INDICATOR FACT – SHEET
2. “Hardware” of waste management

Sub-indicators

IND 2.A Waste Collection

IND 2.A.1 Waste Collection Coverage

IND 2.A.2 Waste Captured by the system

IND 2.B Environmental Control

IND 2.B.1 % of waste to uncontrolled dumpsites

IND 2.B.2 Uncontrolled dumpsites in Coastal Areas

IND 2.B.3 Waste going to dumpsites in Coastal Areas

IND 2.C Resource Recovery

IND 2.C.1 % of plastic waste generated that is recycled

DRAFT Indicator Specification

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Indicator Specification

H2020 Indicators	
Thematic area WASTE	**Date** **Author (s)**
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Indicator 2. “Hardware” of waste management **Sub-indicators** *IND 2.A Waste Collection* *IND 2.A.1 Waste Collection Coverage* *IND 2.A.2 Waste Captured by the system* *IND 2.B Environmental Control* *IND 2.B.1 % of waste to uncontrolled dumpsites* *IND 2.B.2 Uncontrolled dumpsites in Coastal Areas* *IND 2.B.3 Waste going to dumpsites in Coastal Areas* *IND 2.C Resource Recovery* *IND 2.C.1 % of plastic waste generated that is recycled* **Additional information** (if applicable) The specification has been modified, comparing to the 2015 versions. This indicator substitutes the previous Indicator 2 “Collected and treated municipla waste”. The reasons are explained at the rationale.	

Rationale

Performance indicators provide a good basis for assessing the existing situation, carrying out a comparison and tracking changes or progress made over time. For indicators to be useful as a tool for decision makers and politicians, they need to simplify the potential mass of data by being selective, by focusing on the important elements rather than trying to cover all aspects. By doing so, the information the indicators present will be relatively easy to use and understand.

Unfortunately, compiling high quality data on waste and waste treatment has long been a challenge. The available estimates are diverse, not verified or reliable, and often rather outdated. Thus, transforming waste data into reliable waste statistics has proven difficult. Definitely, this situation reflects to Marine Litter Statistics too, in one or another way. Some of the major areas of concern are:

- Lack of standard definitions and classifications
- Absence of measurement and of standard methodologies for measurement
- Lack of standard reporting systems

Interest in performance indicators for solid waste management is long-standing. Researchers have examined the bias issues in the then-standard set of three benchmark indicators: waste generated per capita; proportion of waste being managed by different methods; and proportion of households with a regular collection service. They found that although solid waste planning is a multi-disciplinary field requiring information about the physical, environmental, social, and economic implications of a system, the environmental indicators in use for solid waste do not adequately inform decision-makers about these attributes. Therefore, in many cases the indicators do not facilitate a holistic approach to environmental planning and policymaking.

A notable recent attempt to develop benchmark indicators and apply them to the comparison of cities both North and South was the report prepared for UN-Habitat on the state of solid waste management in the World's cities. The evolution of this tool is described in the recent UNEP – ISWA Global Waste Management Outlook and the set of Wasteaware Indicators.

According this tool, experience suggests that, for a system to be sustainable in the long term, consideration needs to be given to:

- All the physical elements (infrastructure) of the system.
- All the stakeholders (actors) involved.
- All the strategic aspects, including the political, health, institutional, social, economic, financial, environmental and technical facets.

The concept of Integrated Sustainable Waste Management (ISWM) which explicitly brings together all three dimensions, is gradually becoming the norm in discussion of solid waste management in developing countries. In this systematic description we can refer to the "software" and the "hardware" of waste management. The "software" refers to all the governance aspects (financial sustainability, social inclusion, institutional development). The "hardware" refers to all the relevant infrastructure (collection, recycling, treatment and disposal).

Justification for indicator selection

The “Hardware” of waste management comprises the three primary physical components (elements), each linked to one of the key drivers that are described.

<u>Waste collection: driven primarily by public health (Indicator 2A)</u>

Safe management of human excreta (sanitation) and removal, treatment, and management of solid waste are two of the most vital urban environmental services. While other essential utilities and infrastructure like energy, transport and housing often get more attention (and much more budget); failing to manage the ‘back end’ of the materials cycle has direct impacts on health, length of life, and the human and natural environment. Uncollected solid waste clogs drains and causes flooding and subsequent spread of water-borne diseases.

Cities spend a substantial proportion of their available recurrent budget on solid waste management, perhaps as much as 20-50% for some smaller cities. Yet UN-HABITAT data shows waste collection rates for cities in low- and middle-income countries generally in the range of 10-90%, which means that large portions of the population receive no services at all, and much waste ends up in the environment. The data also show that rates of diarrhoea and acute respiratory infections are significantly higher for children living in households where solid waste is dumped, or burned, in the yard, compared to households in the same cities, which receive a regular waste collection service.

<u>Waste treatment and disposal: driven primarily by environmental protection (Indicator 2B)</u>

Until the environmental movement emerged in the 1960s, most unwanted materials were discharged to land, as open dumping, to air, as burning or evaporation of volatile compounds, or to water by discharging solids and liquids to surface or groundwater or the ocean. There was little regard for the effects on drinking water resources and health of those living nearby, because disposal was based on the idea that wastes decomposed and returned to the environment without harming it.

Over the last 30-40 years, environmental control over has seen development of a series of steps, first phasing out uncontrolled disposal, then introducing, and gradually increasing, environmental standards, for example on water pollution and methane emissions from sanitary landfills and air pollution from incinerators. Many cities in low- and middle-income countries are still working on phasing out open dumps and establishing controlled disposal. This is a first step towards good waste management, and is designed to pave the way for a sanitary landfill, seen to be an essential part of any waste management system.

<u>The 3Rs – reduce, reuse, recycle: driven by the resource value of the waste (IND 2.C)</u>

Many developing and transitional country cities still have active informal sector recycling, reuse, and repair systems, which often achieve recycling rates comparable to those in the West, at no cost to the formal waste management sector. Not only does the informal recycling sector provide livelihoods to huge numbers of the urban poor, but they also save the city 15-20% of its waste management budget, by reducing the amount of wastes that would otherwise have to be collected and disposed of by the City.

During the past 10-20 years, high-income countries have been rediscovering the value of recycling as an integral part of their waste (and resource, management systems, and have invested heavily in both physical infrastructure and communication strategies to increase recycling rates. Major priorities to improve environmental performance and conserve resources work to shift the focus of waste management. e goal of safe disposal shifts to an emphasis on valorisation, and commercialisation, of three sets of materials:

- Products which can be re-used, repaired, refurbished, or re-manufactured to have longer useful lives;
- Recyclable materials which can be extracted, recovered, and returned to industrial value chains, where they strengthen local, regional, and global production; and
- Bio-solids consisting of plant and animal wastes from kitchen, garden, and agricultural production, together with safely managed and treated human excreta, which are sources of key nutrients for the agricultural value chain, and have a major role to play in food security and sustainable development.

REFERENCES

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Indicator definition

IND 2.A: Waste Collection

IND 2.A.1: Waste Collection Coverage

This indicator provides the % of the population of the country that is covered by a regular collection service organised either by public authorities or private companies. It is a measure of the public health protection (due to regular removal of waste) and the quality of municipal governance. The indicator includes both formal municipal and informal sector services.

<u>Definitions required</u>

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.

Formal Waste Sector: Solid waste system, solid waste authorities, government, materials recovery facility; Solid waste management activities planned, sponsored, financed, carried out or, regulated and/or recognised by the formal local authorities or their agents, usually through contracts, licenses or concessions.

Informal Waste Sector: Waste pickers, scavengers, junkshops; Individuals or enterprises who are involved in waste activities but are not sponsored, financed, recognised or allowed by the formal solid waste authorities, or who operate in violation of or in competition with formal authorities

<u>Temporal Unit</u>

Annualy

<u>Units</u>

% on total population of the country

IND 2.A: Waste Collection

IND 2.A.2: Waste captured by the system

This indicator provides the % of the percentage of waste generated that is actually handled completely by the formal waste management and recycling system, thus the waste that is not lost through illegal burning, burying or dumping in unofficial areas.

Waste captured by the system represents all the waste materials shown on a Materials Flow Diagram that are delivered to an official treatment/disposal facility or to a recycling factory (MRF). This includes street sweepings, wastes collected, and waste materials collected for and delivered to recycling. Accordingly, once again it is mentioned that waste capture does not include collected waste materials that are then dumped at an illegal ('wild') dumpsite location.

Although the positive role of the informal recyclers is recognized, there is a huge lack of relevant reliable data, so their contribution can't be measured.

Definitions required

Formal Waste Sector: as defined in IND 2.A.1

MRF (Material Recover Facility: Materials recovery facility, IPC, IPF, intermediate processing centre/facility, recycling processing centre; An industrial facility of moderate scale that is designed for post-collection sorting, processing, and packing of recyclable and compostable materials. It is usually of moderate technical complexity with a combination of automated and hand-sorting. e inputs are usually commingled or mixed recyclables and not mixed waste. The outputs are industrial grade materials, usually crushed or baled and separated by type, colour, etc.

Treatment: Decontamination, processing, incineration, anaerobic digestion, biogas production, pyrolysis, composting; Labour based or mechanical methods to reduce the risk of exposure or reduce the impacts to the environment of toxic or hazardous materials associated with the waste stream and in some cases, can concurrently capture and increase the economic value of specific waste stream components value added

Disposal-legal: Disposal of waste at a site designated by the municipal authorities

Temporal Unit

Annualy

Units

w/w % on total waste generated

IND 2.B: Environmental Control - % of controlled treatment and disposal

This indicator provides the % of controlled treatment and safe disposal practices, the percentage of the total municipal solid waste destined for treatment or disposal in either a state- of-the-art, engineered facility or a 'controlled' treatment or disposal site. Thus, the indicator is a measure of the environmental control or protection achieved by the formal system. Waste being accepted at a facility 'counts' towards this quantitative indicator if the facility has reached at least an intermediate level of control. By definition, the calculation does not include informal recycling facilities, illegal disposal and dumpsites.

The numerator is similar to IND 2.A.2. The denominator is (Total Waste generated – Waste recycled and reused).

Definitions required

Formal Waste Sector: as defined in IND 2.A.1

Informal Waste Sector: as defined in IND 2.A.1

Dumpsite: Dump, open dump, uncontrolled waste disposal site; A designated or undesignated site where any kinds of wastes are deposited on land, or burned, or buried, without supervision ad without precautions regarding human health or environment

Disposal-illegal: Dumping, wild dumping, littering; Disposal of waste at a site different from one officially designated by the municipal authorities, especially where it is specifically prohibited. May also refer to disposal at the wrong time or in the wrong quantities, even if all other aspects are correct

Temporal Unit

Annualy

Units

w/w % in (Total Waste generated – Waste recycled and reused).

IND 2.B.1: % of waste that goes to uncontrolled dumpsites This indicator provides the % of the waste that goes to the dumpsites, thus it is a measure of the pressure for leakages related to ML and water pollution. In addition, it shows the maturity of the national waste management system. % Waste that goes to dumpsites = Waste delivered to dumpsites / (Total waste generated – recycled and reused waste) In practice, the indicator can be calculated as follows: % Waste that goes to dumpsites = 100% - IND 2.B <u>Definitions required</u> Dumpsites: as in IND 2.B Disposal – illegal: as in IND 2.B <u>Temporal Unit</u> Annualy <u>Units</u> w/w % on (Total waste generated – recycled and reused waste)
IND 2.B.2: Number of Dumpsites in Coastal Areas Dumpsites are hot-spots for marine litter leakages. This indicator provides the dispersion of potential leakages sources in the Coastal Area, thus it is a direct measure of the pressure and the drivers for ML and water pollution. In addition, it shows the maturity of the waste management system in the Coastal Areas. <u>Definitions required</u> Dumpsites: as in IND 2.B Disposal – illegal: as in IND 2.B Coastal Areas: as in IND 1.C <u>Temporal Unit</u> Annualy <u>Units</u> Number of dumpsites in the Coastal Area
IND 2.B.3: Waste going to dumpsites in the Coastal Areas Dumpsites are hot-spots for marine litter leakages. This indicator provides how much waste goes to dumpsites located in Coastal Areas (note that indicator IND 2.B.2 measures the hot-spots but not the pollution load). In practice, the waste quantities going to dumpsites located in the Coastal Areas are the source for ML leakages, while the spatial distribution of dumpsites provides a very good picture for the paths that the pollution follows. <u>Definitions required</u> Dumpsites: as in IND 2.B Disposal – illegal: as in IND 2.B Coastal Areas: as in IND 1.C <u>Temporal Unit</u> Annualy <u>Units</u> Tonnes of waste going to dumpsites in the Coastal Area w/w % on (Total waste generated – recycled and reused waste)

IND 2.C: Resource Recovery

The indicator shows the percentage of total municipal solid waste generated that is recycled. It includes both materials recycling and organics valorisation / recycling (composting, animal feed, anaerobic digestion).

<u>Definitions required</u>

Recycling: 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'. The recycling rate should include the contribution from the 'informal' recycling sector as well as formal recycling as part of the solid waste management system. Recycling is higher up the waste hierarchy, so energy recovery from e.g. thermal treatment is not considered here.

Formal Sector: as defined in IND 2.A.1

Informal Waste Sector: as defined in IND 2.A.1

<u>Temporal Unit</u>

Annualy

<u>Units</u>

w/w % of total municipal solid waste generated that is recycled

IND 2.C.1: % of plastic waste generated that is recycled

The indicator shows the percentage of total plastic municipal solid waste generated that is recycled. It includes materials recycling only.

<u>Definitions required</u>

Plastics: The plastic fraction includes mostly packaging wastes, such as PET, PVC, polypropylene, high and low density polyethylene (HDPE/LDPE) and polystyrene.

<u>Temporal Unit</u>

Annualy

<u>Units</u>

w/w % of total plastic municipal solid waste generated that is recycled

Policy Context and Targets

Marine litter (ML) is a challenge of planetary scale and implications. It is necessary to develop a more integrated perspective regarding ML. ML is not simply related to SWM and recycling, it is a result of a systemic failure, with the following four key-parameters:

(I) The continuous growth in use of thousands of different forms of plastics.

(II) Poor or absent solid waste management services and infrastructure (mainly in the Med South), and insufficient monitoring & law enforcement (mainly in the Med North).

(III) Problematic - vulnerable markets for secondary plastics.

(IV) Lack of a systemic and in-depth understanding of:

- The technical challenges and the restrictions of material properties and the flows of plastics.
- The effects of social consumption patterns and littering behaviours on solid waste generation.
- The impacts of unplanned tourist developments and of the fishing industry.

The plastic production & consumption, the lack of waste & recycling infrastructure and enforcement, (especially in coastal areas), the problematic markets for secondary materials and the touristic activities should be considered as Drivers of ML.

The Horizon 2020 Initiative, which aims to reduce the pollution of the Mediterranean Sea by 2020, recognizes the importance of waste as one of the three priority areas causing major pollution in the Mediterranean Sea. The UN Global Programme of Action for the Protection of the Marine Environment against Land-Based Activities and the Convention for the Protection of the Mediterranean Sea against Pollution have also identified waste management as a priority intervention.

The major target is to reduce plastic waste by shifting to circular economy, enabling re-design of materials and products, advancing reuse and recycling practices. The proposed indicators are directly related with the SDGs as follows:

GOALS	TARGET	INDICATORS
Goal 11: Make cities and human settlements inclusive, safe, resilient and sustainable	11.6 By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management.	% of urban solid waste regularly collected and with adequate final discharge with regards to the total waste generated by the city
Goal 12: Ensure sustainable consumption and production patterns	12.4 By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment.	Treatment of waste, generation of hazardous waste, hazardous waste management, by type of treatment
	12.5 By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse.	National recycling rate, tons of material recycled
Goal 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development	14.1 By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution	Index of coastal eutrophication and floating plastic debris density

The UN has established the Global Partnership on Marine Litter, with the following Goals. Goal A: Reduced levels and impacts of land-based litter and solid waste introduced into the aquatic environment. Goal B: Reduced levels and impact of sea-based sources of marine debris including solid waste, lost cargo, ALDFG, and abandoned vessels introduced into the aquatic environment. Goal C: Reduced levels and impacts of (accumulated) marine debris on shorelines, aquatic habitats, and biodiversity. It is anticipated that different stakeholders will form sub-groups to focus on specific issues, e.g. cross-cutting issues.

The shift to Circular Economy is necessary for the substantial reduction and prevention of ML. The G20 have advocated for a global roadmap for action to address the life cycle of plastics and effectively valorize plastics in the economy whilst mitigating their environmental impacts. This roadmap includes:

1. Upstream measures
2. Consumption based measures
3. Worldwide engagement in awareness of impacts and the need for social change.
4. Measures to enhance and advance waste management - the required measures involve (indicatively):

- Separate waste collection: Emphasis should be placed on moving away from landfill and energy recovery towards re-use and recycling. Separate municipal waste collection is a key element within this infrastructure, to make recycling a convenient option for citizens to deal with their waste plastics. Re- use opportunities in the plastic packaging sector, ranging from reusable B2B crates to refillable bottles for beverages and cleaning products.
- Waste management infrastructure and services: Direct investment in waste infrastructure is needed in all countries to increase the rate of recovery and reduce the leakage of plastics. Although landfilling should be the least-preferred option, investment in sanitary landfills is still desirable in countries where informal and unprotected landfills are a major source of plastic pollution.
- Export of plastic waste: In general, plastic waste should not be exported for disposal or treatment in locations with significantly lower treatment standards than the country of origin. Countries which export waste for recycling should have responsibility to assess and take into account the impacts of that trade. An estimated 15 million tonnes of plastic is traded per year as waste destined for recycling.
- Infrastructure for maritime and fisheries marine litter: Whilst terrestrial sources are the most important, an estimated 0.5 to 5.9 million tonnes of plastics enters the oceans from sea-based sources every year. Appropriate waste infrastructure at ports can reduce this flow of waste.
- Deposit refunds and extended producer responsibility (EPR): Producers should be made responsible for their products after the point of sale. Deposit refund and EPR instruments, which support the uptake, quality and economics of recycling, thus reducing marine littering, should be implemented. EPR schemes also encourage producers to design their products to be suitable for take-back and recycling.
- Clean-up and collection: Given the size of the oceans and the scale of the marine litter problem, clean- up activities are costly, largely ineffective and create an unhelpful illusion that upstream measures are not necessary. Whilst upstream measures should be preferred, clean-up may be a suitable last resort for addressing marine litter in limited zones such as urban areas, tourist beaches and ports where the litter causes severe social and economic damage.

Related policy documents

- United Nations Environment Assembly of the United Nations Environment Programme, Resolution on Marine Litter and Microplastics, UNEP/EA.3/L.20, Third Session, 4-6 December 2017
- EU Marine Strategy Framework Directive (MSFD), 2008/56/EC
- A European Strategy for Plastics in a Circular Economy, COM (28) 2018, 16-1-2018
- EU, DG for Internal Policies, EU Action to Combat Marine Litter, IP/A/ENVI/2017-02, May 2017
- G20 Insights, T20 Task Force Circular Economy: Circular economy measures to keep plastics and their value in the economy, avoid waste and reduce marine litter, 2017
- UN Global Programme of Action for the Protection of the Marine Environment against Land-Based Activities

Methodology

IND 2.A: Waste Collection

IND 2.A.1: Waste Collection Coverage

Calculations

% of population with access to collection service = Population with regular service / Total population in the country

The national figures should be aggregated by the regional or municipal figures – obviously, the final figures should be weighed.

Geographical coverage
It will be very important if the information related to Coastal Areas and Tourists in Coastal Areas is easily separated and assessed. This will help to understand the importance of ML drivers. It will be also very helpful if the data related to big river catchment areas can be easily separated and assessed.

Temporal Coverage
It will be very useful if 10-15 years' time series can be provided

Data collection & availability
In general terms, data about population is usually available by state statistic authorities. However, it is not always sure that the data regarding the waste collection coverage is organized and collected on a national level. In some cases, this is done by ad-hoc committees under the ministries of Environment or the one that deals with municipalities.

Problems and gaps
The major problem is that in many countries the collection coverage is not measured and aggregated on a national level, and sometimes not even on a regional level. Another important problem is that the activities and the involvement of the informal sector is sometimes ignored or underestimated, although in several cities and countries informal recyclers manage up to 8-10% of the waste generated.

Uncertainties
Unless there is a proper national reporting system that works, it will be very difficult to assess the national collection coverage. In addition, even when such systems are in place they usually refer to the waste collection done by the municipalities or the accredited companies and they do not include the collection by informal recyclers. The quantification of the informal recyclers contribution is one of the most difficult aspects, by definition, but it is not impossible to have at least an assessment of it, as it will be explained later.

IND 2.A: Waste Collection

IND 2.A.2: Waste captured by the system

Calculations

% Waste captured by the system = Waste collected and delivered to an official recycling or waste treatment and/or disposal facility / Total waste generated

The numerator includes:
The waste that goes to sanitary landfills
The waste that goes to MRFs, mechanical biological treatment and waste to energy facilities

Geographical coverage

It will be very important if the information related to Coastal Areas and Tourists in Coastal Areas is easily separated and assessed. This will help to understand the importance of ML drivers. It will be also very helpful if the data related to big river catchment areas can be easily separated and assessed.

Temporal Coverage

It will be very useful if 10-15 years' time series can be provided.

Data collection & availability

In general terms, the crucial issue is to collect and find access to the data collected at the facilities. Even if these data sets are not available in a ministry or in the statistic authorities, the waste management authorities can retrieve them and then, the national authorities have to aggregate them.

Problems and gaps

If the data from facilities is retrieved, then before the aggregation it is required to manage the data and provide it in a uniform way. Usual problems that emerge are the different units used (in some cases there are landfills measuring the number of vehicles instead of the tons of waste), not comparable time-series due to the different time of operations or other problems, inconsistent data sets involving different service areas monthly or even daily etc. Another important problem is that in several cases facilities do not distinguish in their records different waste streams, so there is a risk to aggregate non-municipal waste in the national figures.

Uncertainties

The major uncertainty regards the availability of the data on a national level. If there is not a proper reporting system in place, then the indicator can be only roughly assessed by the capacities of the official facilities.

IND 2.B: Environmental Control - % of controlled treatment and disposal

Calculations

% Waste captured by the system = Waste collected and delivered to an official recycling or waste treatment and/or disposal facility / (Total waste generated – recycled and reused waste)

The 'numerator' in this calculation is the total waste that is dealt with in a 'controlled' facility. The 'denominator' is the total solid waste generated less waste recycled or reused.

Geographical coverage

It will be very important if the information related to Coastal Areas and Tourists in Coastal Areas is easily separated and assessed. This will help to understand the importance of ML drivers. It will be also very helpful if the data related to big river catchment areas can be easily separated and assessed.

Temporal Coverage

It will be very useful if 10-15 years' time series can be provided.

Data collection & availability

The data required can be assessed using the records of the relevant facilities. Those facilities almost always have weighbridges and measure the input waste, so their records can be used to estimate the numerator. In general terms, the crucial issue is to collect and find access to the data collected at the facilities. Even if these data sets are not available in a ministry or in the statistic authorities, the waste management authorities can retrieve them and then, the national authorities must aggregate them.

Problems and gaps

If the data from facilities is retrieved, then before the aggregation it is required to manage the data and provide it in a uniform way. Usual problems that emerge are the different units used (in some cases there are landfills measuring the number of vehicles instead of the tons of waste), not comparable time-series due to the different time of operations or other problems, inconsistent data sets involving different service areas monthly or even daily etc. Another very important problem is that in several cases facilities do not distinguish in their records different waste streams, so there is a risk to aggregate non-municipal waste in the national figures.

Uncertainties

The main problem again lies around landfills and when they are considered safe and protect public health and environment. The Landfill Working Group of the International Solid Waste Association[1] has developed a concrete evaluation system to hep decision-makers on distinguishing between safe and controlled Vs uncontrolled disposal.

[1] ISWA International Guidelines for Landfill Evaluation, 2011, available at http://www.iswa.org/media/publications/knowledge-base/

IND 2.B.1: % of waste that goes to dumpsites <u>Calculations</u> % Waste that goes to dumpsites = Waste delivered to dumpsites / (Total waste generated – recycled and reused waste) In practice, the indicator can be calculated as follows: % Waste that goes to dumpsites = 100% - IND 2.B <u>Geographical coverage</u> It will be very important if the information related to Coastal Areas and Tourists in Coastal Areas is easily separated and assessed. This will help to understand the importance of ML drivers. It will be also very helpful if the data related to big river catchment areas can be easily separated and assessed. <u>Temporal Coverage</u> It will be very useful if 10-15 years' time series can be provided. <u>Data collection & availability</u> The issues here are the same with the issues regarding the IND 2.B <u>Problems and gaps</u> The issues here are the same with the issues regarding the IND 2.B <u>Uncertainties</u> The issues here are the same with the issues regarding the IND 2.B
IND 2.B.2: Number of dumpsites in Coastal Areas <u>Calculations</u> If the Coastal Area has been defined as it has been presented in the discussion for IND1.C, then the indicator can be calculated only by counting the number of dumpsites in the Coastal Area. <u>Geographical coverage</u> The issues here are mostly related with the issues discussed in IND 1.C <u>Temporal Coverage</u> It will be very useful if 10-15 years' time series can be provided. <u>Data collection & availability</u> The issues here are the same with the issues regarding the IND 1.C. Some countries have already made a national inventory of their dumpsites so using a GIS system it will not be that difficult to calculate the indicator. <u>Problems and gaps</u> The issues here are the same with the issues regarding the IND 1.C <u>Uncertainties</u> The issues here are the same with the issues regarding the IND 1.C. In some cases, there are no records about the dumpsites, so the relevant data can be retrieved from rough assessments or national - regional inventories.
IND 2.B.3: Waste going to dumpsites in the Coastal Areas <u>Calculations</u> If the Coastal Area has been defined as it has been presented in the discussion for IND1.C, then the indicator can be calculated only by counting the waste that goes to dumpsites in the Coastal Area. Another way to calculate the indicator is by applying IND 2.B and IND 2.B.1 in the Coastal Area. <u>Geographical coverage</u> The issues here are mostly related with the issues discussed in IND 1.C, IND 2.B, IND 2.B.1 <u>Temporal Coverage</u> It will be very useful if 10-15 years' time series can be provided. <u>Data collection & availability</u> As in IND 2.B.2 <u>Problems and gaps</u> The issues here are mostly related with the issues discussed in IND 1.C, IND 2.B, IND 2.B.1 <u>Uncertainties</u> The issues here are mostly related with the issues discussed in IND 1.C, IND 2.B, IND 2.B.1

IND 2.C: Resource Recovery

<u>Calculations</u>

The total quantity collected for recycling should be adjusted downwards to allow for any materials that are subsequently rejected and sent for treatment or disposal. However, materials recycling from treatment plants, including e.g. paper or plastics recycling at MBT plants or metals recovery from incinerator bottom ash, is 'counted' here when calculating the recycling rate. The formula is as follows.

% of total municipal solid waste generated that is recycled = materials recycled and reused / IND 1

<u>Geographical coverage</u>

It will be very important if the information related to Coastal Areas and Tourists in Coastal Areas is easily separated and assessed. This will help to understand the importance of ML drivers. It will be also very helpful if the data related to big river catchment areas can be easily separated and assessed.

<u>Temporal Coverage</u>

It will be very useful if 10-15 years' time series can be provided.

<u>Data collection & availability</u>

For this calculation, since IND1 has been already calculated, it is necessary to recover data from both the formal and the informal sector. The recyclables from the formal sector are always registered and usually there are invoices or other receipts for their quantities. However, the difficulty lies in quantifying the contribution of the informal recyclers. Unless there is a detailed study about them, we propose an empirical assessment as follows. The informal recyclers, finally, sell their recyclables to the same supply chains that deal with the recyclables from the formal sector. So, a survey and research for the quantities that those companies manage can provide the contribution of the informal sector. Most of those companies are willing to share information about the recyclables they buy from the informal sector and provide an order of magnitude for the contribution of the informal sector.

<u>Problems and gaps</u>

In several countries, the recycling markets are not well structured and the relevant data is not systematically aggregated and reported on a national level. If the data from facilities is retrieved, then before the aggregation it is required to manage the data and provide it in a uniform way. Other problems are the relevant mentioned in IND 2.B.

<u>Uncertainties</u>

The problem lies in the assessment of the contribution of the informal sector, since in many cases informal recyclers do not use the official facilities and they deliver their recyclables directly to companies dealing with recyclables. The quantification of the informal recyclers contribution is one of the most difficult aspects, by definition, but it is not impossible to have at least an assessment of it, as it will be explained later.

IND 2.C.1: % of plastic waste generated that is recycled

<u>Calculations</u>

% of plastic waste generated that is recycled = plastic waste recycled / plastic waste generated

The plastic waste generated can be calculated like this: IND1 x (% of plastics in IND1.A)

<u>Geographical coverage</u>

As in IND 2.C

<u>Temporal Coverage</u>

As in IND 2.C

<u>Data collection & availability</u>

As in IND 2.C. Since plastic producers are usually aware of the recycling market, they can be helpful for a quick survey if the relevant data is not available.

<u>Problems and gaps</u>

As in IND 2.C

<u>Uncertainties</u>

As in IND 2.C