Indicator Fact Sheet

5. Coastal and Marine Water Quality

Indicators:

5.1 Nutrient concentrations in transitional, coastal and marine waters

5.2 Bathing water quality

Indicator Specification

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Version History

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2.0	12.04.2018	MED POL, EEA/ETC (Deltares), UNEP-MAP	Includes comments from UNEP-MAP	ENI South Countries (Athens Workshop)
3.0	11.05.2018	MED POL, EEA/ETC (Deltares), UNEP-MAP	Adjustment after revision of UNEP/MAP ("Policy Questions" removed)	

Indicator Specification

H2020 Indicators	
Thematic area **WATER**	**Date** 11.05.2018 **Author (s): MED POL, EEA/ETC**
Policy theme **5. Coastal and Marine Water Quality**	
Indicators: **5.1 Nutrient concentrations in transitional, coastal and marine waters** **5.2 Bathing water quality** The specification for Indicator 5.1 is based on the specification sheet from ENPI-SEIS I (MED POL, 2015) and both Indicators 5.1 and 5.2 are in line with IMAP's fact sheets for Common Indicators 13 and 21, respectively.	

Rationale

Why is coastal and marine water quality important in the Mediterranean?

Water quality in transitional and coastal regions can be adversely affected by anthropogenic activities, such as the discharge of urban and industrial untreated sewage, agricultural and animal waste runnoff, atmospheric deposition of airborne emissions from shipping and combustion processes. These activities can lead to elevated nutrient concentrations and euthrophication phenomena, which can have negative impacts such as potentially harmful algal blooms and oxygen depletion, affecting benthic communities and fish. Furthermore, contamination with untreated wastewater will degrade the quality of bathing water and pose health risks due to increased pathogens concentrations.

Water quality is thus not only important from an environemntal perspective but also from a socio-economic one, considering that coastal tourism is a key economic activity in the Mediterranean region. Indicators 5.1 and 5.2 capture these two aspects of water quality.

Justification for indicator selection

5.1 Nutrient concentrations in transitional, coastal and marine waters

The Mediterranean Sea is one of the most oligotrophic (poor in nutrients) oceanic systems. However, some coastal hotspots receive excessive loads of nutrients from sewage effluents, river fluxes, aquaculture farms, fertilizers, and industrial facilities, resulting into intense eutrophic phenomena with adverse effects for the marine ecosystem and humans. Because nutrient enrichment is the first factor promoting eutrophication, eutrophic areas in the Mediterranean are mostly limited to coastal areas, enclosed bays, river estuaries, coastal lagoons or embayments with restricted water exchange with the open sea.

Eutrophication can cause a chain of undesirable effects, including changes in species composition and functioning, reduced water transparency due to an increase in suspended algae, oxygen depletion and noxious odour due to the decay of organic material.

Prevention of human-induced eutrophication and its adverse effects, is one of the ecological objectives (EO) of the Ecossystem Approach being implemented by the Barcelona Convention. The concentration of key nutrients in the water column is one of the Common Indicators from the Integrated Monitoring and Assessment Programme (IMAP), linked to EO5 on Eutrophication.

Different parameters have been identified as providing most information relative to eutrophication

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e.g. chlorophyll, dissolved oxygen, inorganic nutrients, organic matter, water transparency. The concentration of key nutrients in the water column, in particular where in situ monitoring is advised (see IMAP, 2016), is a «state» indicator and can relate more directly to land-based sources, with link to H2020 indicators on wastewater management and nutrients release from industrial sectors («pressure» indicators).

The results of the assessment by UNEP/MAP on key nutrients in the water column in the Mediterranean indicate that the picture in the Mediterranean is rather limited due to data availability and quality but confirm the validity of this indicator in assessing eutrophication.

5.2 Bathing water quality

Tourism is an important component of socio-economic development in the Meditteranean region. The Mediterranean beaches are known for their attractiveness and are popular tourist destinations. Discharge of untreated or partially treated wastewater in the coastal and marine environment can lead to feacal contamination, microbiological pollution and potential pathogens in the environment, posing a public health risk in bathing water sites. Despite the overal improvement of sewerage systems in the Mediterranean region, in particular in the Northern part, bathing water degradation is still a problem in many areas. Thus it remains crucial to monitor the state of the Mediterranean water quality in view of implementing and monitor the necessary measures and inform the public and visitors on the safety of coastal bathing sites.

The Barcelona Convention has adopeted ecological objectives for *contaminants not to cause significant impact on coastal and marine ecosystems and human health.* Indicator 5.2 corresponds to IMAP's Common Indicator 21: *Percentage of intestinal enterococci concentration measurements within established standards*, used to assess water quality in coastal bathing water sites.

Enterococci sp. has been demonstrated to be an appropriate indicator for faecal bacteria in brackish and marine waters and is known to be a good indicator for human pathogens in wastewater discharges.

References

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- Kocak, M. et al, 2010. Long-term atmospheric nutrient inputs to the Eastern Mediterranean: sources, solubility and comparison with riverine inputs
- MAP, 2001. Atmospheric transport and deposition of pollutants into the Mditerranean Sea, MAP Technical Report Series, No 133, Athens.
- MED POL, 2015. Indicator Fact Sheet 5. Nutrient concentrations in transitional, coastal and marine waters of the Mediterranean Sea.
- UNEP/MAP, 2016. Integrated Monitoring and Assessment Programme (IMAP) of the Mediterranean Sea and Coast and Related Assessment Criteria.

- UNEP/MAP, 2017. IMAP Common Indicator Guidance Fact Sheets (Pollution and Marine Litter).
- UNEP/MAP, 2017. Mediterranean Quality Status Report

Indicator definition

***5.1** Nutrient concentrations in transitional, coastal and marine waters*

Main indicators definition: Total Nitrogen and Total Phosphorus

The indicators refer to the levels and trends in total nitrogen and total phosphorus concentration in the transitional, coastal and marine waters of the Mediterranean Sea.

Total nitrogen (TN) is not a chemical entity but the methodological addition of the nitrogen equivalent of a number of nitrogen-containing substances. Total nitrogen 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).

Sub-indicators: **NO3, NO2, NH4, o-PO4**
These sub indicators refer to the levels and trends in: nitrate, nitrite, ammonia 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. Nitrate is the most stable form of nitrogen in oxidized marine environments. Elemental nitrogen (gas), present in the atmosphere and dissolved in the seawater, may be converted to one of other forms by micro-organisms in the nitrogen-fixation process. The reverse is also true, nitrate and other forms of nitrogen may be converted into elemental nitrogen through de-nitrification.

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, contribute 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, contribute 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 and is 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).

Units
Concentrations in micromol per liter (µmol/L)

Geographical scope
Mediterranean.

Indicator definition

***5.2** Bathing water quality*

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Main indicators definition: Percentage of intestinal enterococci concentration measurements in bathing water sites within established standards

The indicator refers to a microbiological parameter of water quality in terms of standards and criteria adopted in the Mediterranean (Decision IG.20/9) and which are also in line with the EU New bathing Water Directive (2006/7/EC). It is based on the concentration of intestinal enterococci, a faecal indicator that includes all the species from the *Enterococcus* genus. Environmental Enterococci species can often be grouped, since they fulfill the following criteria: growth between 10-45 °C, resistance to 60 °C for 30 minutres, growth at pH 9.6 and 6.5 % NaCl, and the ability to reduce 0.1% methylene blue.

Quality standards were set based on Intestinal enterococci concentration (cfu/100mL), with limit values per water quality status: Excellent quality (<100), Good quality, (101-200), Sufficient quality (185) and Poor quality/Immediate action (>185).

Units
cfu/100 mL (based on Intestinal enterococci)
Quality standards: Excellent quality, Good quality, Sufficient quality, Pool quality/Immediate action

Geographical scope
Coastal bathing sites of the Mediterranean.

Policy context and targets

General context description

One of the Barcelona Convention's main objectives is to assess and control marine pollution and eutrophication in the Mediterranean. Both the Convention and the H2020 Initiative, recognise contamination from land-based sources, including urban wastewater, as a major source of pollution in the Mediterranean Sea. The Mediterranean Action Plan and the Barcelona Convention's Protocols, together with the European Union Directives on water quality and coastal management, provide a solid policy background to assess and tackle eutrophication problems and bathing water quality degradation in the Mediterranean region.

In 2016, the Integrated Monitoring and Assessment Programme and related Assessment Criteria (IMAP) was adopted. IMAP provides guidelines for Mediterranean Contracting Parties to apply the Ecosystem Approach to the management of human activities that affect the region.

5.1 Nutrient concentrations in transitional, coastal and marine waters

The issue of a consistent monitoring strategy and assessment of eutrophication was first raised at the UNEP/MAP MED POL National Coordinators Meeting in 2001 (Venice, Italy) which recommended to the Secretariat to elaborate a draft programme for monitoring of eutrophication in the Mediterranean coastal waters (UNEP/MAP MED POL, 2003). In spite of a series of assessments reviewing the concept and state of eutrophication, there are important gaps in the capacity to assess the intensity of this phenomenon. Efforts have been devoted to define the concepts to assess the intensity and to extend experience beyond the initial sites in the Adriatic Sea, admittedly, the most eutrophic area in the entire Mediterranean Sea. In the context of the Mediterranean Sea, the Integrated Monitoring and Assessment Programme (UNEP/MAP, 2016) and the European Marine Strategy Framework Directive (2000/56/EC) are the two main policy tools for the eutrophication phenomenon.

Targets

The most pertinent regional and national targets with regard to concentrations of nutrients in water arises from the implementation of UNEP/MAP's Ecosystem Approach (EcAp) and IMAP, done in synergy with EU Marine Strategy Directive (MSFD).
The EO5 is "human-induced eutrophication is prevented, especially adverse effects thereof, such as losses in biodiversity, ecosystem degradation, harmful algal blooms and oxygen deficiency in bottom waters."
In this framework, a few targets associated to EO5 have been proposed:

1. Reference nutrients concentrations according to the local hydrological, chemical and morphological characteristics of the un-impacted marine region.
2. Decreasing trend of nutrients concentrations in water column of human impacted areas, statistically defined.
3. Reduction of BOD emissions from land based sources.
4. Reduction of nutrients emissions from land based sources

Decision IG. 21/3 of the Barcelona Convention Contractibg Parties on the ecosystems approach includes also targets on eutrophication for achieving GES.
In relation to IMAP's Indicator, for each considered marine spatial scale (region, sub-region, local water mass, etc.) the nutrient levels should be compared based on base reference levels and trends monitoring until commonly agreed thresholds have been scientifically assessed and agreed upon in the Mediterranean Sea.

Related policy documents

- UNEP/MAP, 1997. SAP MED, 1997
- UNEP/MAP, 2016. Decision IG.22/7 - Integrated Monitoring and Assessment Programme (IMAP) of the Mediterranean Sea and Coast and Related Assessment Criteria.
- UNEP/MAP, 2009. Decision IG.19/7. Regional Plan on the reduction of BOD5 from urban waste water in the framework of the implementation of Article 15 of the LBS Protocol.
- EU, 2000. 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.
- EU, 2008. Marine Strategy Framework Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy.
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5.2 Bathing water quality.

In 1985, the Contracting Parties of the Barcelona Convention adopted ad interim common Quality criteria and standards for coastal and recreational waters in 1985, in anticipation of further evidence.

In 2003, the WHO developed the "Guidelines for Safe Recreational Water Environments", which resulted in the EU linking their new proposal to the WHO guidelines.

The Mediterranean Standards and Criteria for bathing waters were proposed in 2007, based on the WHO guidelines for "Safe Recreational Water Environments" and the EC Directive for "Bathing Waters". The proposal was made in an effort to provide updated criteria and standards that can be used in the Mediterranean countries and to harmonize their legislation in order to provide homogenous data. These guidelines were coupled with instructions to prepare water quality profiles in 2009. All Mediterranean countries were assisted by WHO/MED POL to perform pilot studies on the preparation of bathing water quality profiles, which were presented in Athens in 2010. In 2012, the revised criteria and standards were agreed at the 17th meething of the Contracting parties to the Barcelona Convention (Decision IG.20/9 Criteria and Standards for bathing waters quality in the framework of the implementation of Article 7 of the LBS Protocol). The revised criteria and standards require monitoring, assessment and classification of bathing water quality status that is referred to as "excellent", "good", "sufficient" and "poor quality", with each qualification linked to clear numerical quality standards of bacteriological quality.

The EU Directive on the quality of bathing waters (76/160/EEC) is one of the oldest environmental laws in the EU, adopted in 1976. A new EC Directive was adopted by the EU, in 2006.

Targets

The main objective is to reduce gastroenteritis and other waterborne health risks and to provide better and earlier information of bathing water quality to the citizens. Though no specific targets for reduction have been set regionally, under the MAP Barcelona Convention. The initial GES proposed target is an *Increasing trend in the measurements within established standards (levels of intestinal enterococci comply with established national or international standards, such as EU 2006/7 Directive).*

Related policy documents

- UNEP/MAP, 2012. Decision IG.20/9 - Criteria and Standards for bathing waters quality in the framework of the implementation of Article 7 of the LBS Protocol.
- UNEP/MAP, 2013. Decision IG.21/3 - Ecosystems Approach including adopting definitions of Good Environmental Status (GES) and Targets.
- UNEP/MAP, 2016. Decision IG.22/7 - Integrated Monitoring and Assessment Programme (IMAP) of the Mediterranean Sea and Coast and Related Assessment Criteria.
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- EEA, 2017. European bathing water quality in 2017. 1977-8449, report no 5.
- EU, 2006. Directive 2006/7/EC of the European Parliament and of the Council - concerning the management of bathing water quality and repealing Directive 76/160/EEC.
- EU, 1975. Council – Council Directive of 8 December 1975 – concerning the quality of bathing water (76/160/EEC).
- WHO, 2003. Guidelines for safe recreational water environments. Volume 1: Coastal and Fresh Water. Geneva, Switserland.

Methodology

5.1 Nutrient concentrations in transitional, coastal and marine waters

Methodology for indicator calculation (including description of data used)

For all indicators: Spectrophotometry (manually or automated methods and instrumentation).

Main Indicators

Total nitrogen (TN) concentration

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 (ammonia, organic and reduced N) and, after oxidation, by the standard photometric technique used for analysis of nitrate. Alternatively, filtering through glass fiber filters allows the concentration of Particulate Nitrogen which will be submitted to digestion, while the filtrate would be oxidised and submitted to the nitrate analysis. The sensitivity of these techniques is high. However, except in hotspots, concentrations in surface waters may be near detection level.

Other nitrogen ions and fractions may be analyzed, depending on whether the aliquot of water has been previously filtered and/or digested: a) *organic Nitrogen (DON);* b) *Total Dissolved Nitrogen (DN)*; c) *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.

Total phosphorus (TP) concentration

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.

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.

Sub-indicators

Nitrate (NO3) concentration

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 sensitivity of this technique is very high. However, except in hotspots, concentrations in surface waters may be near detection level.

Nitrite (NO2) concentration

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. The precision of this technique is very high; however, concentrations in deeper waters may be near detection level.

Ammonium (NH4) concentration

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 sensitivity 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.

Orthophosphate (o-PO4) concentration

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 sensitivity of this technique is very high. However, except in hotspots, concentrations in surface waters may be near detection level.

Geographical coverage

Mediterranean transitional, coastal and relevant marine waters.

The geographic scale of monitoring depends on several factors (e.g. hydrological conditions, input from rivers) and the purpose of monitoring (e.g. monitoring of "hotpsots", assessment of "Good Environmental Status", etc – See IMAP Common Indicators Guidance Fact sheets).

Transitional waters: Transitional waters are those waters between the land and the sea and include fjords, estuaries, lagoons, deltas and rias. They often encompass river mouths and so show the transition from freshwater to marine conditions. Depending on the tidal influence from coastal waters, but also on the freshwater influence from upstream, transitional waters are often characterised by frequently changing salinity.

Coastal waters: The part of the ocean adjacent to the coast of a state that is considered to be part of the territory of that state and subject to its sovereignty (see http://www.wiser.eu/background/coastal-waters/)

Marine Waters: The part of the ocean that extends further to the coastal waters to the open seas.

Data sources

Data are generated from the national monitoring programme of the countries in transitional, coastal and marine waters.

In Europe: EEA Waterbase - Transitional, coastal and marine waters

In the Mediterranean: MED POL/WHO

Temporal units

At the Mediterranean Sea latitudes, in general terms, the pre-summer and Winter primary production bloom intensity peaks of natural eutrophication will define the strategy for the sampling frequency, altough year round measurements of nutrients may be more appropriate. The optimum frequency (seasonal 2 to 4 times per year or monthly 12 times per year) for the monitoring of nutrients at the selected stations should be choseen taking into account the necessity of both to control the deviations of the known natural cycles of eutrophication in coastal areas and the control of (decreasing) trends monitoring impacted areas, therefore, from low frequency (mínimum)to high frequency measurements.

Therefore, either for impacted or non-impacted coastal waters the optimal frequency per year and sampling locations needs to be selected at a local scales, whilst for open waters the sampling frequency to be determined on a sub-regional level following a risk based approach.

Temporal coverage

2003-2016

For some areas, data series exist since 1998.

Methodology for gap filling

National Laboratories should be encouraged to provide the data for the years that are not available in MEDPOL data base because they were not complying with the agreed reporting format and quality assurance programme.

Methodological references

- MED POL, 2014
- UNEP/MAP, 2017. IMAP Common Indicator Guidance Fact Sheets (Pollution and Marine Litter).

Methodology

5.2 Bathing water quality

Methodology for indicator calculation

The following methodology is in line with the IMAP's Common Indicators Guidance Fact-sheets.

ISO 7899-2 (based on membrane filtration technique or any other approved technique) has been proposed by Directive 2006/7/EC with the specification below.

Based upon percentile evaluation of the $\log_{10}$ normal probability density function of microbiological data acquired from the particular bathing water, the percentile value is derived as follows:

1) Take the log10 value of all bacterial enumerations in the data sequence to be evaluated. (If a zero value is obtained, take the log10 value of the minimum detection limit of the analytical method used instead)
2) Calculate the arithmetic mean of the log10 values (μ).
3) Calculate the standard deviation of the log10 values (σ).

Quality standards and limit values per water quality status (Decision IG.20/9):

Category	A	B	C	D
Limit values	**<100***	**101-200***	**185****	**>185****(1)
Water Quality	**Excellent**	**Good**	**Sufficient**	**Poor/Immediate Action**

(*)The upper 95-percentile point of the data probability density function is derived from the following equation: upper 95-percentile = antilog (μ + 1,65 σ).
(**)The upper 90-percentile point of the data probability density function is derived from the following equation: upper 90-percentile = antilog (μ + 1,282 σ).

(1) For single sample appropriate action is recommended to be carried out once the count for IE exceeds 500 cfu/100 mL

Minimum sampling frequency: at least one per month and not less than four in a bathing period including an initial one prior to the start of the bathing period. For classification purposes at least 12 sample results are needed spread over 3-4 bathing seasons.

Data sources

For EU countries: Directorate-General for Environment (DG ENV) , European Environment Agency (EEA).

Geographical scope

In order to comply with the stated Common Indicator within IMAP the geographic reporting scales (nested approach) should be taken into account. However, the balance between data, location and

spatial resolution should be carefully considered for coherence in areas (1) and (2), as this Common Indicator is largely (if not entirely) evaluated in coastal waters (3):

(1) Whole region (i.e. Mediterranean Sea);

(2) Mediterranean sub-regions, as presented in the Initial Assessment of the Mediterranean Sea, UNEP(DEPI)/MED IG.20/Inf.8;

(3) Coastal waters and other marine waters;

(4) Subdivisions of coastal waters provided by Contracting Parties

Temporal units
Seasonal (bathing water season, usually May-September).

Temporal coverage
IMAP referes to the Annex IV of the EU Directive 2006/7/EC for the temporal scope guidance:

1. One sample is to be taken shortly before the start of each bathing season. Taking account of this extra sample and subject to point 2 (below), no fewer than four samples are to be taken and analysed per bathing season.
2. However, only three samples need be taken and analysed per bathing season in the case of a bathing water that either:

(a) has a bathing season not exceeding eight weeks; or
(b) is situated in a region subject to special geographical constraints.

3. Sampling dates are to be distributed throughout the bathing season, with the interval between sampling dates never exceeding one month.
4. In the event of short-term pollution, one additional sample is to be taken to confirm that the incident has ended. This sample is not to be part of the set of bathing water quality data. If necessary to replace a disregarded sample, an additional sample is to be taken seven days after the end of the short-term pollution.

Methodology for gap filling
No gaps are filled.

Methodological references

- UNEP/MED, 2012. Decision IG.20/9 - Criteria and Standards for bathing waters quality in the framework of the implementation of Article 7 of the LBS Protocol.
- UNEP/MAP, 2017. IMAP Common Indicator Guidance Fact Sheets (Pollution and Marine Litter).
- WHO, 2000. Monitoring Bathing Waters - A Practical Guide to the Design and Implementation of Assessments and Monitoring Programmes.

Uncertainties
5.1 *Nutrient concentrations in transitional, coastal and marine waters*
Methodology uncertainty A number of scientific studies, in the Eastern Mediterranean clearly show that atmospheric deposition (wet and dry) plays an important role in the open sea and possibly in the coastal area as well.
Data sets uncertainty According to UNEP/MAP MEDPOL existing monitoring programme is targeting hotspot locations including sources and therefore data points are not evenly distributed along the Mediterranean coastline. This may result in geographical gaps in the available information.
Rationale uncertainty Due to variations in fresh water discharges and the hydrological variability of the coastal zone and internal nutrient cycling processes, trend and nutrient concentrations as such cannot be directly related to policy measures taken.
5.2 *Bathing water quality*
Methodology uncertainty ISO 7899-2 describes the isolation of intestinal enterococci (*Enterococcus faecalis*, *E. faecium*, *E. durans* and *E. hirae*). In addition, other *Enterococcus* species and some species of the genus *Streptococcus* (namely *S. bovis* and *S. equinus*) may occasionally be detected. These *Streptococcus* species do not survive long in water and are probably not enumerated quantitatively. For purposes of water examination, enterococci sp. can be regarded as indicators of faecal pollution, despite it should be mentioned that some enterococci found in water can occasionally also originate from other habitats.
Data sets uncertainty Different time-series may not be consistent in terms of geographic coverage, as different countries started monitoring bathig water sites in different years. There may be also a large variability in terms of the number and type of bathing sites designated.
Rationale uncertainty Human enteric viruses are the most likely pathogens responsible for waterborne diseases from recreational water use but detection methods are complex and costly for routine monitoring. Given that this indicator only consideres intestinal enterococci, compliance with high standards does not necessarily guarantee that there is no risk to human health.