INDICATOR FACT – SHEET
1. Municipal Waste Generation

Sub-indicators

IND 1.A Municipal waste composition

IND 1.B Plastic waste generation per capita

IND 1.C % of population living in Coastal Areas

IND 1.D % of Tourists in Coastal Areas

DRAFT Indicator Specification

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Indicator Specification

H2020 Indicators

Thematic area	**Date**
WASTE	**Author (s)**

Policy theme
Marine Litter and waste management interfaces

Indicators
1. Municipal Waste Generation

Sub-indicators
1.A Municipal waste composition
1.B Plastic waste generation per capita
1.C % of population living in Coastal Areas
1.D % of Tourists in Coastal Areas

Additional information
(if applicable)
The specification has been modified, comparing to the 2015 versions, trying to reflect the Marine Litter drivers (plastic waste generated, touristic activities) and to focus on the Costal Areas

Rationale

Despite the progress made, waste management is still a major concern for the Mediterranean countries. In the Mediterannean North, in general terms, countries have sufficient waste management and recycling infrastructure, almost complete collection coverage and long-established formal recycling activities. However, even in these countries, there are still active dumpsites, especially in some of the small and touristic islands, while the high touristic pressures push the exisitng infrastructure out of its limits, especially during the high season. The plastic waste generated during the high toursitic seasons can hardly be captured by the existing recycling and waste management systems, while on some cases, scale economies, geographical particularities, and serious logistic problems prohibit the development of substantial recycling activities.
In the rest of the countries (North Africa, Middle East, Turkey) while there are substantial on-going efforts to implement waste management systems, uncontrolled dumpsites and poor sanitary landfills are still a major disposal practice, recycling efforts are mainly stimulated by the informal sector and waste treatment infrastructure is still at its very beginning. In many cases, the biggest problems appear in the most touristic areas that lack waste management infrastructure, resulting in serious waste leakages towards the Mediterranean Sea, dumpsites on the sea-shore, rivers full of plastics, serious risks for the water quality, and increased Marine Litter Quantities. In addition, there are still cases where less than 100% of the waste generated is collected, due to the lack of collection capacity in the most remote and rural areas.
The combination of high touristic pressures (Mediterranean Sea is the most atractive touristic destination of the world), population growth especially in the South – Easter Mediterranean countries, highly urbanised coastal areas, and important refugee streams, creates a very dynamic and difficult landscape for waste management and poses serious governance challenges for the authorities involved.

Justification for indicator selection

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. The selected indicators are the following.

1. Waste Generation

This indicator shows the overall pressure from the waste generated on a national level. For benchmarking purposes, it is better to express it with the national average waste generation per capita (kg/y).

1.A Waste Composition

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.

1.B Plastic waste generation per capita

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.

1.C % of Population living in Coastal Areas

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.

1.D % of Tourists in Coastal Areas

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.

REFERENCES

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Indicator definition

IND 1: Total municipal solid waste (MSW) generation on a specific geographical level

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

Definitions required

The definition of MSW used in this document is the one from the UN-Habitat1: '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.

Temporal Unit

Annualy

Units

Tons per year (on the geogrpahical scale defined)
Kg/cap/year (on the geogrpahical scale defined)

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

IND 1.A Waste Composition

Summary composition of MSW as generated.

Data points used for 5 key fractions – all as % wt. of total MSW generated as follows.

Definitions required

[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]

Temporal Unit

Annualy

Units

w/w % on wet basis

IND 1.B: Plastic waste generation per capita

IND1.B is calculated in 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)

Definitions required

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

Temporal Unit
Annualy

Units
Kg/cap/year (on the geogrpahical scale defined)

IND 1.C: % of population living in Coastal Areas / Total Population

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[2]. As general guidance, any informal or unofficial settlements should be included in the estimate used.

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[3].

Definitions required
Population in coastal areas, according the recent UN work on SDGs, is the population living within 100 km of the coastline. Using a GIS, the percentage of the population in the coastal zone can be calculated easily.

Temporal Unit
Annualy

Units
% of population living in Coastal Areas (population in Coastals Areas /Total Population)

[2] http://www.un.org/esa/sustdev/natlinfo/indicators/methodology_sheets/oceans_seas_coasts/pop_coastal_areas.pdf
[3] See *Population density and urban centres in the Mediterranean basin* at http://www.grida.no/resources/5900

IND 1.D: % of Tourists in Coastal Areas / Population in Coastal Areas

This calculation of this indicator is based on two 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 equivalent of a single resident is also used (see definitions below). 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.

Definitions required

Tourists and visitors are defined according the UN World Tourism Organization[4]

"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."

Equivalent of a single permanent resident: 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[5].

Temporal Unit
Annualy

Units

% of Tourists in Coastal Areas (Tourists on Coastals Areas / Population in Coastal Areas)

[4] 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

[5] 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

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 1: Total municipal solid waste (MSW) generation on a specific geographical level

Calculations

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

Geographical coverage

Ideally it is required a spatial analysis of the waste generated per municipality or region or waste management authority. 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

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.

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.

IND 1.A: Waste Composition

Calculations

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)

Geographical coverage

Ideally it is required a spatial analysis of the waste generated per municipality or region or waste management authority. 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, with the changes of the composition for each material.

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[6] "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.

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.

[6] 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

Calculations

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)

Geographical coverage

Ideally it is required a spatial analysis of the waste generated per municipality or region or waste management authority. 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, with the changes of the composition for each material.

Data collection & availability

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[7] 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.

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.

[7] 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 Coastals Areas / Total Population

Calculations

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[8]. 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.

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.

Temporal Coverage

The changes in coastal population is enough to be monitored on a 3-5 years basis

Data collection & availability

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. 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.

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.

IND 1.D: % of Tourists in Coastal Areas / Population in Coastal Areas

Calculations

This calculation of this indicator is based on the following parameters a. the population P in Coastal Areas b. the number of tourists – visitors overnight stays (S) in various types of accommodation, c. the equivalent of one permanent resident which is equal with 365 overnight stays.
The indicator is calculated as below:
% of Tourists / Population = (S/365)/P

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.

Temporal Coverage

The changes in this ratio is enough to be monitored on a 3-5 years basis

Data collection & availability

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[9]. In any case, as described below, what is required is a good proxy of the relevant data and not an exact estimation. 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 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[10], as well as in the World Bank database[11].

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[12] and the global edition *TSA Data Around the World*[13] can provide useful insights and some ideas on how to set up a Tourism Satellite Account.

[8] http://www.un.org/esa/sustdev/natlinfo/indicators/methodology_sheets/oceans_seas_coasts/pop_coastal_areas.pdf
[9] 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
[10] https://www.e-unwto.org
[11] https://data.worldbank.org/indicator/ST.INT.ARVL
[12] 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
[13] WTO, TSA data around the world, 2010 http://statistics.unwto.org/sites/all/files/pdf/tsa_data.pdf