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H2020 Indicators Fact Sheets

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Indicator Fact Sheet

1. Municipal waste generation per capita

Additional information: Waste composition

Draft Indicator Specification

Version: 3.0
Date: 17.01.2013

Version History

Version	Date	Author	Status and description	Distribution
1.0	**17.10.2012**	**EEA/ETC/UNEP-MAP**	**Includes comments after October 2nd Env. Ind. workshop**	**Countries for feedback**
2.0	**29.11.2012**	**EEA/ETC/UNEP-MAP**	**Includes comments from country consultation**	
3.0	**17.01.2013**	**EEA/ETC/UNEP-MAP**	**Includes comments from Eurostat**	

Indicator Specification

Indicator Set	**Date** 17.01.2013 **Author (s): EEA/ETC, UNEP/MAP**
Indicator Title Municipal waste generation per capita Additional information: Waste Composition	

Rationale
Justification for indicator selection (namely environmental context) Waste represents an enormous loss of resources in the form of both materials and energy. The amount of (municipal) waste generated in a country is closely related to the economic development, the rate of urbanization, the types and patterns of consumption of raw materials, household revenue and lifestyles. While municipal waste is only one part of total waste generated in each country, its management and treatment often reflects more than one third of the public sector's financial efforts to abate and control pollution (OECD Factbook, 2010). However, the challenge still remains to reduce waste generation and to decouple GDP growth from the increase in waste generation. The Horizon 2020 Initiative, which aims to reduce the pollution of the Mediterranean Sea by 2020, recognizes municipal waste as one of the three priority areas causing major pollution in the Mediterranean Sea. Solid waste produced along the Mediterranean coastline is often disposed of in dumping sites with minimal or no sanitary treatment (EEA, 2006). Uncontrolled dumping sites that are often within the town limits or on waterfronts pose serious threats to both human health and the coastal/marine environment, as sources of chemical pollution, infectious disease and litter to the surrounding areas. In many cases, no measures are taken to control and treat leachates from the dumping sites which may lead to the contamination with organic compounds and heavy metals of groundwater and the marine environment (EEA, 2006). Another problem is the uncontrolled disposal of solid waste, littering, which may contribute to the generation of marine litter through the transport of waste mainly from coastal urban centres to coastal and marine areas. Littering is a growing problem not only due to aesthetic degradation but also to a number of potentially harmful implications, such as the transport of persistent organic pollutants, the release of toxic compounds, the entanglement of larger marine organisms and the mortality of many marine species, including marine mammals, sea birds and turtles after ingestion of litter (Katsanevakis, 2008).
Scientific references • EEA Report, 2006. Priority issues in the Mediterranean environment. • Katsanevakis S., 2008. Marine debris, a growing problem: Sources, distribution, composition, and impacts. In: Hofer TN (ed) Marine Pollution: New Research. Nova Science Publishers, New York., 53–100 • OECD Factbook 2011-2012, Economic, Environmental and Social Statistics. • OECD Key Environmental Indicators 2008. OECD Environment Directorate Paris,

France, 2008.

- UNEP/MAP-Plan Bleu, 2009. State of the Environment and Development in the Mediterranean, UNEP/MAP-Plan Bleu, Athens.

Indicator definition

The indicator presents municipal waste generation, expressed in kg per capita per year.

"Municipal waste" refers to waste collected by or on behalf of municipalities; the main part originates from households, but similar wastes from commerce and trade, office buildings, institutions and small businesses is also included. While there is general consensus on the definitions of industrial and hazardous waste, the definition of municipal waste varies greatly between countries. There is no common definition for "municipal waste" in the Mediterranean (UNEP/MAP-Plan Bleu, 2009).

According to the OECD/Eurostat Joint Questionnaire "municipal waste" includes the following types of materials: paper, paperboard and paper products, plastics, glass, metals, food and garden waste and textiles. The definition also includes:

- waste from selected municipal services, i.e. waste from park and garden maintenance, waste from street cleaning services (street sweepings, the content of litter containers, market cleansing waste), if managed as waste.

It includes collected waste from these sources:

- door-to-door through traditional collection (mixed household waste)
- fractions collected separately for recovery operations (through door-to-door collection and/or through voluntary deposits).

The definition also includes waste from the same sources and similar in nature and composition which:

- are collected directly by the private sector (business or private non-profit institutions) not on behalf of municipalities (mainly separate collection for recovery purposes),
- originate from rural areas not served by a regular waste service, even if they are disposed by the generator.

The definition excludes:

- waste from municipal sewage network and treatment,
- municipal construction and demolition waste.

Other definitions:
(1) 'household waste' means waste generated by households;
(2) 'similar waste' means waste in nature and composition comparable to household waste, excluding production waste and waste from agriculture and forestry;
(3) 'municipal waste' means household waste and similar waste.

This indicator is a measure of the amount of waste produced by human settlements activity. It represents a *Pressure* in the DPSIR Framework.

Additional information: Waste composition

The following waste composition categories are considered (UNSD Waste questionnaire):

1	Paper, paperboard
2	Textiles
3	Plastics
4	Glass
5	Metals
6	Other inorganic material
7	Organic material
8	*of which*: food and garden waste

Units

Municipal waste generation in kg per capita per year.

Waste composition in % of the municipal waste generated per waste composition category.

Policy context and targets

Policy context description

While no international agreements currently apply, there is growing international backing for the OECD's 3R's approach to tackling waste: Reduce, Reuse and Recycle.

The renewed EU Sustainable Development Strategy sets the target of 'avoiding the generation of waste and enhancing efficient use of natural resources by applying the concept of life-cycle thinking and promoting reuse and recycling'.

The Mediterranean Strategy for Sustainable Development (MSSD) promotes environmentally sound production processes, products and services through the development of voluntary initiatives and reduction of waste generation by adopting the "3R" approach (reducing, reusing and recycling).

Targets

This indicator is linked to the MSSD recommendations and chapter:

Promoting sustainable urban development

The management of urban waste includes the reduction of waste generation and the recycling and rational disposal of packaging. Suitable objectives by 2015 would be to dissociate the increase in waste generation and GDP growth so as to reduce the current growth rate in waste generation by around 50%, double recycling rates and transform at least half of unregulated waste dumps into sanitary landfills (UNEP/MAP, 2005).

Some countries have set national targets for the reduction of solid waste within a specified time frame. For example, the Strategic Objective Three: *Effective and environmentally-safe management of solid waste services* of the National Strategy for Solid Waste Management in the Palestinian Territory 2010-2014 refers to Policy (6) *Encouraging the reduction of solid waste destined for landfilling*.

Related policy documents

- Commission Decision 2000/532/EC List of Wastes
- Directive 99/31/EC on landfill of Waste
- UNEP/MAP (2005). Mediterranean Strategy for Sustainable Development. Athens, MAP.

Policy Question(s)

Waste prevention: are we reducing the generation of municipal waste?

Specific policy question (s) (if applicable)

Methodology

Methodology for indicator calculation (including description of data used)

The base data set for the calculation of this indicator consists of:

1) amount of collected municipal waste
2) % of population served by municipal waste collection scheme (collection rate)

These datasets are collected as part of Indicator 2 - Amount of collected and treated municipal waste, including collection rate and type of treatment. By knowing the % of population served by waste collection scheme, the amount of collected municipal waste and the total population, the municipal waste generation can then be estimated. The amounts of municipal waste generated are divided by the population of the geographical unit (national and coastal administrative unit – see below).

Geographical unit:

- National level
- Coastal cities or conurbations with a population over 10 000 inhabitants within the coastal NUTS3 administrative units of the countries

Temporal unit

Annual

Temporal coverage

2003 onwards; earlier if data is available

Statistical aggregation per station and year

Basis for aggregation

Trend analysis

To be filled in later

Methodology for gap filling

If no data are available for a certain country and year, estimations will be made.

To be filled in later

Methodology references

- EEA CSI 016 (Municipal waste generation) Indicator factsheet

  http://www.eea.europa.eu/data-and-maps/indicators/municipal-waste-generation/municipal-waste-generation-assessment-published-4

- Methodological sheets of the 34 priority indicators for the "Mediterranean Strategy for Sustainable development" Follow up. Plan Bleu, 2006
- UN Department of Economic and Social Affairs–Division for Sustainable

Development.

http://www.un.org/esa/sustdev/natlinfo/indicators/indisd/english/chapt21e.htm

- OECD/Eurostat Joint Questionnaire waq5a and 5c
- United Nations Statistics Division (UNSD) and United Nations Environment Programme (UNEP) Questionnaire 2010 on Environmental Statistics
- EEA 2000. Household and municipal waste: Comparability of data in EEA member countries Topic report No 3/2000
- UNCSD 1996 Generation of Industrial and Municipal Solid Waste methodology sheet Household waste disposed per capita

Data specifications

Data references

External data references

Data on municipal waste generation intensities is available for most OECD countries (OECD Key Environmental Indicators, 2008) and European countries (Eurostat and EEA CSI 016/waste001 Municipal waste generation). Household waste produced per capita (and number of uncontrolled landfills) (MSSD 21/URB_P03) is the waste indicator proposed by UNEP/MAP, Plan Bleu to promote sustainable urban development.

Uncertainties

Methodology Uncertainty

- The definition of municipal waste and the surveying methods used to collect information vary from country to country, because different management practices are applied in different countries.
- The main problems in terms data comparability relate to the coverage of waste from commerce and trade, and separate waste collections carried out by private companies. The concept of municipal waste reflects different waste management practices in municipalities, especially regarding to the degree that waste from small businesses, offices and public institutions is included. This makes and interpretation of differences between countries more difficult. Definitions of 'household' waste (and controlled landfill) may also vary from country to country.
- It is assumed that imports and exports of municipal waste in the countries/coastal areas are rather low and are therefore not accounted for, unless evidence is available to show that this fraction is not insignificant.

Data sets uncertainty

- Household waste production at source is difficult to measure, except by using intensive studies and surveys at the household level. It is highly dependent on the mode of collection by the local authorities and whether or not the waste is actually disposed of in the official system.

Rationale uncertainty

- Municipal waste constitutes only around 10 % of total waste generated (EEA CSI016 factsheet - http://www.eea.europa.eu/data-and-maps/indicators/municipal-waste-generation/municipal-waste-generation-assessment-published-4#toc-1), but because of its complex character and its distribution among many waste generators, environmentally sound management of this waste is complicated.
- When interpreting these indicators, it should be noted that while municipal waste is only one part of total waste generated, its management and treatment represents more than one third of the public sector's financial efforts to abate and control pollution. It should be kept in mind that waste generation intensities are first approximations of potential environmental pressure; more information is needed to describe the actual pressure. These indicators should be read in connection with other indicators, such as Amount of collected and treated waste- and should be complemented with information on waste management practices and costs, consumption levels and patterns (OECD Key Environmental Indicators, 2008).
- The difference between "Municipal waste generation" and "Amount of collected municipal waste" gives an indication of the amount of municipal waste that is NOT collected and which has implications on the amount of waste dispersed in the environment, especially as marine litter.

Further work

Short-term work

The main challenge is to strengthen measures for waste minimisation, especially for waste prevention and recycling, and to move further towards life cycle management of products and extended producer responsibility. This implies internalising the costs of waste management into prices of consumer goods and of waste management services; and ensuring greater cost-effectiveness and full public involvement in designing measures (OECD Key Indicators, 2008).

Medium-term work

Work description

Status

Deadline

Long-term work

Indicator Fact Sheet

2. Amount of collected and treated municipal waste, including collection rate and type of treatment

Additional information: Number, type and location of landfills

Draft Indicator Specification

Version: 3.0
Date: 17.01.2013

Version History

Version	Date	Author	Status and description	Distribution
1.0	**17.10.2012**	**EEA/ETC-UNEP/MAP**	**Includes comments after October 2nd Env. Ind. workshop**	**Countries for feedback**
2.0	**29.11.2012**	**EEA/ETC/UNEP-MAP**	**Includes comments from country consultation**	
3.0	**17.01.2013**	**EEA/ETC/UNEP-MAP**	**Includes comments from Eurostat**	

Indicator Specification

Indicator Set	**Date** 17.01.2013 **Author (s) : EEA/ETC, UNEP/MAP**
Indicator Title Amount of collected and treated municipal waste, including collection rate and type of treatment Additional information: Number, type and location of landfills	

Rationale

Justification for indicator selection (namely environmental context)

Since the mid-1970s, solid waste management has become a major concern for Mediterranean countries which have invested heavily in the collection, treatment, disposal and more recently prevention, control and recycling of waste (UNEP/MAP-Plan Bleu, 2009). Solid waste poses numerous direct and indirect risks to both man and the environment in the form of infectious diseases, pollution of groundwater and surface waters, contamination of the soil, degradation of natural ecosystems; emissions of greenhouse gases or more harmful dioxins. Malodors can pose a serious nuisance to neighbourhoods, while landfills scar landscapes. Waste has the potential to become beach and marine litter if not managed appropriately (recycled or disposed of properly), leading to environmental, ecological and socio-economic impacts.

In the Southern Mediterranean countries, priority is given to clearing urban streets from the health hazards and environmental threats that waste may pose (UNEP/MAP-Plan Bleu, 2009). Although the proper management, i.e. collection, treatment and disposal of waste is important from an environmental and social viewpoint, it can be an economic burden on industries, municipalities and households. In fact, in most Southern Mediterranean countries, *treatment* consists of the disposal of waste in largely uncontrolled waste dumps in the outskirts of cities.

Especially in developing countries, the lack of land areas and resources available for the safe disposal of wastes, together with population growth and growing tourism industry make waste management a critical issue. Despite achievements in waste recycling and relative decoupling of municipal waste generation from economic growth, important questions remain on the capacities of existing facilities for final treatment and disposal, the location and social acceptance of new facilities (e.g. NIMBY for controlled landfill and incineration plants) and illegal shipments. The collection rate of municipal waste is assumed to be a measure of the progress in the implementation of solid waste management practices. The measure of the proportion of waste collected which is recycled, composted, incinerated, or landfilled in controlled sites gives an indication of the environmental impact of waste management in a country/region.

Scientific references

- UNEP/MAP-Plan Bleu, 2009. State of the Environment and Development in the Mediterranean, UNEP/MAP-Plan Bleu, Athens.

Indicator definition

This indicator measures:

- Amount of collected municipal waste
- Amount of treated municipal waste
- % of population served by waste collection service (collection rate)
- % waste treated according to the type of treatment (i. recycled, ii. incinerated, and iiii. landfilled)

While there is general consensus on the definitions of industrial and hazardous waste, that of municipal waste varies greatly between countries. There is no common definition in the Mediterranean for "municipal waste" (UNEP/MAP-Plan Bleu, 2009). A detailed definition of "Municipal waste" is given in the specification factsheet of Indicator 1- Municipal waste generation per capita.

The type of treatment includes landfilling, recycling and incineration. According to the OECD/Eurostat Joint Questionnaire:

- **Recycling** is defined as any reprocessing of material in a production process that diverts it from the waste stream, except reuse as fuel. **Composting** is considered as part of Recycling.
- **Incineration** means thermal treatment of waste in an incineration plant.
- **Landfilling** refers to the final placement of waste into or onto the land in a controlled or uncontrolled way. The definition covers both landfilling in internal sites (i.e., where a generator of waste is carrying out its own waste disposal at the place of generation) and in external sites. In this context, we distinguish between:

  -Open dump sites/non-sanitary/uncontrolled landfill defined as uncontrolled deposit of waste into or onto land

  -Sanitary/controlled/engineered landfill, refers to a controlled waste (refuse) disposal site on land, whose operation is submitted to a permit system and to technical control procedures (e.g. facilities like impermeable liners, leachate collection systems) in compliance with the national legislation in force.

<u>Additional information</u>

- The number of open dump sites and controlled landfills
- Location of landfills (dump sites and controlled landfills)

Units:

- Amount in kg per year (amount of collected waste; amount of treated waste)
- % population served by waste collection service
- % recycled waste of collected waste,
- % incinerated waste of collected waste
- % landfilled waste of collected waste (controlled and uncontrolled)

Additional information

- Number of sanitary and non-sanitary landfills
- Geographical coordinates of sanitary and non-sanitary landfills

Policy context and targets

Policy context description

The way a country manages its solid waste has significant long-term implications for public health, the economy and the natural environment. Therefore it is essential to promote an environmentally sound solid waste treatment and disposal programme. Generally, adequate waste management indicates that the authorities are aware of the health and environmental risks and that they support or impose suitable measures to prevent or reduce waste. Solid waste recycling and composting is an important component of a sustainable approach to solid waste management. As well as reducing the amount of waste that needs to be disposed of, increasing the amount of waste recycled and composted reduces the demand for raw materials, leading to a reduction in resource extraction. There may also be a benefit of increased income generation through recycling schemes.

For waste that is not suitable for recycling or composting, incineration is often considered the next best option, if the incineration plants comply with legislation for emission standards, and if energy from waste incineration is recovered, as this will reduce the overall volume of waste.

If recycling, composting and incineration are excluded, waste should be landfilled in a controlled site, with suitable technical control in line with national legislation. Uncontrolled landfilling may cause serious environmental problems to soil and ground water and should be avoided.

While no international agreements currently apply, there is growing international backing for the OECD's 3R's approach to tackling waste: Reduce, Reuse and Recycle.

The Mediterranean Strategy for Sustainable Development (MSSD) promotes environmentally sound production processes, products and services through the development of voluntary initiatives and reduction of waste generation by adopting the "3R" approach (reducing, reusing and recycling).

Targets

This indicator is linked to the MSSD recommendations and chapter :

Promoting sustainable urban development

The management of urban waste includes the reduction of waste generation and the recycling and

rational disposal of packaging. Suitable objectives by 2015 would be to dissociate the increase in waste generation and GDP growth so as to reduce the current growth rate in waste generation by around 50%, double recycling rates and transform at least half of unregulated waste dumps into sanitary landfills (UNEP/MAP, 2005).

There are no specific targets for waste treated in different categories (i.e. recycling, incineration, landfilling). However, some countries have set other national targets for the management of waste. For example, in Morocco, a national program has been set up jointly by the Ministry of Interior and the Environment Department with the aim to:

- increase the collection rate from the current 70% to 90%
- set up controlled landfills for domestic waste for the benefit of all urban centers.
- rehabilitate all the existing uncontrolled dumps after closure (100%)
- elaborate "sorting-recycling-valorization" field, with sorting pilot actions, to reach a rate of 20% of recycling

Strategic Objective Three: *Effective and environmentally-safe management of solid waste services* of the National Strategy for Solid Waste Management in the Palestinian Territory 2010-2014 includes 5 policies aimed at the improvement of the collection and disposal/treatment services.

In Jordan, the Ministry of Environment is developing a new framework law on waste, with the objective to provide for the basic requirements for the elimination, reduction, recycling, recovery and processing of waste, the extraction of secondary raw materials from waste and energy as well as safe disposal of waste in accordance with the goals of environmental protection, human health and sustainable development.

In the European Union, the treatment of municipal waste is, to some extent, driven by landfill diversion targets of biodegradable municipal waste (BMW) set out in the Landfill Directive. However, the recent revision of the Waste Framework Directive includes the following target for household, and similar waste (which comprises the majority of Municipal Waste):

•by 2020, the preparing for re-use and the recycling of waste materials such as at least paper, metal, plastic and glass from households and possibly from other origins as far as these waste streams are similar to waste from households, shall be increased to a minimum of overall 50 % by weight.

Related policy documents

- UNEP/MAP (2005). Mediterranean Strategy for Sustainable Development. Athens, MAP.
- Directive 99/31/EC on landfill of waste
- Directive (EC) No 2008/98/EC on waste
- http://epp.eurostat.ec.europa.eu/portal/page/portal/waste/key_waste_streams/municipal_waste

Policy Question(s)
Is the management of municipal waste improving?

Specific policy question (s) (if applicable)

Is the amount of treated waste increasing?

Is the number of sanitary landfills increasing?

Methodology

Methodology for indicator calculation (including description of data used)

The base datasets for the calculation of the indicator are:

1) amount of municipal waste collected by or on behalf of municipal authorities
2) amount of municipal waste treated by recycling, incineration and landfilled (both non-sanitary and sanitary); the quantity treated by each method is then divided by the amount of collected municipal waste and expressed as percentage, for the calculation of waste treatment distribution by method
3) % of population served by collection scheme.

Note that datasets 1) and 3) are also needed to compute Indicator 1 - Municipal waste generation – as explained in the specification factsheet of Indicator 1.

Geographical coverage:

- National level
- Coastal cities or conurbations with a population over 10 000 inhabitants within the coastal NUTS3 administrative units of the countries

Temporal unit

Annual

Temporal coverage

2003 onwards; earlier if data is available

Statistical aggregation per station and year

Basis for aggregation

Trend analysis

To be filled in later

Methodology for gap filling

To be filled in later

Methodology references

- EEA CSI 016 (Municipal waste generation) Indicator factsheet

  http://www.eea.europa.eu/data-and-maps/indicators/municipal-waste-generation/municipal-waste-generation-assessment-published-4

- Methodological sheets of the 34 priority indicators for the "Mediterranean Strategy for Sustainable development" Follow up. Plan Bleu, 2006

- UN Department of Economic and Social Affairs–Division for Sustainable Development "Waste treatment and disposal" Methodology Sheets.

http://www.un.org/esa/sustdev/natlinfo/indicators/methodology_sheets/consumption_production/waste_treatment_disposal.pdf

- OECD/Eurostat Joint Questionnaire waq5a and 5c
- UNCSD 1996 Generation of Industrial and Municipal Solid Waste methodology sheet Household waste disposed per capita

http://www.un.org/esa/sustdev/natlinfo/indicators/indisd/english/chapt21e.htm

Data specifications

Data references

External data references

Eurostat collects data on municipal waste generation and treatment by type of treatment method in European countries.

Uncertainties

Methodology Uncertainty

- Although significant progress has been made to harmonise definitions, wide variations still prevail which also reflect in the data acquisition methods (declaration, surveys, estimates).
- It is assumed that imports and exports of municipal waste in the countries/coastal areas are rather low and are therefore not accounted for, unless evidence is available to show that this fraction is not insignificant.

Data sets uncertainty

- The term "municipal waste" is less elusive when related to the role of municipalities as guarantor of public health at the origin of municipal services (of public utility), such as waste collection. What is collected, however, may vary considerably but generally consists of waste from households and similar waste generated by high street commerce, private and municipal services, schools and hospitals, workshops and enterprises and sometimes industry. It may also contain spoil earth from street cleaning, while industrial waste is generally collected by parallel collection channels. In the Mediterranean, such a framework typifies Northern Mediterranean Countries and Turkey. In Morocco and Tunisia, for instance, regulations distinguish between hazardous and non hazardous waste, but the waste generated by small crafts and industrial enterprises, and those generated by markets, are often mixed with domestic waste in most major cities (UNEP/MAP-Plan Bleu, 2009).
- The definition of the term "treatment" also varies between countries and regions.

Rationale uncertainty

- The currently proposed indicator does not give information on the fate of uncollected waste and the level of hazardous content in the collected waste.
- Supplementary data on leakage of contaminants from landfills to the sea (via ground- and surface water) and the environmental quality of the landfill surroundings is also necessary.

Further work
Medium-term work **Work description** **Status** **Deadline**
Long-term work

Indicator Fact Sheet

3. Share of population with access to an improved sanitation system (total, urban, rural)

Draft Indicator Specification

Version: 2.0
Date: 29.11.2012

Version History

Version	Date	Author	Status and description	Distribution
1.0	**18.10.2012**	**EEA/ETC/UNEP-MAP**	**Includes comments after October 2nd Env. Ind. workshop**	**Countries for feedback**
2.0	**29.112012**	**EEA/ETC/UNEP-MAP**	**Includes comments from country consultation**	

Indicator Specification

Indicator Set	**Date** 29.11.2012 **Author (s) EEA/ETC, UNEP/MAP**

Indicator Title

Share of population with access to an improved sanitation system (total, urban, rural)

Rationale

Justification for indicator selection (namely environmental context)

Improved sanitation refers to the presence of facilities, at the household level, facilities that hygienically separate human excreta from human, animal and insect contact. Lack of sanitation poses health risks, from contaminated drinking water to life-threatening forms of diarrhea to infants, particularly for poorer segments of the population who are most exposed to inadequate human waste disposal.

In the Mediterranean, access to sanitation and wastewater treatment is still lagging behind as compared to access to drinking water. Yet it is above the world average. Although 2.6 billion people are deprived of access to adequate sanitation systems at the global level, Northern Africa is the only region that has already surpassed the Millennium Development Goal (MDG) sanitation target by increasing the coverage from 72 % in 1990 to 89 % in 2008 (MDG, 2011). This can be attributed to the significant investments that have been made in South and East Mediterranean Countries and regional development assistance since the 1990s (UNEP/MAP-Plan Bleu, 2009). Yet, the disparities between rural and urban areas still remain significant and may reach as much as 30% in certain Southern Mediterranean countries.

Improving access to improved sanitation services remains politically challenging due to rural/urban inequalities and the emergence of "pockets" of urban poverty. The urban population is likely to increase by 50 % by 2025 on the Southern and Eastern Mediterranean rims. Therefore ensuring access to sanitation services in unregulated peripheral quarters and in medium and small-sized towns is a major social challenge in these developing regions (UNEP/MAP-Plan Bleu, 2009).

Despite discrepancies in the national definitions of urban population and acceptable sanitation, this indicator is important to show the progress being made in the Mediterranean region according to the type of wastewater collection (individual or collective) and the treatment methods, thus linking directly to the other priority indicator on volume of wastewater collected and type of treatment.

Scientific references

- Millenium Development Goals Report 2012, United Nations, 2012.
- UNEP/MAP-Plan Bleu, 2009. State of the Environment and Development in the Mediterranean, UNEP/MAP-Plan Bleu, Athens.
- Plan Bleu, 2011. Mediterranean strategy for sustainable development follow-up: Main indicators, 2011 Update.
- World Health Organization and United Nations Children's Fund, 2000. Global Water

Supply and Sanitation Assessment 2000 Report.

- Municipal wastewater treatment plants in Mediterranean coastal cities – Inventory of treatment plants in cities of between 2,000 and 10,000 inhabitants UNEP. Mediterranean Action Plan. MED POL, World Health Organization (WHO), Athens 2008, UNEP/MAP MTS 169
- Municipal Wastewater Treatment Plants in Mediterranean Coastal Cities (II) UNEP. Mediterranean Action Plan. MED POL, World Health Organization (WHO), Athens 2004, UNEP/MAP MTS 157
- United Nations Development Group, 2003. Handbook for Indicators for Monitoring the Millennium Development Goals.

Indicator definition

Indicator definition

Share of population (total, urban, rural) with access to improved sanitation refers to the percentage of the population with access to facilities which hygienically separate human excreta from human, animal and insect contact. According to the World Health Organization and United Nations Children's Fund (2000), facilities such as sewers or septic tanks, pour-flush latrines and simple pit or ventilated improved pit latrines are assumed to be adequate, provided that they are not public. To be effective, facilities must be correctly constructed and properly maintained.

This indicator represents the share of population having access to improved sanitation systems, installed in homes or in the immediate vicinity, for the evacuation of human faeces (public sanitation network, septic tank…).

The definition of "improved sanitation system" provided by the Joint Monitoring Programme for Water Supply and Sanitation by the World Health Organization and UNICEF is:
Connection to a public sewer, connection to a septic system, pour-flush latrine, access to a pit latrine, ventilated improved pit latrine.

Excreta disposal systems are considered adequate if they are private and if they separate human excreta from human contact. Sanitation solutions that are considered as "non-improved" are: public or shared latrine, open pit latrine, bucket latrines.

The characteristics of urban and rural areas are different from country to country. Therefore, no single definition can be applied regionally as regards the distinction between "urban" and "rural" populations. National definitions most often refer to the size of locations. Rural populations represent the rest of the population considered as non-urban.

Units

Percentage

Policy context and targets

Policy context description

This indicator corresponds to Millennium Development Goals (MDG) Indicator 7.9: *Proportion of population using an improved sanitation facility*, under Goal 7: *Ensure environmental sustainability.*

In the Mediterranean area, this indicator is linked to the Barcelona Convention LBS protocol and MSSD recommendations and chapters:

« Improving integrated water resource and water demand management »

Access to water and sanitation

8. Support investment to halve by 2015 the proportion of the population without access to safe drinking water and sanitation, pursuant to the MDGs.

9. Strengthen regulations, where appropriate, and promote investment in wastewater treatment systems to prevent and reduce pollution from urban and industrial sources.

« Promoting sustainable urban development »

Improve the quality of life

"The treatment of municipal waste waters, in conformity with the provisions of the LBS Protocol to treat them all by 2025".

Targets

According to the Millennium Declaration, the target for the MDG Indicator Proportion of population using an improved sanitation facility is: To halve, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation (compared to 1990). Same target for the MSSD.

Related policy documents

- Millenium Development Goals Report 2012, United Nations, 2012.
- UNEP-MAP (2005). Mediterranean Strategy for Sustainable Development. Athens, MAP.

Policy Question(s)
Is access to improved sanitation system increasing?

Specific policy question (s) (if applicable)

Is access to improved sanitation system increasing in rural areas?

Methodology

Methodology for indicator calculation (including description of data used)

The indicator is computed as follows:

(A / P) x 100

A: Population having access to improved sanitation installations

P: Population

The ratio is expressed as percentage. The indicator is calculated for urban, rural and total (urban + rural) populations.

National definitions are most commonly based on size of locality, with rural population as the residual of population that is not considered urban. Reference to the geopolis database for MENA countries is made:

http://www.e-geopolis.eu

Data Sources

National sources :

Since the late 1990s, data have routinely been collected at (sub)national levels in more than 100 countries using censuses and surveys by national governments, often with support from international development agencies. Two data sources are common: administrative or infrastructure data that report on new and existing facilities, and data from household surveys including Multiple Indicator Cluster Surveys, Demographic and Health Surveys, and LSMS surveys. Before those population-based data were available, provider-based data were used. Rural and urban population statistics come directly from population censuses.

International sources :

At the national level, data are available in the MDG database:

http://mdgs.un.org/unsd/mdg/Default.aspx

Geographical coverage:

The geographical units are :

- Total population of entire country
- Urban population of country
- Rural population of country
- Total population of hydrological basin
- Urban population of hydrological basin
- Rural population of hydrological basin

Temporal unit

Annual

Temporal coverage

2003 onwards

Statistical aggregation per station and year

Basis for aggregation

Trend analysis

To be filled in later

Methodology for gap filling

Methodology references

- United Nations Development Group, 2003. Handbook for Indicators for Monitoring the Millennium Development Goals.
- Methodological sheets of the 34 priority indicators for the "Mediterranean Strategy for Sustainable development" Follow up. Plan Blue, 2006

Data specifications
Data references
External data references

Uncertainties
Methodology Uncertainty

- While access is the most reasonable indicator for sanitation facilities, it still involves severe methodological and practical problems, such as:
- Facility quality is not systematically addressed in surveys and censuses
- The definition of access to improved sanitation facilities and methods for assessing it are even more contentious than those for water, with national definitions of acceptable sanitation varying widely
- Excreta disposal systems are considered "improved" if they are private and if they separate human excreta from human contact. In practice, it is often hard to ascertain during a survey or a census which type of sanitation solution is considered improved or not. This leads to difficulties in comparing data from various sources.
- Owing to national differences in characteristics that distinguish urban from rural areas, the distinction between urban and rural population is not amenable to a single definition applicable to all countries.

Data sets uncertainty

- Data are not routinely collected by "the sector" but by others outside the sector as part of more general surveys, thus increasing risk of inconsistencies.
- The timing of collection and analysis of household survey data is irregular, with long intervals between surveys
- When data are from administrative sources, they generally refer to existing sanitation facilities, whether used or not. Evidence suggests that data from surveys are more reliable than administrative records and provide information on facilities actually used by the population. Household survey data are therefore generally preferred over administrative data, since survey data are based on actual use of facilities by the surveyed population rather than the simple existence of the facilities.
- There is no single definition which can be applied regionally as regards the distinction between "urban" and "rural" populations. National definitions most often refer to the size of locations. Rural populations represent the rest of the population considered as non-urban.

Rationale uncertainty

- The fact that facilities are available does not mean that they are used.

Further work

Medium-term work

Work description

Status

Deadline

Long-term work

Indicator Fact Sheet

4. Volume of wastewater collected, of which volume of wastewater treated

Additional information: Type of treatment

Draft Indicator Specification

Version: 2.0
Date: 29.11.2012

Version History

Version	Date	Author	Status and description	Distribution
	28.09.2012	**CS**	**Includes comments from PB and Eurostat (Joergen) worked in or as comment boxes**	
1.0	**17.10.2012**	**EEA/ETC**	**Includes comments after October 2nd Env. Ind. workshop**	**Countries for feedback**
2.0	**17.10.2012**	**EEA/ETC/UNEP-MAP**	**Includes comments from country consultation**	

Indicator Specification

Indicator Set	**Date: 29.11.2012** **Author (s) EEA/ETC, UNEP/MAP**
Indicator Title Volume of wastewater collected, of which volume of wastewater treated Additional information: Type of treatment	

Rationale
Justification for indicator selection (namely environmental context) The discharge of untreated wastewater directly in freshwater, coastal and marine environments causes enormous health concern. It also represents a significant pressure on aquatic ecosystems as wastewater carries high loads of nutrients (nitrogen and phosphorus), and pathogenic micro-organisms (including coliforms, faecal streptococcus, salmonella etc). In cities, sewage discharged directly into public sewerage systems generally contains a variety of chemical wastes originating from households and industrial installations. Substances such as total dissolved solids, ions (such as sodium, calcium, magnesium), organic compounds (such as phenols, pesticides, chlorinated hydrocarbons) and metals (cadmium, zinc, nickel, and mercury, etc) are particularly of concern due to their toxicity and their resistance to conventional wastewater treatment methods. The polluting effect of wastewater discharge is variable and largely dependent on the initial composition, quantity, level of treatment of the collected wastewater and composition of the effluent, and capacity of the receiving water bodies. The initial composition of wastewater depends on factors connected to the standard of living, weather conditions, water supply systems, water quantities available and composition of industrial wastes. In coastal communities, seasonal variations may be affected by tourism. In many countries, a large proportion of collected wastewater is discharged to the environment with little or no treatment. In the Mediterranean, the rate of wastewater collected and treated by public sanitation ranges from 7% to 90%. In the South Mediterranean, a significant portion of the collected wastewater is discharged either into internal waterways or into the sea without prior treatment (UNEP/MAP-Plan Bleu, 2009). Wastewater generation from coastal cities is one of the major pollution problems and is therefore recognized amongst the Horizon 2020 Initiative priority areas (reference to H2020 doc). In the Northern Mediterranean, the European Directive of 1991 on urban wastewater treatment, which prescribes as a minimum the secondary treatment for urban areas in excess 10,000 inhabitants, has contributed to the significant increase of the servicing of the population with wastewater treatment plants over the past two decades. This indicator assesses the potential level of pollution from domestic and industrial/ commercial point sources entering the aquatic environment, and monitors progress towards reducing this potential within a framework of integrated water resource management. It helps identify communities where wastewater treatment action is required to protect the ecosystem. It may also indicate which type of treatment has the largest potential: if a large portion is collected but not treated, than centralised treatment might be preferable. Conversely, if both wastewater treatment and its collection are still underdeveloped (as in many rural areas is the case), than decentralised treatment could be a better solution.

Scientific references

- UNEP/MAP-Plan Bleu, 2009. State of the Environment and Development in the Mediterranean, UNEP/MAP-Plan Bleu, Athens.
- Wastewater treatment UNCSD 1996
- Wastewater treatment coverage WHO EH indicators

Indicator definition

This indicator measures:

- Volume of municipal wastewater collected
- Total volume of wastewater effectively treated in wastewater treatment plants

Additional information

- Percentage of the treated wastewater according to the type of treatment (primary, secondary, tertiary)

The treatment of wastewater can be defined as the deliberate collection and sufficient alteration to allow for its discharge to the environment without adverse impact on public health and the ecosystem.

Units

- volume of municipal wastewater collected in million m^3 per year
- volume of municipal wastewater treated in wastewater plants in million m^3 per year

Additional information

- % wastewater treated by primary treatment ,
- % wastewater treated by secondary treatment,
- % wastewater treated by tertiary treatment

Policy context and targets

Policy context description

This indicator is linked to the Barcelona Convention LBS protocol and MSSD recommendations and chapters:

« Improving integrated water resource and water demand management »

Access to water and sanitation

8. Support investment to halve by 2015 the proportion of the population without access to safe drinking water and sanitation, pursuant to the MDGs.

9. Strengthen regulations, where appropriate, and promote investment in wastewater treatment systems to prevent and reduce pollution from urban and industrial sources.

« Promoting sustainable urban development »

Improve the quality of life

"The treatment of municipal wastewaters, in conformity with the provisions of the LBS Protocol to treat them all by 2025"

Targets

Agenda 21 recommends that quantitative and qualitative discharge standards for municipal and industrial effluents are established and applied by the year 2000.

In the European Union, the Urban Waste Water Treatment Directive (UWWTD; 91/271/EEC) aims to protect the environment from the adverse effects of urban wastewater discharges. It prescribes the level of treatment required before discharge and has to be fully implemented in the EU-15 countries by 2005 and in the twelve new Member States by 2008 - 2015. The Directive requires Member States to provide all agglomerations of more than 2 000 population equivalent (p.e.) with collecting systems and all wastewaters collected to be provided with appropriate treatment by 2005. Secondary treatment (i.e. biological treatment) must be provided for all agglomerations of more than 2 000 p.e. that discharge into fresh waters, while more advanced treatment (tertiary treatment) is required for discharges into sensitive areas. To help minimise pollution from various point sources, the Integrated Pollution Prevention and Control directive, which came into force 1996, has a set of common

rules on permitting for industrial installations. The achievements through the UWWTD and the IPPC directive have to be seen as an integrated part of objectives under the Water Framework Directive (WFD) which aim at a good chemical and biological status for all waters by 2015.

Related policy documents *(to be updated)*

- UNEP-MAP (2005). Mediterranean Strategy for Sustainable Development. Athens, MAP.
- WHO/UNEP-MAP-MEDPOL (2004).Municipal wastewater treatment plants in Mediterranean coastal cities (II). MAP Technical Report Series No 157. UNEP/MAP, Athens.
- UNEP/MAP-MEDPOL/WHO: Municipal wastewater treatment plants in Mediterranean coastal cities: inventory of treatment plants in cities of between 2,000 and 10,000 inhabitants. MAP Technical Reports Series No. 169, UNEP/MAP, Athens, 2008.
- Implementation of Council Directive 91/271/EEC of 21 May 1991 concerning urban wastewater treatment, as amended by Commission Directive 98/15/EC of 27 February 1998 (COM(2004) 248 final)
- Agenda 21. Chapter 18: Protection of the Quality and Supply of Freshwater Resources: Application of Integrated Approaches to the Development, Management, and Use of Water Resources.

Policy Question(s)
Is the purification of collected wastewater increasing?

Specific policy question (s) (if applicable)

Is the pollution of coastal water by the wastewater decreasing?

Methodology

Methodology for indicator calculation (including description of data used)

This indicator gives the volume of municipal wastewater collected by central sewerage system and the volume of municipal wastewater treated by the public sanitation system.

There are many types of wastewater collection systems (such as separated collection systems, in which rainwater and wastewater are discharged in separate conducts versus mixed collection systems, which discharge rainwater and wastewater in one conduct). In general, a collection system is located at or near the point of wastewater generation and is designed to receive one or more wastewater streams and then to direct these streams to treatment and/or storage systems.

The volume can be calculated for the urban areas and for the total area (hydrological basin and national).

Additional information

Type of treatment:

The volume of wastewater treated is the proportion of collected water that is returned to the environment according to criteria and standards that ensure no impact on the aquatic environment. Within this context, treatment can comprise a wide range of processes including simple screening, sedimentation, biological-chemical processes, or appropriately designed marine discharge. Here reference is made to primary (mechanical) treatment that removes part of the suspended solids, and secondary (biological) treatment that uses aerobic or anaerobic micro-organisms to decompose most of the organic matter and retain some of the nutrients (around 20 - 30 %). Tertiary (advanced) treatment removes the organic matter even more efficiently. It generally includes phosphorus retention and in some cases nitrogen removal. Primary treatment alone removes no ammonium whereas secondary (biological) treatment removes around 75 %.

Data Sources

National sources:

Data required include: meter readings from water authorities (in case that the volume of collected wastewater is estimated from the volume of water used by the population connected to the sewerage system); data on the capacity of the serviced area; and performance of wastewater treatment facilities; information from wastewater laboratories and number of house connections to the sewerage system. The data are available from national water authorities and water supply utilities, river basin/catchment authorities, municipal authorities, industry and field project evaluation reports.

International sources : MEDPOL

Geographical units:

This indicator can be calculated for:

- Entire country
- Hydrological basin

Temporal unit

Annual

Temporal coverage

2003 onwards

Statistical aggregation per station and year

Basis for aggregation

Trend analysis

To be filled in later

Methodology for gap filling

To be filled in later

Methodology references

- Agenda 21. Chapter 18: Protection of the Quality and Supply of Freshwater Resources: Application of Integrated Approaches to the Development, Management, and Use of Water Resources.

http://www.un.org/esa/sustdev/natlinfo/indicators/indisd/english/chapt18e.htm

- EEA CSI 024 (Urban waste water treatment) Indicator factsheet

http://www.eea.europa.eu/data-and-maps/indicators/urban-waste-water-treatment/

- Methodological sheets of the 34 priority indicators for the "Mediterranean Strategy for Sustainable development" Follow up. Plan Bleu, 2006.
- UNEP/ROWA, Regional Workshop on Priority Environmental Indicators 13 – 15 October 2003
- WHO, 2000. Environmental health indicators: Development of a methodology for the WHO European region

Data specifications
Data references
External data references

Uncertainties
Methodology Uncertainty

Data sets uncertainty Data is often not available, or is incomplete. Without surveys of individual industrial establishments or environmental impact assessments associated with new industrial developments, data will remain partial or, at best professional estimates.
Rationale uncertainty This indicator provides information on the degree of treatment but does not, however, deal with the level of treatment required to meet the requirements of specific ecosystems.

Further work
Medium-term work **Work description** **Status** **Deadline**
Long-term work

Indicator Fact Sheet

Nutrient concentrations in transitional, coastal and marine waters of the Mediterranean Sea

Draft Indicator Specification

Version: 0.4
Date: 5.10.2012

Version History

Version	Date	Author	Status and description	Distribution
0.3	**1.10.2012**	**MEDPOL**		
0.4	**5.10.2012**	**MEDPOL**		

Indicator Specification

Indicator Set	**Date: 05.10.2012** **Author (s)** MED POL
Indicator Title Nutrient concentrations in transitional, coastal and marine waters of the Mediterranean Sea	

Rationale

Justification for indicator selection (namely environmental context)

The water quality in transitional and coastal regions could be adversely affected by anthropogenic activities, such as the discharge of untreated sewage, the application of agricultural fertilizers and animal waste, and atmospheric deposition of airborne emissions from shipping and combustion processes. These activities may result in elevated nutrient (nitrogen and phosphorus) concentrations, leading to eutrophication and causing a chain of undesirable effects, including changes in species composition and functioning (such as diatom to flagellate ratio, benthic to pelagic shifts, bloom events of nuisance/toxic algal blooms), reduced water transparency due to an increase in suspended algae, oxygen depletion and noxious odour due to the decay of organic material. The main nutrients causing eutrophication are nitrogen (in the dissolved form of nitrate, nitrite and ammonium) and phosphorus (in the dissolved form of ortho-phosphate that is directly taken up by algae). Since nitrogen and phosphorus may also be bound to sediment particles in organic and inorganic forms with the possibility of returning to the dissolved state, the particulate and organic forms also have to be taken into account. Silicate is essential for diatom growth, but it is assumed that its input is not significantly influenced by human activity.

The Mediterranean Sea is one of the most oligotrophic (poor in nutrients) oceanic systems and is characterised by an eastwards longitudinal gradient in oligotrophy. This is due to the exchange between the outflowing deep, relatively nutrient-rich water to the Atlantic and the inflow of superficial, nutrient-poor Atlantic water through the Gibraltar Strait. Another specific characteristic is the high Redfield ratio (N/P ratio), with values ranging from 21 to 27, as compared to the typical ratio of ~ 16 measured in other oceans. This implies that phosphorus is the most important limiting nutrient in the Mediterranean.

Although the main body of water of the Mediterranean is characterized by very low nutrient concentrations, some coastal hotspots receive excessive loads of nutrients from sewage effluents, river fluxes, aquaculture farms, fertilizers, and industrial facilities, showing intense eutrophic phenomena with adverse effects for the marine ecosystem and humans. Local productivity is the result of a combination of factors including solar radiation, concentration of nutrients or nutrient gradients in the water column, prevailing meteorological and hydrodynamic conditions. This explains why eutrophication in the Mediterranean is mostly limited to coastal areas, enclosed bays, river estuaries, coastal lagoons or embayments with restricted water exchange with the open sea. Although eutrophication has been more intense in the Northern part of the basin, special attention also has to be paid to the Southern part where the population keeps on growing steadily, agricultural and industrial activities are in rapid development and national legislation is less effective in controlling nutrient enrichment.

Scientific references

To be revised later

- M. A. R. Abdel-Moati (1997), Industrial dumping impact on oxygen and nitrogen fluxes in Abu Qir Bay, Southeastern Mediterranean Sea, Environment International, Volume 23, Issue 3, Pages 349-357.

- G. Arhonditsis, G. Tsirtsis, M. O. Angelidis and M. Karydis (2000), Quantification of the effects of nonpoint nutrient sources to coastal marine eutrophication: applications to a semi-enclosed gulf in the Mediterranean Sea, Ecological Modelling, Volume 129, Issues 2-3, Pages 209-227.
- G. Arhonditsis, G. Tsirtsis and M. Karydis (2002), The effects of episodic rainfall events to the dynamics of coastal marine ecosystems: applications to a semi-enclosed gulf in the Meditteranean Sea, Journal of Marine Systems, Volume 35, Issues 3-4, Pages 183-205.
- M. Astraldi, F. Conversano, G. Civitarese, G. P. Gasparini, M. Ribera d'Alcalà and A. Vetrano (2002), Water mass properties and chemical signatures in the central Mediterranean region, Journal of Marine Systems, Volumes 33-34, Pages 155-177.
- Y. Azov (1991), Eastern Mediterranean--a marine desert?, Marine Pollution Bulletin, Volume 23, Pages 225-232.
- Jean P. Béthoux, Pascal Morin and Diana P. Ruiz-Pino (2002), Temporal trends in nutrient ratios: chemical evidence of Mediterranean ecosystem changes driven by human activity, Deep Sea Research Part II: Topical Studies in Oceanography, Volume 49, Issue 11, Pages 2007-2016.
- J. P. Béthoux, P. Morin, C. Chaumery, O. Connan, B. Gentili and D. Ruiz-Pino (1998), Nutrients in the Mediterranean Sea, mass balance and statistical analysis of concentrations with respect to environmental change, Marine Chemistry, Volume 63, Issues 1-2, Pages 155-169.
- J. P. Bethoux and B. Gentili (1996), The Mediterranean Sea, coastal and deep-sea signatures

Indicator definition

Main indicator definition

This indicator refers to the levels and trends in: nitrate, nitrite, ammonium and ortho-phosphate concentration in transitional, coastal and marine waters of the Mediterranean Sea.

NO3

Nitrate is a chemical entity naturally existing in the environment. Other forms in which nitrogen may be made available in the environment are nitrite, ammonium, organic nitrogen, etc. Nitrate, however, is the most stable form in oxidised marine environments. Elemental nitrogen (gas), present everywhere in the atmosphere and dissolved in the seawater, may be converted to one of the other forms by micro-organisms in the nitrogen-fixation process andthe reverse is also true, nitrate and other forms of nitrogen may be converted into elemental nitrogen through denitrification.

NO2

Nitrite is a chemical entity naturally existing in the environment contributing, as a source of Nitrogen, to the maintenance of the ecosystem. Although free nitrite is toxic to all kinds of higher organisms, marine plants can take it up and some micro-organisms can transform it onto nitrate, ammonium or even nitrogen gas. Nitrite will, eventually, end up contributing to the production of particulate organic matter (POM) and/or dissolved organic matter (DOM).

NH4

Ammonium is a chemical entity naturally existing in the environment contributing, as a source of Nitrogen, to the maintenance of the ecosystem. Ammonium is excreted by many organisms, particularly those constituting the zooplankton, and marine plants can take it up even more readily than nitrate or nitrite. Some micro -organisms can transform it onto nitrite, nitrate or even nitrogen gas. Ammonium will, eventually, end up contributing to the production of particulate organic matter (POM) and/or dissolved organic matter (DOM).

o-PO4

Orthophosphate is a chemical entity naturally existing in the environment of great importance for the maintenance of the ecosystem since it is required by marine plants and other microorganisms for the production of particulate organic matter (POM) and, eventually, dissolved organic matter (DOM). The Mediterranean Sea has very peculiar conditions when compared to the world's oceans for having one order of magnitude lower concentrations in the intermediate and deep waters. The Mediterranean Sea also has a higher than normal N/P ratio which makes this sea possibly P-limited instead of N-limited as is considered normal for most oceanic waters

Sub-indicator definition

The indicator refers to the levels and trends in total nitrogen and total phosphorus concentration in the coastal waters of the Mediterranean Sea.

Total nitrogen (TN) comprises the ions nitrate, nitrite and ammonium in the dissolved phase (DIN) and the organic forms of nitrogen (mostly proteins and other N-containing substances) existing in biota and other particulate materials (PON) and in dissolved organic matter (DON).

Total nitrogen is not a chemical entity but the methodological addition of the nitrogen equivalent of a number of nitrogen-containing substances. Total nitrogen would comprise the ions nitrate, nitrite and ammonium in the dissolved phase (DIN) and the organic forms of nitrogen (mostly proteins and other N-containing substances) existing in biota and other particulate materials (PON) and in dissolved organic matter (DON).

Total phosphorus (TP) comprises the dissolved ion phosphate and the organic forms of phosphorus existing in biota and other particulate materials (POP) and in dissolved organic matter (DOP).

Units of main indicators

- Concentrations in micromol/l

Units of sub-indicators

- Concentrations in micromol/l

Policy context and targets

Policy context description

Various national and international authorities have taken legal and administrative measures to mitigate eutrophication trends in the area, in addition to monitoring. The Mediterranean environment is a good paradigm of integration of extensive legal framework, scientific knowledge and administrative practices. The Barcelona Convention, the Mediterranean Action Plan, and European Union Directives on water quality and coastal management, together with scientific information derived from international research programs in the Mediterranean, provide a sound background for practical actions in eutrophication problems.

In 1985, the Contracting Parties to the Barcelona Convention and its LBS Protocol adopted **The Genoa Declaration**. Amongst the targets approved, one of the priorities was the establishment of sewage treatment plants in all cities around the Mediterranean Sea with more than 100,000 inhabitants and appropriate outfalls and appropriate treatment plants for all cities with more than 10,000 inhabitants. This important target was further agreed in the framework of the Strategic Action programme to combat pollution from land based sources in the Mediterranean (SAP MED) adopted in 1997 by the Contracting parties. In addition, the Contracting Parties in the same framework committed to reduce 50% the nutrient inputs from industrial sources to the Mediterranean sea area by 2010 as well as reduce nutrient inputs from diffuse sources (agriculture and aquaculture) into areas they are likely to cause pollution.

In 2009 the Contracting parties adopted the Regional plan (legally binding measures, programmes and timeframes based on Article 15 of the LBS Protocol) with regard to BOD emissions from municipal waste water treatment plants according to which the parties shall ensure that all agglomerations (of more than 2000 p.e and or with economic activities sufficiently concentrated for urban waste water to be collected and treated) to collect and treat their urban wastewaters before discharging them into environment (mainly primary and secondary treatment).

Targets

The most pertinent regional and national targets with regard to concentrations of nutrients in water arises from the implementation in the Mediterranean will be determined in the framework of UNEP/MAPEcosystem approach roadmap implementation as well as where appropriate in the framework of the EU Water Framework (WFD) and Marine Strategy (MSFD) Directives, where one of the environmental objectives is to achieve good ecological status. The EU Member States have defined water-type specific environmental standards to support the achievement of good ecological status. However there is no yet any agreement of thresholds for nutrients in the WFD for the respective Mediterranean countries (EU member states).

As natural and background concentrations of nutrients vary between and within the regional seas, and between types of coastal water bodies, nutrient targets or thresholds for achieving good ecological status have to be determined while taking into account local conditions.

Within the scope of the UNEP/MAP Ecosystem approach that is implemented in synergy with the MSFD, nutrient levels (nutrient concentrations in the water column and nutrient ratios for nitrogen, phosphorus and silica, where appropriate), are the relevant indicators in marine waters under

Ecological objective: Human-induced eutrophication. The assessment of eutrophication in marine waters needs to combine information on nutrient levels as well as a range of ecologically relevant primary effects and secondary effects, taking into account relevant temporal scales. The nutrient targets and thresholds for achieving good environmental status have not been defined yet and are currently under negotiation by the Contracting parties.

Related policy documents

- UNEP/MAP SAP MED, 1997
- Regional Plan on BOD from Waste water treatment plants,2009
- Karydis M, Kitsiou D. (2012) Eutrophication and environmental policy in the Mediterranean Sea: A review. Environ Monit Assess. 184(8): 4931-84.
- *Commission Staff Working Paper concerning the relationship between the initial assessment of marine waters and the criteria for good environmental status (SEC(2011) 1255 final)*
- *Commission Decision 1 September 2010 on criteria and methodological standards on good environmental status of marine waters (notified under document C(2010) 5956) (2010/477/EU)*
- *Policy Summary of Guidance document No. 23 on Eutrophication assessment in the context of European water policies. Common Implementation Strategy for the Water Framework Directive (2000/60/EC) Technical Report 2009-039*
- *Water Framework Directive (WFD) 2000/60/EC: Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy.*
- *Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean.*
- *Council Directive of 8 December 1975 concerning the Quality of Bathing Water (76/160/EEC)*

Policy Question(s)
Are elevated nutrient concentrations in coastal waters decreasing?

Specific policy question (s) (if applicable)

Methodology

Methodology for indicator calculation (including description of data used)

Main indicators

Determination of Nitrate:
The test for determination of nitrate in seawater (and fresh water as well) consists of a standard photometric technique based on the reduction of nitrate to nitrite with copperised cadmium and then formation of a dye with sulphanilamide and nafthyl-ethylene-diamine. The second step also reacts with nitrite. Usually, nitrite is determined separately by the same technique without the reducing step although, often, the parameter Nitrate includes Nitrite as well. The precision of this technique is very high; however, concentrations in surface waters may be near detection level.

Determination of Nitrite:
The test for determination of nitrite in seawater (and fresh water as well) consists in a standard photometric technique based on the formation of a dye with sulphanilamide and nafthyl-ethylene-diamine. If the procedure starts with the reduction of nitrate, both ions are quantified together. Sometimes, nitrite is determined separately from nitrate although, often, the parameter Nitrate includes Nitrite as well. The precision of this technique is very high; however, concentrations in deeper waters may be near detection level.

Determination of Ammonia:
The test for determination of ammonium in seawater (and fresh water as well) consists of a standard photometric technique based on the formation of an indophenol dye. The precision of this technique is relatively high; however, concentrations in open sea waters may be near detection level. The technique is subject to laboratory contamination if proper working conditions are not kept.

Determination of Ortho-phosphate
Standars methods are available. The test for determination of orthophosphate in seawater (and fresh water as well) consists in a standard specific photometric technique based on the reduction of molybdate to molybdenum blue. The precision of this technique is very high, however, concentrations in surface waters are near its detection level.

Sub-indicators

Determination of Total Nitrogen:
The test for determination of total nitrogen in seawater (and fresh water as well) consists in the digestion of the unfiltered sample followed by Kjeldahl (ammonium) or, after oxidation, by the standard photometric technique used for analysis of nitrate. Alternatively, filtering through glass fiber filters allows the concentration of PN which will be submitted to digestion, while the filtrate would be oxidised and submitted to the nitrate analysis. The precision of these techniques is high; however, concentrations in surface waters may be near detection level.

Other nitrogen ions and fractions may be analysed, depending on whether the aliquot of water has been previously filtered and/or digested:

- Dissolved organic Nitrogen (DON)
- Total Dissolved Nitrogen (DN)
- Particulate organic Nitrogen (PON)

From an environmental point of view, the state in which the nutrient is present in the effluent is quite irrelevant, since the transit from one form to another is readily carried out by one or other kind of the

omnipresent micro-organisms. It should be noted that the transformation of organic onto inorganic nutrients (also ammonium onto nitrate) are oxygen-consuming processes dealt with in the BOD test and the particulate form will also contribute to turbidity dealt with elsewhere. No atmospheric deposition of nutrients is monitored by the mediterranean countries. The monitoring of nurients and BOD from municipal wastewater treatment plants have been discontined, so no data are available. However, information on nutrients loads from municipal and industrial sources are available from the NBB database. In addition the 2009 Regional Plan creates the legal basis for establishing a solid and continuous monitoring programme in the near future of municipal waste water quality with regard to BOD content.
From a purely technical point of view, it should be stressed that all analytical procedures and techniques should be subject to inter-calibration and quality control protocols.

Determination of Total Phosphorus:
The test for determination of total phosphorus in seawater (and fresh water as well) consists in the oxidation to phosphate, which is then determined by standard photometric technique.

Data Sources

Data are generated from the national monitoring programme of the countries in coastal waters

Geographical coverage

- With regard to the atmospheric deposition, there is no regular monitoring. Four locations, two coastal locations in Croatia and another two in Israel with references to other locations in the Mediterranean Sea were included in the research project reported.
- The entire Mediterranean coastal area was covered by the Municipal wastewater survey. It refers mainly to monitoring the areas at vicinity of pollution sources.

Geographical units

Local scale, because data are generated from the national monitoring programme of the countries in coastal waters

Temporal coverage

2006-2011 (to be confirmed)

For some areas, data series exist since 1998. However, there are several countries that do not regularly report on nutrient.

Temporal unit: In the current methodology of EEA CSI 021 winter nutrient concentrations for all sea regions are monitored currently under refinement of the temporal unit per sea region. In UNEP/MAP MEDPOL monthly measurements; in case of difficulties 4 samples per year (seasonal) are taken.

Statistical aggregation per station and year

There is no agreement in MEDPOL on this issue. Yearly mean may be an option. However it has to be discussed and agreed by country experts.

Basis for aggregation

To be filled in later

Trend analysis
EEA uses the Mann-Kendall test to compute trends, for which 5 or more years for each station are

required. In UNEP/MAP it has to be agreed by experts.
Methodology for gap filling
Methodology references

Data specifications
Data references
External data references

Uncertainties
Methodology Uncertainty
Data sets uncertainty According to UNEP/MAP MEDPOL data, there is not a statistically significant trend (increasing or decreasing) of nutrients concentrations in coastal water. However, data points are not evenly distributed along the Mediterranean coastline, resulting in important geographical gaps in the available information.
Rationale uncertainty

Further work
Medium-term work **Work description** **Status** **Deadline**
Long-term work

Indicator Fact Sheet

Release of toxic substances and nutrients from industrial sectors

Draft Indicator Specification

Version: 0.4
Date: 5.11.2012

Version History

Version	Date	Author	Status and description	Distribution
0.2	2.10.2012	MEDPOL		
0.3	5.10.2012	MEDPOL		
0.4	5.11.2012	MEDPOL		

Indicator Specification

Indicator Set	**Date: 05.10.2012** **Author (s)** MED POL
Indicator Title Release of toxic substances and nutrients from industrial sectors	

Rationale

Justification for indicator selection (to be further developed)

This indicator represents the emissions from industrial sources from individual facilities within the Mediterranean coastal zone with regard to

1. Nutrients and oxygen depleting substances.
2. Hydrocarbons.
3. Halogenated hydrocarbons.
4. Heavy metals.
5. Other organic compounds.

CATEGORIES	SUBSTANCES
Nutrients and oxygen depleting substances	BOD5, Total nitrogen, Total phosphorus
Hydrocarbons	PAH (gas), VOC
Halogenated hydrocarbons	PCDD/PCDF (gas)
Heavy metals	Cadmium (gas), Chromium (g, liq), Lead (gas, liq), Mercury (gas)
Other organic compounds	Phenols

1. BOD/COD

Ordinary sea water contains low or very low concentrations of organic matter either in soluble (DOM) or particulate (POM) forms and near-saturation dissolved oxygen (DO) concentrations. The amount of organic matter (autochthonous) that can possibly be synthesized on the basis of the nutrient concentrations present in any sea area is always less than would be required for consumption of the oxygen dissolved in such water. However, when additional nutrients or organic matter (allochtonous) are carried out by rivers or effluents to a coastal area (or confined sea), the respiratory processes may well upset the above-mentioned equilibrium initiating the process of ***eutrophication***. Discharges of high-BOD/COD waters to the coastal environment should therefore be restricted unless a sufficiently high degree of dispersion is guaranteed by the outfall to avoid accumulation of POM in its surroundings and assure that DOM/POM concentrations in the water column will be lower than the DO at saturation. An excessive load of dissolved or particulate organic matter may lead to the generation of hypoxic or anoxic environments shifting the system from being oxygen-controlled to be sulphur-controlled with the appearance of nasty smelling hydrogen sulphide and toxic sulphides for the biota. BOD/COD are among the most representatives pollutants reported in the Mediterrenan by most of the Mediterranean countries in both inventories carried out in 2003 and 2008.

2. Nutrients (Total N and P)

Nutrients consist of simple inorganic molecules containing nitrogen, phosphorus, silicon and other minor or trace elements such as iron, molybdenum, etc, indispensable for the production of mainly plant material through the photosynthetic process. Other, mostly carbon-containing, substances utilised by bacteria and other micro-organisms for their heterotrophic development, are also considered nutrients. In the present context, only the inorganic nutrients are considered although they may be constitutive of organic matter either in dissolved (DON, DOP, etc) or particulate (PON, POP) form.

Nutrients, being chemical entities naturally existing in the environment, can only be considered as pollutants when their loads are in excess of the receiving capacity of the systems. Since they are taken up by marine plants and other micro-organisms, they may contribute to the production of particulate organic matter (POM) and, eventually, dissolved organic matter (DOM). Therefore, nutrients may contribute to the production of BOD. If discharged through proper diffusing devices in areas without important circulation restrictions, nutrients should not be of great concern. The seawater is a large reservoir of nutrients cycling with the global hydrological cycle (Conveyor Belt). Nutrients alternate between the dissolved inorganic and organic forms by virtue of the two major opposing biogeochemical processes: photosynthesis and metabolic oxidation. Nutrients flow to the illuminated upper layers of the sea (euphotic zone) mainly by advection and turbulent diffusion, i.e. by transport of water and of dissolved/dispersed materials from greater depths by virtue of the existing vertical gradients and the kinetic/turbulent energy-driven motions.

Local productivity is thus the result of a combination of factors that include prevailing meteorological and hydrodynamic conditions, solar radiation and existence of nutrients or nutrient gradients in the water column, all parameters subject to strong seasonal and regional variability. Part of the organic material resulting from the photosynthetic activity will be metabolically oxidised within a relatively small distance of the place in which it was produced, thus generating a small cycle, often known as the microbial loop, regenerating nutrients that will be re-used within or near the place of "first" utilisation. The remaining of the organic material produced will be metabolised at greater depths entering the global cycle of remineralisation of carbon, nitrogen, phosphorus, etc.

When sources of nutrients external to the marine system add a surplus of productivity, various phenomena may occur depending, among other, on the relative proportion of external to internal nutrient loads and also on the proportion of organic material being regenerated on the spot or exported to greater depths and/or distances. Though the production of supplementary organic material may seem, per se, a favourable process for typically oligotrophic environments such as the Mediterranean Sea in general, the overall assessment will have to take into account the resulting effects on the ecosystem receiving the discharges. It also depends on whether the source is a point or diffuse one.

Atmospheric nutrient deposition to the Mediterranean Sea has been estimated at $0.3 – 4$ $g.m^{-2}.yr^{-1}$ for nitrogen and $0.01 – 0.02$ $g.m^{-2}.yr^{-1}$ for phosphorus (MTS #133), values comparable to the N and P exported through Gibraltar with the Mediterranean out flowing waters. However, the diffuse atmospheric deposition does not generate any significant increase in fertility except when a heavy rainfall event may trigger the development of short-lived surface phytoplankton blooms.

On the other hand, effluent discharge of nutrients to the marine environment, either directly or through rivers, has the effect of promoting the photosynthetic uptake and the production of organic matter in a limited area thus having a significant effect on the receiving waters.

One of the most striking rules applying to the oceanic nutrient concentrations in their cycling is the Redfield principle by which N-Nitrate and P-Phosphate concentrations maintain a precise ratio of about 16 when expressed in molar form. This ratio seems to be controlled, in the biogeochemical sense, by the average composition of the marine organisms though this is subject to space and time variations at scales below those of the oceanic cycles. By extension, a similar ratio is also applied to other elements such as Carbon and Oxygen.

Weather of urban, agricultural or industrial origin effluents always contain important nutrient loads that, unless properly disposed of, may lead to eutrophication with discolouration of waters, reduced transparency, unsightliness and impairing recreation. The most serious manifestations of this phenomenon are appearance of algal blooms (red tides), algal scum, enhanced benthic algal growth and, at times, a massive growth of submersed and floating macrophytes that may choke shallow channels, lagoons and estuaries impairing fishery and navigation.

When aging, the organic material produced as a consequence of nutrient discharges decays through complex microbial activity, consuming and, in serious cases depleting, the limited oxygen reserve of

the water causing an array of secondary problems such as mortality, formation of undesirable substances such as CH4, H2S, NH3, organic acids, toxins, etc, many of which produce intense noxious odour.

Discharge of nutrients to the marine environment may also upset the balanced proportions of naturally occurring nutrients thus creating additional ecological problems like the production of extra cellular materials such as polysaccharides or muco-polysaccharides (mucilage). The N/P ratio in atmospheric deposition is clearly unbalanced towards a greater N load than required by the P deposition thus favouring the high N/P ratio observed in Mediterranean Sea waters, more in the Eastern than in the Western basin. The same is true of N/P in river and in effluent waters.

3. Halogenated hydrocarbons (PCB, PCDD/PCDF)

Halogenated hydrocarbons are amongst the most toxic and persistent substances reaching the marine and coastal environment through point and diffuse sources. Although levels of DDT, PCBs and congeners are decreasing worldwide, scarcity of data do not allow a proper assessment to be made. PCB, PCDD/PCDF are among the most representatives pollutants reported in the Mediterrenan by most of the Mediterranean countries in both inventories carried out in 2003 and 2008.

PCBs are a group of synthetic organic chemicals that can cause a number of different harmful effects. There are no known natural sources of PCBs in the environment. Because they don't burn easily and are good insulating materials, PCBs were used widely as coolants and lubricants in transformers, capacitors, and other electrical equipment. PCBs are either oily liquids or solids and are colourless to light yellow. Some PCBs are volatile and may exist as a vapour in air. They have no known smell or taste. PCBs enter the environment as mixtures containing a variety of individual chlorinated biphenyl components, known as congeners, as well as impurities. Consumer products that may contain PCBs include old fluorescent lighting fixtures, electrical devices or appliances containing PCB capacitors made before PCB use was stopped, old microscope oil, and old hydraulic oil. Before the ban, PCBs entered the air, water, and soil during their manufacture and use. Wastes that contained PCBs were generated at that time, and these wastes were often placed in landfills. PCBs also entered the environment from accidental spills and leaks during the transport of the chemicals, or from leaks or fires in transformers, capacitors, or other products containing PCBs. Today, PCBs can still be released into the environment from poorly maintained hazardous waste sites that contain PCBs; illegal or improper dumping of PCB wastes, such as old transformer fluids; leaks or releases from electrical transformers containing PCBs; and disposal of PCB-containing consumer products into municipal or other landfills not designed to handle hazardous waste. PCBs may be released into the environment by the burning of some wastes in municipal and industrial incinerators. Once in the environment, PCBs do not readily break down and therefore may remain for very long periods of time. They can easily cycle between air, water, and soil. For example, PCBs can enter the air by evaporation from both soil and water. In air, PCBs can be carried long distances and have been found in snow and sea water in areas far away from where they were released into the environment, such as in the arctic. As a consequence, PCBs are found all over the world.

In general, the lighter the type of PCBs, the further they may be transported from the source of contamination. PCBs are present as solid particles or as a vapor in the atmosphere. They will eventually return to land and water by settling as dust or in rain and snow. In water, PCBs may be transported by currents, attach to bottom sediment or particles in the water, and evaporate into air. Heavy kinds of PCBs are more likely to settle into sediments while lighter PCBs are more likely to evaporate to air. Sediments that contain PCBs can also release the PCBs into the surrounding water. PCBs stick strongly to soil and will not usually be carried deep into the soil with rainwater. They do not readily break down in soil and may stay in the soil for months or years; generally, the more chlorine atoms that the PCBs contain, the more slowly they break down. Evaporation appears to be an important way by which the lighter PCBs leave soil.

As a gas, PCBs can accumulate in the leaves and above-ground parts of plants and food crops. PCBs are taken up into the bodies of small organisms and fish in water. They are also taken up by other animals that eat these aquatic animals as food. PCBs especially accumulate in fish and marine

mammals (such as seals and whales) reaching levels that may be many thousands of times higher than in water. PCB levels are highest in animals high up in the food chain.

4. Polychlorinated dibenzo-dioxins (PCDDs) and Polychlorinated dibenzo-furans (PCDFs)
Dioxins' is a collective term, referring to a number of specific polychlorinated dibenzo-p-dioxins and dibenzofurans. PCDD/PCDF(gas) are among the most representatives pollutants reported in the Mediterrenan by most of the Mediterranean countries in both inventories carried out in 2003 and 2008. Dioxins and furans (PCDD, PCDF) are a group of toxic chemicals classified as persistent organic pollutants (POPs) that persist in the environment, bioaccumulate through the food chain and pose a risk of causing adverse effects to human health and the environment. They can cause impairment of the immune system, the nervous system, the endocrine system and the reproductive functions and are also suspected of causing cancer.

Hydrocarbons

5. Volatile Organic Compounds (VOC)
A VOC is any organic compound having an initial boiling point less than or equal to 250 °C measured at a standard atmospheric pressure of 101.3 kPa and can do damage to visual or audible senses. VOCs are numerous, varied, and ubiquitous. They include both human-made and naturally occurring chemical compounds. Some VOCs are dangerous to human health or cause harm to the environment. Anthropogenic VOCs are regulated by law, especially indoors, where concentrations are the highest. Harmful VOCs are typically not acutely toxic, but instead have compounding long-term health effects. VOC are among the most representatives pollutants reported in the Mediterrenan by most of the Mediterranean countries in both inventories carried out in 2003 and 2008

6. Polycyclic aromatic hydrocarbons (PAH)
PAH are a large group of compounds, they consist of two or more fused aromatic rings made entirely from carbon and hydrogen. The physical and chemical properties of the individual PAH vary. Most important industrial sources include cokeries, primary aluminium production (in particular plants using the Soderberg process) and wood preservation. As the industrial sources are being increasingly regulated; in addition improved energy management this is leading to improved combustion. PAH(gas) are among the most representatives pollutants reported in the Mediterrenan by most of the Mediterranean countries in both inventories carried out in 2003 and 2008

7. Heavy metals (to be further developped)
Heavy metals are ubiquitous in the environment and occur naturally in rock-forming and ore minerals. Consequently there is a range of normal background concentrations of these elements in soils, sediments, waters and living organisms.

A great number of them, like copper, iron, zinc and possibly aluminium and selenium are essential for life however, they reach the marine environment from an array of anthropogenic sources as well as from natural geochemical processes like land erosion and volcanic activity.

A number of elements in this group are required by most living organisms in small but critical concentrations for normally healthy growth. These essential metals include Al, Co, Cr, Cu, Fe, Mn, Sn and Zn. Under certain conditions, however, they can bio accumulate to toxic concentrations and cause ecological damage.

These elements are consistently present in the environment. The background concentrations though, meaning the concentrations of metals that occur in the environment in situations that have not been influenced by anthropogenic emissions or by unusual natural exposures, differ between elements.

Arsenic usually occurs as compounds with sulphur either alone or in combination with metals. The toxicity of arsenic depends very much upon the nature of the compound it forms and particularly its valence.

Cadmium is highly toxic and accumulates in the mammalian kidney causing kidney dysfunction. Cd is closely related to zinc and will be found wherever zinc is found in nature. Zinc is an essential metal for most life forms thus it is probable that no naturally occurring material will be completely free from cadmium.

Lead is a cumulative toxin in the mammalian body and toxic concentrations can accumulate in the bone marrow, where red blood corpuscle formation occurs. Like Hg, lead is a powerful neurotoxin and a range of pathological conditions are associated with acute Pb poisoning, most characteristic of which is cerebral oedema. Zn has a relatively low toxicity to animals and humans. Arsenic, cobalt, mercury, lead and selenium can be methylated in the environment through the action of enzymes secreted by micro organisms and also by abiotic chemical reactions. However, consideration of total quantity of a metal in the organisms' tissues gives little information about its potential toxicity.

Copper is plentiful in the environment and essential for the normal growth and metabolism of all living organisms. Despite the existence of a number of detoxifying and storage systems for copper, it is the most toxic metal after mercury and silver to a wide spectrum of marine life. It often accumulates and could cause irreversible harm to some species at concentration just above levels required for growth and reproduction. Copper levels can increase markedly in coastal areas where there is runoff from the land. Bioavailability and toxicity of copper to aquatic organisms depends on the total concentration of copper and its speciation. Elevated concentrations of copper interfere with oxygen transport and energy metabolism. In animals, copper interacts with essential trace elements such as iron, zinc, molybdenum, manganese, nickel and selenium and also with nonessential elements like silver, cadmium, mercury and lead. These interactions could be either beneficial or harmful to the organism.

Zinc is a commonly occurring trace-metal and is essential to living organisms for enzymatic functions. High levels of zinc are found in coastal areas but biota, dispersion and diffusion can rapidly remove zinc. Heavy metals are among the most representatives pollutants reported in the Mediterrenan by most of the Mediterranean countries in both inventories carried out in 2003 and 2008 in particular Cd (gas),Hg (g), Chr(liq and gas), Lead(liq and gas), Zn (liq), As(gas), Copper (gas).

Scientific references *To be completed at a later stage*

Indicator definition

Main indicator definition

BOD&COD

This indicator presents information on the BOD/COD estimate of effluent discharged from the urban/agricultural effluents collected by the hydrologic network that end up in the rivers. Due to the very irregular flow of the Mediterranean rivers, they are more vulnerable to organic pollution, particularly in the dry season, when even small amounts of urban and/or agricultural waste waters may be sufficient to cause environmental problems within the rivers and also in the coastal zone.

Nutrients

This indicator presents information on releases to water of total nitrogen and phosphorus reported from industrial facilities in the coastal zone of the Mediterranean Sea.

Total nitrogen (TN) comprises the ions nitrate, nitrite and ammonium in the dissolved phase (DIN) and the organic forms of nitrogen (mostly proteins and other N-containing substances) existing in biota and other particulate materials (PON) and in dissolved organic matter (DON).

Total phosphorus (TP) comprises the dissolved ion phosphate and the organic forms of phosphorus existing in biota and other particulate materials (POP) and in dissolved organic matter (DOP).

Halogenated Hydrocarbons

Polychlorinated biphenyls (PCBs). The PCBs have been used in a wide variety of manufacturing

processes, especially as plasticizers, insulators and fire retardants. They are widely distributed in the environment through inappropriate handling of waste material, leakage from large condensers or hydraulic systems, and other sources. No natural sources are known. Their toxic effects are well documented.

The number of possible PCB congeners is 209, having one to ten chlorine atoms. Twenty of these congeners have non-ortho chlorine substitutions, and so can attain a co-planar structure, similar to the highly toxic polychlorinated dibenzo-p-dioxins and dibenzofurans. Metabolites like methylsulfonyl-PCB have also been detected.

Dioxins and furans (PCDD, PCDF)

This indicator presents information on dioxin emissions reported from point sources in the Mediterranean Sea area.

PAH
This indicator presents information on PAH annual emissions reported from point sources in the Mediterranean Sea area (land based sources/coastal zone)

VOC
This indicators presents information on VOC annual emissions reported from point sources in the Mediterranean Sea area (land based sources/coastal zone)

Heavy metals

Heavy metals are a general collective term applying to the group of metals and metalloids with an atomic density greater than 6 g/cm3. Although it is only a loosely defined term it is widely recognized and usually applied to the elements such as Cd, Cr, Co, Cu, Fe, Hg, Ni, Pb and Zn which are commonly associated with pollution and toxicity problems.

An alternative, theoretically more acceptable, name for this group of elements is "Trace Metals" but is not as widely used. In addition, a number of other lighter elements such as aluminium (Al) arsenic (As) and selenium (Se) have most frequently been associated with toxicity from environmental exposures.

This indicator presents information on heavy metal annual emissions reported from point sources in the Mediterranean Sea area (land based sources/coastal zone)).

Units of main indicators
The indicators are defined in terms kg (TEQ) emissions per year per contaminant

Policy context and targets

Policy context description
The objective of indicators is to convey the levels and trends of hazardous substances inputs and concentrations in the Mediterranean Sea.

Measures to reduce fluvial inputs, direct discharges and atmospheric deposition of heavy metals and to protect the marine environment from these hazardous substances are being taken as a result of various initiatives taken on different levels.

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 identified contaminants or groups of contaminants whose dumping or land-based discharges are prohibited or limited (Barcelona Convention and Protocols).

In particular, the Strategic Action Programme, adopted by the Contracting Parties to the Barcelona

Convention in 1997 contains several obligations for the countries to reduce pollution from different sectors and substances.

In 2009 and 2012 the Contracting parties adopted several Regional plans (legally binding measures, programmes and timeframes based on Article 15 of the LBS Protocol)

1. Regional Plan on the reduction of BOD5 from urban waste water in the framework of the implementation of Article 15 of the LBS Protocol (2009)
2. Regional Plan on the elimination of Aldrin, Chlordane, Dieldrin, Endrin, Heptachlor, Mirex and Toxaphene in the framework of the implementation of Article 15 of the LBS Protocol (2009)
3. Regional Plan on the phasing out of DDT in the framework of the implementation of Article 15 of the LBS Protocol (2009)
4. Regional Plan on the elimination of Alpha hexachlorocyclohexane; Beta exachlorocyclohexane; Hexabromobiphenyl; Chlordecone; Pentachlorobenzene; Tetrabromodiphenyl ether and Pentabromodiphenyl ether; Hexabromodiphenyl ether and Heptabromodiphenyl ether; Lindane; Endosulfan, Perfluorooctane sulfonic acid, its salts and perfluorooactane sulfonyl fluoride, in the framework of the implementation of Article 15 of the LBS Protocol (2012)
5. Regional Plan on the reduction of inputs of Mercury in the framework of the implementation of Article 15 of the LBS Protocol (2012)
6. Regional Plan on the reduction of BOD5 in the food sector in the framework of the implementation of Article 15 of the LBS Protocol (2012)

Several European Union Directives regulate pollution reduction and elimination by the EU Member states. Most heavy metals are also on the EU's list of priority substances (2455/2001/EC (EU, 2001a)); The Water Framework Directive (2000/60/EU), the Dangerous Substances Directive (76/464/EEC); Directive (2008/105/EC) on environmental quality standards in the field of water policy, the Waste Management etc. Halogenated hydrocarbons are also on the EU's list of priority substances (2455/2001/EC (EU, 2001a).

Targets

Several regional targets with regard to such indicators are defined in the framework of SAP MED 1997 and Regional Plans, 2009 and 2012 to be achieved by 2010, 2015 and 2025. The agreed targets may be also reviewed in the framework of UNEP/MAP Ecosystem approach roadmap implementation in synergy with EU Marine Strategy (MSFD) Directives. H2020 is also providing for de-pollution of the Mediterranean by 2020.

EU targets (to be inserted asap) as appropriate

Related policy documents (to be updated)

- *Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean*
- UNEP/MAP SAP MED, 1997
- Regional Plan on BOD from Waste water treatment plants,2009
- *Commission Staff Working Paper concerning the relationship between the initial assessment of marine waters and the criteria for good environmental status (SEC(2011) 1255 final)*
- *other*

Policy Question(s)

Specific policy question (s) (if applicable)

Methodology *To be completed later*
Methodology for indicator calculation (including description of data used) **Main indicators** *Mainly through emission factors* **Description of data** *Annual load per contaminant per administrative region* **Geographical coverage:** *Administrative regions of the whole Mediterranean sea watershed* **Temporal coverage** *Two data series are available : 2003 and 2008* **Basis for aggregation:** *Not yet discussed in the MAP system* **Trend analysis**: *Not yet fully available.*
Methodology for gap filling Further work needed.
Methodology references

Data specifications
Data references
External data references

Uncertainties
Methodology Uncertainty
Data sets uncertainty
Rationale uncertainty

Further work
Medium-term work **Work description** **Status** **Deadline**
Long-term work