



China Integrated  
Waste Management  
NAMA

China Integrated Waste Management (IWM) NAMA Project

# Wasteaware Benchmark Indicators for Integrated Sustainable Waste Management in Chinese Cities

Edition, 3.0

November 2019



# Imprint

## Published by:

Deutsche Gesellschaft für  
Internationale Zusammenarbeit (GIZ) GmbH

Registered offices  
Bonn and Eschborn

Address (China Representative Office)  
Sunflower Tower 1100, 37 Maizidian Street, Chaoyang District  
100125 Beijing, PR China

## Project:

China Integrated Waste Management (IWM) NAMA, this project is supported by the NAMA Facility on behalf of the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU), the UK Department for Business, Energy and Industrial Strategy (BEIS) (formerly DECC), the Danish Ministry of Energy, Utilities and Climate (EFKM) and the European Commission

## Authors:

Andrew Whiteman, Professor David C Wilson, Qian Mingyu, Nina Mitiaieva, Liu Xiao, Li Xinrui

## URL links:

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The original version of User Manual for Wasteaware ISWM Benchmark Indicators was published as a supporting Information to: Wilson et al., 2014 – doi: 10.1016/j.wasman.2014.10.006 and is available under the link: <https://www.sciencedirect.com/science/article/pii/S0956053X14004905>



Beijing, PR China, 2019

中华人民共和国住房和城乡建设部  
Ministry of Housing and Urban-Rural  
Development (MoHURD)

**NAMA** Facility

On behalf of



Implemented by

**giz** Deutsche Gesellschaft  
für Internationale  
Zusammenarbeit (GIZ) GmbH



中国城市环境卫生协会  
China Association of Urban Environmental Sanitation

## 1. BACKGROUND

In partnership with the Ministry of Housing and Urban-Rural Development (MoHURD) and China Association of Urban Environmental Sanitation (CAUES), GIZ is implementing a China Integrated NAMA Support Project (China IWM NSP) in the People's Republic of China. The NSP aims to support the transition of the current Chinese waste management practices in an environmentally sound and sustainable way, towards a low carbon future.

A comprehensive system for the measurement and monitoring of waste management systems does not yet exist in the PRC. A benchmarking system has been developed to fill this gap. Building on international best-practice, the award winning “Wasteaware Benchmark Indicators for Integrated Sustainable Waste Management in Cities”<sup>1</sup> has been adapted to suit the specific characteristics of Chinese municipal waste management systems.

The Wasteaware ISWM benchmark indicators (WABIs) have been developed over a period of 10 years through a multi-agency expert-led process. Conceptualised in 2010 during the preparation of the UN Habitat Solid Waste Management in the Worlds Cities publication<sup>2</sup>, and further developed through a series of international collaborations, the WABIs provide a comprehensive method for evaluating the status of municipal waste management systems around the world.

Adapting the WABIs to China has been an illuminating experience. Calibration to Chinese city waste management systems required specific adjustments to be made at the ‘high’ end of the performance spectrum to emphasize and encourage further advancements towards the upper-levels of the waste hierarchy. This is reflective of the great strides that China has made in waste management over the last decade.

Despite the consistent high performance, variations in performance can be pinpointed between cities. It is hoped that through making first steps in developing a national standard benchmarking system, Chinese waste management can reinforce its place at the centre of technological innovation as a world leader in sustainable low carbon integrated waste management.

## 2. WHAT ARE THE WASTEWARE BENCHMARK INDICATORS (WABIs)

### 2.1 Aim, Scope and Analytical framework

The aim of the Wasteaware benchmark indicators (WABIs) is to provide an overview of a city's solid waste management performance, to reveal clearly those aspects which are performing well and not so well, in order to point the way to next steps on the road to improvement; to monitor progress over time; and to allow benchmarking against other cities on a consistent basis.

The scope includes all municipal solid wastes – defined as waste from households plus waste of a similar composition from other sources in the city (Scheinberg et al, 2010). This generally means including some

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<sup>1</sup> The [original version of User Manual for Wasteaware ISWM Benchmark Indicators](#) was published as a Supporting Information to: [Wilson et al., 2014 – doi: 10.1016/j.wasman.2014.10.006](#)

<sup>2</sup> Scheinberg et al. Solid Waste Management in the Worlds Cities. UN Habitat, 2010

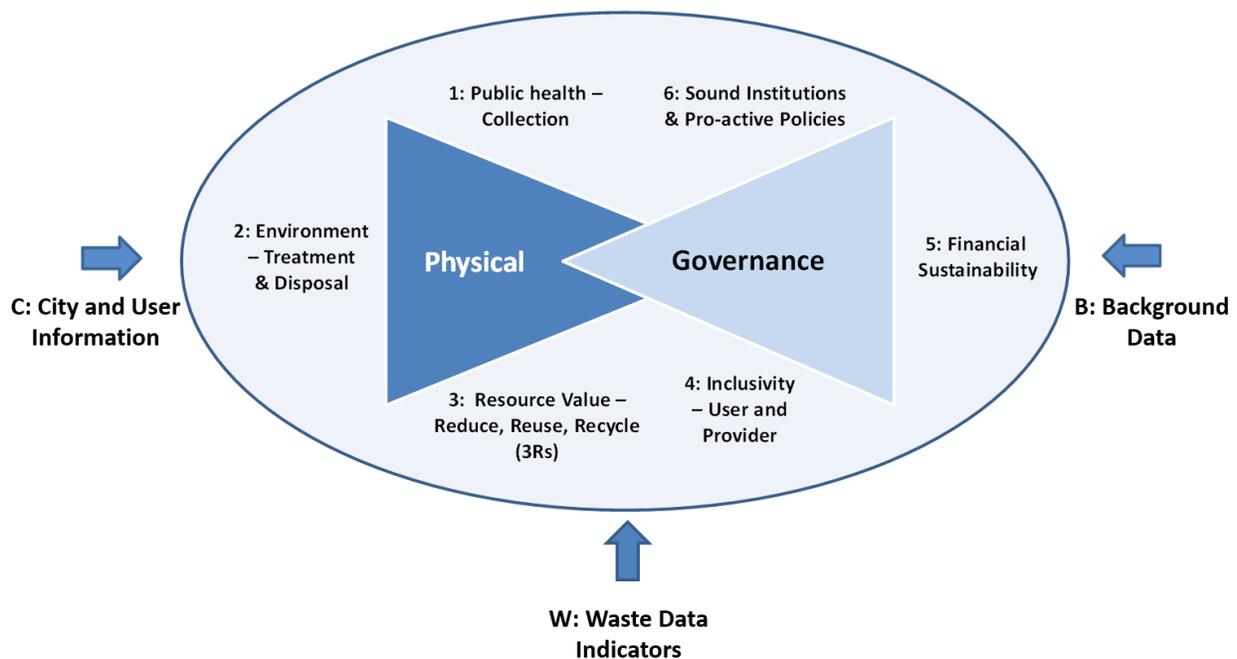
commercial and industrial wastes from small shops and offices, together with small-scale construction and demolition wastes from household repairs. Commercial and industrial process wastes from larger industries and 'bulk' construction and demolition wastes are excluded.

The system boundary is the waste management service area, generally the administrative boundaries of the municipality plus the major waste management facilities located outside of the municipality area. It includes services provided by public and private activities in waste management, including the reuse and recycling systems regardless of their status and degree of formality/informality.

The analytical framework used in WABIs is a simplified 'two triangles' version (Figure 1) of integrated sustainable (solid) waste management (ISWM), initially developed for UN-Habitat (Scheinberg et al., 2010). The first 'triangle' focuses on three key drivers for development of waste management (Wilson, 2007), corresponding to the three key physical, 'hardware' components: protection of public health which depends on a good waste collection service; environmental protection particularly during waste recovery and disposal; and resource value, the '3Rs' – reduce, reuse, recycle.

The second 'triangle' focuses on ISWM 'software', the governance strategies to deliver a well-functioning system. These have been identified as *inclusivity*, allowing stakeholders to contribute and benefit, both as service users and service providers; *financial sustainability*, ensuring that solid waste management services and activities are cost-effective and affordable; and a base of *sound institutions and pro-active policies*.

These physical and governance indicators are complemented by background information, comprising city and user information (C) and other background (B) data, which are used to calculate waste data indicators (W).



**Figure 1:** The Integrated Sustainable Waste Management (ISWM) framework used by the Wasteware benchmark indicators (WABIs). This is a simplified version of the original ISWM concept ((Scheinberg, et al., 2010), grouping together the three physical components and the three governance aspects, as represented by the two triangles.

## 2.2 Quantitative and qualitative indicators and visualising the results

There are six quantitative WABI indicators, two related to waste generation per capita and to a sub-set of waste composition; and four to the physical components of the system.

Early experience with applying the quantitative physical indicators in various cities revealed a need to refine them beyond a numerical score so as to differentiate performance levels between cities with apparently similar scores: e.g. even in municipalities where collection coverage is close to 100%, the *quality* of the collection service may not yet be comparable. So, the quantitative % indicator(s) for each physical component are complemented by a composite, multi-attribute 'quality' indicator assessed against five or six component criteria.

Measuring waste governance in objective, quantitative terms is generally not possible, so a similar qualitative approach has been adopted for the governance indicator sets; this is the case even for financial sustainability, where different aspects of financial performance need to be considered.

WABI uses a total of eight composite, multi-attribute, qualitative indicators, based on assessment against five or six criteria for each. The assessment is made on an interval scale, consisting of a standardised, five-fold scoring system with a score of 0, 5, 10, 15 or 20 being assigned against each criterion. The scores for each of the criteria comprising a qualitative indicator are summed together into a score for that indicator, which allows the different aspects of performance – each ideally being assessed by its own distinct and traceable criterion – to be combined into one indicator.

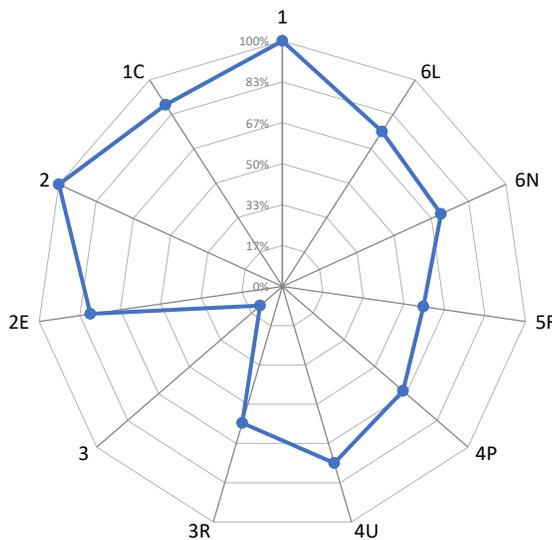
The resulting score is then converted into a qualitative assessment of the system's performance regarding that indicator. This qualitative assessment is also five-fold, to match the scoring system for the individual criteria comprising the indicator. In addition, resulting ranges of scores have also been colour-coded using a 'traffic lights' system, to assist with a rapid visual assessment of the tabulated data and to illustrate, at a glance, areas of performance requiring immediate attention – as denoted by the colour red.

The convention used is that an assessment of LOW corresponds to an overall score in the range 0-20% and is coded as red; LOW/MEDIUM to 21-40% and red-amber; MEDIUM – 41-60%, amber; MEDIUM/HIGH – 61-80%, amber-green; and HIGH – 81-100%, green. In the examples shown later, the colour amber (orange) is also shaded, to make the colour coding more legible for the colour-blind as well as when printed in black and white.

The same traffic lights coding system from LOW to HIGH has been used to rate performance for each quantitative physical indicator. The values that are currently considered good practice differ, which means that the indicators do not follow the same gradation pattern when assessing relative performance, and that gradation is not linear. This 'normalisation' is presented in Section 3 below.

A complementary means of visualising the results is through a radar diagram, which shows a city's performance against the 11 physical and governance indicators on a zero to 100 scale. The main difference is that the traffic lights 'normalise' performance against all the indicators into a five-fold scale from 'low' (red) to 'high' (green), while the radar diagram shows the scores against each indicator without such normalization.

## Taian, Shandong province, 2018



**Figure 2:** Example of a radar diagram based on the WABI assessment conducted by China IWM NSP in the city of Taian, Shandong Province (September 2018).

The exception is for the quantitative recycling indicator, where across the world the experience in using the WABIs shows that a reasonable maximum achievable performance is approximately 50% rather than 100%, so a corresponding normalization of the assessment has been introduced in this Chinese edition (and will be included in the next international revision).

The international WABI were not originally conceived as a 'scoring' mechanism, and the intention was not to produce any single overall or absolute number as a performance index.

### 2.3 The User Manual

The role of the 'user' – the person, team or organisation applying the indicators to a particular city – is very important; ideally the WABI assessor would be a small team led by an experienced solid waste professional who is familiar with the local and national situation.

Consistency in application of the WABIs is critical – eight of the 11 main indicators are composite indicators based on a qualitative assessment against a series of criteria where the user or user group need(s) to apply their (collective) professional judgment. So, the User Manual provides detailed guidance on definitions used, interpretations and the scoring system used for each criterion (Appendix 1).

It is important that the WABI assessment form contains as much detail as possible on the sources, assumptions, local definitions, information used and the rationale behind the scores; such traceability is essential also 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.

Wherever possible, the user should provide supplementary evidence, such as available reports, photographs of the waste management system, and other sources, alongside the completed Indicator Form.

## 2.4 Background Information and Waste Data Indicators

The background information required has been reduced to a reasonable minimum, so as both to calculate waste data indicators. Full details are provided in Part A of the User Manual in Appendix 1.

City and user information (C) seeks information on the city itself and its relationship to the wider region; key data sources and dates; and the person/ team/ organization who have completed the WABI user form.

Background data (B) comprises the gross national income (GNI) per capita for the country and the corresponding World Bank income category; the population of the city; and the total municipal solid waste (MSW) generation.

This information is then used to calculate the key waste data indicator (W.1) which is the MSW generation per capita per year. This sits alongside W.2, comprising six sub-indicators of MSW composition which have been selected both as those that vary the most between cities and are important for resource recovery and/or technology selection. These six sub-indicators comprise four basic composition categories: organic (food and green waste) fraction; paper and cardboard; plastics; and metals; plus two over-arching physical parameters: waste density and moisture content.

Where possible the MSW generation should be assessed using primary data collection survey. The WABIs are fully aligned with the methodology for data collection and reporting for the UN Sustainable Development Goal (SDG) 11.6.1 and reference can be made to that SDG indicator for guidance on collecting primary data.

## 3. THE PHYSICAL INDICATORS

### 3.1 Quantitative Indicators

The Wasteaware benchmark indicators for the physical components of the system include four quantitative indicators, as shown in Table 1, plus three multi-attribute, composite indicators of the 'quality' of service provision for each component, as shown in Table 2, 3 and 4. In each case, some adjustments have been made to adapt the WABI for use in comparing Chinese cities.

In Table 1, indicator 1 (formerly 1.1), waste collection coverage, focuses on *access* to a reliable waste collection service; and indicator 2 represents the percentage of waste destined for recovery or disposal that is handled in at least a 'controlled' facility.

Indicator 1.2 in the original WABI focused on waste captured by the system, which was important in some of the least developed countries where 'wild' dumping and open burning by householders or primary collection service providers might still be common. However, in China this indicator would universally be near 100%, so in the Chinese adapted version this WABI indicator has been deleted; the indicator 1.1. has been correspondingly renamed into the indicator 1.

Indicator 3 is the recycling rate: this includes both formal and informal recycling; and both dry recyclables and organic valorisation (from composting, anaerobic digestion and animal feed); quantities collected for recycling should ideally be adjusted downwards to allow for any materials subsequently rejected and sent to disposal or thermal recovery.

The User Manual provides further elaboration of the definitions used for each of the quantitative indicators and guidance on the calculations. The WABI quantitative indicators are also fully embedded into the SDG 11.6.1 indicator, and reference can be made in the future to the calculation methodology as it evolves and develops.

The ‘quantitative’ indicators values are ranked with a traffic lights visualisation. The values that are currently considered good practice differ for each physical component, which means that the indicators do not follow the same gradation pattern when assessing relative performance, and that gradation is not linear. For example, collection coverage or waste captured or managed in controlled recovery and disposal facilities at 50% is relatively low, while a recycling rate of 50% is extremely high.

The original WABI paper used a set of values which attempted to be universal, in order to allow comparison between all countries globally. The result was that when the indicators were used to compare cities within one country, and to monitor progress over time, more advanced countries such as China found that all cities scored near the top end of the scale for many indicators from the outset; while some developing countries found that all of their cities were effectively ‘stuck’ at the lower levels. So, adaptation to make the scales more sensitive to differentiate gradations in performance within a country has been encouraged.

For China, Indicator 1 on collection coverage (1) has been retained; for Indicator 2 managed in controlled recovery and disposal facilities, the ranges have been made more linear, although the threshold for excellent performance is set at a ‘high’ 95%; while for Indicator 3 on recycling rates, a relatively linear scale is used but with the threshold for high performance set at 50%.

**Table 1: The four quantitative indicators for the physical components of a SWM system**

No.	Physical component	Indicator name and definition	Traffic light colour coding				
			LOW	LOW/ MEDIUM	MEDIUM	MEDIUM/ HIGH	HIGH
1	Public health - waste collection	<b>Waste Collection Coverage:</b> % households who have access to a reliable waste collection service	0-49%	50-69%	70-89%	90-98%	99-100%
2	Environmental control – recovery and disposal	<b>Waste Managed in Controlled Facilities:</b> Percentage of MSW generated that is managed in controlled facilities	0-24%	25-49%	50-74%	75-94%	95-100%
3	Resource value - ‘3Rs’ - Reduce, reuse, recycle	<b>Recycling rate:</b> % of MSW generated that is recycled. (Includes both formal and informal, and both dry materials and organics recycling)	0-9%	10-19%	20-29%	30-49%	50% and over

## 4.2 Qualitative Indicators

The quantitative indicators are supplemented by a multi-attribute, composite indicator of the quality of service provision for each physical component, assessed using best professional judgment against a defined set of six criteria. Most of these follow the original international WABIs, but some have been adapted to allow better differentiation between cities on aspects of performance that are particularly relevant to China.

The User Manual in Appendix 1 provides full details of the assessment and scoring systems defined for all of these ‘qualitative’ criteria. To encourage consistent assessment by users in different cities, the User Manual is as explicit as possible, but the level of detail possible varies widely between the criteria. Regarding the allocation of scores, one frequently used scheme is to explain for the particular criterion what a high compliant operation would look like: scoring is then based on the users assessment - no compliance scores 0, low compliance scores 5, medium 10, medium/high 15 and high 20.

Table 2 sets out the six criteria used to assess the quality of the municipal waste collection service. 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, *Efficiency and effectiveness of waste transport*, focuses on the next step, getting the waste to (perhaps more distant) recovery and disposal facilities. The last two criteria, 1C.5 and 1C.6 examine the appropriateness of service planning and monitoring, and health and safety aspects.

The WABIs have been adapted for use in China to strengthen the sensitivity at the higher end of performance in order to better reflect the latest generation of Chinese improvements in the environmental control of transfer operations (1C.4) and the use of SMART data<sup>3</sup> (1C.4 and 1C.5), which represent a new level of global best practice.

**Table 2: Criteria used to assess Indicator 1C: Quality of the waste collection and street cleaning service**

No.	Criterion	Description
1C.1	Appearance of waste collection points	Presence of accumulated waste around collection points/containers
1C.2	Effectiveness of street cleaning	Presence of litter and of overflowing litter bins
1C.3	Effectiveness of collection in low income districts	Presence of accumulated waste/ illegal dumps/ open burning
1C.4	Efficiency and effectiveness of waste transport	Appropriate public health and environmental controls of waste transport
1C.5	Appropriateness of service planning and monitoring	Appropriate service implementation, management and supervision in place
1C.6	Health and safety of collection workers	Use of appropriate personal protection equipment & supporting procedures

<sup>3</sup> The SMART data with relation to waste management is digital information that is (1) collected on a daily basis during primary and secondary waste collection, (transportation), treatment and disposal and/or recovery, (2) filtered, (3) structured and (4) analyzed within the broader context of urban data in order to foster more efficient decision-making

Table 3 summarises the six criteria used to assess indicator 2E, the degree of environmental protection in recovery and disposal.

The first three criteria focus in turn on different aspects of environmental protection at a recovery/disposal facilities: 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. A score of at least 10 out of 20 on each of these criteria is the threshold for a facility to count as ‘controlled’ under the indicator 2.

The User Manual tabulates explicit guidance for scoring different types of facility against 2E.2 in particular: this has been updated both for the Chinese situation and in line with the latest WABI global matrix for assessing level of control of recovery and disposal facilities.

Criterion 2E.4 assesses efficiency of energy generation and use, including incineration of residual wastes, advanced thermal treatment (e.g. gasification or pyrolysis) or production of a refuse-derived or secondary recovered fuel (RDF or SRF) for combustion elsewhere. The last two criteria focus on technical competence (2E.5) and on occupational health and safety (2E.6).

**Table 3: Criteria used to derive Indicator 2E: Degree of environmental protection in recovery & disposal facilities**

No.	Criterion	Description
2E.1	Degree of control over waste reception and general site management	This criterion should be applied to all recovery and disposal sites, whatever the specific process being used.
2E.2	Degree of control over waste recovery and disposal	The focus here is on the recovery or disposal <i>process</i> in use at each site and over any potential emissions. This covers both the presence of the necessary technologies, and the operating procedures for their proper use.
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.
2E.4	Efficiency of energy generation and use ( <i>Used for energy recovery facilities only</i> )	Assesses the energy efficiency of those facilities for which a major purpose is (or could be) energy recovery.
2E.5	Degree of technical competence in the planning, management and operation of recovery 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 recovery and disposal facilities; and (iii) the frontline operational staff.
2E.6	Occupational health and safety	Use of appropriate personal protection equipment & supporting procedures. This has been extended in the Chinese version to include health and safety at biological and materials recovery facilities.

Table 4 summarises the criteria used to assess indicator 3R, the *Quality of 3Rs - reduce, reuse, recycle - provision*.

The first two criteria focus on the extent of source separation, which to a large extent determines the quality of recycling, both 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’.

Criterion 3R.4 focuses on *Integration of community and/or informal recycling sector* with the formal MSW management system while 3R.5 focuses on the environmental protection. The original criterion 3R.6 focused on health and safety in recycling, which for the Chinese version has been merged into 2E.6. A new criterion focusing attention on the management practices for separated organics at specialised recovery facilities has been created for China.

**Table 4: Criteria used to derive Indicator 3R - Quality of 3Rs- reduce, reuse, recycle - provision**

No	Criterion	Description
3R.1	Source separation of ‘dry recyclables’	Assessed on the basis of the proportion 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. Detailed guidance is provided in the User Manual.
3R.2	Source separation of organic materials	A qualitative assessment of the extent of source separation of organic materials. This impacts on the likely quality of the recycled product (i.e. animal feed, compost, and the organic product (digestate) from anaerobic digestion).
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.
3R.4	Integration of community and/or informal recycling sector (IRS)	An assessment of how far and how successfully efforts have been made to include the informal and community recycling sector into the formal solid waste management system.
3R.5	Environmental protection in recycling	Environmental impacts of the recycling chain, from collection through to the separation and processing of the separated materials. NOTE: the environmental impact of other recovery facilities that also produce materials for recycling (e.g. composting, MBT plants) is considered elsewhere under Indicator 2E.
3R.6	Focus on organics management	An assessment of the degree of both policy and practical focus on separate treatment of organic waste.

## 4. THE GOVERNANCE INDICATORS

A major principle in developing the WABIs was that they should reflect also the ‘soft’, inherently difficult to measure, governance aspects. If adequate attention is not paid to these governance aspects, then any attempt to modernise solid waste management systems through technological improvements are likely to fail (Scheinberg, et al., 2010). So, the indicators here are again ‘qualitative’, multi-attribute, composite indicators assessed in each case against five or six criteria.

*Inclusivity* addresses the degree of involvement, interest and influence of key groups of stakeholders, with separate indicators for user and provider inclusivity (Table 5).

For indicator set 4U on *user inclusivity*, criterion 4U.1 *Equity of service provision*, assesses the extent to which all citizens, irrespective of their income level receive a good service which they can afford. Criteria 4U.2 - 4 focus on assessing the degree to which users of the solid waste services (i.e. households, business and other waste generators) are involved in the planning, policy formation, implementation and evaluation of those services. The remaining 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.

The indicator for *provider inclusivity*, 4P, represents the degree to which service providers from both municipal and non-municipal (including the formal private, community or ‘informal’) sectors are included in the planning and implementation of solid waste and recycling services and activities.

This is in line with evidence that all forms of ‘operator model’ for the delivery of solid waste and recycling services can be appropriate, with each model likely to be more suitable in particular ‘niches’ and according to the local circumstances (Soos, et al., 2013). The criterion 4P.1, *Legal framework*, 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 of public and private sector interests, and assesses whether appropriate contract terms, checks and balances are in place for a mutually beneficial system. The User Manual elaborates relevant contract features, including objectives, performance measures, duration, flexibility, incentives and penalties. Criterion 4P.5 assesses the bid process, to ensure that: there is a level playing field (i.e. bidding and/or contract management is not corrupt); the process is open to all interested parties from the formal private, community-based and/or organised ‘community/informal’ sectors; and the contract is clear and fit for purpose.

**Table 5: Criteria used to assess Indicators 4U and 4P: Degree of user and provider inclusivity**

4U - Degree of user inclusivity			4P - Degree of provider inclusivity		
No	Criterion	Description	No	Criterion	Description
4U.1	Equity of service provision	Extent to which all citizens (users and potential users), irrespective of income level, receive a good MSW management service- i.e. a service which they can afford, which meets their expressed needs, and which protects public health and environmental quality.	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 MSW management services on a stable basis.
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?	4P.2	Representation of the private sector	Organisations or structures in place which represent the private waste sector and actively participate within solid waste management planning forums, task forces, committees and/or steering-groups.

4U.3	Level of public involvement	Evidence of public involvement at appropriate stages of the solid waste management decision-making, planning and implementation process.	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 the formal solid waste management system.
4U.4	Public feedback mechanisms	Existence and use of public feedback mechanisms on solid waste management services.	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.
4U.5	Public education & Awareness	Implementation of comprehensive, culturally appropriate public education, and/or awareness raising programmes - focus here on the level of activity.	4P.5	Bid processes	Degree of openness, transparency and accountability of bid processes.
4U.6	Effectiveness in achieving behavior change	Change in habits and behaviour of both the public and businesses regarding their waste management/handling practices - focus here on the effectiveness of education and awareness-raising programmes.	-	-	-

Indicator 5F is assessed against six criteria covering the full spectrum of *financial sustainability* (Table 6). These generally follow the international WABI, with the exception of two sub-indicators.

Criterion 5F.3 in the international WABI focuses on the % of households who pay at least some direct contribution to the cost of primary collections services. As the mechanism for recovering the costs of household waste management services is fairly standardised across Chinese cities this indicator is not so sensitive to variation. However, the charging/cost recovery systems for commercial and institutional premises is more diverse and arguably more important to shine a spotlight on at this stage. 5F.3 has therefore been adapted to look at the percentage of the total waste management service costs that are recovered from commercial and institutional premises.

Criterion 5F.4 of the international WABI focuses on the affordability of direct or indirect user charges. Given the largely universal access to service, and the funding modalities for waste management services in China this is arguably not a sensitive indicator. So, 5F.4 has been amended to focus on the diversity of financing instruments applied to the MSW management system. Possible additional sources of funding include carbon-based market mechanisms that are of importance for low-carbon integrated waste management.

**Table 6: Criteria used to assess Indicator 5F: Degree of financial sustainability**

No	Criterion	Description
5F.1	Cost accounting	Extent to which the MSW management accounts reflect accurately the full costs of providing the service and the relative costs of the different activities within solid waste management; and whether the accounts are open to public scrutiny.
5F.2	Coverage of the available budget	Is the annual budget adequate to cover the full costs of providing the service?
5F.3	Local cost recovery – from commercial and institutional premises	Percentage of the total waste management costs recovered from commercial and institutional premises. The focus here is on driving cost recovery upwards in order to ensure that there is no latent cross-subsidy of commercial/institutional waste generators from the public budget.
5F.4	Diversification of financial instruments (FIs)	Are diverse financing opportunities such as user charges, recycling funds, carbon-based market mechanisms, EPR etc. being utilized in order to fund the waste management services and infrastructure?
5F.5	Pricing of disposal	Degree to which all the wastes coming to the recovery and disposal site(s) are charged at a rate that covers (at least) the operating costs.
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?

Two benchmark indicators are defined for sound institutions and proactive policies, allowing separate assessment of the national framework and the local institutions, enabling the comparison of cities within a country.

Table 7 summarises the six criteria used to assess each. Indicator 6N assesses the adequacy of the national solid waste management framework and to what degree it has been implemented. 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 responsible for enforcement (6N.5); and the use of extended producer responsibility (EPR) policy instruments (6N.6).

Indicator 6L is a measure of the institutional strength and coherence of a city's solid waste management functions, with the individual criteria including organisational structure, institutional capacity, availability and quality of data and inter-municipal cooperation. The international WABI User manual has been adapted to China, in particular by strengthening 6L.4 (waste data) to include more sensitivity at the high end of performance.

**Table 7: Criteria used to assess indicators for sound institutions and proactive policies: 6N - National framework and 6L - Local institutions**

6N - Adequacy of national framework for solid waste management (SWM)			6L - Degree of local institutional coherence		
No	Criterion	Description	No	Criterion	Description
6N.1	Legislation and regulations	Is there a comprehensive national law(s) 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?	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.
6N.2	Strategy/ Policy	Is there an approved and recent national strategy for solid waste management, and clear policies in place and implemented?	6L.2	Institutional capacity	An assessment of the organisational strength and capacity of the department(s) responsible for solid waste management
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?	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?
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?	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?
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?	6L.5	Management, control and supervision of service delivery	A measure of the strength of control by the city, as 'client' for solid waste management, over the on-the-ground delivery of solid waste management services. The services may actually be delivered by the private or public sector, or a combination of the two.

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?	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?
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## 5. WABI ASSESSMENT OF THE FIVE DEMONSTRATION CITIES

The WABI assessment was applied in the demonstration municipalities of China IWM NSP during a comprehensive baseline study that was conducted in the second half of 2018. The system boundary for the assessment was selected on a case by case basis together with the demonstration municipalities.

The assessment set the baseline for the level of development of IWM and highlighted an overall strong performance of the cities in terms of waste collection quality and coverage (100% in all demo-cities) as well as waste treatment and disposal in controlled facilities (100% of collected waste in all demo-cities). At the same time, the following areas were considered to have significant potential for improvement:

- efficiency of energy generation and use;
- materials recycling;
- existence and quality of source segregation of waste;
- focus on separate treatment of organic waste;
- public education and awareness-raising;
- cost recovery and variety of financial instruments applied in order to sustain and improve the quality of waste management services;
- data collection and monitoring;
- national-level legislative framework, specifically in terms of promoting waste reduction, re-use and recycling.

In certain areas such as health and safety of worker's involved in provision of waste management services, integration of informal sector, capacities of local-level decision-makers, planners and waste management facilities' operators, the demonstration municipalities showcased mixed results with some cities being in the lead and some lagging behind.

The overall situation in all demonstration municipalities based on the WABI assessment conducted in 2018 is presented below. Further monitoring of cities waste management on the basis of KPIs shall take place annually within the framework of China IWM NSP.

## Wasteaware ISWM benchmark indicators – assessment of five Chinese municipalities (2018)

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

Country		China																
Date since previous application of indicators:			2017, first application															
B1	Country income category	World Bank income category	Gross National Income (GNI) per capita															
			USD 8.630															
No	Category	Data	Suzhou		Bengbu		Taian		Xi'an		Lanzhou							
B2	Population of city	Total population of the city	4.230.000		1.217.000		1.010.000		5.860.000 (city)		2.492.900							
B3	Waste generation	Total municipal solid waste generation (tonnes/year)	2.371.879		321.598		415.473		3.653.000		954.800							
No	Category	Data/ Benchmark Indicator	Results	Code	Results	Code	Results	Code	Results	Code	Results	Code						
<b>Key Waste-related data</b>		<b>Data</b>																
W1	Waste per capita	MSW per capita	kg per year	560	-	-	264	-	-	411	-	-	623	-	-	383	-	-
			kg per day	1,5	-	-	0,7	-	-	1,1	-	-	1,7	-	-	1,0	-	-
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) %	65%	-	-	37%	-	-	39%	-	-	42%	-	-	42%	-	-	
W2.2	Paper	Paper %	10%	-	-	26%	-	-	2%	-	-	9%	-	-	13%	-	-	
W2.3	Plastics	Plastics %	20%	-	-	22%	-	-	16%	-	-	13%	-	-	12%	-	-	
W2.4	Metals	Metals %	0,3%	-	-	0,3%	-	-	0,8%	-	-	0,8%	-	-	0,5%	-	-	
W2.5	Solid waste density	Solid waste density	n/a	-	-	n/a	-	-	n/a	-	-	n/a	-	-	n/a	-	-	
W2.6	Moisture content	Moisture content	n/a	-	-	n/a	-	-	n/a	-	-	n/a	-	-	n/a	-	-	
<b>Physical Components</b>		<b>Benchmark Indicator</b>																
1	Public health – waste collection	Waste collection coverage	100		100		100		100		100		100					
1C		Quality of waste collection service	92		88		88		83		88							
2	Environmental control – recovery and disposal	Controlled recovery and disposal	100		100		100		100		100							
2E		Degree of environmental protection in recovery & disposal facilities	83		71		79		58		79							
3	Resource Management – Reduce, Reuse, Recycle	Recycling rate	26		5		6		35		10							
3R		Quality of 3Rs – Reduce, reuse, recycle	50		25		58		33		50							
<b>Governance Factors</b>		<b>Benchmark Indicator</b>																
4U	Inclusivity	User inclusivity	75		67		75		71		71							
4P		Provider inclusivity	90		80		65		60		70							
5F	Financial sustainability	Financial sustainability	67		50		58		58		63							
6N	Sound institutions, proactive policies	Adequacy of national solid waste management framework	71		71		71		71		71							
6L		Local institutional coherence	88		75		75		75		67							

### Key for colour coding:

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



### Key for abbreviations:

- B – Background Data
- W – Waste Data
- 1C – Public Health
- 2E – Environmental Control
- 3R – Resource Management
- 4U – User Inclusivity
- 4P – Provider Inclusivity
- 5F – Financial Sustainability
- 6N – National Framework
- 6L – Local Institutions

# APPENDIX 1 THE WABI USER MANUAL AS ADAPTED TO CHINA

## November 2019

### Introduction

The aim of the Wasteaware benchmark indicators (WABIs) is to provide an overview of a municipal solid waste (MSW) management performance, to reveal clearly those aspects which are performing well and not so well, in order to point the way to next steps on the road to improvement; to monitor progress over time; and to allow benchmarking against other cities on a consistent basis.

For this version, the original international WABIs have been adapted specifically for use within China, to compare the performance of MSW management between cities and to monitor progress over time. This User Manual should be read together with the WABI Guidelines for Chinese Cities.

The role of the 'user' – the person, team or organisation applying the indicators to a particular city – is very important; ideally the WABI assessor would be a small team led by an experienced solid waste professional who is familiar with the local and national situation.

Consistency in application of the WABIs is critical – eight of the 11 main indicators are composite indicators based on a qualitative assessment against a series of criteria where the user or user group need(s) to apply their (collective) professional judgment. So, this User Manual provides detailed guidance on definitions used, interpretations and the scoring system used for each criterion.

The detailed pages of the User Manual contain guidance on how to complete each individual indicator and criterion. The aim is to ensure that the indicators are applied consistently, irrespective of user or location. The justification column in the excel User Form should be filled out as completely as possible, including e.g. detail on the sources, assumptions, local definitions (e.g. the definition of 'municipal solid waste'), information used and the rationale behind the scores. In addition, relevant interview dates and transcripts, formulae and calculations used should be attached, alongside any supplementary evidence, such as available reports, photographs of the waste management system.

The *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, both across cities within China but also between different countries.

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. These notes have been reviewed and adapted where noted for use within China.

## Part A: Background 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.
C.2	Province/Country	Please indicate which province the city is located in.
C.3	Name of the person or team, and of the organisation, filling in the indicator forms	Please provide information on the person or team, and the organisation, 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 the indicator form is completed.
C.6	Date to which the indicators apply	Ideally, if the assessment is being carried out in say 2019, and the latest official data is available for the last full year, 2018, then this date would be 2018. 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 MSW management 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 data

No	Category	Indicator	Guidance notes
B.1	GNI/capita	Gross national income (GNI) per capita for the country in USD	Please provide the World Bank data <i>for the country</i> , and the city/province if available, indicating the data source.
B.2	Population	Total population of the city	<p>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.</p> <p>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.</p>
B.3	Waste generation	Total municipal solid waste (MSW) generation (tonnes per year)	<p>The best estimate of total MSW generation. 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.</p> <p>The definition of MSW used in this document is the one from the UN-Habitat<sup>1</sup>: ‘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.</p> <p>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.</p>

<sup>1</sup> [http://www.waste.nl/sites/waste.nl/files/product/files/swm\\_in\\_world\\_cities\\_2010.pdf](http://www.waste.nl/sites/waste.nl/files/product/files/swm_in_world_cities_2010.pdf). (page 6).

## W: Waste data indicators

No	Category	Indicator	Guidance notes
W.1	Waste per capita	MSW per capita [expressed both in <i>kg per year</i> and <i>kg per day</i> ]	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.
W.2	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.
W.2.1	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.
W.2.2	Paper	Paper	The paper fraction includes cardboard, but excludes laminated materials such as drink cartons.
W.2.3	Plastics	Plastics	The plastic fraction includes mostly packaging wastes, such as PET, PVC, polypropylene, high and low density polyethylene (HDPE/LDPE) and polystyrene.
W.2.4	Metals	Metals	The metal fraction includes ferrous (iron and steel) and non-ferrous (e.g. aluminium, copper, lead, zinc, tin) metals and alloys.
W.2.5	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’.
W.2.6	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															
<i>Indicator 1 provides a quantitative measure of the waste collection service coverage.</i>																		
1	Waste Collection Coverage	Percentage of households in the city that receive a reliable waste collection service.	<p>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.</p> <p>The calculations here, and for the other quantitative indicators 2 and 3, will be helped greatly by compiling a Materials Flow Diagram (MFD), to identify and quantify all of the waste flows through the MSW management and recycling system.</p> <p>Conversion of quantitative collection coverage to 'traffic lights' colours:</p> <table> <tr> <td>Low</td> <td>red</td> <td>0 – 49%</td> </tr> <tr> <td>Low/Medium</td> <td>red/orange</td> <td>50 – 69%</td> </tr> <tr> <td>Medium</td> <td>orange</td> <td>70 – 89%</td> </tr> <tr> <td>Medium/High</td> <td>orange/green</td> <td>90 – 98%</td> </tr> <tr> <td>High</td> <td>green</td> <td>99 - 100%</td> </tr> </table>	Low	red	0 – 49%	Low/Medium	red/orange	50 – 69%	Medium	orange	70 – 89%	Medium/High	orange/green	90 – 98%	High	green	99 - 100%
Low	red	0 – 49%																
Low/Medium	red/orange	50 – 69%																
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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	<p><i>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) recovery 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.</i></p> <p><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 standard categories, i.e.: 0-20% LOW; 21-40% LOW/MEDIUM; 41-60% MEDIUM; 61-80% MEDIUM/HIGH; &gt;80% HIGH.</i></p>															
1C.1	Appearance of waste collection points	Presence of accumulated waste around collection points/containers.	<p>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.</p> <table> <tr> <td>a.</td> <td>Very high incidence of littering</td> <td>0 is scored</td> </tr> <tr> <td>b.</td> <td>High incidence</td> <td>5</td> </tr> <tr> <td>c.</td> <td>Medium incidence</td> <td>10</td> </tr> <tr> <td>d.</td> <td>Low incidence</td> <td>15</td> </tr> <tr> <td>e.</td> <td>Very low incidence</td> <td>20</td> </tr> </table>	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
a.	Very high incidence of littering	0 is scored																
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d.	Low incidence	15																
e.	Very low incidence	20																

<b>No</b>	<b>Short name</b>	<b>Description</b>	<b>Guidance notes</b>															
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 <sup>4</sup>	Efficiency and effectiveness of waste transport	Appropriate public health and environmental controls of waste transport.	<p>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) recovery or disposal facilities.</p> <p>A medium (or higher) compliant transport operation will need to 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.</p> <p>Use of GPS for optimizing routes, SMART data<sup>5</sup> for fuel efficiency, and low-emission vehicles will be considered as necessary for a high compliant waste transport operation.</p> <p>Where a transfer station forms part of the overall transport operation, some of the guidance on assessment provided under criteria 2E.1 and 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 recovery or disposal site with an appropriate frequency to prevent this.</p> <p>For small neighbourhood transfer stations, older stations with underground containers would be considered to score 10; while the addition of modern emission controls would score 20.</p> <p>The overall assessment for a city should be a weighted average, over all the components above; both transport and transfer stations; and all the individual vehicles/ transfer stations in use. So, for example, for the transfer component, if 50 out of 100 TS in the city have been modernized, then one would carry forward a score of 15.</p> <table border="0"> <tr> <td>a.</td> <td>No compliance</td> <td>0 is scored</td> </tr> <tr> <td>b.</td> <td>Low compliance</td> <td>5</td> </tr> <tr> <td>c.</td> <td>Medium Compliance</td> <td>10</td> </tr> <tr> <td>d.</td> <td>Medium/High compliance</td> <td>15</td> </tr> <tr> <td>e.</td> <td>High compliance</td> <td>20</td> </tr> </table>	a.	No compliance	0 is scored	b.	Low compliance	5	c.	Medium Compliance	10	d.	Medium/High compliance	15	e.	High compliance	20
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 <sup>6</sup>	Appropriateness of service planning and monitoring	Appropriate service implementation, management and supervision in place.	<p>(a) Where the private sector is 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.</p> <p>OR</p>															

<sup>4</sup> Indicator has been adapted in order to strengthen the sensitivity at the higher end of performance in order to better reflect the variations in high-performing transfer operations in Chinese cities

<sup>5</sup> The SMART data with relation to waste management is digital information that is (1) collected on a daily basis during primary and secondary waste collection, (transportation), treatment and disposal and/or recovery, (2) filtered, (3) structured and (4) analyzed within the broader context of urban data in order to foster more efficient decision-making

<sup>6</sup> Indicator has been adapted in order to strengthen the sensitivity at the higher end of performance in particular the use of SMART data management systems to monitor waste collection services in China

<b>No</b>	<b>Short name</b>	<b>Description</b>	<b>Guidance notes</b>
			<p>(b) Where public sector provides collection: is there documentary evidence of appropriate service planning, specifications of service, service delivery, and monitoring procedure and tools.</p> <p>Scoring as for 1C.4 with “high compliance” requiring the application of monitoring tools and SMART data for waste management planning.</p>
1C.6	Health and safety of collection workers	Use of appropriate personal protection equipment & supporting procedures.	<p>Applies to both/either public &amp; private operators. The reference requirements are regular health-checks/ inoculations/ boots/ gloves/ overalls /high visibility vests.</p> <p>Scoring as for 1C.4.</p>

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

This set of criteria focuses on the environmental impacts of waste recovery and disposal.

No	Short name	Description	Guidance notes															
2 <sup>7</sup>	Controlled recovery and disposal	Percentage of the total municipal solid waste destined for recovery or disposal in either a state-of-the-art, engineered facility or a 'controlled' recovery or disposal site.	<p>Waste managed in controlled facilities assesses the extent to which the wastes generated are delivered to controlled landfill, thermal recovery, or biological and/or materials recovery/recycling facilities.</p> <p>The standards of control are graded – the minimum standard (threshold) required to 'count' under this indicator is 'controlled', which requires at a minimum a score of 10/20 on three criteria under indicator 2E.2. A 'controlled' landfill must include compaction, daily cover, with site staffed, fenced and sufficient functional equipment on site. A 'controlled' thermal recovery facility must include at least basic emissions control, trained staff following set operating procedures, maintained equipment and ash management. A 'controlled' biological and/or materials recovery/recycling facility must be registered, with marked boundaries, with provision made for worker health and safety.</p> <p>Conversion of quantitative waste captured by the system to 'traffic lights' colours:</p> <table> <tr> <td>Low</td> <td>red</td> <td>0 – 24%</td> </tr> <tr> <td>Low/Medium</td> <td>red/orange</td> <td>25 – 49%</td> </tr> <tr> <td>Medium</td> <td>orange</td> <td>50 – 74%</td> </tr> <tr> <td>Medium/High</td> <td>orange/green</td> <td>75 – 94%</td> </tr> <tr> <td>High</td> <td>green</td> <td>95 - 100%</td> </tr> </table>	Low	red	0 – 24%	Low/Medium	red/orange	25 – 49%	Medium	orange	50 – 74%	Medium/High	orange/green	75 – 94%	High	green	95 - 100%
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Medium/High	orange/green	75 – 94%																
High	green	95 - 100%																
2E	Degree of environmental protection in recovery & disposal facilities	Indicator to assess the 'quality' of recovery and disposal	<p><i>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 recovery / disposal facility: 2E.1 looks at waste reception and general site management; 2E.2 at the specific recovery 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).</i></p> <p><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 standard categories, i.e.: 0-20% LOW; 21-40% LOW/MEDIUM; 41-60% MEDIUM; 61-80% MEDIUM/HIGH; &gt;80% HIGH.</i></p>															
	<p><i>The guidance notes below provide advice on how to score particular types of recovery and disposal facility. However, it is neither practicable nor desirable to provide comprehensive guidance here. There is a large variety of recovery 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 recovery 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 recovered/ 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.</i></p>																	

<sup>7</sup> For the Chinese version of WABI, the colour coding has been modified to provide more sensitivity to gradations of performance across the country.

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 recovery and disposal sites, whatever the specific process being used.	<p>Factors affecting the assessment include:</p> <ul style="list-style-type: none"> <li>• 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)</li> <li>• 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).</li> <li>• Site security (high level of control: site fenced; no unauthorised site access; gates locked when site closed).</li> <li>• 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). <i>Note that the procedures for monitoring the records thus collected are assessed under 2E.3.</i></li> <li>• Waste unloading (high level of control: waste directed to a designated area; unloading supervised by site staff).</li> <li>• Control over nuisance (high level of control: successful control of windblown litter, flies, vermin, birds and of ‘mud’ leaving the site on vehicle tires)</li> <li>• 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)</li> </ul> <table border="0" style="width: 100%;"> <tr> <td style="width: 5%;">a.</td> <td style="width: 75%;">No control</td> <td style="width: 20%;">0 is scored</td> </tr> <tr> <td>b.</td> <td>Low level of control</td> <td>5</td> </tr> <tr> <td>c.</td> <td>Medium level of control</td> <td>10</td> </tr> <tr> <td>d.</td> <td>Medium/High level of control</td> <td>15</td> </tr> <tr> <td>e.</td> <td>High level of control</td> <td>20</td> </tr> </table>	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
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2E.2	Degree of control over recovery and disposal	Degree of control over both the recovery 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.	<p>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 recovery (using the specific example of mass-burn incineration).</p> <p>For biological recovery, 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</p> <p>Similar principles can be applied to other facilities, including mechanical-biological treatment (MBT) plants, advanced thermal recovery 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<sup>8</sup>.</p> <p>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.</p>															

<sup>8</sup> The detailed guidance table for scoring under this criterion has been updated, both in line with on-going work for SDG indicator 11.6.1 and to reflect the developments in the waste sector in China over the last decade.

	Level of Control	Score	Land disposal	Thermal recovery	Biological and materials recovery
a.	Low (uncontrolled) facility	0	Uncontrolled dumping – no controls.	Uncontrolled burning lacking most 'control' functions.	Unregistered locations with no distinguishable boundaries. No provisions made for worker health and safety.
b.	Low/medium (semi-controlled) facility	5	Site staffed; waste placed in designated area; some site equipment.	N/A	Unregistered facilities with distinguishable boundaries. No provisions made for worker health and safety.
c.	Medium (controlled) facility	10	Waste compacted using site equipment; waste covered (at least irregularly).	Process control over residence time, turbulence and temperature; fly-ash actively managed. Emission controls to capture particulates and acid gases.	Registered or unregistered facilities with marked boundaries. Evidence of materials being delivered into recycling or recovery markets. Provision made for basic environmental controls and worker health and safety.
d.	Medium/high - improved facility	15	Engineered landfill site: use daily cover material; some level of leachate containment and treatment; collection of landfill gas.	More sophisticated emissions controls to higher standards, including controls over dioxins and SOx. Active enforcement of the standards.	Registered and engineered facilities with effective process control and worker health and safety. Evidence of both dry and organic materials extracted being delivered into markets. Rejects disposed of in an environmentally sound manner.
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 Fly ash managed as a hazardous waste using best appropriate technology.	Built to and in compliance with international best practice. Nutrient value of biologically treated materials utilised (eg. in agriculture/horticulture). Materials extracted with high purity and delivered into recycling markets.

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 (see criterion 6N.5).	<p>The environmental monitoring programme and process control record keeping required will be specific to the type of facility.</p> <ul style="list-style-type: none"> <li>• 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.</li> <li>• 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).</li> <li>• For all land disposal: ground and surface water.</li> <li>• For engineered and sanitary landfills: leachate and landfill gas management.</li> <li>• For thermal recovery: moisture content and calorific value of incoming wastes; temperature, residence time, emissions to air (including those of nitrogen oxides (NO), sulphur dioxide (SO<sub>2</sub>), hydrogen chloride (HCl), heavy metals and dioxins), effluent treatment and disposal, and the quantities and management methods of both flyash and bottom ash.</li> <li>• For biological recovery: 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).</li> </ul> <table border="0" data-bbox="824 1291 1339 1442"> <tr> <td>a.</td> <td>No compliance</td> <td>0 is scored</td> </tr> <tr> <td>b.</td> <td>Low compliance</td> <td>5</td> </tr> <tr> <td>c.</td> <td>Medium Compliance</td> <td>10</td> </tr> <tr> <td>d.</td> <td>Medium/High compliance</td> <td>15</td> </tr> <tr> <td>e.</td> <td>High compliance</td> <td>20</td> </tr> </table>	a.	No compliance	0 is scored	b.	Low compliance	5	c.	Medium Compliance	10	d.	Medium/High compliance	15	e.	High compliance	20
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No	Short name	Description	Guidance notes
2E.4	Efficiency of energy generation and use <i>(Optional criterion used for energy recovery facilities only)</i>	Assesses the energy efficiency of those facilities for which a major purpose is (or could be) energy recovery.	<p>Some recovery facilities justify themselves by 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 recovery is a substantial part of the overall mix of technologies used for recovery and disposal. It should always be used where there is a thermal recovery facility accepting municipal solid waste (including mass burn incineration, advanced thermal recovery (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).</p> <p>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.</p> <p>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.</p> <p>As an example of the assessment, reference is made to a conventional mass-burn thermal recovery plant:</p> <ul style="list-style-type: none"> <li>• No compliance: either no energy recovery installed, OR support fuel often needed to support combustion. 0 is scored</li> <li>• Low: some thermal energy generation, used mainly for internal process purposes. 5</li> <li>• 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</li> <li>• 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</li> <li>• 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. Meets European ‘R1’ or similar standard for energy efficiency. 20</li> </ul>

<b>No</b>	<b>Short name</b>	<b>Description</b>	<b>Guidance notes</b>
2E.5	Degree of technical competence in the planning, management and operation of recovery 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.	<p>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 recovery and disposal sites are provided and operated in line with the authorities' objectives; and also EITHER:</p> <p>(a) where the private sector operates recovery and disposal: documentary evidence of appropriate contracts in place; detailed specifications of service; contractual monitoring procedures and tools; OR</p> <p>(b) where the public sector provides recovery and disposal: documentary evidence of appropriate service planning, delivery, liaison and feedback.</p> <p>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.</p> <p>Scoring as for 2E.3</p>
2E.6 <sup>9</sup>	Occupational health and safety	Use of appropriate personal protection equipment & supporting procedures.	<p>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.</p> <p>For thermal recovery, additional safety equipment should be provided and used as appropriate, including heat protection and respiratory protection equipment meeting appropriate specifications.</p> <p>For biological and/or materials recovery/recycling facilities, the following questions should be addressed (applies to both/either public/private/ informal recycling sector individuals, establishments and operators):</p> <ul style="list-style-type: none"> <li>a) Are the equipment and infrastructure fit for purpose, ergonomic and safe?</li> <li>b) Do the workers have appropriate clothing and equipment (e.g. boots/ gloves/ overalls /high visibility vests) and do they receive regular health-checks/inoculations?</li> </ul> <p>Scoring as for 2E.3</p>

<sup>9</sup> Indicator has been adapted to include assessment of environmental health and safety conditions at biological and materials recovery/recycling facilities, which in the international version of WABI was under criterion 3R.6. Combining the two indicators into one both makes more sense in China; and frees up 3R.6 to improve the overall sensitivity of the indicators to compare performance across Chinese cities.

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

No	Short name	Description	Guidance notes															
3 <sup>10</sup>	Recycling rate	Percentage of total municipal solid waste generated that is recycled.	<p>Includes both materials recycling and organics valorisation / recycling (composting, animal feed, anaerobic digestion).</p> <p>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'<sup>11</sup>.</p> <p>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 MSW management system. Please indicate in your notes the methods used to estimate the informal sector contribution to the whole.</p> <p>The total quantity collected for recycling should be adjusted downwards to allow for any materials that are subsequently rejected and sent for recovery or disposal.</p> <p>Recycling is higher up the waste hierarchy, so energy recovery is here dealt with under recovery and disposal (benchmark indicator 2). However, materials recycling from recovery facilities, 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.</p> <p>Conversion of quantitative recycling rate to 'traffic lights' colours:</p> <table border="0"> <tr> <td>Low</td> <td>red</td> <td>0 - 9%</td> </tr> <tr> <td>Low/Medium</td> <td>red/orange</td> <td>10 - 19%</td> </tr> <tr> <td>Medium</td> <td>orange</td> <td>20 - 29%</td> </tr> <tr> <td>Medium/High</td> <td>orange/green</td> <td>30- 49%</td> </tr> <tr> <td>High</td> <td>green</td> <td>&gt;50%</td> </tr> </table>	Low	red	0 - 9%	Low/Medium	red/orange	10 - 19%	Medium	orange	20 - 29%	Medium/High	orange/green	30- 49%	High	green	>50%
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3R	Quality of 3Rs – Reduce, reuse, recycle – provision	Indicator to assess the 'quality' of 3Rs provision	<p><i>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. Criterion 3R.4 recognises 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.6).</i></p> <p><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 as per the standard categories, i.e.: 0-20% LOW; 21-40% LOW/MEDIUM; 41-60% MEDIUM; 61-80% MEDIUM/HIGH; &gt;80% HIGH</i></p>															

<sup>10</sup> For the Chinese version of WABI, the colour coding has been modified to provide more sensitivity to gradations of performance across the country.

<sup>11</sup> [http://www.waste.nl/sites/waste.nl/files/product/files/swm\\_in\\_world\\_cities\\_2010.pdf](http://www.waste.nl/sites/waste.nl/files/product/files/swm_in_world_cities_2010.pdf). (page 116).

<b>No</b>	<b>Short name</b>	<b>Description</b>	<b>Guidance notes</b>
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.	<p>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.</p> <p>In high-income countries, the materials separated at source and either separately collected, or brought by the waste generator to a recycling centre.</p> <p>In low- and middle- income countries, the materials collected by 'itinerant waste buyers' and directly delivered to 'recycling shops'.</p> <p>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?</p> <ul style="list-style-type: none"> <li>a. 0-1% clean source-separated materials- all recycling from mixed wastes – 0 is scored</li> <li>b. 1 – 25 % clean source-separated materials - majority from mixed wastes – 5</li> <li>c. 26 – 65 % clean source-separated materials – 10</li> <li>d. 65 – 95 % clean source-separated materials – 15</li> <li>e. 96-100% clean source-separated materials – 20</li> </ul>
3R.2 <sup>12</sup>	Source separation of organic materials	A qualitative assessment of the extent of source separation of organic materials. This impacts on the likely quality of the recycled organic product (i.e. animal feed, compost, and the organic product [digestate] from anaerobic digestion).	<p>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'.</p> <p>The following questions should be addressed when scoring: How much is being separated at source? And to what standard is this separation?</p> <ul style="list-style-type: none"> <li>a. Little or no separation or quality control - 0 is scored</li> <li>b. Some separation to reduce contamination - 5</li> <li>c. Organic materials thoroughly separated from other mixed wastes in a recovery facility - 10</li> <li>d. All input material separated at source – 15</li> <li>e. All input material separated at source and product meets a formal quality standard - 20</li> </ul>

<sup>12</sup> The name of this indicator has been changed, to make it clear that the focus here is on source separation of organic materials; subsequent processing and marketing is now considered under 3R.6.

<b>No</b>	<b>Short name</b>	<b>Description</b>	<b>Guidance notes</b>															
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'.	<p>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.</p> <p>For lower waste generating cities, assesses primarily the degree of policy and practical focus on diverting waste from recovery 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?</p> <table> <tr> <td>a.</td> <td>No focus</td> <td>0 is scored</td> </tr> <tr> <td>b.</td> <td>Low focus</td> <td>5</td> </tr> <tr> <td>c.</td> <td>Medium focus</td> <td>10</td> </tr> <tr> <td>d.</td> <td>Medium/High focus</td> <td>15</td> </tr> <tr> <td>e.</td> <td>High level of focus</td> <td>20</td> </tr> </table>	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
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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.	<p>This criterion focuses on the degree of integration of the informal/community sector with the formal solid waste and resource management system(s). It is considered important as a 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.</p> <p>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<sup>13</sup>. 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.</p>															

<sup>13</sup> [http://wmr.sagepub.com/content/30/9\\_suppl/43.short](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).

<b>No</b>	<b>Short name</b>	<b>Description</b>	<b>Guidance notes</b>															
3R.5	Environmental protection in recycling	Environmental impacts of the recycling chain.	<p>This criterion 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.</p> <p>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.</p> <p>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.</p> <p>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.</p> <table border="0"> <tr> <td>a.</td> <td>No compliance</td> <td>0 is scored</td> </tr> <tr> <td>b.</td> <td>Low compliance</td> <td>5</td> </tr> <tr> <td>c.</td> <td>Medium Compliance</td> <td>10</td> </tr> <tr> <td>d.</td> <td>Medium/High compliance</td> <td>15</td> </tr> <tr> <td>e.</td> <td>High compliance</td> <td>20</td> </tr> </table> <p>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.</p> <p>Scoring as for 3R.3</p>	a.	No compliance	0 is scored	b.	Low compliance	5	c.	Medium Compliance	10	d.	Medium/High compliance	15	e.	High compliance	20
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<b>No</b>	<b>Short name</b>	<b>Description</b>	<b>Guidance notes</b>
3R.6 <sup>14</sup>	Focus on organics management	An assessment of the degree of both policy and practical focus on separate recovery of organic waste.	<p>This indicator focuses, in particular, on the existence of a comprehensive diversified system for a separate recovery of different fractions of organic waste (i.e. kitchen waste, restaurant waste, green waste, farmers' market waste etc.) in order to maximise its energy-generation, resource-recovery and recycling capacities.</p> <p>The focus is likely to be on composting or anaerobic digestion, using both source separated organics (see 3R.2) and the organic output from MBT facilities. However, allowance should also be made for any source separated organics collected and processed for use as animal feed.</p> <p>The following questions should be addressed when scoring: What streams of organic waste does the city manage separately if any? What models of treatment it applies (e.g. technology, scale, feedstock etc.) and how diverse these models are? Where organics are treated through aerobic and anaerobic techniques, how much of treated output is then brought back to land in a form of compost, liquid fertilizer and/or soil conditioner? The acceptability of other byproducts of organics treatment (e.g. biofuels, livestock bedding etc.) in local markets is also a relevant criterion when assigning the appropriate score.</p> <p>a. No attention to organics management                      0 is scored</p> <p>b. Focus on organics recovery prior to incineration or landfill &lt;5% of total MSW                      5</p> <p>c. Focus on organics recovery prior to incineration or landfill 5-10% of total MSW                      10</p> <p>d. Focus on organics recovery prior to incineration or landfill 11-15% of total MSW and organics recycling with return of compost/digestate to land                      15</p> <p>e. Focus on organics recovery prior to incineration or landfill &gt;15% and organics recycling with return of compost/digestate to land                      20</p>

<sup>14</sup> The original indicator here focused on health and safety in recycling, and for the Chinese version has been merged into 2E.6. This has made space here for a new indicator particularly relevant to on-going developments in the Chinese SWM system, which is organics management. So, Indicator 3R.6 now focuses attention on the management practices for separated organics at specialised recovery facilities.

## 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 implemented	<p>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.</p> <p>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 standard categories, i.e.: 0-20% LOW; 21-40% LOW/MEDIUM; 41-60% MEDIUM; 61-80% MEDIUM/HIGH; &gt;80% HIGH.</p>										
4U.1	Equity of service provision	Extent to which all citizens (users and potential users), irrespective of income level, receive a good MSW management service- i.e. a service which they can afford, which meets their expressed needs, and which protects public health and environmental quality.	<p>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?</p> <p>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.</p> <table border="0"> <tr> <td>a. No compliance</td> <td>0 is scored</td> </tr> <tr> <td>b. Low compliance</td> <td>5</td> </tr> <tr> <td>c. Medium Compliance</td> <td>10</td> </tr> <tr> <td>d. Medium/High compliance</td> <td>15</td> </tr> <tr> <td>e. High compliance</td> <td>20</td> </tr> </table>	a. No compliance	0 is scored	b. Low compliance	5	c. Medium Compliance	10	d. Medium/High compliance	15	e. High compliance	20
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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.	<p>Do the relevant stakeholders actually participate in:</p> <ul style="list-style-type: none"> <li>Public involvement through appropriate representation (women, youth, religious leaders, unions etc.) at key stages of the solid waste management planning and implementation process?</li> <li>Solid waste management committees/task forces/ ‘platforms’ established and meeting regularly?</li> <li>Procedures for public engagement in facility siting?</li> </ul> <p>Scoring as for 4U.1</p>										

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 behaviour 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' <sup>15</sup> ) sectors are included in the planning and implementation of solid waste and recycling services and activities	<p>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' sectors can all be appropriate, with each 'operator model' likely to be more suitable in particular 'niches' and according to the local circumstances<sup>16</sup>.</p> <p>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.</p> <p>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 standard categories, i.e.: 0-20% LOW; 21-40% LOW/MEDIUM; 41-60% MEDIUM; 61-80% MEDIUM/HIGH; &gt;80% HIGH.</p>										
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.	<p>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.</p> <p>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)?</p> <p>Are there clear regulations and guidance for service contracts? Are there any restrictions regarding their duration or annulment within the law?</p> <p>This criterion applies regardless of whether PSP, or public service provision, is actually implemented in a municipality.</p> <table border="0"> <tr> <td>a. No compliance</td> <td>0 is scored</td> </tr> <tr> <td>b. Low compliance</td> <td>5</td> </tr> <tr> <td>c. Medium Compliance</td> <td>10</td> </tr> <tr> <td>d. Medium/High compliance</td> <td>15</td> </tr> <tr> <td>e. High compliance</td> <td>20</td> </tr> </table>	a. No compliance	0 is scored	b. Low compliance	5	c. Medium Compliance	10	d. Medium/High compliance	15	e. High compliance	20
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<sup>15</sup> 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](http://wmr.sagepub.com/content/30/9_suppl/43.short)).

<sup>16</sup> <http://www.giz.de/en/downloads/giz2013-swm-operator-models-sourcebook-en.pdf>

<b>No</b>	<b>Short name</b>	<b>Description</b>	<b>Guidance notes</b>
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
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 informal recycling sector is also providing a service in waste collection, recycling and reuse. This criterion is assessing how far this reality is being recognised by the city authorities. The criterion also focuses on community-based organisations, who are providing 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 MSW management 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

## 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.	<p>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 commercial and institutional premises; 5F.4 diversification of financial instruments (FIs); 5F.5 coverage of disposal costs, focusing on how far disposal is 'priced'; and 5F.6 ability to raise capital for investment.</p> <p>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 standard categories, i.e.: 0-20% LOW; 21-40% LOW/MEDIUM; 41-60% MEDIUM; 61-80% MEDIUM/HIGH; &gt;80% HIGH.</p>															
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.	<p>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.</p> <p>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 (e.g. under national taxation laws):</p> <table border="0"> <tr> <td>a.</td> <td>No compliance</td> <td>0 is scored</td> </tr> <tr> <td>b.</td> <td>Low compliance</td> <td>5</td> </tr> <tr> <td>c.</td> <td>Medium Compliance</td> <td>10</td> </tr> <tr> <td>d.</td> <td>Medium/High compliance</td> <td>15</td> </tr> <tr> <td>e.</td> <td>High compliance</td> <td>20</td> </tr> </table>	a.	No compliance	0 is scored	b.	Low compliance	5	c.	Medium Compliance	10	d.	Medium/High compliance	15	e.	High compliance	20
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5F.2	Coverage of the available budget	Is the annual budget adequate to cover the full costs of providing the service?	<p>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.</p> <table border="0"> <tr> <td>a.</td> <td>Covers 50% or less of current operating costs</td> <td>0 is scored</td> </tr> <tr> <td>b.</td> <td>Covers most current operating costs</td> <td>5</td> </tr> <tr> <td>c.</td> <td>Covers full operating &amp; maintenance costs of current level of service</td> <td>10</td> </tr> <tr> <td>d.</td> <td>Covers full cost of providing current level of service including allowance for necessary improvements and costs of capital</td> <td>15</td> </tr> <tr> <td>e.</td> <td>Covers full cost of providing a high quality service including costs of capital</td> <td>20</td> </tr> </table>	a.	Covers 50% or less of current operating costs	0 is scored	b.	Covers most current operating costs	5	c.	Covers full operating & maintenance costs of current level of service	10	d.	Covers full cost of providing current level of service including allowance for necessary improvements and costs of capital	15	e.	Covers full cost of providing a high quality service including costs of capital	20
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<b>No</b>	<b>Short name</b>	<b>Description</b>	<b>Guidance notes</b>										
5F.3 <sup>17</sup>	Local cost recovery – from commercial and institutional premises	Percentage of the total costs that the commercial and institutional customers pay for waste management services.	<p>It is important for financial sustainability that commercial and institutional customers pay for the full costs of waste management services.</p> <p>Direct charging systems for commercial and institutional waste provide an important local revenue source for municipal solid waste systems. It also provides a stimulus for these organisations to reduce the quantities of waste generated at source.</p> <p>The focus here is on assessing the proportion of the total waste management costs that are recovered from commercial and institutional premises, considering the costs of collection, transfer, recovery and disposal.</p> <ul style="list-style-type: none"> <li>• Commercial premises include offices, restaurants, shops, hotels, markets etc.</li> <li>• Institutional premises include schools, hospitals, government offices etc.</li> </ul> <table data-bbox="876 730 1312 884"> <tr> <td>a. None</td> <td>0 is scored</td> </tr> <tr> <td>b. Less than 25%</td> <td>5</td> </tr> <tr> <td>c. 25 – 49 %</td> <td>10</td> </tr> <tr> <td>d. 50 - 74%</td> <td>15</td> </tr> <tr> <td>e. 75 - 100%</td> <td>20</td> </tr> </table>	a. None	0 is scored	b. Less than 25%	5	c. 25 – 49 %	10	d. 50 - 74%	15	e. 75 - 100%	20
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<sup>17</sup> In the international WABI, this indicator refers to households. Considering that the charging mechanisms in place to cover the costs of household waste management services are well established, and combine direct and indirect charging mechanisms, the focus of this indicator has been changed to the important issue of direct charging systems for commercial and institutional waste.

No	Short name	Description	Guidance notes
5F.4 <sup>18</sup>	Diversification of financial instruments (FIs)	Are diverse financing opportunities such as recycling funds, waste charges, emission certificates, PPPs etc. being utilized in order to fund the waste management services and infrastructure?	<p>This indicator assesses whether the mechanisms used for financing waste management services include variety of funding models and approaches aimed at implementing ‘polluter-pays-principle’ as well as guaranteeing resilience and stability of waste management services provision through diversification of funding.</p> <p>The questions that need to be answered are: What types of financial instruments are used to finance waste management services and infrastructure development/maintenance? How diverse the instruments are? Are the charges responsive/ tied to the amount of waste generated by households, commercial entities etc.? Are innovative funding mechanisms (e.g. carbon certificates, green bonds, extended producer responsibility, recycling funds) sought for (if indicated in municipal planning documents/ strategic guidelines) and applied?</p> <p>a. No diversification of FIs 0 is scored</p> <p>b. Combination of 2 major FIs (e.g. fixed waste charges + public-private partnerships (PPPs)) 5</p> <p>c. Polluter-pays-principle for households and commercial waste generators is applied + PPPs for infrastructure development 10</p> <p>d. Polluter-pays-principle is comprehensively applied + EPR mechanisms/recycling fund + PPPs/green bonds/CCERs for infrastructure funding 15</p> <p>e. Various FIs are comprehensively applied and additional innovation and diversification is planned/ promoted by the local government 20</p>
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 (recovery or) disposal.	<p><i>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<sup>19</sup>.</i></p> <p>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?</p>

<sup>18</sup> The original WBI indicator 5F.4 focused on the affordability of direct or indirect user charges. As the current system in China is primarily payment via indirect taxes to central government, which then assigns a budget back to the city, this is arguably not a sensitive indicator. So, 5F.4 has been amended to focus on the diversity of financing instruments applied to the MSW management system. Possible additional sources of funding include carbon-based market mechanisms that are of importance for low-carbon integrated waste management.

<sup>19</sup> <http://edepot.wur.nl/179408>

<b>No</b>	<b>Short name</b>	<b>Description</b>	<b>Guidance notes</b>
			<ul style="list-style-type: none"> <li>a. No charge is made 0 is scored</li> <li>b. Charged rate covers some costs of operation 5</li> <li>c. Charged rate covers full operating and maintenance costs. 10</li> <li>d. Charged rate covers all operating costs, maintenance and capital costs. 15</li> <li>e. Charge rated covers all operating, maintenance and capital costs, and also sets aside savings for future closure and aftercare. 20</li> </ul>
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 5F.1.

**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	<p>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 must operate.</p> <p>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</p> <p>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 standard categories, i.e.: 0-20% LOW; 21-40% LOW/MEDIUM; 41-60% MEDIUM; 61-80% MEDIUM/HIGH; &gt;80% HIGH.</p>															
6N.1	Legislation and regulations	<p>Is there a comprehensive national law or laws in place to address solid waste management requirements?</p> <p>Does the legislation require regulation in order to bring it to force and have these regulations been put in place?</p>	<p>The presence of specific national solid waste management legislation (i.e. not only general environmental legislation) – approved by the executive and legislature of the government and updated as necessary to accommodate any changes in the national and/or regional situation.</p> <p>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.</p> <table> <tr> <td>a.</td> <td>No compliance</td> <td>0 is scored</td> </tr> <tr> <td>b.</td> <td>Low compliance</td> <td>5</td> </tr> <tr> <td>c.</td> <td>Medium Compliance</td> <td>10</td> </tr> <tr> <td>d.</td> <td>Medium/High compliance</td> <td>15</td> </tr> <tr> <td>e.</td> <td>High compliance</td> <td>20</td> </tr> </table>	a.	No compliance	0 is scored	b.	Low compliance	5	c.	Medium Compliance	10	d.	Medium/High compliance	15	e.	High compliance	20
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6N.2	Strategy/Policy	Is there an approved and recent national strategy for solid waste management, and clear policies in place and implemented?	<p>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).</p> <p>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.</p> <p>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).</p> <p>Scoring as for 6N.1</p>
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?	<ul style="list-style-type: none"> <li>Guidelines should set out how, in practical terms, the national solid waste management legislation and strategy/policy should be implemented at the local level.</li> <li>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 &amp; disposal infrastructure/ facilities to improve environmental standards.</li> <li>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.</li> <li>NIMBY should not be allowed to drive all facilities to the lowest income districts.</li> </ul> <p>Scoring as for 6N.1</p>
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?	<p>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.</p> <ul style="list-style-type: none"> <li>Low - institutional responsibility for implementation of strategy/policy is unclear and/or undefined 0 is scored</li> <li>Low/Medium – several departments have both some responsibility and some level of staffing 5</li> <li>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</li> <li>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</li> <li>High compliance - one single national entity, adequately and professionally staffed and separate from the environmental regulator 20</li> </ul>

No	Short name	Description	Guidance notes
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?	<p>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.</p> <p>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'?</p> <p>Scoring as for 6N.1</p>
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?	<p>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.</p> <p>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.</p> <p>Scoring as for 6N.1</p>

## (ii) 6L Local institutions

No	Short name	Description	Guidance notes
6L	Local institutional coherence	A measure of the institutional strength and coherence of the city's solid waste management functions	<p><i>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.</i></p> <p><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 standard categories, i.e.: 0-20% LOW; 21-40% LOW/MEDIUM; 41-60% MEDIUM; 61-80% MEDIUM/HIGH; &gt;80% HIGH.</i></p>

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.	<ul style="list-style-type: none"> <li>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?</li> <li>Does all of the solid waste management budget fall within the budget line of that organisation/department? <ul style="list-style-type: none"> <li>a. No compliance 0 is scored</li> <li>b. Low compliance 5</li> <li>c. Medium Compliance 10</li> <li>d. Medium/High compliance 15</li> <li>e. High compliance 20</li> </ul> </li> </ul>
6L.2	Institutional capacity	An assessment of the organisational strength and capacity of the department(s) responsible for solid waste management.	<p>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.</p> <ul style="list-style-type: none"> <li>Is there a detailed organisation chart of the solid waste management department (or of each department with some responsibility)?</li> <li>Are all key positions filled and are staff suitably qualified?</li> <li>Is there structured career progression and are staff provided with appropriate training – both in the class-room and the field?</li> </ul> <p>Scoring as for 6L.1</p>
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?	<ul style="list-style-type: none"> <li>This strategy/plan needs to conform with the national strategy, implementing that at the local (regional, city) level</li> <li>Is the strategy/plan recent / still valid?</li> <li>Are the resources and funding for implementation in place?</li> </ul> <p>Scoring as for 6L.1</p>
6L.4 <sup>20</sup>	Availability and quality of solid waste management data	Is there a management information system (MIS) in place? Are data regularly measured, collected and monitored?	<ul style="list-style-type: none"> <li>Components of such an MIS should include regular measurement of waste generation; waste composition; quantities collected, recycled, treated and disposed.</li> <li>Volume based measurement is unreliable; it should score, but score lower than where waste is physically weighed.</li> <li>A key element of the scoring is the date of the latest available dataset – the more recent, the higher the scored assigned.</li> <li>High score is when SMART data are comprehensively used, including capturing weight-based statistics at key points in the IWM chain.</li> </ul> <p>Scoring as for 6L.1</p>

<sup>20</sup> The guidance notes have been strengthened to include more sensitivity at the high end of performance, owing to the trend towards application of SMART data collection systems in Chinese cities.

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.	<p>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<sup>21</sup>.</p> <p>(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?</p> <p>AND</p> <p>(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 &amp; enforcement? Is there documentary evidence of service monitoring procedure in place? Do monitoring staff have access to suitable transportation such as motorcycles or vehicles?</p> <p>Scoring as for 6L.1</p>
6L.6	Inter-municipal (or regional) co-operation	Waste collection is often delivered at a district level, while recovery 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?	<ul style="list-style-type: none"> <li>• Evidence of good working relationships &amp; 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.</li> <li>• Particularly important for solid waste management policy, planning and service delivery.</li> <li>• Other local, regional and national government departments may also be involved e.g. on budgets/ funding, regulatory control and enforcement, and public communications.</li> </ul> <p>Scoring as for 6L.1</p>

<sup>21</sup> <http://www.giz.de/en/downloads/giz2013-swm-operator-models-sourcebook-en.pdf>



China Integrated Waste Management (IWM) NAMA Project  
Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

Tayuan Diplomatic Office Building 2-5, 14 Liangmahe South Rd,  
Chaoyang District,  
100600 Beijing, PR China  
Contact: Qian Mingyu  
Tel: +86 (0)10 8527 5589  
E-mail: [iwm-nama@giz.de](mailto:iwm-nama@giz.de)  
Website: [www.iwm-nama.org](http://www.iwm-nama.org)

Website



Wechat

