Solid Waste Management indicators

Indicators

The European Environment Agency defines an indicator as an elementary datum or a simple combination of data capable of measuring an observed phenomenon. Related SWM, The European Union's approach to waste management is based on the "waste hierarchy" which sets the following priority order when shaping waste policy and managing waste at the operational level: prevention, (preparing for) reuse, recycling, recovery and, as the least preferred option, disposal.

1. To reduce the amount of waste generated;
2. To maximise recycling and re-use;
3. To limit incineration to non-recyclable materials;
4. To phase out landfilling to non-recyclable and non-recoverable waste;
5. To ensure full implementation of the waste policy targets in all Member States.

System Design Indicators

System related Indicators are used to measure the suitability of a system. In Solid Waste management this can refer to the design of the system as a whole and possible need to redesign or update the system, or it can refer to the day-to-day operation.

[1]The challenges faced today by solid waste managing entities go beyond simple quantification and characterization of the collected wastes. These challenges involve not only regulatory and law abid-

ing but also global performance assessment by quantification of the system's efficiency. Efficiency is measured in terms of achievement of management targets and resource optimization.

The following table is an example of key questions to be considered:

Indicator	Policy Issue	Assessment
Generation and treatment of sewage sludge	Are we disposing of the growing stream of sewage sludge in an environmentally friendly way?	The amount of sewage sludge for disposal in landfills is expected to increase by 50% by 2019
Landfilling of biodegradable municipal waste	Progress towards Directive target on landfilling of biodegradable municipal waste	Too much biodegradable waste is still being landfilled. In countries that make most use of landfill to dispose of their waste, no improvement has happened.
Total waste generation	Is creating less waste, and is waste generation still tied to economic growth?	The limited information available indicates that total waste generation is increasing.
Waste generation from household and commercial activities	Are we on course for meeting targets for municipal and household waste generation?	Target for municipal and household waste was not met - and is unlikely to be met in the future if current trends are not reversed.

Basic indicators of integrated solid waste management[2]

Performance Indicators (PI)

Performance indicators monitor the effect of policy measure implementation. They indicate whether or not targets will be met, and communicate the need for additional measures. Performance Indicators can quantify and qualify the level of quality of a service rendered by a WMS. A PI can evaluate simultaneously how efficiently the resources are put into use and how far the System is from achieving predefined management goals. Each indicator reflects the performance of the System, according to each management component and in a well defined period of time and area. [3] The definition of a Performance Indicators Frameworks (PIF) can help verify the adequacy of management procedures, whether targets have been met or how far they are from being accomplished. PIF monitor services compliance with the scheduled activities and strategic goals by supporting decision makers with the analysis of updated information.

Key Performance Indicators (KPI) are concentrating of a limited number of values that can be set nationally or internationally and allow a comparison between companies, municipalities or countries. KPIs evaluate the success of an organization or of a particular activity in which it engages. Choosing the right KPIs relies upon a good understanding of what is important to an organization. KPI's are developed as a part of a strategic management tool and need to be easy to measure. A key performance indicator (KPI) is a business metric used to evaluate factors that are crucial to the success of an organization, and what are presented here are political ambitions that are not simple to measure.

For example, the World Bank has proposed six KPIs which should be met by the Sino-Singapore Tianjin Eco-City by 2020 (or earlier) have been highlighted also in the 2009 World Bank study[4] of the SSTEC experience:

- KPI 5: Carbon emissions per unit GDP: Carbon emissions per unit GDP: ≤150 tons C per one million US$ GDP

This KPI is related to solid waste management (SWM), but not limited to SWM. Less fuel per collected amount of waste will contribute positively to the index. Production of heat and electricity using waste incineration may displace the consumption oil, gas, and coal. Recycling may also have a positive impact since it is minimising the need of new raw materials. However, it is not an easy KPI to measure and a number of sub-KPI have to be elaborated in order to be able to measure.

- KPI 7: proportion of green buildings: 100 %;

- KPI 11: per capita domestic waste generation: ≤0.8 kg per day (by 2013)

    This KPI is problematic. It is not possible to measure waste generation. It is only possible to measure collected amount of waste, which is performed by the formal sector. The activities of the informal sector – Scavengers – cannot be measured. The correct KPI should be amount of waste and recyclable materials collected.

- KPI 12: Proportion of green trips: > 90%.

- KPI 13: Overall solid waste recycling rate: ≥60% (by 2013);

    Depending on what is defined as recycling the ambition of 60% is high. It is not clear whether composting or bio-gasification of organic waste is considered as recycling? This KPI has to be divided into several sub-KPIs: for instance, one for glass, one for newspaper, one for office paper, one for plastic in order to be measurable.

KPI 19: Renewable energy usage: ≥20%;

KPI 20: Water supply from non-conventional resources: ≥50%.

By elaborating sub-KPIs, changes in consumer habits will also be taken into consideration. In Europe in 1990s it was easy to get a high recycling percentage just by collecting glass bottles and newspapers. Today we have replaced all the glass bottles are with PET and the newspapers are read on the internet. The recycling percent would have dropped if not other materials and processes where included as recycling.

	Indicator Category	Indicators: indicative values	Current achievements/ Time frame for accomplishment
1	Domestic waste generation [1]	≤ 0.8 kg / day / person [1]	By 2013 [1]
2	Garbage collation ratio [2] - Household waste - Businesses, institutions - Other activities	100% [2]	
3	Treatment to render hazardous and domestic solid waste non-toxic [1]	100% [1]	Immediate [1]
4	Rate of reuse of domestic waste [3]	Non-hazardous waste: 100% Recycling rate: ≥50% [3] reuse rate ≥50% [3] [5]	
5	Overall Solid waste recycling rate [1]	≥60% [1]	By 2013 [1]
6	Waste conversion to energy [4]	__ % of total waste __ KW of energy produced	
7	Recycling of building waste [4]	≥98% [4]	

[1] World Bank. 2009. *Sino-Singapore Tianjin Eco-City: A Case Study of an Emerging Eco-City in China.* Technical Assistance Report. Beijing.
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Proposed Solid Waste Management KPIs[5]

Credentials

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[2] Source: FACTA UNIVERSITATIS Series: Working and Living Environmental Protection Vol. 2, No 5, 2005, pp. 383 – 392. http://facta.junis.ni.ac.rs/walep/walep2005n/walep2005-05n.pdf

[3] UK Drinking Water Inspectorate annual reports can be found *at http://dwi.defra.gov.uk/about/annual-report/index.htm*

[4] Source: World Bank. 2009. Sino-Singapore Tianjin Eco-City: A Case Study of an Emerging Eco-City in China. Technical Assistance Report. Beijing.

[5] These key performance indicators were prepared and compiled by the EC-Link Project. See: EC-Link. 2016. *Sino-EU Key Performance Indicators for Eco-Cities*. Beijing (unpublished draft)