained to react to changing conditions within a long-term contract. Scoring as for 4P.1
4P.5	Bid processes	Degree of openness, transparency and accountability of bid processes.	The focus on this criterion is on the bid processes, to ensure that there is a level playing field, corruption is not a factor, the process is open to all interested parties from the formal private, community-based and/or organised 'informal' sectors, and the contract is clear and fit for purpose. Scoring as for 4P.1

[1]Informal service providers working in the waste sector are defined primarily in terms of their lack of a formal, recognized status within the municipally-organised solid waste management system. It is important to note that many informal waste and recycling businesses are registered to work as transport, construction, cleaning or agricultural enterprises, or even as businesses in the industrial value chain, and in those sectors they do pay taxes. The definition of informality relates to their lack of status within the solid waste sector. For convenience, the term 'informal' sector is used here, both before and during the process of 'integration' or (partial) 'formalisation' as a stakeholder and service provider within the formal solid waste management system. (See: http://wmr.sagepub.com/content/30/9_suppl/43.short).

[2] http://www.giz.de/en/downloads/giz2013-swm-operator-models-sourcebook-en.pdf

Benchmark Indicator 5 – Financial Sustainability

No	Short name	Description	Guidance notes
5F	Financial Sustainability	Degree of Financial Sustainability Represents the degree to *which a city's solid waste* management service is financially sustainable.	This is a composite indicator made up by marking the criteria 5F.1-5F.6 below. Criterion 5F.1 assesses transparent cost accounting procedures; 5F.2 the adequacy of the total budget, irrespective of the source of revenues; 5F.3 local cost recovery from households; 5F.4 affordability of user charges; 5F.5 coverage of disposal costs, focusing on how far disposal is *'priced'*; and 5F.6 ability to raise capital for investment. Each criterion is assigned a score as indicated in their own guidance note. All the individual scores are then summed to provide an overall %, which is reported here alongside a qualitative assessment as per the categories on page 2: LOW; LOW/MEDIUM; MEDIUM; MEDIUM/HIGH; HIGH.
5F.1	Cost accounting	Extent to which the solid waste management accounts reflect accurately the full costs of providing the service, the relative costs of the different activities within solid waste management, and whether the accounts are open to public scrutiny.	It is important both that the city knows the full and accurate costs of solid waste management, and that these accounts are open to public scrutiny to ensure transparency and accountability. If the city knows the full costs but does not respond to requests to disclose them, then this should be considered as a medium/high compliance, except in cases where disclosure of the cost compromises a legal right to confidentiality (eg. under national taxation laws): a. No compliance 0 is scored b. Low compliance 5 c. Medium Compliance 10 d. Medium/High compliance 15 e. High compliance 20
5F.2	Coverage of the available budget	Is the annual budget adequate to cover the full costs of providing the service?	This criterion focuses on the adequacy of the total budget, irrespective of the source of revenues – local cost recovery is examined by criteria 5.3 and 5.5 below, and ability to raise capital by 5.6. High scores indicate that revenues are sufficient to provide a quality collection service to all the citizens, and deliver a high level of environmental protection in treatment/disposal service, and that those revenues cover the costs of depreciation/ repaying capital. a. Covers 50% or less of current operating costs: 0 is scored b. Covers most current operating costs: 5 is scored c. Covers full operating & maintenance costs of current level of service 10 is scored d. Covers full cost of providing current level of service including allowance for necessary improvements and costs of capital: 15 is scored e. Covers full cost of providing a high quality service including costs of capital: 20 is scored
5F.3	Local cost recovery – from households	Percentage of the total number of households both using and paying for 'primary waste collection services'. The focus here is on the number of households, NOT on the percentage of the total costs which they pay.	• It is important that all service users pay at least some proportion of the total costs of providing that service (see also criterion 5F.4 which addresses affordability), either directly (through direct charging to the household) or indirectly (via property tax, communal service charges or a utility bill or a component of a utility bill linked to water/wastewater or electricity bills). • The focus here is on the costs of primary collection – that is the part of the service which ensures that waste is removed from individual properties, either via some sort of individual service or via the provision of communal collection points

No	Short name	Description	Guidance notes
			a. None 0 is scored b. Less than 25% 5 c. 25 – 49 % 10 d. 50 - 74% 15 e. 75 - 100% 20
5F.4	Affordability of user charges	Are practices or procedures in place to support charges for those who can least afford to pay?	Providing solid waste management services to all benefits the whole city. So if a direct or indirect charging system is in place, it makes sense to enable those who can least afford to pay to receive a service, so as to benefit the city as a whole. Such support will depend on how charges are levied. For example: for a direct user charge for solid waste management, some users could be exempted or subsidized, using either central funds or by cross-subsidy from other users; for a charge levied alongside other utility payments (e.g. electricity, water, housing), then existing support arrangements for the other utility could be used; for indirect charging, e.g. through a property tax or charge, again existing support arrangements could be used. If no charges are levied, then this criterion should be marked as Not Applicable (N/A), in which case it is excluded from the total score, which is now out of 100 rather than 120 (so that no normalisation is required) Scoring as for 5F.1
5F.5	Pricing of disposal	Degree to which all the wastes coming to the final (treatment or) disposal site(s) are charged at a rate that covers (at least) the operating costs of (treatment or) disposal	This criterion focuses *on how far disposal is 'priced', as the* evidence suggests that such price signals are necessary if solid waste management is to be taken seriously by waste generators and handlers[1]. Are all the operating costs (i.e. labour, fuel, maintenance, consumables such as tyres, etc.) covered by the gate fee charged to both the municipality and private users of the treatment and disposal facilities? Further, do the gate fees cover also capital costs and facility closure and aftercare? a. No charge is made 0 is scored b. Charged rate covers some costs of operation 5 c. Charged rate covers full operating and maintenance costs. 10 d. Charged rate covers all operating costs, maintenance and capital costs. 15 e. Charge rated covers all operating, maintenance and capital costs, and also sets aside savings for future closure and aftercare. 20
5F.6	Access to capital for investment	Has adequate provision been made for necessary capital investments, both to extend collection coverage to any un-served areas; to upgrade standards of waste disposal; and to replace existing vehicles, equipment and sites at the end of their life?	Sources for such investment could include national government; investment by the private sector as part of contractual arrangements; grants or loans from international donors; and grants from the national government to municipal or local levels as part of availability and management of national funds for investments in waste management infrastructure. If reliance on private investment is being made, can the service providers readily raise the capital required? Allowance should be given in this assessment for any usage of the carbon development mechanism (CDM) or other post-Kyoto mechanism (eg. NAMA) – although this strictly funds operational rather than capital costs, its existence does facilitate the availability of funds for capital investment. Scoring as for 5.F.1.

[1] http://edepot.wur.nl/179408

Benchmark Indicators for Sound institutions, proactive policies:

(i) 6N – Adequacy of national framework for solid waste management (SWM)

No	Short name	Description	Guidance notes
6N	National SWM Framework	Assesses the adequacy of the national solid waste management framework – including the degree of implementation	The focus here is on the national framework within which a city needs to make its own local arrangements. In some large countries that *operate a 'Federal' system, the assessment here should include both the National and 'State' or 'Provincial' (i.e. regional) frameworks* within which the city muct operate. This is a composite indicator made up by marking the criteria 6N.1-6N.6 below. The criteria cover the basic legislation and implementing regulations (6N.1); an approved and recent national strategy and clear policies (6N.2); guidelines for local government on implementation (6N.3); the designation and capacity of a single national responsible authority for solid waste management (6N.4); the environmental regulatory agency (6N.5); and the extent to which companies responsible for the products that become solid waste share the costs of its management thorough extended producer responsibility (6N.6). I Each criterion is assigned a score as indicated in their own guidance note. All the individual scores are then summed to provide an overall %, which is reported here alongside a qualitative assessment as per the categories on page 2: LOW; LOW/MEDIUM; MEDIUM; MEDIUM/HIGH; HIGH.
6N.1	Legislation and regulations	Is there a comprehensive national law or laws in place to address solid waste management requirements? Does the legislation require regulation in order to bring it to force and have these regulations been put in place?	The presence of specific national solid waste management legislation (i.e. not only general environmental legislation) – approved by the executive and legislature of Government, and updated as necessary to accommodate any changes in the national and/or regional situation. If this is framework legislation, then the necessary implementing regulations also need to be in place and approved. So, for example, a comprehensive law passed some years ago but never moved forward to implementation would score poorly. a. No compliance 0 is scored b. Low compliance 5 c. Medium Compliance 10 d. Medium/High compliance 15 e. High compliance 20
6N.2	Strategy/Policy	Is there an approved and recent national strategy for solid waste management, and clear policies in place and implemented?	The national solid waste management strategy (sometimes called a 'National Plan') should define actions which need to be taken within a specified period of time, to support the solid waste management legislation. Elements of a strategy might include targets to be met (e.g. for collection coverage, or for controlled disposal or for recycling or for diversion from landfill) or economic instruments to be used (e.g. landfill or incineration tax). The typical duration of a strategy is 5-15 years, during or after which time the policy/strategy is reviewed and amended as necessary (either producing a new document or an update). A more recent strategy scores higher. Both strategy and policy need to have been approved by the executive and legislature, and/or being actively implemented by the institution with the legal responsibility for solid waste management (see 6N.4). Scoring as for 6N.1

No	Short name	Description	Guidance notes
6N.3	Guidelines and implementation procedures	Are there clear guidelines for local authorities on how to implement the laws and strategy? Are there effective mechanisms in place for facility siting?	• Guidelines should set out how, in practical terms, the national solid waste management legislation and strategy/policy should be implemented at the local level. • The guidelines should, amongst other things, set out requirements for regional/local plans to be developed and implemented, including extension of collection services to unserved areas, an increase in recycling rates, and development of waste treatment & disposal infrastructure/ facilities to improve environmental standards. • This then should be backed up by effective mechanisms which ensure that the new facilities are built in the most suitable places determined using EIA, balancing national/ regional needs against the views of local residents. • NIMBY should not be allowed to drive all facilities to the lowest income districts. Scoring as for 6N.1
6N.4	National institution responsible for implementing solid waste management policy	Is there a single institution at the national level which is charged with the responsibility of implementing, or coordinating the implementation of, solid waste management strategy/policy	Situations where clear responsibility is placed on one well-resourced and well-defined entity within a single Ministry attract the highest score. Separation of functions between policy and regulation (see 6N.5) also attracts higher scores. • Low - institutional responsibility for implementation of strategy/policy is unclear and/or undefined — 0 is scored • Low/Medium – several departments have both some responsibility and some level of staffing — 5 • Medium - institutional mechanism in place for coordination of strategy implementation with the participation of all relevant ministries, or waste department lightly staffed within the environmental regulator — 10 • Medium/High - one single national entity, either professionally staffed but within the national environmental regulator, or not completely staffed and outside the environmental regulator — 15 • High compliance - one single national entity, adequately and professionally staffed and separate from the environmental regulator — 20
6N.5	Regulatory control / enforcement	Is there a well organised and adequately resourced environmental regulatory agency? Does it enforce the legislation so as to ensure a 'level playing field' for all?	It is assumed that enforcement is undertaken by a wider 'environmental regulatory agency'. Responsibilities with respect to solid waste management would include permitting and inspection of waste treatment and disposal sites. It is relatively common for a country to put comprehensive legislation in place; having the institutional capacity, resources and commitment to enforce that legislation effectively in practice is less common. The institutional arrangements for the 'environmental regulatory agency' may be organised via national, regional or municipal governments - the level is not so important in the assessment here - the focus is rather on 'does it work in practice across the whole country'? Scoring as for 6N.1

No	Short name	Description	Guidance notes
6N.6	Extended producer responsibility (EPR) or Product Stewardship (PS)	Has engagement been made with national and international companies who produce the packaging, electronic goods and other products that end up as MSW? Do they share at least some of the costs of the solid waste management service and/or recycling?	EPR is increasingly used in high and some middle-income countries, as a means of passing the burden of financing and managing recycling systems back in part to those who place on the market products which make up a significant part of the solid wastes that are handled by the cities. Given both the increasing presence of such 'end-of-life' products in municipal solid waste in developing countries, and their chronic budget shortages, this is an attractive policy for all countries, so is included here as a 'normal' part of a national framework. Often, these schemes are introduced via national legislation, but voluntary schemes and national or local partnerships, e.g. between groups of major brand holders and organised 'informal' sector recyclers, are also possible. Scoring as for 6N.1

Benchmark Indicators for Sound institutions, proactive policies: (ii) 6L Local institutions

No	Short name	Description	Guidance notes
6 L	Local institutional coherence	A measure of the institutional strength and coherence of the *city's solid waste* management functions	This is a composite indicator made up by marking the criteria 6L.1-6L.6 below. The individual criteria assess organizational structure, institutional capacity, city-level strategic planning, availability and quality of data, management control and supervision of service delivery and inter-municipal co-operation. Each criterion is assigned a score as indicated in their own guidance note. All the individual scores are then summed to provide an overall %, which is reported here alongside a qualitative assessment as per the categories on page 2: LOW; LOW/MEDIUM; MEDIUM; MEDIUM/HIGH; HIGH.
6L.1	Organisational structure/ coherence	The degree to which all solid waste management responsibilities are concentrated into a single organisation or department, that can be held accountable for performance, or if multiple organisations, the presence of a significant concentration of responsibilities in one named agency.	• Is there a specific organisation or department within the municipality which is responsible for ensuring that solid waste management services are planned, delivered and funded? • Does all of the solid waste management budget fall within the budget line of that organisation/department? a. No compliance 0 is scored b. Low compliance 5 c. Medium Compliance 10 d. Medium/High compliance 15 e. High compliance 20
6L.2	Institutional capacity	An assessment of the organisational strength and capacity of the department(s) responsible for solid waste management	Although the existence of a single, responsible department would score more highly under Criterion 6L.1, the assessment here should be applied to all departments with a degree of responsibility for solid waste management. • Is there a detailed organisation chart of the solid waste management department (or of each department with some responsibility)? • Are all key positions filled and are staff suitably qualified? • Is there structured career progression and are staff provided with appropriate training – both in the class-room and the field? Scoring as for 6L.1
6L.3	City-wide solid waste management strategy & plan	Is there a recent strategy or plan in place & being implemented at the city (or regional) level for solid waste management?	• This strategy/plan needs to conform with the national strategy, implementing that at the local (regional, city) level • Is the strategy/plan recent / still valid? • Are the resources and funding for implementation in place? Scoring as for 6L.1

6L.4	Availability and quality of solid waste management data	Is there a management information system (MIS) in place? Are data regularly measured, collected and monitored?	• Components of such an MIS should include regular measurement of waste generation; waste composition; quantities collected, recycled, treated and disposed. • Volume based measurement is unreliable; it should score, but score lower than where waste is physically weighed. • A key element of the scoring is the date of the latest available dataset – the more recent, the higher the scored assigned. Scoring as for 6L.1
6L.5	Management, control and supervision of service delivery	A measure of the strength of control by the city, as the 'client' for solid waste management, over the on-the-ground delivery of solid waste management services.	This criterion focuses on the role of the city as the 'client' for solid waste management services. The services may actually be delivered by the private or public sector, or a combination of the two. For a discussion of the various roles, see the recent GIZ report on 'Operator models' in solid waste management[1]. (a) In the areas of the city where the private sector is involved in service delivery: Are the municipal waste collection and/or disposal services adequately supervised by the municipalities; are supervisory staff aware of the contracted service specifications and how to measure and enforce them; do monitoring staff have access to suitable transportation such as motorcycles or vehicles? AND (b) In the areas of the city where the public sector directly delivers services: is there a clear separation of the roles of service provision and service monitoring & enforcement? Is there documentary evidence of service monitoring procedure in place? Do monitoring staff have access to suitable transportation such as motorcycles or vehicles? Scoring as for 6L.1
6L.6	Inter-municipal (or regional) co-operation	Waste collection is often delivered at a local level, while treatment and disposal may require co-operation city-wide or at a regional level. Regulatory control may be organised at regional or national level. How well does such co-operation work?	• Evidence of good working relationships & clearly defined/ articulated roles and responsibilities between the various tiers of government responsible for different aspects of solid waste management, including district/ city/ regional/ national levels. • Particularly important for solid waste management policy, planning and service delivery. • Other local, regional and national government departments may also be involved e.g. on budgets/ funding, regulatory control and enforcement, and public communications. Scoring as for 6L.1 The need for such inter-municipal co-operation is likely to be the norm in most cities. However, local government arrangements in some countries may mean that a city can be regarded as autonomous, and capable of making its own arrangements for all aspects of solid waste management without the need for co-operation with its neighbours. In such cases, this criterion can be designated as 'not-applicable' - if you consider this to be appropriate in your city, please provide full justification in the User Form. This criterion will then be excluded from the total score, which is now out of 100 rather than 120 (so that no normalization is required).

[1] http://www.giz.de/en/downloads/giz2013-swm-operator-models-sourcebook-en.pdf