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Waste Indicators factsheets

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[1] Organic fraction % w/w	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.
[2] Plastic fraction %	The plastic fraction includes mostly packaging wastes, such as PET,PVC, polypropylene, high and low density polyethylene (HDPE/LDPE) and polystyrene.
[3] Paper fraction %	The paper fraction includes cardboard, but excludes laminated materials such as drink cartons.
[4] Metal fraction %	The metal fraction includes ferrous (iron and steel) and non-ferrous (e.g. aluminium, copper, lead, zinc, tin) metals and alloys.
[5] Rest %	[5] = 100% - [4] - [3] - [2] - [1]

IND 1.B Plastic waste generation per capita

Plastic waste generated per capita expressed in kg per year

IND 1.C % of population living in Coastal Areas

% Population living in Coastal Areas / Total population

Coastal areas be defined either according the World Resource Institute as including the land area within 60 km of adjacent near-shore waters1 or according the recent UN methodology[2] as total population living within 100 kilometers of the coastline. In this work, we prefer the second way.

IND 1.D % of Tourists in Coastal Areas

% of Tourists in Coastal Areas / Population Living in Coastal Areas

Tourists and visitors are defined according the UN World Tourism Organization[3]

"Tourism comprises the activities of persons travelling to and staying in places outside their usual environment for not more than one consecutive year for leisure, business and other purposes not related to the exercise of an activity remunerated from within the place visited."

[1] FAO, Integrated coastal area management *and* agriculture, forestry and fisheries, 1998

[2] http://www.un.org/esa/sustdev/natlinfo/indicators/methodology_sheets/oceans_seas_coasts/pop_coastal_areas.pdf

[3] See UN, Department of Economic and Social Affairs Statistics Division International Recommendations for Tourism Statistics 2008, https://unstats.un.org/unsd/publication/Seriesm/SeriesM_83rev1e.pdf#page=21

Rationale

This indicator and its sub-indicators are describing the pressure and the drivers for ML. The indicator was already in use in H2020, as well as in several other relevant documents. More specifically, the waste quantity on a national level is somehow representative of the pressure on a national level. However, the total waste generated on a national level is just a slight (and sometimes minor) indication of what is happening with ML because as it was explained i.ML origins mainly from coastal and river catchment areas, so the geography determines the relevance of the national figures to ML and ii. the most important component of ML is plastic waste, thus the % of plastics in waste is also very important. In addition, as touristic activities are also a driver for ML, it is important to highlight their relevance. So, the initial indicator was enriched with three new sub-indicators to reflect better the pressure and the drivers for ML. The use of the composition in five fractions is based on the Wasteaware Indicators as developed by UNEP and ISWA in the Global Waste Management Outlook[4].

Policy context and targets

As it has been discussed in the conceptual note, 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[5]:

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

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.

[4] UNEP – ISWA, Global Waste Management Outlook, 2015, ISBN: 978-92-807-3479-9

[5] Nao Takeuchi Urban Basic Services Branch, UN-Habitat, Introducing Indicator 11.6.1: Current Metadata and Feedback from Experts Questionnaire, 2017

Methodological aspects

IND 1: Total municipal solid waste (MSW) generation (tonnes per year) on a specific geographical level	
What it means	This indicator shows the overall pressure from the waste generated on a national level. It is better to combine it with the national average waste generation per capita (kg/y).
Indicator calculation	IND1 is calculated by aggregating the waste generated in a geographic region. Usually, the quantities are reported on a municipality or regional level based on: • Assessments from the waste collection system • Records from the local waste treatment and disposal facilities • Assessments based on the population using proper waste generation rates
Required data	Ideally it is required a spatial analysis of the waste generated per municipality or region or waste management authority. The units should be waste generated per year in tons.
Data collection & availability	Collect data from different sources, compare and contrast recent available data and estimates; and provide justification of the estimate used. When official data is scarce, please obtain the best estimate by extrapolating data from interviews with as many solid waste management stakeholders as possible and, when applicable, observing waste trucks during their rounds. The definition of MSW used in this document is the one from the UN-Habitat[6]: '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 are comparable.
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.
Problems and gaps	It is important to notice that in the developing world the waste generated is usually more than the waste collected (due to both lack of regular collection services and collection by the informal sector) and the waste collected is more than the waste disposed of in controlled facilities (due to the existence of dumpsites). The usual mistake that should be avoided is to report the waste collected by municipalities as waste generated and ignore uncollected waste and the informal recyclers collection systems.
Uncertainties	A major uncertainty comes from the different definitions used in different countries and areas. There must be a common definition or when different definition are in use, there must be a careful screening before any comparison or aggregation should be made. Some useful questions that should be put before the final outcomes. 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 check for their consistency. 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 double check and justify the information. One of the easy ways to cross-check the reliability of your data sets is to compare the national or regional average waste generation per capita (in kg/year or kg/day) with the waste generation per capita from similar countries. The word "similar" means to look for countries or regions with similar GDP/cap, similar poverty and urbanization rates. Tools like the Waste Atlas (www.atlas.d-waste.com) and reports like the Global Waste Management Outlook can be very helpful on that.

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

IND 1.A: Summary composition of MSW as generated	
What it means	This indicator shows the different streams of the waste generated and it helps to identify the recovery and recycling potential. In addition, it shows the importance of plastics in the waste stream, the dominant material in ML.
Indicator calculation	The average national composition in the relevant fractions is calculated by aggregating the different compositions in municipalities or regions or waste management authorities. The aggregation should be weighted with the waste generation of each area. As an example, the national average % w/w of plastic waste to MSW in a country with 3 regions (with W1, W2, W3 waste quantities) and three different % w/w of plastic fraction (P1, P2, P3) the national average is calculated as below: % w/w $P_{national}$ = [(W1 x P1) + (W2 x P2) + (W3 x P3)] / (W1 + W2 + W3)
Required data	Ideally it is required a spatial analysis of the waste composition per municipality or region or waste management authority. The units should be % w/w for the different fractions.
Data collection & availability	It is important to examine the full sets of whatever data are available on MSW composition as generated, with accompanying details. The best method is to run waste characterization campaigns that will provide results based on measurements. There are many ways to organize a waste characterization campaign, UNEP's document[7] "DEVELOPING INTEGRATED SOLID WASTE MANAGEMENT PLAN - TRAINING MANUAL" provides very practical ways to organize and aggregate the results on a national level. In case there are no proper data sets, then using benchmarking indicators and tools related to GDP/cap and consumption, it is possible to simulate the national waste composition, of course with more uncertainties.
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.
Problems and gaps	The most important issue when measurements are available is to identify where the measurements took place in a waste bin or in a treatment – disposal facility. In the first case, the waste composition is more representative in terms of the materials and their potential for recovery. In the second case, as waste has been mixed and maybe compacted in the collection vehicles, some materials have been mixed with the organic fraction (especially papers and small plastics). Do data reflect waste composition 'as generated' (prior to any recycling), or 'as collected, treated or disposed'? If at the disposal site, is correction made for materials removed earlier for recycling? A very common problem is that measurements are made in disposal sites, thus the waste composition is already changed due to formal and informal recycling practices. In many countries, there are specific guidelines for the implementation of waste characterization campaigns to ensure that the results are uniform.
Uncertainties	Review 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, check their consistency. One of the easy ways to cross-check the reliability of your data sets is to compare the national or regional average waste generation per capita (in kg/year or kg/day) with the waste generation per capita from similar countries. The word "similar" means to look for countries or regions with similar GDP/cap, similar poverty and urbanization rates. Tools like the Waste Atlas (www.atlas.d-waste.com) and reports like the Global Waste Management Outlook can be very helpful on that.

[7] UNEP DEVELOPING INTEGRATED SOLID WASTE MANAGEMENT PLAN - TRAINING MANUAL, VOL. 1 Waste Quantification and Characterization with Projections for the future
https://wedocs.unep.org/bitstream/handle/20.500.11822/7502/ISWMPlan_Vol1.pdf?sequence=3&isAllowed=y

IND 1.B: Plastic waste generation per capita per year	
What it means	This indicator shows how much plastic waste is generated per capita annually. The more the plastic waste per capita the more the leakages of plastics to ML. The indicator is a measure of the potential contribution of the waste stream to ML.
Indicator calculation	This indicator is calculated with two ways. A. If the waste quantities (W in tons), the composition (P the w/w% of plastics) and the population (N) are known and calculated, then: Plastic Waste / Capita = 1000 * (W x P) / N (in kg/year) B. If the waste has been calculated using special waste generation rates per capita (SR in kg/year) and the composition is known (P the w/w% of plastics), then: Plastic Waste / Capita = SR x P (in kg/year)
Required data	The data required is the waste quantities, the composition and the population. A crucial issue concerns the estimation population, especially in areas with refugees and touristic activities. In several cases, instead of the permanent population which is usually known, the equivalent population[8] is calculated, in a similar way with the waste-water treatment facilities. In other cases, the total waste generated is just divided with the permanent population, so the actual waste generation per capita includes also the contribution of tourists and refugees. In any case, the seasonal variations should be considered.
Data collection & availability	As this indicator is calculated using the waste quantities, the composition and the population, the data availability is considered as given.
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.
Problems and gaps	The problems and gaps are related with the problems and gaps in calculating the waste quantities and composition.
Uncertainties	As this indicator is calculated using the waste quantities, the composition and the population, all the uncertainties in waste quantities, composition and population are involved in this calculation. One of the easy ways to cross-check the reliability of your data sets is to compare the national or regional average plastic waste generation per capita (in kg/year or kg/day) with the plastic waste generation per capita from similar countries. The word “similar” means to look for countries or regions with similar GDP/cap, similar poverty and urbanization rates. Tools like the Waste Atlas (www.atlas.d-waste.com) and reports like the Global Waste Management Outlook can be very helpful on that.

[8] Oscar Saladie, Determinants of waste generation per capita in Catalonia (North-eastern Spain): the role of seasonal population, *European Journal of Sustainable Development* (2016), **5**, 3, 489-504

IND 1.C: % of population living in Coastal Areas / Total Population	
What it means	This indicator shows how the % of the total population that lives in coastal areas. This indicator can be used as a proxy for the waste quantities that are more possible to leak ML in case a detailed waste distribution is not available. It also shows the population that will be more vulnerable to the economic and environmental impacts of ML. As an example of the importance of this indicator, the Mediterranean region's population is concentrated near the coasts. More than a third live in coastal administrative entities totalling less than 12 % of the surface area of the Mediterranean countries. The population of the coastal regions grew from 95 million in 1979 to 143 million in 2000. It could reach 174 million by 2025. The concentration of population in coastal zones is heaviest in the western Mediterranean, the western shore of the Adriatic Sea, the eastern shore of the Aegean-Levantine region, and the Nile Delta[9].
Indicator calculation	This calculation of this indicator is based on the definition of the coastal areas. Population in coastal areas, according the recent UN work on SDGs, is the population living within 100 km of the coastline[10]. As general guidance, any informal or unofficial settlements should be included in the estimate used. A GIS system is required. Using a GIS, the percentage of the population in the coastal zone can be calculated easily. If a country's census administrative units line up with the coastal zone, the population from these units can be summed to estimate the population of the zone. It is far more likely, however, that the geographic administrative units will not match the area of the coastal zone exactly. In these cases, creating a gridded surface of population can provide an estimate of the population in the zone. The vector layer of administrative units with associated population can be converted into a raster layer made up of grid cells of an assigned size (e.g., 30 arc-seconds which equates to an approximately 1 km grid at the equator). The population of an administrative unit is distributed evenly among the grid cells within that unit. On the edges, where a grid cell is split by two or more units, a proportional allocation method can be used to assign population to the grid cell based on the area of each unit that falls within the cell.
Required data	The crucial issue is how to calculate the 100 kilometre coastal buffer of the land area. For that purpose, the data must be projected into an equidistant map projection appropriate for the country. Due to the curvature of the Earth, this will be different for each country. The map projection used to create the 100 kilometre buffer for Iceland won't create an accurate 100 kilometre buffer for India. An equidistant map projection will minimize distortion so that distance calculations can be measured with relative accuracy (examples include Polar Azimuthal Equidistant Projection and Equidistant Cylindrical Projection). Using such an equidistant map projection, the next step is to calculate an inland buffer of 100 kilometres. Subsequently, convert the buffered layer into the same map projection as the population data. If the coastlines of your population and land area layers do not exactly match, one can also include in the 100 kilometre buffer a thin band extending from the coastline into the ocean.
Data collection & availability	The two pieces of spatial data needed to measure this indicator are gridded population and a coastal zone delineation (or mask). Countries may have the most detailed and accurate population and coastal zone data available for their own country. Where these data are not available, or where data incompatibilities make integration difficult, there are freely-available global datasets that can be used. For example, the Socioeconomic Data and Applications Center (SEDAC) of the Center for International Earth Science Information Network at Columbia University (CIESIN) has developed a digital database of global population distribution in 1990, 1995, and 2000. Known as Gridded Population of the World v.3 (GPW), this data set is available at a 2.5 arc-minute grid (equivalent to 21 km2 at the equator), and its coastline closely matches the widely available coastline from the Digital Chart of the World (DCW). The Global Rural-Urban Mapping Project (GRUMP) is a related product that delineates urban areas using a variety of information sources (night-time lights, Digital Chart of the World, tactical pilotage charts, and classified satellite data), reallocating the population distribution of GPW to reflect higher densities in urban areas.

[9] See *Population density and urban centres in the Mediterranean basin* at http://www.grida.no/resources/5900

[10] http://www.un.org/esa/sustdev/natlinfo/indicators/methodology_sheets/oceans_seas_coasts/pop_coastal_areas.pdf

Geographical coverage	To measure the population in the coastal zone, the population data of a country needs to be disaggregated such that the population within the zone can be distinguished from the population in the rest of the country. Censuses usually offer population data disaggregated sub-nationally by administrative units, such as regions and districts. The smaller the geographic area covered by each unit, the better the precision can be in measuring where people live within the country.
Problems and gaps	This indicator can be used as a proxy of the drivers and pressures to ML and coastal ecosystems, but it does not directly quantify the pressures. Quantification of pressures requires knowledge of the total population in details, not just percentages, and is further enhanced by information on environmentally significant human activities (e.g., industry, tourism, agriculture).
Uncertainties	The coastal zone can be defined in different ways depending on the focus of interest and the availability of data. Typically, a combination of distance-to-coast and elevation data is used. The Millennium Ecosystem Assessment used 100 kilometres from the coast as the distance threshold and 50 meters as the elevation threshold, choosing whichever was closer to the sea. Other works use 10 meters elevation contiguous with the coast and no distance threshold; in most places this delineated an area closer than 100km from the sea, though in some areas it extended farther. In general distance- based measures are best suited for indicators used to denote coastal pressures, while elevation-based measures are best suited for indicators used to denote hazard vulnerability. Another approach would be to assess the population size or percentage of population residing in delta areas, which are important areas at the land-ocean interface.

IND 1.D: % of Tourists in Coastal Areas / Population in Coastal Areas	
What it means	Tourism, recreational activities and maritime transport are major marine litter drivers. This indicator shows the additional pressure to ML from touristic activities. As tourism is an important driver to ML, this indicator also demonstrates the relevance of this driver in comparison with others. An increased no. of tourist overnight stays means production of more waste, increased emissions of climate gases and other air pollutants as well as an increased consumption of certain natural resources (e.g. drinking water) etc. This means an increased pressure on the physical environment.
Indicator calculation	This calculation of this indicator is based on three parameters. The first is the population P in Coastal Areas (as discussed before). The second one is the number of tourists – visitors overnight stays (S) in various types of accommodation. The residential population has been thought to stay the whole year within the area, 365 days (the number of days taken for holiday by the residential population assumes covers up the seasonal population who is not included in the overnight stays statistics). Thus, the equivalent of one permanent resident is equal with 365 overnight stays[11]. By doing this, an assumption is made that the tourists and the residents have the same consumption and production patterns and the same contribution to ML. Although this is not accurate, as tourists tend to produce more waste than permanent residents, we will follow this assumption for simplification purposes. So, the indicator is calculated as below: % of Tourists / Population = (S/365)/P A practical example. Santorini island in Greece has 13,000 people permanent population and almost 2,000,000 overnight stays by tourists. Thus, the calculation is as follows: % of Tourists / Population = (2,000,000 /365) / 13,000 = 42% - this shows a really high contribution of the touristic activities in waste management and ML. Alternatively, the indicator can be calculated using (instead of the overnight stays) the number of arrivals by different transportation means (A) and the average duration of staying in the area (D). In this case, it is assumed that: S (overnight stays) = A (arrivals in number of people) x D (average stay in days) Using the Santorini example again, the arrivals were 1,000,000 and the average stay was 2 days.
Required data	The data regarding the permanent population is supposed to be known. The data regarding the overnight stays and the arrivals are supposed to be available from the Tourism Satellite Accounts (TSA) as described in details by the UNWTO[12]. In any case, as described below, what is required is a good proxy of the relevant data and not an exact estimation.
Data collection & availability	The usual data collected for tourism concerns: • number of trips and overnights by type of tourism and categories of visitors; • inbound tourism: number of arrivals and overnights by means of transportation; • number of establishments and capacity by forms of accommodation; • number of establishments in tourism characteristic and tourism connected activities Unless a TSA has been established, it is unlikely that any one statistical source would be able to provide all the information needed for this calculations. In particular, international and domestic travel data sets are almost always distinct and do not emanate from the same statistical sources. This has two important implications for the

[11] EU, EUROSTAT, Methodological work of measuring the sustainable development of tourism, Part 2: Manual of sustainable development indicators of tourism, 2006 http://ec.europa.eu/eurostat/documents/3888793/5834249/KS-DE-06-002-EN.PDF/178f8c9a-4a03-409c-b020-70ff7ef6803a

[12] WTO, UNWTO General Guidelines for Developing the Tourism Satellite Account (TSA) – Measuring Tourism Supply Chain, 2000 https://www.e-unwto.org/doi/pdf/10.18111/9789284403837

	building of the data for this section. First, it is most likely that the data will have to be compiled from multiple sources. Second, and, more importantly, the definitions employed for the data elements will almost certainly be different and great care will be needed to establish comparability. In case the required data is not available, some rough calculations can be done using the number of beds available in touristic enterprises and an average stay based on surveys. Useful resources for statistics on tourism are available at the UNWTO E-Library[13], as well as in the World Bank database[14].
Geographical coverage	It is important that the calculations will take place in the Coastal Area as defined previously. In case there are touristic activities in the same administrative units (municipalities, counties, regions) but not necessarily in the boundaries of the Coastal Area, an assumption can be made to include all the touristic activities of the unit.
Problems and gaps	In general terms, in case there are substantial touristic activities in an area, suitable statistics are developed if not by the state entities by commercial chambers, associations of touristic enterprises etc. So, in such cases the statistic authorities must find the proper source to "pump" the relevant data. In cases where Tourism Satellite Account are in places, alternative statistics by non-state entities can be used to reduce the uncertainties and cross-check the outputs.
Uncertainties	The main problem is that several countries might not have reliable Tourism Satellite Accounts, thus their availability is a key-issue. The European Edition of Data from the Tourism Satellite Accounts[15] and the global edition *TSA Data Around the World*[16] can provide useful insights and some ideas on how to set up a Tourism Satellite Account.

[13] https://www.e-unwto.org
[14] https://data.worldbank.org/indicator/ST.INT.ARVL
[15] EUROSTAT, Tourism Satellite Accounts in Europe, 2016 http://ec.europa.eu/eurostat/documents/7870049/7880233/KS-FT-17-002-EN-N.pdf/1070ebdc-b9e1-4a93-abb8-cecd83d40f68
[16] WTO, TSA data around the world, 2010 http://statistics.unwto.org/sites/all/files/pdf/tsa_data.pdf

IND 2 – "Hardware" of waste management

This is a composite indicator that combines waste collection, environmental control and resource recovery from the waste streams.

Sub-indicators

IND 2.A Waste Collection

IND 2.A.1 Waste Collection Coverage: % households who have access to a reliable waste collection service.

IND 2.A.2 Waste Captured by the solid waste management and recycling system: % of waste generated that is collected and delivered to an official facility.

IND 2.B Environmental Control

Controlled treatment or disposal: % of the total municipal solid waste destined for treatment or disposal which goes to either a waste treatment facility (MRF, thermal, mechanical-biological) or sanitary landfill.

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

IND 2.B.2 Number of uncontrolled dumpsites in Coastal Areas

IND 2.B.3 Quantities of waste going to uncontrolled dumpsites in Coastal Areas

IND 2.C Resource Recovery

% of total municipal solid waste generated that is recycled. Includes materials recycling and organics valorization (composting, animal feed, anaerobic digestion).

IND 2.C.1 % % of plastic solid waste generated that is recycled. Includes plastic recycled in formal and informal systems, both through source separation and MRFs.

Rationale

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[17].

[17] UNEP – ISWA, Global Waste Management Outlook, 2015, ISBN: 978-92-807-3479-9

Policy context and targets

As it has been discussed in the conceptual note, 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

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.

Methodological aspects

IND 2.A.1 Waste Collection Coverage: % households who have access to a reliable waste collection service	
What it means	This indicator provides the % of the households (or 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. 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.
Indicator calculation	*% households with access to collection service = Households with regular service / Total number of households in the country* In case the number of households is not available, a similar calculation can be made using the population instead of the households. The national figures should be aggregated by the regional or municipal figures – obviously, the final figures should be weighed.
Required data	The data required regards households or population.
Data collection & availability	In general terms, data about households and 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.
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.
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.2 Waste Captured by the solid waste management and recycling system: % of waste generated that is collected treated and disposed of	
What it means	This indicator provides the % of the percentage of waste generated that is actually handled completely by the waste management and recycling system, thus the waste that is not lost through illegal burning, burying or dumping in unofficial areas. Waste captured by the system represents all the waste materials shown on a Materials Flow Diagram (MFD) that are delivered to an official treatment/disposal facility or to a recycling factory. This includes street sweepings, wastes collected, and waste materials collected for and delivered to recycling; including both formal municipal and informal sector services. Accordingly, once again it is mentioned that waste capture does not include collected waste materials that are then dumped at an illegal ('wild') dumpsite location.
Indicator calculation	*% 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 The waste that is recycled – recovered by the informal sector
Required data	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. The denominator is the same with the indicator IND1 Municipal Waste Generation.
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.
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.
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 problem again 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.B Environmental Control: Controlled treatment or disposal: % of the total municipal solid waste destined for treatment or disposal which goes to either a waste treatment facility (MRF, thermal, mechanical-biological) or sanitary landfill.	
What it means	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 official system.
Indicator calculation	*% 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. Waste being accepted at a facility 'counts' towards this quantitative indicator if the facility has reached at least an intermediate level of control. To use land disposal as an example, and referring to the World Bank categorisation for the stepwise improvement of sites, both uncontrolled and semi-controlled sites would fall below the threshold, while controlled, engineered and full sanitary landfills would all be counted towards this 'controlled' indicator. By definition, the calculation does not include informal recycling facilities. Thus, the difference from IND 2.A.2 is both at the numerator and the denominator.
Required data	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. The denominator is the same with the indicator IND1 Municipal Waste Generation minus the waste that is recycled or reused.
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 must aggregate them.
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.
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[18] has developed a concrete evaluation system to hep decision-makers on distinguishing between safe and controlled Vs uncontrolled disposal.

[18] 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 uncontrolled dumpsites	
What it means	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.
Indicator calculation	*% 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*
Required data	Usually there are no records about the waste that goes to dumpsites, so the relevant data can be retrieved from rough assessments or national inventories. Therefore it is always easier to calculate this indicator using the second formula above: *% Waste that goes to dumpsites = 100% - IND 2.B*
Data collection & availability	The issues here are the same with the issues regarding the IND 2.B
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.
Problems and gaps	The issues here are the same with the issues regarding the IND 2.B
Uncertainties	The issues here are the same with the issues regarding the IND 2.B

IND 2.B.2 Number of uncontrolled dumpsites in Coastal Areas	
What it means	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.
Indicator calculation	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.
Required data	Usually there are no records about the waste that goes to dumpsites, so the relevant data can be retrieved from rough assessments or national - regional inventories.
Data collection & availability	The issues here are the same with the issues regarding the IND 1.C. A lot of 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.
Geographical coverage	The issues here are mostly related with the issues discussed in IND 1.C
Problems and gaps	The issues here are mostly related with the issues discussed in IND 1.C
Uncertainties	The issues here are mostly related with the issues discussed in IND 1.C

IND 2.B.3 Quantities of waste going to uncontrolled dumpsites in Coastal Areas	
What it means	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.
Indicator calculation	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.
Required data	Usually there are no records about the waste that goes to dumpsites, so the relevant data can be retrieved from rough assessments or national - regional inventories. See also the discussion for IND 2.B and IND 2.B.1
Data collection & availability	The issues here are the same with the issues regarding the IND 1.C. A lot of 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.
Geographical coverage	The issues here are mostly related with the issues discussed in IND 1.C, IND 2.B, IND 2.B.1
Problems and gaps	The issues here are mostly related with the issues discussed in IND 1.C, IND 2.B, IND 2.B.1
Uncertainties	The issues here are mostly related with the issues discussed in IND 1.C, IND 2.B, IND 2.B.1

IND 2.C and IND 2.C.1 Resource Recovery: % of total municipal solid waste generated that is recycled. Includes materials recycling and organics valorization (composting, animal feed, anaerobic digestion).	
What it means	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). The definition of recycling used in this document comes from the UN-Habitat book[19]: '[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.
Indicator calculation	The total quantity collected for recycling should be adjusted downwards to allow for any materials that are subsequently rejected and sent for treatment or disposal. Recycling is higher up the waste hierarchy, so energy recovery from e.g. thermal treatment is not considered here. 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
Required data	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. For the informal sector see below.
Data collection & availability	The issues here are the same with the issues regarding the IND 2.B and 2.B.1. 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.
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.
Problems and gaps	The issues here are mostly related with the issues discussed in IND 2.B, IND 2.B.1
Uncertainties	The issues here are mostly related with the issues discussed in IND 2.B, IND 2.B.1

[19] See Wasteaware Indicators, User's Manual